CONTENTS

POSSIBILITIES OF EARLY SELECTION DONORS OF BONE MARROW NON-INVASIVE AND INVASIVE METHODS OF DIAGNOSTICS INFECTION HELICOBACTER PYLORI

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The article presents the results of studies non-invasive and invasive methods of diagnosis of Helicobacter pylori infection in donors of hematopoietic stem cells Kirghizia. Such studies are being conducted for the first time. After spending a non-invasive breathing ammonia HELIK® – test at 201 voluntary bone marrow donors, as a result of the study, which revealed positive results in 55 % of cases of Helicobacter pylori infection among donors кirghiz nationality and healthy residents of russian-speaking population of Kirghizia in 45 % of cases. And during primary of negotiability at donors кirghiz ethnic nationality revealed negative results in 43 % of cases and 57 % of cases at healthy residents of russian-speaking population of Kirghizia. Invasive method identified 84 potential bone marrow donors of кirghiz nationality from National Register of hematopoietic stem cells Kirghizia residing in the city of St. Petersburg in order to determine the amount of IgG antibodies to Helicobacter pylori infection by enzyme immunoassay. It is established that the majority of examined potential donors кirghiz nationality had blood low and middle-Ig G to infection Helicobacter pylori. High level (from 91–120 U/ml) of antibody IgG to Helicobacter pylori was detected in 13 % of cases. Detection rate infection H. pylori is high, and breathing ammonia HELIK®-test and the determination antibodies of IgG to Helicobacter pylori infection often recorded H. pylori infection among men compared with women. Thus, at the selection of donors in National Register of hematopoietic stem cells Kirghizia and in the planning of the closely related, unrelated bone marrow transplantation, research is needed on the H. pylori infection to improve the safety of bone marrow. This allows us to investigate the donor as with prophylactic measure for the early detection of infection and timely carrying in-depth examination and treatment at doctors specialists the National Registry of hematopoietic stem cells. In the presence of H. pylori infection in donors necessary be timely with the pathology of the gastrointestinal tract, dyspeptic syndrome, to not allow before expensive immunogenetic studies donors bone marrow and included in the database of the National Register of hematopoietic stem cells Kirghizia, as carriers of infection H. pylori. At observance to international protocols take biopsy material in the stomach, breathing ammonia HELIK® test and determination of serum antibody titers by enzyme immunoassay IgG to infection Helicobacter pylori have a high clinical efficacy for the diagnosis of H. pylori in the stomach which accuracy is 90 %.

Keywords: Helicobacter pylori, donors, кirghiz nation, prevalence, prevention

To date, infection Helicobacter pylori (H. pylori) – wears a global character and it has ubiquitous spread.

H. pylori – isolated in pure culture and B. Marshalom Dzh. Uorrenom in 1982 [3], is defined as the probable etiologic agent of gastritis and peptic ulcer in humans.

Infection H. pylori, plays a role in the development of tumor process "carcinogen for human" factor is deeply involved in the genesis of cancer, lymphoma of the stomach MALT-type and a significant role

in the occurrence of erosive gastritis, gastric ulcer, duodenal ulcer.

According to several authors [1, 2] that in Kirghizia by prevalence morbidity rate of stomach cancer is significantly high constitute in 12,4 %, and came in first place in the structure of cancer among the countries of the CIS.

It is well known, that in most developed and developing countries prevalence infection Helicobacter pylori has fundamental differences.

There are principled differences in the levels and the pace of infected in the different ethnic groups in developed countries. In the USA, of infected europeoids to 21 years of life is 8 %, dark-skinned of the same age – 43 % [6].

According to the data some researchers [5] in China rates infection Helicobacter pylori infection were noted in 86 % among adult population.

At the epidemiological direction Helicobacter pylori infection wears widespread character, it is believed, according to numerous data [4], that the infection takes over 60 % of the world's population, which is comparable only with the prevalence of dental caries, Streptococcus mutans.

It is known, that in the development of clinical disease play an important role such factors as the genetic characteristics of an organism, so and internal, external, and social environment. Given, that the disease often transformed and have a chronic form. However, on the early stages of infection process targeted investigations of bone marrow donors on infection H.pylori extremely are rare.

The purpose of this study was to identify non-invasive and invasive methods of infection with infection Helicobacter pylori of donor's hematopoietic stem cells.

Materials and methods of research

From February 2012 to November 2015 years were investigated 201 voluntary donors bone marrow breathing ammonia HELIK® tests at clinics in Bishkek and of

the St. Petersburg, at the age of 17 to 55 years, of them kirgchiz nationality women 54, men – 46 donor's and 100 donors residents Russian-speaking population of Kirghizia, of them – 48 women and 52 men.

And in the group of studies from 2003 to October 2015 years included 84 potential bone marrow donors kirgchiz nationality from the National Register of hematopoietic stem cells Kirghizia The studied 84 sera bloods from donors on determine the amount of antibodies IgG to Helicobacter pylori infection in the laboratory of the St. Petersburg Scientific Research Institute of Pasteur, in aged 17 to 55 years old, of them 16 women and 68 men, residents in the city St. Petersburg.

The data of were compared, with control group – 79 healthy people of the North-West region of the Russian Federation.

Determination of ammonia breathing helik®-test infection helicobacter pylori

Ammonia breathing HELIK® test (Co, Ltd "AMA", St. Petersburg, Russia). Registration number 012600862. The method is determined by registering the concentration of ammonia in the air after oral administration to the patient portion of carbamide,

Based on the evaluation of urease activity in the stomach to change ammonia – concentration in exhaled air after taking the patient portion of urea normal isotopic composition, Conducted 6 minutes before load and 6 minutes after loading, Studies sampling will take about 15 minites with conclusion about results. Method comfortable, painless and immediately after the test with the interpretation of the survey results. Specificity – 95 %. Sensitivity 92 %.

Determination of the amount antibodies of igg to infection H. pilori:

In order to determine the amount of IgG to Helicobacter pylori by enzyme immunoassay, analysis expressed in international units, was used in this test-system "ImmunoKombII H. pylori IgG".

The results were evaluated on a scale attached to the test system. On antibody levels serum distributed by the respective groups. 0–19 U/ml – negative, 20–39 U/ml – a low level of antibodies, 40–90 U/ml – the average (middle) levels of antibodies, 91–120 or more U/ml – high levels of antibodies

Statistical analysis of the results include the analysis of standard criteria. X^2-square was used to assess significant differences in the propagation of certain characteristics between the control group and a group of donors Determination of the "p" corresponding to the found value X^2 is the square, was carried out by a computer program based on one degree of freedom. Statistical analysis of the studies were carried out using the application package for the spreadsheet – Microsoft – ExcelM version 7.0 for Windows 95, for Windows-based 2010, Statistica-5.

Results of research and their discussion

The results studies at voluntary bone marrow donors enable the early diagnosis hidden carrier's infection H. pylori, which leads to the timely suspension from donation donor bone marrow.

As seen from Fig. 1, the prevalence of carriage of infection H. pylori among voluntary donors кirghiz nationality during primary of negotiability, detection of negative results in 43 % of cases and 57 % of cases in healthy residents of Russian-speaking population of Kirghizia. It is shown, that the most frequently revealed positive results among donors кirghiz nationality in 55 % of cases and in healthy resident's Russian-speaking population of Kirghizia in 45 % of cases.

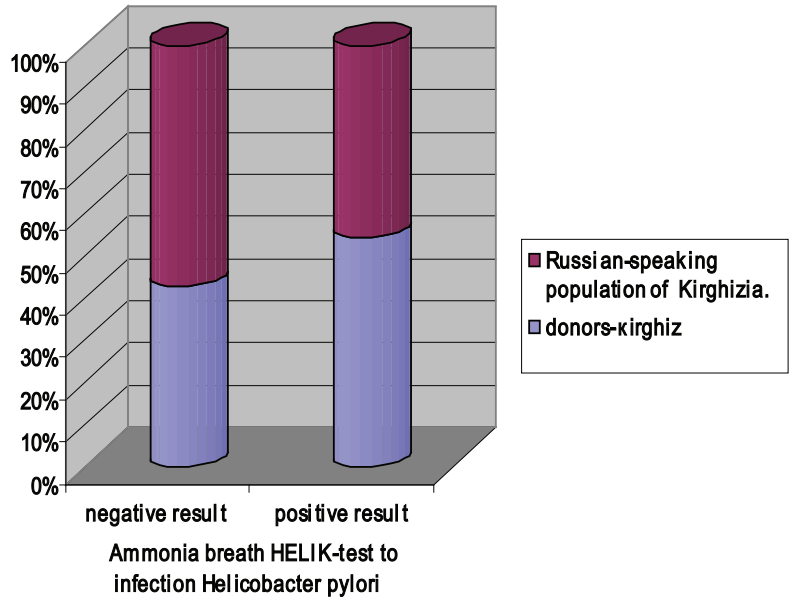

Fig. 1. Comparative evaluation of the frequency detection of infection H. pylori ammonia breathing HELIK®-tests at voluntary donors of kirgchiz nationality and residents of the Russian-speaking population of Kirghizia

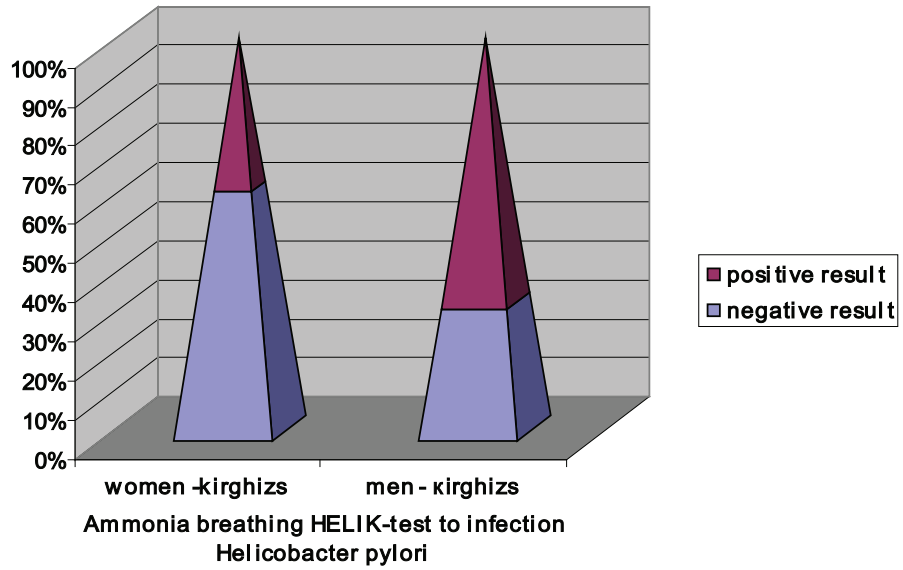

Fig. 2. Prevalence carriers infection H. pylori among voluntary donors of kirghiz nationality

In carrying out our research on the carriage of infection H. pylori ammonia breathing HELIK®-test among voluntary donors of kirghiz nationality, the data presented in Fig. 2, negative resuts amond women found in 58% of cases and the positive results of an average in 42% of cases, and among men donors kirghiz ethnic negative results in 29% of cases and the positive results in 68% of cases, but donors considered themselves practically healthy people, however, at in-depth polls we identified clinical manifestations of some donors in the form of dyspeptic symptoms (dyspeptic syndrome) and had a chronic disease in remission. When conducting us research from the National Register of hematopoietic stem cells Kirghizia at potential donors were identified antibodies to infection Helicobacter pylori. Donors who considered themselves healthy people. Clinically no symptoms.

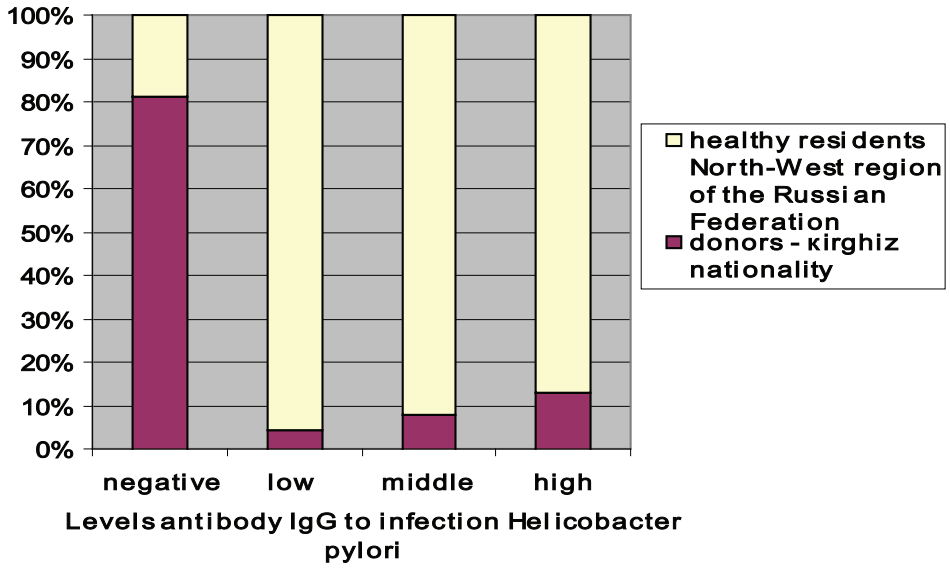

Fig. 3. The frequency detection of antibodies IgG to infection Helicobacter pylori in potential donors kirghiz nationality and healthy residents of the North-West of Russia

As seen in Fig. 3, most often revealed antibodies IgG to infection H. pylori among donor кirghiz nationality highest levels in 13 % of cases, the average level in 8 %, of the lowest levels in almost a few cases about 1–2 % and negative in 80 % of cases. In contrast, at healthy residents of the North-West region of the Russian Federation, it turned that more often low levels in 98–99 % of cases, the average levels in 92 % of cases, high levels in 87 % of cases and negative levels antibodies IgG to infection

Helicobacter pylori in 20 % of cases. When detailed surveys revealed in anamnesis of chronic gastritis in remission, chronic bronchitis (smoker) in remission.

At potential bone marrow donors, these data are given in Fig. 4, shows that among men of кirghiz nationality negative levels of antibodies IgG to infection H. pylori detected in 66 % of cases and women in 34 % of cases, low levels of antibodies indicators among men 54 %, women 56 %, medium and high levels are detected among women from 1–2 to 3–4 % of cases, and among men from 99,9 % to 99,7 % of the time.

Conclusion

Thus, considering the above data, for the selection of donors in bone marrow register, you need a thorough and quality examination, by to the principle of “do no harm neither to the donor, neither patient”. With inclusion the donor in the National Register of hematopoietic cells of Kirghizia, it is necessary to survey of a donor for the presence of microbe H. pylori ammoniac breathing HELIK®-test.

Ammonia breath HELIK®-test appropriate to apply with purpose in the quality as a method of early diagnosis on the presence of infection H. pylori at primary of negotiability voluntary donors to the National Register of hematopoietic stem cells Kirghizia for the solution of important and specific issues The donor is health or not? on indications include in the National Register of donor hematopoietic stem cells Kirghizia or not? The subsequently, donor whether the can be a potential bone marrow donor or not?

On the current time the advantage of ammoniac breathing HELIK®-test is its safety, accessibility and economically profitably. The uniqueness this non-invasive method HELIK®-test – the need to address specific issues the presence or absence infection H. pylori and is one of the most effective and convenient methods for diagnosing in outpatient conditions in clinical practice.

When planning unrelated, closely related bone marrow transplantation in potential donors of bone marrow from National Register of hematopoietic stem cells, necessary define antibodies IgG to infection H. pylori.

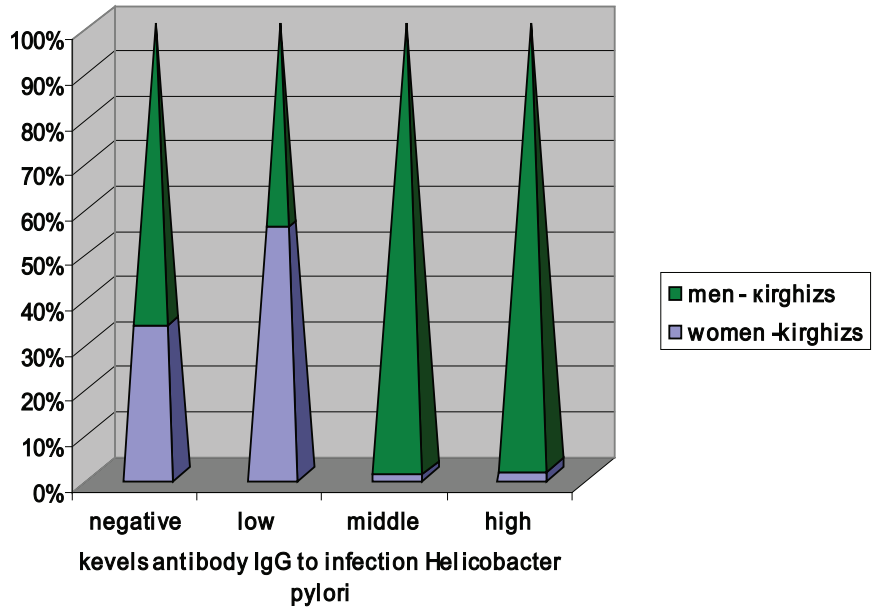

Fig. 4. The frequency of detection antibodies IgG to infection H.pylori among potential donors of кirghiz nationality from the National Register of hematopoietic stem cells Kirghizia

When diagnosing infection H. pylori, donors included in the database of the National Register of hematopoietic stem cells of Kirghizia, how debarred from the donation of bone marrow, as carriers infection H. pylori.

Findings

1. Investigate the voluntary donor on the infection H. pylori ammonia breathing HELIK®-test before inclusion in the National Register of hematopoietic stem cells Kirghizia.

2. Investigate the potential donors of bone marrow from the National Register of hematopoietic stem cells Kirghizia, before the planning closely related, unrelated transplantation ammonia breathing HELIK®-test and antibodies IgG infection to H. pylori with prophylactically.

3. In potential bone marrow donors кirghiz nationality, often revealed low and medium levels antibodies of IgG to infection Helicobacter pylori. At available a chronic dyspeptic symptoms in the gastrointestinal tract and in the blood serum elevated levels of antibodies IgG infection to H. pylori, importantly conduct EGD-skopiya with biopsy.

4. In the presence of ammonia detection infection of H. pylori respiratory HELIK® test and ELISA high levels of antibodies IgG to H. pylori infection, you need in-depth study, to conduct EGD-scopy with take with different and it is desirable a maximum before 5 section of biopsy material, and further treatment and observation at the gastroenterologist, therapist (oncologist if appropriate).

References

1. Kaziev N.K. in the Kyrgyz Republic annually growing incidence of cancer in 2012. – http://news.mail.ru//inwold//kyrgyztan/society/9550144.

2. Kibarova G.R. Clinical and morphological features of gastric cancer in young patients: dis ... cand medical sciences. – Bishkek, 2009. – P. 50–75.

3. Marshall B., Warren J.Unidentified curved bacilli in the stomach of patients with gastritis and peptic ulceration. – Lancet 1984. – № 1. – P.1311–1315.

4. Graham D. Gastroenterology. – 1997. – № 113. – P. 113–117.

5. Ma J., You W., Gail M., et.al. Helicobacter pylori infection and mode of transmission in a population at high risk of stomach cancer // Int J Epidemiol. – 1998. – № 27. – P. 570–573.

6. Malaty H., Graham D. Importance of childhood socioeconomic status on the current prevalence of H pylori infection. – Gut 1994. – № 35. – P. 742–745.

Materials of Conferences

INTRAVAGINAL VOLVULUS WITH ALLOTOPIA OF TESTICLE AMONG CHILDREN OF YOUNG AGE WITH PINCH OF INBORN GROIN-SCROTAL HERNIA OF THE RIGHT SIDE

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Urgency. Throughout the literature sources, available in the internet we have not come across description of intravaginal volvulus with allotopia of testicle among children of young age

with pinch of inborn groin-scrotal hernia of the right side, therefore, we consider our observation urgent and believe that it represents certain scientific and practical interest for practicing doctors.

Research objective. Intravaginal volvulus with allotopia of testicle is one of the most severe pathologies of scrotum organs among children, it is observed among 12,4 to 42,2% of children [1, 2], and practically does not happen to children of early age.

Methods and materials. Our examples studies a diseased child E. aged 1 year and 6 months, who was delivered to railroad clinic of the city of Aktobe in emergency with complaints of vomiting, moderate temperature, and anxiety, according to the words of mother. The woman considered the child to be diseased for 6–7 hours, did not relate his condition to faults of nutrition as the child was on lactation. It is outlines in anamnesis and, according to mother, since the date of birth there was no testicle in the right part of scrotum, and sometimes she noticed its growth in size, in the state of sleep size of scrotum came back to normal due to independent reposition of bowel loop. Local observation of the diseased child revealed swelling of solid-elastic consistence in the right groin-scrotum area with size of 2×2,5×1,5 cm, it was acutely painful for palpation, skin above the swelling was normal. The right testicle in scrotum was unable to define. Hearing of bowels peristalsis registered a solid formation of round shape, sized 5×5×3 cm in the area of right groin, acutely painful, skin above it was moderately hyperemic. The formation in groin area was noticed by mother from birth, but originally it was a small painless moderately-mobile compaction. Preliminary diagnosis – pinched inborn right-side groin-scrotum rupture and acute inflammation of misplaced testicle with reprocession to groin area. Mother had not applied to surgeons before.

With allowance of mother, considering the combination of pathological processes, the diseased child was taken to surgery under narcosis according to emergency indications. A slanting 4 cm cut in groin area was used to cleave soft tissue down to rupture sack, the latter was opened, rupture liquid was clear with hemorrhagic tint. The pinched loop of iliac bowels was acknowledged as livable after revelation of outer groin ring, and blockade of mesentery root with 7 ml of 0,25% novocaine solution was placed into stomach cavity. Rupture sack was sewed in foundation, bandaged, and cut out. Then soft tissues were moved apart along the way of distal end of seed funiculus after opening of its vagina, via method of careful pressing upon the formation in the area of right vagina of seed funiculus testicle of size 1×1,5×0,5 cm, blue-gray color was extracted into the wound. Intravaginal volvulus of testicle around axis of right seed funiculus with angle of 360° was registered. Blockade of seed funiculus was carried out with the same solution of novocaine, and after detorsion the testicle was acknowledged as livable and placed into the right part of scrotum and fixed on the bottom with catgut (as in case of cryptorchism). Stiches were placed upon vagina of seed funiculus, and groin channel was sewed according to the method of Martynov, way to the area of misplaced testicle was closed completely. Layered stiches, and after hemostasis – aseptic sticker. Post-surgical period flew with no complication. The patient carried suspension, stiches were removed on days 6–7 after surgery, healing per prima. Discharged in satisfactory condition, healthy in 3–6 months, development corresponds to age of patient. Local status: the right testicle is identical to the left in size, scrotum is painless, no swelling is present, skin color is natural.

Summary. The presented observation, though unique, demonstrates the possibility of intravaginal volvulus of testicle around seed funiculus among children of early age with its allotopia and pinching of inborn groin-scrotum rupture.

References

1. Doletskiy S.N., Zuyev Y.E., Okulov A.B. // Surgery. – 1977. – № 8. – P. 66–72.

2. Bartsch A. MadersbacherH // Z. Allgemein-med. – 1973. – Bd8. – № 26. – S. 1210.

3. Behman R.E., Kliegman R.M., Jenson H.B. (Eds), Saunders, Philadelphia 2004.

4. Brandt M.L. Pediatric hernias. – Surg Clin North Am. – Feb 2008. – № 88(1). – P. 27–43,

5. Bronsther B., Abrams M.W., Elboim C. Inguinal hernias in children a study. – 1972. – № 27. – P. 522.

6. Engum S., Grosfeld J. Hernias in children. In: Spitz L. and Coran A.G. (eds): Operative Paediatric Surgery, 6th ed. – London: Hodder Arnold, 2007.

7. Lao O.B., Fitzgibbons R.J. Jr, Cusick R.A. Pediatric inguinal hernias, hydroceles, and undescended testicles // Surg Clin North Am. – Jun 2012. – № 92(3). – P. 487–504.

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PROSPECTIVE MONITORING OF THE PITUITARY ADENOMAS ASSOCIATED WITH HYPERPROLACTINEMIA

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Introduction. Among all the most common pituitary tumors are prolactinomas, they accounted for 29 % of all pituitary tumors, and this percentage increases to 47 % if not pure prolactinoma and their mixed. If from the point of view of a specialist MRI we haven't problems in the diagnosis of pituitary adenomas, from the perspective of dynamic monitoring of patients at stages of therapy, there are certain difficulties due to the lack of monitoring standards, multiplicity of conducting MRI of the pituitary gland in the treatment, and this applies to both conservative and surgical phase.

The aim is to trace the changes in the stages of prolactinomas therapy and practice the multiplicity of conducting MRI on stages of surgical and therapeutic treatment in the prospective study.

Material and methods. For almost 20 years there has been a group of patients (n = 1200, m = 84; w = 1116, ranging in age from 6 to 65 years). The study was conducted on low field magnetic resonance system (0,23T) and superconducting MRI using standard sequences and used copyright protocols.

Results and discussion. The author in great material was able to show the multiplicity of conducting MRI with adenomas of varying size, track the dynamics of changes of pituitary adenomas and prove the possibility of recourse to signs in the hyperprolactinemia stages of macro adenomas therapy of prolactin inhibitors. The duration of monitoring allowed the author to generate a new approach to classification of adenomas with the inclusion of initial changes in the pituitary gland, identified them as adenopatia. The work is supplied with high-quality graphics and histologically verified clinical materials, allowing her to consider this as a teaching aid, which can be successfully used in professions in radiology, radiation therapy, Gynecology, Endocrinology, eye diseases, Neurology, Oncology, neurosurgery. The cited author of clinical samples and duration observations confirm the fact that patients management prolactinomas conservative way are completely justified. Extremely important is described by the author of the discovery of the syndrome of sellar hypertension, mechanisms of its development and ways of intravital diagnosis with MRI. The above allows us to consider and recommend its use monograph as a handbook for medical professions listed above, as well as in the pedagogical process of medical students, doctors, improve qualifications in postgraduate training. Deserves the description approaches such patients, the survey author's methods of calculating adenomas on the stages of therapy, development options and the pituitary Sella turcica, contrasting approaches.

Findings and conclusions. Prospective follow-up for patients with hyperprolactinemia, allowed to make a hypothesis about the existence of "co-factor" contributing to the pineal gland as the depress action on the pituitary gland, and in certain situations, the stimulating effect on the pituitary gland and the development of adenomas. Regress of clinical symptoms is especially pronounced when the pituitary micro adenoma associated thyroid dysfunction, taking contraceptives, as well as in micro prolactinoma, adenomas, the dimensions of which do not exceed 10 mm. It is, on the basis of these considerations, dynamic MRI, pathological changes in the pituitary gland, the author offers classified as adenopatia (small hypo intensive on T1 enable up to 1–2 mm in the front lobe of the pituitary gland 1 to 4-th, not inclined to merge), micro adenomas – sizes 4–6 mm, adenoma (sizes 6–10 mm), and where macro adenoma dimensions adenomas were more than 10 mm. The majority of prolactin requires conservative tactics of treatment for endocrinologist, but MRI approach-monitoring must be different.

So when pituitary changes caused by adenopatia enough observations 1–2 times per year; in adenomas, which size is 4–6 mm^{-1} in 1,5 years; when prolactinomas size 6–10 mm^{-1} once a year. It should be noted that in the process of dynamic monitoring of patients with pituitary adenomas with hyperprolactinemia, the translation should be sought from adenoma to adenopatia. While downsizing inclusions to 2–3 mm, must be implemented in the future, the hormonal control of times in 3–6 months. In this case, there is no need to understand some endocrinologists in carrying out magnetic resonance imaging at the stages of treatment bromocriptine or dostinex every six months. Best we can consider, when control of the situation is conducted in the Commonwealth physician-Endocrinologist and specialist of MRI.

The results of this work are published in the form of a monograph. The book contains 94 references, 78 figures and 294 pages.

The monograph will be accepted as collective and individual applications by E-mail: Lukans@yandex.ru.

The work is submitted to the International Scientific Conference «Innovative medical technologies», Russia (Moscow), February, 25–27, 2016, came to the editorial office on 03.02.2016.

WATER AND ELECTROLYTE METABOLISM IN PATIENTS WITH GRADE 3–4 COXARTHROSIS IN HIP JOINT IN THE CONDITIONS OF USE OF THE CATHOLYTE – LIQUIDS WITH NEGATIVE REDOX POTENTIAL

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The influence of the fluid with a negative redox potential (ORP) on indicators of water and electrolyte metabolism (VEO) in patients with grade 3–4 coxarthrosis of various etiologies, which were produced cementless total hip replacement prosthesis Baimetov. The study of these parameters analyzed in the early perioperative period (the first day the patient is in intensive care), on the fifth day after the surgery and on the twelfth day of stay (at the time of removal of sutures to surgical wound on the primary healing and the patient is discharged to outpatient treatment). Revealed the following changes: use catholyte orally two times a day in patients with grade 3–4 coxarthrosis early perioperative after Tatsu, significantly improves the studied parameters to 12 days, an increase of six indexes – the total protein (albumin) in blood plasma, hemoglobin, sodium concentration in serum, plasma osmolality, mean corpuscular volume (MCV), the mean corpuscular hemoglobin concentration (MCH). All of this contributes to the conservation of water and electrolyte homeostasis, which in turn is the prevention of possible physical complications.

Operation total hip replacement tazobedrennogy joint THA (CHP) is today one of the most popular surgical procedures – in traumatology and orthopedics. Like any high-tech operation TETS causes significant shifts of homeostasis, which reduces the adaptability of the organism and contributes to the development of various somatic complications. Currently, the study of related mechanisms of water and electrolyte metabolism in hip arthroplasty are attracting more attention of clinicians and researchers in the field of basic medicine. It is well known that water and electrolyte metabolism is one of the major systems of regulation of homeostasis responsible for the integrity and heterogeneity. This set of metabolic processes involved in the regulation of homeostatic parameters by compartmentalization through the dual system of transport of water and ions [2, 4] In the last decade, found that a significant effect on water and electrolyte metabolism, and other parameters of homeostasis has physical and chemical condition of the water [8]. The achievements of modern clinical medicine in the treatment of disorders of water and electrolyte metabolism, the problem of increasing the efficiency of the treatment of these pathological conditions to date is far from the final solution. In connection with the search for means of optimization of complex surgical treatment of orthopedic pathology our attention electroactivated aqueous solutions – a liquid with a negative redox potential (ORP). Despite the fact that currently there are numerous publications on the use of liquids with various AFP in clinical medicine [1, 3, 5, 6, 7, 9], and their mechanisms of action of pharmacological effects not completely understood. In light of this problem of particular relevance is the study of the impact of water-programmed solutions to the structural properties of the body, the control parameters of water-electrolyte metabolism and course of orthopedic pathology in the early perioperative period.

Objective: to study and determine the features changes of water and electrolyte metabolism (VEO) at the complex surgical treatment of coxarthrosis grade 3–4 (TETS) in the early perioperative period on the background of the catholyte – liquids with negative ORP.

Material and methods. To assess VEO laboratory parameters studied, were divided into two groups: indicators to assess the extracellular fluid volume; indicators for the intracellular fluid volume. The volume of extracellular fluid was assessed using the following parameters:

- the number of erythrocytes in peripheral blood;
- concentration of total protein (albumin) in blood plasma;
- the concentration of hemoglobin in the blood;
- hematocrit.

Intracellular fluid volume was assessed by:

- sodium concentration in serum;
- plasma osmolality;
- mean corpuscular volume (MCV);
- the average concentration of hemoglobin (MCH).

In the study conducted on 80 patients of both sexes with a primary Tatsu distributed into 3 equal groups: Group 1 comparisons (without ve); 2nd and 3rd experimental group (use of catholyte) aged 42–67 years from deforming coxarthrosis grade 3–4 in complex surgical treatment in the early perioperative period on the basis of the Center of Traumatology and Orthopedics CST on art. Voronezh-1 Russian Railways since September 2012 to September 2014. The study complied with the ethical rules were laid down in the Helsinki Declaration of 1964, modified 41 World Assembly, Hong Kong, 1989 and the 52nd WMA General Assembly, Edinburgh, Scotland (UK), October 2000. Each patient signed an informed consent.

Patients of the first group ($n = 40$), the correction parameters HEO conducted standard pharmacological methods adopted in our clinic. In the second and third groups of patients catholyte used in two ways, respectively. Patients of the second group ($n = 20$) received a negative

ORP liquid follows: po – catholyte (pH 8,2–8,9; ORP = –480–520 mV) 1 time per day in the 900 – the rate of 2 ml 1 kg of body weight daily for the entire period of the patient in the hospital with a first day, three days prior to surgery, with the exception of the day of surgery and then every day during the early postoperative period until complete healing n/a wound and discharge from the hospital on the 12th day). The patients of the third group ($n = 20$) were treated orally with the catholyte (the same specifications) 2 times per day and 900 to 1200 at the rate of 2 ml catholyte 1 kg body weight of the patient during the entire period of the patient in the hospital (similar 2nd patients).

The liquid with predetermined properties were obtained by setting the "Carat" (mod 20) and TU 9451-005-51702726-2006 electroactivator domestic water "Karat M" TU 3468-001-51702726. Investigations were carried out in three stages.

The study of these parameters analyzed in the early perioperative period in three stages: the first stage – the first day the patient is in intensive care; the second stage – the fifth day after the surgery; third stage – on the twelfth day of hospital stay. The indicators were examined preoperatively from all patients in the first, second and third groups. These second and third groups were not significantly different from those in the first group.

Results indicators were compared between these two patients ($n = 20$) and third ($n = 20$) groups, and the figures of the same parameters of the first group ($n = 40$), which conducted the standard perioperative management of patients without the use of catholyte. Simultaneously, patients in all three groups with a standard adopted by the conservative support for patients in a clinic on the 2nd day after surgery until discharge from hospital. In some cases (8 patients) – appointed by cardiac drugs (with concomitant cardiac pathology) with individual selection of average daily doses, depending on the degree of comorbidity.

Statistical data processing was performed using the Student t-test, using SPSS 11.0 and spreadsheet Excel. Statistically significant – effects were seen at $p < 0,05$.

Results and discussion. In the first stage on the first day the patient is in intensive care after TETS investigated following indicators VEO (Table 1).

In the first stage on the first day the patient is in intensive care after TETS first group of patients was statistically significant reduction of HGB 21,7 % ($p \leq 0,05$); the concentration of total protein (albumin) in blood plasma by 15 % ($p \leq 0,05$); serum sodium concentration of 9,5 % ($p \leq 0,05$); MCV 12,3 % ($p \leq 0,05$); MCH by 31,7 % ($p \leq 0,05$) compared with the first group before the operation.

Patients of the second group was significantly outside the concentration of total protein (albumin) in blood plasma to more than 7,35 % ($p \leq 0,05$); plasma osmolality higher by 9,3 % ($p \leq 0,05$) when compared with the same parameters of the first group on the first day after surgery.

Table 1

Dynamics of some indicators of VEO
in patients with coxarthrosis grade 3–4 in the first stage after TETS

Number	Indicators to assess the extracellular fluid volume	Before surgery	On the first day after surgery (STAGE 1)		
		The first group ($n = 40$)	The first group ($n = 40$) without the catholyte	The second group ($n = 20$) catholyte 1 per day	The third group ($n = 20$) catholyte two times a day
1	The number of erythrocytes in peripheral blood	6,22 ± 1,31	3,2 ± 1,44	3,38 ± 1,54	3,42 ± 1,27
2	Concentration of total protein (albumin) in blood plasma	80 ± 1,6	68 ± 1,1*	73 ± 0,9*	79 ± 0,3*
3	The concentration of hemoglobin in the blood	138 ± 3,12*	108 ± 3,56*	114 ± 2,88	124 ± 3,22*
4	The value of hematocrit	0,586 ± 1,84	0,348 ± 1,45	0,367 ± 1,98	0,387 ± 2,12
Performance measures intracellular fluid volume					
5	The concentration of sodium in serum	137 ± 2,31	124 ± 1,45*	142 ± 1,21	149 ± 1,13
6	Plasma osmolality	265 ± 1,6	258 ± 1,1	282 ± 0,9*	291 ± 0,3*
7	Mean corpuscular volume (MCV)	106,8 ± 4,42*	93,6 ± 3,34*	94,2 ± 3,78	97,4 ± 4,06*
8	The average concentration of hemoglobin (MCH)	37,2 ± 1,58*	25,4 ± 1,88*	26,2 ± 2,12	28,6 ± 1,66

N o t e . The significance of differences compared with the norm:*p < 0,05.

In the third group of patients was significantly increased following parameters: concentration of total protein (albumin) in the blood plasma of 16,2% ($p \leq 0,05$); the concentration of hemoglobin in the blood of 14,8% ($p \leq 0,05$); plasma osmolality by 12,7% ($p \leq 0,05$); mean corpuscular volume (MCV) 4% ($p \leq 0,05$) when compared with the parameters of the first group on the first day after surgery.

In the second stage, on the fifth day after the operation – thats an analysis of the eight indicators to assess the volume of the extracellular and intracellular fluid. The resulting values of the above parameters were compared between the patients of the second ($n = 20$) and third ($n = 20$) groups, and with the values of the same parameters of the first group ($n = 40$), which conducted a standard postoperative management of patients without the use of liquids with negative ORP (Table 2).

In the second stage on the fifth day after the TETS patients of the first group was a statistically significant decrease in the concentration of total protein (albumin) in the blood plasma of 10,3% ($p \leq 0,05$); HGB content of 14,9% ($p \leq 0,05$); Serum sodium concentration of 8,1% ($p \leq 0,05$); mean corpuscular volume (MCV) by 7,6% ($p \leq 0,05$) as compared with the first group on the first day after surgery.

Patients of the second group was significantly higher than the concentration of total protein (albumin) in blood plasma by 14,8% ($p \leq 0,05$); plasma osmolality by 15,8% ($p \leq 0,05$) when compared with the parameters of the first group on the fifth day after the surgery.

In the third group of patients was significantly increased the number of red blood cells in the peripheral blood of 12,6% ($p \leq 0,05$); the concentration of total protein (albumin) in blood plasma by 19,7% ($p \leq 0,05$); the concentration of hemoglobin in the blood by 23,9% ($p \leq 0,05$); sodium concentration in the serum of 20,1% ($p \leq 0,05$); plasma osmolality by 18,8% ($p \leq 0,05$); mean corpuscular hemoglobin concentration (MCH) by 39,5% ($p \leq 0,05$) when compared with the parameters of the first group on the fifth day after the surgery.

In the third stage in the early perioperative period with complex surgical treatment of patients with coxarthrosis grade 3–4 studied the effect of the catholyte on the 12th day of hospital stay. Results indicators were compared between these two patients ($n = 20$) and third ($n = 20$) groups, and the figures of the same parameters of the first group ($n = 40$), which conducted a standard postoperative management of patients without the use of catholyte (Table 3).

Table 2

Changes in the patients with a VEO coxarthrosis–4 degrees without catholyte (first group $n = 40$) and with the catholyte ($n = 20$ second, and the third group $n = 20$) in a second step after TETS (the fifth day after the operation)

Number	Indicators to assess the extracellular fluid volume	In the 1st day after surgery	On the fifth day after surgery (Stage 2)		
		The first group ($n = 40$)	The first group ($n = 40$) without the catholyte	The second group ($n = 20$) catholyte 1 per day	The third group ($n = 20$) catholyte two times a day
1	The number of erythrocytes in peripheral blood	3,2 ± 1,44	3,0 ± 1,22	3,22 ± 1,46	3,38 ± 1,25*
2	Concentration of total protein (albumin) in blood plasma	68 ± 1,1*	61 ± 1,1*	70 ± 0,4*	73 ± 0,6*
3	The concentration of hemoglobin in the blood	108 ± 3,56*	92 ± 3,56*	110 ± 2,43	114 ± 3,1*
4	The value of hematocrit	0,348 ± 1,45	0,332 ± 1,48	0,347 ± 1,74	0,365 ± 2,18
Performance measures intracellular fluid volume					
5	The concentration of sodium in serum	124 ± 1,45*	114 ± 1,31*	127 ± 1,26	137 ± 1,15*
6	Plasma osmolality	258 ± 1,1	234 ± 1,2	271 ± 0,6*	278 ± 0,1*
7	Mean corpuscular volume (MCV)	93,6 ± 3,34*	86,5 ± 3,24*	88,1 ± 3,54	92,5 ± 3,12
8	The average concentration of hemoglobin (MCH)	25,4 ± 1,88*	23,5 ± 1,56	28,3 ± 2,15	32,8 ± 1,35*

N o t e . The significance of differences compared with the norm:*p < 0,05.

Table 3

Changes in the patients with a VEO coxarthrosis 3–4 degrees without catholyte (first group $n = 40$) and with the catholyte ($n = 20$ second, and the third group $n = 20$) in the third stage after TETS (twelfth day after the operation)

Number	Indicators to assess the extracellular fluid volume	In the 1st day after surgery	On the twelfth day after operation (Stage 3)		
		The first group ($n = 40$)	The first group ($n = 40$) without the catholyte	The second group ($n = 20$) catholyte 1 per day	The third group ($n = 20$) catholyte two times a day
1	The number of erythrocytes in peripheral blood	3,2 ± 1,44	2,8 ± 1,68	3,1 ± 1,35	3,2 ± 1,46
2	Concentration of total protein (albumin) in blood plasma	68 ± 1,1*	63 ± 1,2	74 ± 0,3	76 ± 0,4*
3	The concentration of hemoglobin in the blood	108 ± 3,56*	92 ± 2,68*	118 ± 2,21*	121 ± 2,14*
4	The value of hematocrit	0,348 ± 1,45	0,322 ± 1,68	0,378 ± 1,24	0,392 ± 1,12
Performance measures intracellular fluid volume					
5	The concentration of sodium in serum	124 ± 1,45*	118 ± 1,31	133 ± 1,28*	142 ± 1,15*
6	Plasma osmolality	258 ± 1,1	236 ± 1,6	275 ± 0,4*	283 ± 0,5*
7	Mean corpuscular volume (MCV)	93,6 ± 3,34*	89,4 ± 2,45	95,7 ± 2,12	97,5 ± 2,88*
8	The average concentration of hemoglobin (MCH)	25,4 ± 1,88*	23,1 ± 1,12	27,2 ± 1,25*	27,9 ± 1,42*

N o t e . The significance of differences compared with the norm:*p < 0,05.

In the third step on the twelfth day after TETS first group of patients was statistically significant reduction of HGB 14,8 % ($p \leq 0,05$) compared with the first group on the first day after surgery.

Patients of the second group was significantly increased hemoglobin concentration in the blood of 28,2 % ($p \leq 0,05$); sodium concentration in the serum of 12.7 % ($p \leq 0,05$); plasma osmolality by 16,5 % ($p \leq 0,05$); mean corpuscular hemoglobin concentration (MCH) by 17,7 % ($p \leq 0,05$) when compared with the parameters of the first group on the 12th day after the operation.

In patients of the third group was significantly increased the concentration of total protein (albumin) in blood plasma by 20,6 % ($p \leq 0,05$); the concentration of hemoglobin in the blood of 31,5 % ($p \leq 0,05$); sodium concentration in the serum of 20,3 % ($p \leq 0,05$); plasma osmolality by 19,9 % ($p \leq 0,05$); mean corpuscular volume (MCV) 9 % ($p \leq 0,05$); mean corpuscular hemoglobin concentration (MCH) by 20,7 % ($p \leq 0,05$) when compared with the parameters of the first group on the 12th day after the operation.

Conclusions

1. There is a clear trend towards reduction indicators such as: hemoglobin, total protein (albumin) in blood plasma, serum sodium, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCH) to the first and fifth day after TETS.

2. Patients with catholyte 1 time per day convincing effect observed in the first and fifth day after the operation, upwards following parameters of water-electrolyte metabolism: total protein (albumin) in plasma osmolality. On the 12th day significantly increased three indicators: hemoglobin, serum sodium concentration, the average concentration of hemoglobin (MCH).

3. Use of the catholyte (negative fluid AFP) orally two times a day in patients with grade 3–4 coxarthrosis early perioperative after TETS significantly improves the studied parameters to 12 days, an increase of six indexes – the total protein (albumin) in blood plasma , hemoglobin, serum sodium concentration, osmolality, mean corpuscular volume (MCV), the mean corpuscular hemoglobin concentration (MCH).

4. Using a liquid with a negative ORP if thats contributes to the conservation of water and electrolyte homeostasis, which in turn is the prevention of possible physical complications.

References

1. Brezdenyuk A.D. Influence of electro-aqueous solutions of the reproductive function: Author. Dis. cand. honey. Sciences. Kursk, 2007. 22 p.

2. Gozhenko A.I. Age features of regulation of mineral metabolism in humans / A.I. Gozhenko, L.P. Zubkov, S.I. Dolomatov // Nephrology. – 2002 – 6 T, № 3. – P. 60–63.

3. Gridin A.A. Application of electro-aqueous solutions in the treatment of patients with purulent wounds: Author. Dis. cand. honey. Sciences. – Voronezh, 2005. – 17 p.

4. Kolesnichenko P.D. Influence of liquids with different redox potential of the organs of the gastrointestinal tract: Author. Dis. cand. honey. Sciences. – Kursk, 2012. – 23 p.

5. Latysheva Y.N. The effectiveness of electro-aqueous solutions in the treatment of chronic generalized periodontitis mild: Author. Dis. cand. honey. Sciences. – Voronezh, 2008. – 23 p.

6. Reznikov K.M. The safety of electro-aqueous solution of sodium chloride for medical purposes: monograph / K.M. Reznikov, A.D. Brezdynyuk, Y.N. Latysheva. – Voronezh: VGMA. 2010. – 144 p.

7. Reznikov K.M. Action liquids with different redox potential of the central nervous system: a monograph / K.M. Reznikov, E.B. Sabitova, O.J. Shiryaev [ed. prof. I.E. Esaulenko]. – Voronezh: Publishing and printing center «Science Book», 2012. – 279 p.

8. Smirnov A.V. proactive approach in modern nephrology // Nephrology. – 2004. – № 8 (3). – P. 7–14.

9. Fuflygina MN Influence of electro-aqueous solutions of a system of state regulation of blood agregantnogo: Author. Dis. cand. honey. Sciences. – Kursk, 2009. – 24 p.

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Short Reports

HARDWARE COMPLEX CORRECTION OF THE FUNCTIONAL STATE OF THE ORGANISM

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Introduction. In the previous article we touched upon the comprehensive study of the effects sanogenic «mediated» DAT – therapy, the first results of their research on laboratory animals [1], which is now based on the established equipment complex correction of the functional state of the body (AK (DAT).

The purpose of this study was to evaluate the effect of sanogenic and identify possible side effects AK (DAT) on the body in pathological processes that cause multiple organ failure.

Materials and methods. Investigations were carried out on adult mongrel rats of both sexes. As models of pathological processes were used cytostatic defeat organism fluorouracil (7 series of experiments) and toxic substances carbon tetrachloride (7 series of experiments). In each series of experiments «donor» and «acceptor» [1] were exposed in the complex AK (DAT), all animals, including the control group, according to standard procedures carried out taking for issletovaniya indicators blood tests (in vitro and in vivo), and of bone marrow, spleen and liver, lungs, stomach, intestines, heart, brain, testes or ovaries, pancreas, kidneys, both before and after irradiation.

Results and discussion. It was found that irradiation in combination AK (DAT) provides sanogennykh effect on pathological processes (dystrophy, inflammation), emerging in the digestive, respiratory, cardiovascular, endocrine, urinary, reproductive, immune system, diseases of the blood and of the blood and consequently , in blood.

Conclusions. Thus AK (DAT) is recommended to use in the science and practice physical therapy in the treatment of diseases other than cancer involving degenerative, inflammatory changes of the above organs and systems and, respectively, disturbance state levels of total and biochemical blood tests.

References

1. Sanogennykh effects «mediated» WCT therapy / D.I. Subbotina, etc // The International Journal of Experimental Education. – 2015. – № 10. – P. 9.

CONCEPTUAL BACKGROUND PREPARATION OF MANAGEMENT DECISIONS FOR THE FORMATION OF A MODEL OF NATIONAL HEALTH CARE: A SYSTEMATIC ANALYTICAL APPROACH

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The problems of system-analytical preparation make effective management decisions for the formation of the Russian model of healthcare with the dynamic changes in the macro- and micro-economic factors of the national economy.

Keywords: the health system, national economy, macro and micro-economic factors, the economic crisis, social and demographic aspects, the reproduction of labor potential, the model of healthcare development

Today in the economic and management community there is practically no doubt that to view healthcare as an entirely grant-based industry which consumes resources and is financed with whatever funds remain, is a profound mistake. In the present-day world healthcare is positioned as the most important social state institute, which contributes significantly to the national economy and formation of the national wealth. In all fairness this ensues from projecting the primary goal of healthcare – assurance and support of public health – through a prism of state economy, with focus on reproducing labor potential and preserving ability to work [1].

Also it should be noted that at present many countries of the global community, including the economically developed countries, struggle to resolve issues with putting together most effective models of healthcare development that consider onrush of medical science, equipment and technology, as well as dynamic transformation of social and economic environment under changes of macro- and microeconomic factors in the world and national economies, which are hard to predict. To a great extent this can be explained with greater difficulty and labor intensity in the current social and economic assessment in order to make decisions, which are important and strategically significant for adequate development of any industry, and should enable to fend off new threats, as well as dangerous and already developed problems [2].

Indeed, the globalization processes and major demographic, social, economic and environmental changes issue challenge to all countries. Over the last 25 years the countries of the European region members of the World Health Organization (WHO) witnessed a great number of profound political, economic and social changes. As it is noted in various sources even in the relatively prosperous European countries overall health of its residents improves insufficiently (in relation to the efforts made). Many specialists are getting more emphatic in their assertion that now is the time for deeper apprehension and insight into the nature and extent of determinants of problems that form within social and economic processes, and directly connect with community health care.

There come to the front problems of managerial decisions, which can be figuratively described as “financial and technological scissors” that ruthlessly and literally “hack away” attractive healthcare projects. This paradox of “financial and technological scissors” involves substantial and difficult contradiction of two trends:

– on the one hand, availability of the existing knowledge database and rapidly developing technologies enables to deal with the current issues in disease treatment and community health improvement;

– on the other hand, cost of newer and more extensive technologies can surpass available financial capacities (of both government institutions and individuals if using fee-for-service medicine), especially during periods of economic difficulties.

This explains the mounting concern that the existing state funding can prove insufficient for a financially acceptable universal access to consistent and good medical care, which is of particular importance in the circumstances of global and national economic volatility [3].

In recent years active efforts have been made to improve financial situation of the Russian healthcare. However many problems remain unresolved, with one of the reasons being incompleteness of organizational and management institutional restructuring in the industry. Their acuteness is defined not only by extent of the healthcare underfunding, but also lack of clear understanding as to which model the Russian healthcare goes to today, and what priorities there are in relation to global economic transformations and growing

demographic trends. The economic crisis escalated and clearly highlighted weaknesses in the Russian healthcare, poignantly raised a question of continuing initiated reforms, which were aimed at improving availability and quality of medical care, efficiency in utilization of the allocated state funds. Underestimation of social demographic factors plays a critical part, particularly ageing of population as a slow catalyst of an economic crisis with ominous consequences for the whole management system [4]. Especially important for today's Russia, in light of the abovementioned circumstances, is the focus on creating a strong medical support for the broad movement to fully implement aspirations to active ageing. It should also be noted that only on this basis a fully reasoned decision on incrementing the retirement age can be made (instead of the pointless and incompetent jabbering seen on TV shows).

In all countries, without any exceptions, the economic system and healthcare system are the two most complex, with their interaction contingent upon both direct and deeply internal feedbacks that are often critical for the intended effect. The public health is explicitly dependent on the level and type of economic activity and economic policy. And it involves the following chain of logic: distribution of both private and public resources – availability of effective healthcare – public health.

In fact, this conceptual arrangement determines one of the fundamental key strategies that WHO recommended to the European governments for anti-recessionary measures in 2009, which stated: "Every minister is a Minister of Health" [5]. The strategy is as relevant as ever for the situation in the Russian healthcare system. Within the given context another thesis is also practically assured that healthcare is only one of the important determinants of health, and expenses on healthcare are only one type of investments in health.

From the abovementioned it clearly follows that to invest in health means to invest in economic development of a society, which is especially relevant when the world system undergoes significant transformations in the conditions that enable the so-called "persistence" of an economic crisis. Thus in some countries it can be characterized as an "indolent degenerative economic process", while in other countries with inefficient economic policy it can develop into a threatening situation vulnerable to influences of micro- and macro-setting factors [2, 6].

Today there is an active search for the most effective conceptual framework of the Russian healthcare economic model, based on consistent and analytical research that first and foremost includes:

1. Theoretical understanding of the market mechanisms in order to achieve objectives of the healthcare policy.

2. Case studies of the market reforms in the countries, where it is implemented in the most consistent manner.

3. Assessing implementation of a market model in the Russian healthcare consistent with the aspects of the industry development [7].

4. Search for a model that corresponds with particular qualities of the Russian society and prevailing economic conditions.

The essential aspect of developing conceptual solutions to form a healthcare model is to account for a known factor, which could be called a "recessionary demand increase factor in medical care". This means that in general in a period of crisis demand for medical services increase dramatically. It also employs cause-effect relationships, which are shaped in a recessionary social and economic environment, creating another chain of social strain: changes in resources available for the healthcare system – changes in conditions and style of life and consumer behavior – changes in social norms and values – changes in public health indicators – increased risk of financial difficulties stemming from health condition [8]. To ensure the minimum required amount of financing for healthcare facilities all available sources of funding should be consolidated. Under the conditions of government deficit and low household income only a diversified model with multiple financing could be viable and ultimately effective [9].

According to the signs at this stage Russia is making a rapid transition from the social insurance model to a commercial one, that way committing an error, which some countries try to rectify by reinforcing the state role in the healthcare. The drive to a market model without an adequate understanding of risks related to the transformation is extremely dangerous from the viewpoint of healthcare functioning as a system.

Why cannot a purely market healthcare model be implemented in Russia at the present stage of social and economic development?

Strictly speaking the healthcare market model has a number of disadvantages that at present do not allow for its effective application in Russia:

1. This is an expensive model (in the USA it produces 12% GDP to the budget, and consumes 14% GDP).

2. Access to medical services is limited with the ability to pay. Even with improvements in the quality of life in Russia the most destitute social groups (the elderly, children, and disabled people) would not get full medical service.

3. Reliance on the market self-regulation reduces control over price management.

4. Private healthcare is underdeveloped, hospitals are poorly equipped for effective competition, weak facilities of medical preventive institutions (MPI).

5. Lack of management that could be effective in competitive environment and is guided by generation of profit (importance of this factor cannot be overestimated with transition to the market model).

Under the market conditions, where only changes are constant, there is a pressing need for transformation that would enable companies, or even whole industries, to be more effective. And it has a direct relation to healthcare as well.

It should be realized that in today's Russia the primary motive for company restructuring is the depth of an economic crisis and particulars of development of domestic transition economy, with its oftentimes unsystematic and even controversial reforms.

An idea, crucial to the management concept, was set forth, which stated that an organization is an open system capable of adapting to a rather diversified external and internal environment, and the main cause for what occurs within an organization should be looked for without it.

Therefore the healthcare system should be viewed as an object that functions in the environment and interacts with other systems. Primarily this means that nothing in healthcare can be localized and investigated independently. Only on the basis of such philosophy can the nature of current developments, causes for progression of processes and events be understood and correctly assessed, sources and resources of its occurrence defined, as well as targets they generate and roads to such targets.

Following the appropriate analysis of the current situation and definition of the opportunity corridors a "pattern model" of the prospective healthcare must be created. It also brings to the fore a function of labor potential reproduction in the society and preservation of its ability to work, which, as it was noted above, gives grounds for viewing the industry as the one that contributes to the national economy and generates the national wealth. Clearly in this context the healthcare is also regarded a resource consumer.

Assessing the state of macroeconomic environment in general with regards to the area of interest – healthcare, it is appropriate at first to distinguish essential qualities of the current situation in the international and national social and economic space. Today the social and economic situation in Russia and the rest of the world is ambiguous and an attempt to evaluate it highlights problem areas in practically every prominent system component [10–12]:

1. There is no doubt that the world community is in political crisis, its causes lying in the global crisis of the world order, redivision of spheres of influence, inversion of the global order, intensification of the struggle for global leadership among the largest economies in the world. Some politicians assess the current situation as a controlled chaos. At that the largest threat would be transition of the world order to an unregulated chaos with loss of control.

2. Redivision of spheres of influence between the East and the West. Establishment of global subsystems that in one way or another divide the uniting world (Transatlantic union between Europe and the USA, SCO, etc.).

3. Negative consequences of the globalization policy, which lead different countries to an ever-increasing dependence on the external market and enhance its vulnerability in all economy management areas. A dependency on external investments and exchange rates also increased.

4. The need for reinforcing the national security in all areas, especially economic security.

5. With a serious reliance on external factors, an exercise of one's right to political will may evoke (and, as practice shows, evokes) inadequate response of the world system to a situation of shift of a tenuous pseudoequilibrium in the world order. In such case it is quite challenging to anticipate consequences of some actions – more often than not they are unpredictable (considering close interrelation of different components within a unitary whole the consequences may explosively extend to all sectors in a systemic circle of the macro- and micro-economic space).

6. The "gas diplomacy" still has a significant influence on the social and economic status of the country. The raw material leverage affects strategic decision-making and proves difficult for complete removal.

7. An external political crisis in conjunction with the problems of a "resource economy" creates tendencies for internal unrest in the country. And under certain conditions this process can mount, something that is clearly noticeable in the current situation.

It would seem that healthcare is one of the most apolitical areas of a national economy, however highly qualified and responsible policy makers are increasingly focused on interprocess communications at the macro level, realizing that the most severe "shockwave impact" of the consequences would be on the social welfare, and, among the first industries, healthcare is the one to react to these negative changes.

Today many politicians and leading economists acknowledge an economic crisis is occurring in Russia, with the following characteristics:

1. It is directly related to the global political crisis (economic sanctions).

2. Alleviation of the economic relations with Europe and the USA. Increasing rate of development of economic relations with the Asian countries.

3. Economic redivision of the world – at WTO conditions new alliances between countries are established based on streamlined versions of economic cooperation with the centers of gravity at the USA and China.

4. Reorientation of the production and sales of practically all types of commodities to the Russian domestic market.

5. Rise in exchange rates to ruble. Inflation, which is constantly and perilously close to the loss of control.

6. Price deflation on the oil and gas markets, which makes the basic sector of the Russian economy – base materials – vulnerable.

7. Decrease in investment attractiveness of the Russian economy sectors and changes in the investment geography.

8. Onset of the budget deficit and the need for its redistribution under the conditions of a high uncertainty in the economic status.

9. Increment of business non-confidence in the government agencies and officials.

10. Change in the state (near-critical) of the social section in the macroenvironment as a response to political and economic transformations.

The basis of an optimistic scenario for the Russian innovative breakthrough lies in the industrial expansion and production growth in strategic perspective. Of course, a special place in solving this task is given to import substitution, though in all fairness it must be said that it did not appear on the day of announcement by the USA and Europe of their sanctions. It is well known to the specialists in economics and management. At present this is a situation, where it needs to be solved under the conditions of anti-recessionary measures, and this means quickly, reducing, redistributing and economizing material and financial resources. Under the circumstances, in the conditions of shortage of internal funds and investment reduction it is crucial not to make strategic mistakes (riding on the "wave of short-term production burst") that can lead to persistent recession, which would only be exacerbated by the existing sanctions (proportionate to their extension) [13, 14].

Today, more than ever, effective management can play a fateful role in the bailout of Russia, and it is especially in-demand in the Russian healthcare [15] (fortunately this understanding is apparent at all management levels). A rather significant factor in the effective stabilization of the current situation can be collaboration between the business elite and the state, and investments to fundamentally change the industrial production, which would enable to if not revolutionize the production, but at least to stabilize the basic branches, and outline the development options for high-technology production and systematic reorganization of the existing base concentrated in the real economy [16].

Certainly a special attention should be paid to pharmaceutics and the medical industry. There, as in other industries, the problem of import substitution is long-standing and severe, for which reason back in 2011 the Federal special-purpose program "Development of the pharmaceutical and medical industries in Russia for the period through to 2020 and further on" was designed to transfer these industries to an innovation-driven growth model. The program is geared to technical re-equipment of the Russian pharmaceutical and medical industries, bringing its products to a degree of competitiveness on the international markets, and contains a list of activities aimed at modernization of the existing research institutions and creation of new ones, and their inclusion into the chain of innovative products. It is designed to further introduce the Russian products to the international markets and increase the product output by 8 times compared to 2010 [17].

The leading Russian pharmacologists and practicing physicians feel a certain suspicion towards the announced ambitious plans for a rapid import substitution in the pharmacological industry. According to many specialists the state still allocates insufficient funds to finance research activities that precede production of the Russian medications [18–19]. This means the problems already begin at the preliminary stage of the production process (at the very beginning or even prior to the process), and naturally instead of serving as a foundation for success it creates a high risk of failure. The situation is worsened by the fact that at present it is difficult to find a Russian company able to develop a drug from scratch and carry it through to commercial distribution on the international market. Provided that the full cycle of development is 10 to 15 years, evidently it would be rather problematic to reach 50 % in production of domestic innovative products by 2020 (and according to estimations of a number of experts – absolutely impossible [20]). Meanwhile today there is only one criterion for choosing commodities in pharmacies in most cases – a lower price, which is a focus for pensioners and people of poor income. Many practicing physicians note that the quality of some Russian medications not always conform to the specifications stated and the increase of import substitution is only possible

under greater government control over the quality of pharmaceutical drugs and their compliance to the international quality standards. Out of 448 life-saving medications over 160 are still not produced in Russia [18].

There is also a not exactly comforting situation in production of the domestic medical equipment and health products. From the analysis of the Russian market of medical equipment conducted by the economists of the Bauman MSTU it can be concluded that today the most important segments of the high-technology medical equipment market are unquestionably dominated by the international companies (Hitachi, Philips, Siemens, Toshiba, General Electric, Dräger), and there are no objective preconditions for radical changes in the situation. An adequate import substitution requires consolidation of domestic producers, sufficient funding and personnel resources. The market growth is phenomenal, and the average over the stated period is ca. 19% a year (with the worldwide average of 7%). The reasons for such growth are the increase of business activities in Russia and ageing of the population that leads to a greater demand for healthcare services. In the last decade large-scale investments were attracted to the healthcare, however the funds were mainly invested into purchasing medical equipment, not developing the medical industry. Despite the growth of production of medical equipment in Russia (in value relation over the period from 2000 to 2011 by over 4 times), the share of Russian producers on the domestic market over the stated period reduced from 30 to 18,5% caused, on the one hand, by inflation, and, on the other hand, by a growth of the share of expensive high-tech medical equipment (HME) [21]. According to the analytical data the most important segments of the HME market in Russia are:

– products with high degree of imaging (tomographic scanners, ultrasonic units, angiographic units);

– anesthesia apparatus and artificial ventilation instrumentation;

– vital activities monitoring systems.

Importance of these segments has objective reasons and can be explained by not only ageing of population, but also prevalence of cardiovascular and oncological diseases, including among the middle age and with a dangerous tendency of a shift to the younger age groups.

In March 2014 a new draft decree of the Russian government "On banning purchase of commodities (selective number of medical products) produced in foreign countries for the State and municipal needs in order to protect the domestic market" was published for public hearings and assessment of regulatory control [22]. Among such products are: antiseptic tissues and draining sorbents, tomographic scanners and X-ray agents, fluorographs and defibrillators, microsurgical and dental instruments. It was assumed that following introduction of the decree the output of domestic medical equipment will increase by 4 times by 2020 compared to the estimated figure for 2014 – up to 78,8 billion rubles [23]. However, the Expert Advisory Body noted that having drawn up the draft, the Ministry of Industry and Trade did not provide analysis of the Russian industry capabilities to produce sufficient amount of medical products instead of the banned ones [24]. The experts also made some critical comments on the drafting process: views of the key reference groups and, above all, the medical community and healthcare branch that bear the prime responsibility for the quality medical service [25].

A viable competition, at least on the domestic market of high-tech medical equipment, requires an all-around consolidation of efforts from the Russian companies and drastic modernization of the medical industry. This provides an adequate import substitution on the domestic market, and also reinforces the government credibility, stimulates development of the Russian science and industry in general, creates new work places. Once again it makes abundantly clear the importance of healthcare for development of the Russian economy and possible sizable contribution to solving the task of innovative breakthrough.

It should not go unmentioned that what also poses a serious risk for preparation and implementation of the anti-recessionary program is a "rose-colored spectacles" syndrome, that enables some specialists and officials to say there is no economic crisis in the country [11]. This statement could have been regarded as accurate, if it was not for markers of worsening in the economic climate – emerging of the social crisis patterns in the country. And unfortunately a quite significant "contributor" is the existing healthcare system. For instance, at present Moscow (and it is followed by some of the regions) combines healthcare facilities – first outpatient clinics, then hospitals. The conjoined hospitals close up departments, cut back on doctors and nonmedical personnel, and not one at the time, but by dozens [25]. Doctors are offered to undergo retraining and focus their efforts on the outpatient-based care, where there are staff shortage and low availability of some types of medical care in many outpatient clinics. The reasons for the reform being implemented, according to ideologists, lie in orientation on the European healthcare model, where no more than 10%

of health care institutions are state-owned. Other medical preventive institutions comprise the private healthcare market, which falls under the market self-regulation laws. A number of hospital beds cut are explained by reduction of a number of patients in "social hospitalization" [25]. What is exactly understood under social hospitalization in the Russian healthcare? Strictly speaking it is a paramedical term that is almost never found in medical records. Sometimes we tend to forget that healthcare is a social category and any health problem can be socially important, and there is a number of facts to back it up. With a growing trend of ageing of population perhaps the term "social hospitalization" should be a part the medical practice, followed by an increase in the patient capacity for this population category. Currently the opposite is true.

One of the essential errors of the domestic healthcare is that it is attempted, however formal and without systematic analysis, to copy organizational and managerial decisions of the European countries. Historically there is a completely different structure of society in Russia. The so-called middle class is thinly represented, and high-tech and expensive medical treatment is aimed at it. Stratification of the Russian society is, to put it mildly, "quite paradoxical", and prior to focusing healthcare on a financially reliable population group, this group should be sufficiently present. Today even doctors would not be considered a part of the middle class. The reform stipulates that the social (meaning free-of-charge) segment of medical care would reduce substantially and the released facilities would be acquired by private investors that are expected to solve humanitarian problems of public health protection. Though business and social responsibility in today's Russia are two subject matters that are far apart. The business is prepared to work under public private partnership, but on one condition – it profits from every kopeck invested. The State can save on budget expenditures, though what does that leave for the patients? Now is the time to ask a long-pending question – how should the doctors keep working under the conditions of volatility and complete demotivation in their favorite occupation? Who should frail elderly people that live on a pension turn to, when in the outpatient clinics queues could last for a month, and ambulance may not attend every call, even though doctors may not be on strike at the moment, and so on, and so forth.

Those who want to save on the social sphere should not forget that the result will reverse, and this "boomerang" may hit a lot sooner than it seems. Expenditures of the government funds would increase and there would come a time to raise the question of giving private clinics back under the state jurisdiction. Single-source financing would switch to multi-source, and healthcare would stop its commercialization, as where business begins healthcare usually finishes. And it is well known that health (to the regret of a certain group of people who bought everything else) cannot be bought.

The social component is in direct and continuous relation with healthcare and it constantly affects every person through transformations of notions of employment and recreation, healthy lifestyle and other social components that, at the end of the day, form the society life.

Healthcare and social sphere is the litmus test for any economic crisis, and they are the first to react to the consequences of redistribution of any processes within the society, especially if instead of sound and elaborate anti-recessionary projects the "management enthusiasts" are concerned with another impulsive and perfunctory "modernization".

As such the situation in the domestic healthcare branch cannot be viewed independently from the ongoing processes in the world community and national economy, but should be analyzed in a consistent manner. Only an understanding of interrelations of macro- and microenvironment components would allow predicting a vector of further industry development and correcting control actions that are in the way of the reform.

The management on all levels (especially those officials responsible for strategic solutions) should overcome their irrepressible desire to mindlessly and slavishly copy one-time activities, actions and projects that "caught their fancy" during overseas trips. The branch reforms should not be fragmentary and hasty, and need to account for the interests of those involved. The necessity of unpopular measures always has economic, political and social rationale, but radical surgery is never performed on a patient that has not been prepared for it, at least psychologically.

Of course, transition to a free market economy leads up to the need for a socially responsible business environment, which has its laws of development that are different to other paradigms of commodity exchanges. But at the same time public health officials should take the following thesis as an unbreakable rule: some healthcare categories can be a commodity (in specific and individual cases), and a number of categories would never be able adopt such attributes, whatever the changes in micro- and macroeconomic factors of the national economy.

References

1. Besedin A.L. The Theory of Contemporary Organizations Management in Turbulent Social and Economic Environment: Survival, Reformation and Development // Tula: Tula State University Publishing House. – 2004.

2. Besedin A.L. Management of the Russian Healthcare // Newsletter of new medical technologies. – 2002. – Vol. IX. – № 3. – P. 110–111.

3. Besedin A.L. Theoretical and Methodological Basic of Reformation of Real Sector of Economy Enterprises. – Tula: Tula State University Publishing House, 2005.

4. Connolly M., Postma M. Health Care as Investment: Implications for an Era of Ageing Populations // Consultancy Global Market Solution, Switzerland.

5. Experts Fear the Consequences of the Medical Products Ban // RIA Novosti. – March 2014. – http://ria.ru/disabled_know/20140328/1001458777.html.

6. Gabuyeva L.A., Shipova V.M., Alexandrova Yu.A.; endorsed by L.A. Gabuyeva. Economic Foundations of the Russian Health Care. Institutional Model. – Moscow: Delo Publishing House, RANEPA, 2012.

7. International Medical Devices Manufacturers Association. Information site.

8. Kalinovskiy I. The Industry Handed a Surprise // Expert Online. – October, 2014. – http://expert.ru/2014/10/15/promyishlennost-prepodnesla-syurpriz.

9. Khasanova A. Import Substitution on the Russian Pharmaceutical Market: Values of the Occurrence // Medical Practice. Information Site for Health Care Professionals.

10. Koksharov A. Sacrifices at the Leadership Altar // Expert. – № 44(621). – http://expert.ru/expert/2014/44/zhertvyina-altar-liderstva.

11. Mekhanik A. Revolution Devours Own Doctors // Expert. – № 44 (921). – http://expert.ru/expert/2014/44/revolyutsiya-pozhiraet-svoih-vrachej.

12. Mekhanik A. The Reform Will Be Difficult, But Doctors Not Ready // Expert. – № 44 (921). – http://expert.ru/expert/2014/44/reforma-budet-tyazheloj-a-vrachi-k-nej-ne-gotovyi.

13. Medvedev O. Lagging Strategy // Supplement to the Kommersant newspaper. – 2010. – № 85. – P (4385).

14. Models of the World Healthcare Systems. – http://duma.tomsk.ru/page/2956/.

15. Otstavnov S. Research of Russian High Technology Medical Equipment Market: The Socio-Economic Aspects // Modern Research of Social Problems (Digital Science Magazine) . – 2013. – № 1(21). – http://www.sisp.nkras.ru.

16. Pharma 2020. Open platform of expert discussions. – http://www.pharma2020.ru/discussion/topic/6547.html?pharma2020=0223e3cc41acc42e5.

17. Popovich L.D., Potapchik Ye.G., Sakhutdinova S.K., Seleznyova Ye.V., Sheiman I.M., Shishkin S.V., endorsed by Sheiman I.M., Shishkin S.V. Modernization of Health Care: New Situation and New Tasks. – M.: Delo Publishing House, RANEPA, 2010.

18. Seleznyov M. Stagnant Economy: When Will the Crisis Begin in Russia? // RBC. Personal finance. – 2014. – http://lf.rbc.ru/recommendation/other/2014/05/22/240482.shtml.

19. Sheiman I.M. Theory and Practice of Market Relations in Health Care // State University – Higher School of Economics. – 2007.

20. The new European policy for health – Health 2020: Vision, values, main directions and approaches // WHO. – 2011.

21. WHO, 2009 (World Health Organization). Health in times of global economic crisis: Implications for the WHO European region // Meeting report. – Oslo, 1–2 April 2009.

22. WHO, 2010. World health report // WHO. – 2010. – P. 9.

23. Zhoga G. Gardens and stones // Expert Ural. – № 44(621). – http://expert.ru/ural/2014/44/ogorodyi-i-kamni.

Materials of Conferences

EFFICIENCY EVALUATION OF VIBRATION MILLING OF MINERAL MATERIALS IN THE CONTEXT OF SOLID WASTES FROM HYDROGEN FLUORIDE PRODUCTION

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In this article, the results of performance studies on a laboratory vibration milling device are provided for the process of treatment of calcium sulfate-containing waste of hydrofluoric production in chemical industry. The obtained findings have allowed determining the operational parameters of semi-industrial vibration milling device using calculation analogies method. These parameters are the basis for design and construction of the experimental prototype. Pilot testing of the experimental prototype have demonstrated essentially high performance characteristics of fluoroanhydrite milling process in comparison with traditionally used equipment such as ball mills.

One of the actual ecological problems is a recycling of permanently accumulated industrial wastes. It is reasonable to search for the solution from the point of view of energy- and resource-efficient technologies.

$$CaF_2 + H_2SO_4 = 2HF + CaSO_4. \quad (1)$$

The main aim of this work is to study the efficiency of vibration milling of one of the solid industrial wastes – fluoroanhydrite, the analogue of natural mineral material, anhydrite. Secondly, it is necessary to develop the scaling model for laboratory vibration equipment with the given industrial performance for one of ways of recycling calcium sulfate-containing wastes of hydrofluoric production in chemical industry.

By the reaction of hydrogen fluoride formation (1), the solid waste of anhydrous calcium sulfate affords as by-product. In technical and scientific literature, this product is referred as 'fluoroanhydrite'. Some properties of fluoroanhydrite from OJSC "Siberian chemical combine" (Seversk) are given in Table 1.

As it seen from Table 1, the chemical basis of fluoroanhydrite is a solid anhydrous calcium sulfate (up to 98,2% wt.) in a form of pelletized material with various grain composition (from 30 mm to 0,1 mm), bulk mass in range of 1,37–1,57 t/m^3 and actual mass of 2,57 t/m^3. Previously, it was established that the most perspective direction of the neutralized fluoroanhydrite usage is the exploitation of binding properties of this waste in production of construction materials and products [1].

In Western countries, the top priority direction of fluoroanhydrite usage is the production of anhydrite-based construction materials [2]. In this case, it might be assumed that pelletized fluoroanhydrite was not grinded during the preparation of the fusion mixture, but only the excess of sulfuric acid was neutralized. Even the leader in Western hydrogen fluoride technology, "Buss A" Company does not recycle solid wastes of hydrogen fluoride production and dumps the neutralized pulp is in the nearby canyons [3–5].

It is known from the theory of binding materials that the higher the active surface of the binder, the more durable the building material. Therefore, besides neutralization of acid components in fluoroanhydrite, grinding and averaging of the raw material is required for construction industry. The process of grinding of this mineral technogenic material is a necessary stage of energy- and resource-saving technology of anhydrite binder production.

Materials and methods. Previously, processes of neutralization and grinding were performed in ball mill by staff of the Tomsk Polytechnic University. During this operation, relatively low volumetric efficiency of ball mill (about 0,04 t/m^3·hour) appeared as well as insufficient rate of mechanical activation (the maximum registered size of grain was about 0,6 mm). Respectively, when grinding rate was increased, the hour performance declined. Under these circumstances, it was necessary to improve the existent technology of grinding, thus it was proposed to use vibration-milling method

Table 1

Composition of the initial fluoroanhydrite from OJSC "SCC"

Temperature of the waste, °C	Chemical composition of fluoroanhydrite, % wt.				Angle of slope, degrees	Grain size (mm) and composition, % wt.				
	$CaSO_4$	CaF_2	H_2SO_4	HF		+5	5–2,5	2,5–2	2–1	–1
150–230	88,5–98,2	0,5–1,8	0,5–10,0	0,01–0,2	31–41	6,7–20,2	8,7–20,0	4,2–7,2	14,5–46,2	29,4–39,2

for mechanical activation of fluoroanhydrite [7]. Vibration methods are reputed to have an activation impact on the material properties; due to this fact, they provide the most effective solution for a number of problems [8].

Laboratory vibration milling device (LVM) is represented as grinding chamber made from metal pipe internal diameter of 80 mm and height of 80 mm. In the bottom, it is constrained with metal perforated diaphragm (Fig. 1, 2).

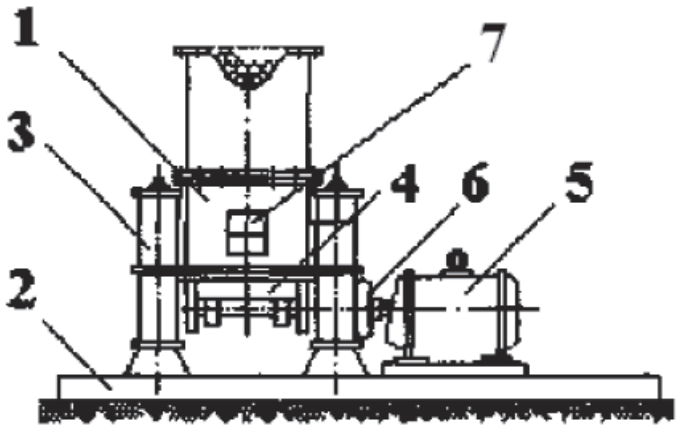

Fig. 1. Laboratory vibration milling device:
1 – grinding chamber volume of 3,2l; 2 – supporting plate; 3 – steel shock absorbers;
4–6 – electromechanical vibrator; 7 – unloading gate

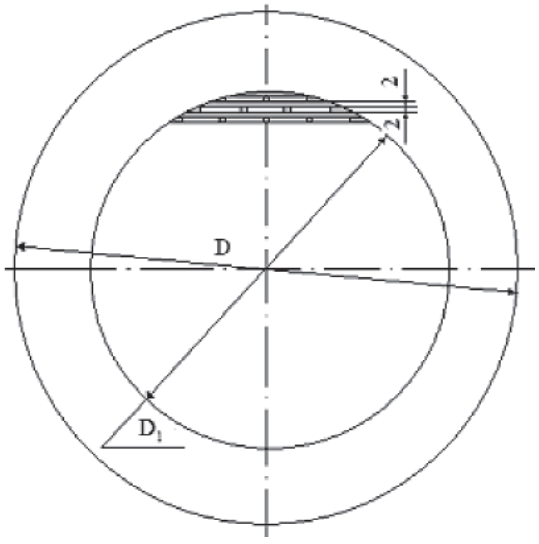

Fig. 2. Grate bar of vibration grinder

The internal chamber is filled with uniform-sized steel balls diameter of 15 mm to the height of 100 to 200 mm. Vibration milling device is equipped with steel shock absorbers, eccentric electromechanical vibrator and bunker with dosing auger conveyor used to supply the grinding chamber with pre-dozed raw material. Using this milling device, operational parameters of fluoroanhydrite milling were established to achieve the desired grain size and maximum effective performance.

As a result of numerous practical experiments, high performance characteristics of LVM were established. These data give ground for design of a pilot device with similar specific characteristics as in industrial scale. Therefore, the analysis of performance characteristics of LVM is necessary to provide recommendations for design and construction of the mentioned device.

Principal scheme of LVM could be demonstrated as a vibrating system (Fig. 3) with parameters *M*, *C* and *Fd*(*t*):

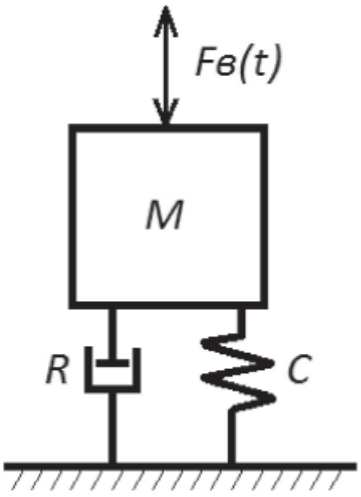

Fig. 3. Principal scheme of LVM

Where M determines the total mass of LVM elements, which oscillate, ***C*** characterizes stiffness of the suspension structure of LVM, and *Fd*(*t*) is the disturbing force which affects the LVM. The total mass of oscillating elements of LVM is the sum of masses of the grinding chamber, steel balls, mill feed material, supporting plate with the chamber and eccentric vibrator attached, and the mass of electromechanical vibrator. Stiffness of the vertical suspension of LVM is formed by four springs is $523 \cdot 10^3$ N/m. Disturbing force of the vibrator *Fd*(*t*) has amplitude F_0 of 2500 N and frequency of 50 Hz.

Taking into account the fact that LVM oscillates only in vertical dimension, we can formulate the equation of LVM movement with specific presumptions as:

$$M\frac{d^2x}{dt^2}+R\frac{dx}{dt}+Cx=F_{0в}\sin\omega t, \qquad (2)$$

where M – the total mass of oscillating LVM elements, kg; R – resistance of viscous losses, N·cm/m; C – suspension stiffness, N/m; x – amplitude of vertical oscillations, m; F_0 – amplitude of the disturbing force, N; $\omega_в$ – frequency of the disturbing force, sec^{-1}.

In case of oscillations in air, losses of viscous friction (R) can be neglected, thus equation (2) can be formulated as:

$$M\frac{d^2x}{dt^2}+Cx=F_0\sin\omega t. \qquad (3)$$

Amplitude of the oscillating chamber loaded with balls and mill feed material can be calculated by the following expression:

$$X_0=\frac{F_0}{M\sqrt{\left(\omega_{0в}^2-\omega^2\right)^2}}, \qquad (4)$$

where X_0 – amplitude of LVM oscillations, m; ω_0 – natural oscillation frequency of LVM, sec^{-1}.

During practical tests on LVM, we have varied height of steel balls filling in the grinding chamber, which influenced the total mass M and its natural oscillation frequency, respectively. The mentioned operational parameters of LVM are presented in Table 2. As seen, changes of the total mass M lead to relevant changes of natural oscillation frequency of LVM.

In Table 3, calculated values of operational parameters for oscillating elements of LVM are demonstrated. These calculations are based on the equation (4), where mass of single steel ball is 13,8 gram.

The maximum obtained performance of LVM corresponded the height of steel balls in the grinding chamber of 200 mm. In this operation mode, natural oscillation frequency of LVM equals to 176 sec^{-1} and oscillating amplitude of balls is 2,2 mm. Steel balls are located on mechanically unbound layers and in some periods of time can oscillate with phase shifting of π. In this case, the maximum distance between balls reaches 4,4 mm. Consequently, for ensuring the optimal operation parameters, it is necessary to perform pre-treatment procedures of the initial material in order to achieve certain grain size of particles. In the current case, the maximal grain size should not excess 4 mm. During the experiment, it was revealed that the maximal performance of grinding stage achieved with the grain size of 3,5 mm, and calculated value of the interaction force between balls of 5,94 N. Moreover, the maximal pressure in space between balls can be evaluated taking into account size of balls and force generated by every single ball in LVM. When the diameter of the single ball is 15 mm, the minimal space between balls is characterized by the diameter of 2,31 mm. In this case, calculated pressure in the inter-ball space in LVM (P_r) that ensures enough performance of grinding of the initial material is $14,2 \cdot 10^5$ Pa. Above mentioned studies and the modeling method are the basis for design of industrial-scale vibration milling device.

Table 2

Operational parameters of LVM

Height of filling with steel balls, mm	100	150	180	200	220
Number of balls, pcs	160	240	290	320	355
Total mass of oscillating elements, kg	14,7	15,8	16,5	16,9	17,3
Suspension stiffness, N/m	$523 \cdot 10^3$	$523 \cdot 10^3$	$523 \cdot 10^3$	$523 \cdot 10^3$	$523 \cdot 10^3$
Natural oscillation frequency, sec^{-1}	188,8	182	178,3	176	173,7

Table 3

Operational parameters of LVM (part II)

Height of filling with steel balls, mm	100	150	180	200	220
Oscillation amplitude of balls, $m \cdot 10^{-3}$	2,7	2,4	2,3	2,2	2,1
Speed of balls, m/sec	0,85	0,76	0,71	0,69	0,66
Ball acceleration, m/sec^2	266,9	238,5	224,3	215,6	207,7
Interaction force between balls, N	7,35	6,57	6,18	5,94	5,72

Data obtained from the practical studies and the known size of steel balls allows to determine the value of the force that is required for milling of the initial material (F_N):

$$F_N \geq P_T S_M, \quad (5)$$

where P_T – required pressure in the inter-ball space, Pa; S_M – surface of the inter-ball space, m^2.

The oscillation amplitude (x_T) of the industrial-scale vibration milling device with the equatable performance can be evaluated if the force F_N and ball mass are known:

$$x_T = \frac{F_N}{2\omega_в^2 m_b}, \quad (6)$$

where m_b – mass of the single ball, kg.

The following properties were set to achieve the suitable uploading volume of material and sufficient number of steel ball layers: diameter of balls is 30 mm, the total mass of device is 700 kg, and the inter-ball space is 4,68 mm.

Basing on expressions (5), (6) and the above-mentioned properties it was revealed that calculated value of the oscillation amplitude of the device should be more than 1,12 mm. In these conditions, the task of designing an industrial-scale device is to choose suspension stiffness and amplitude of the disturbing force.

As it appears from the equation (4), the required oscillation amplitude of the device can be achieved by three possible ways, by changing one of the three parameters while the two others are constant. Adjustment of the suspension stiffness is restricted at the industrial unit by the ability to manufacture springs of enough capacity. That is why standard cylindrical compression springs "K-KT2IIIT" were chosen for industrial unit design. The spring has rod diameter of 12,7 mm, internal spring diameter of 127 mm and 9 spring turns. The stiffness of single spring is $18{,}14 \cdot 10^3$ N/m and the total stiffness of 4 springs is $72{,}56 \cdot 10^3$ N/m, respectively. The frequency of the disturbing force is determined by characteristics of the utilized standard electromechanical vibrator. As a rule, the frequency is 50 Hz. Calculated value of the natural frequency of 700 kg industrial unit equipped with four springs is 10,18 sec^{-1}.

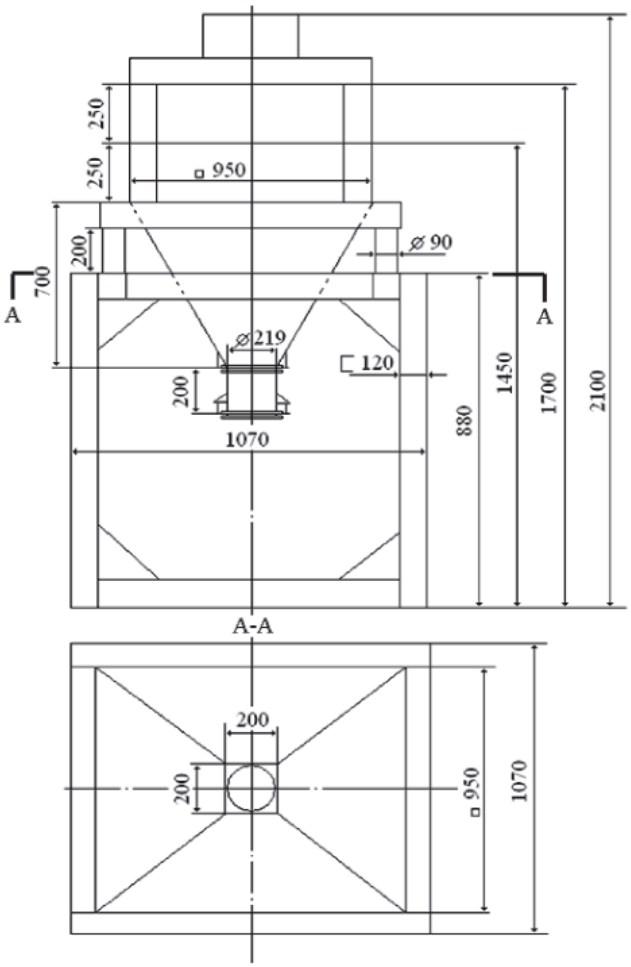

Fig. 4. Dimensions of the industrial vibration milling unit performance of 1500 kg/hour

Then, according to the equation (4), theoretically sufficient value of disturbing force should be at least 77,329 N for obtaining the required oscillation amplitude of the industrial unit of no more than 1,12 mm.

Based on the above calculations, pilotdevice with the following characteristics was constructed (Table 3, Fig. 4).

Table 3

Operational parameters of the pilot device

Total mass of oscillating elements, kg	700
Steel balls diameter, mm	30
Suspension stiffness, N/m·10^3	72,56
Disturbing force, N	85,000
Vibrator frequency, Hz	50

Results and discussions. During pilot testing of the designed and constructed vibration milling device performance of 1500 kg/h (as presented in Fig. 4), it was revealed that it has volumetric efficiency at the level of 4000 kg·m^3/h, what is two-order higher than volumetric efficiency of equatable ball mill. The mass of the device as well as the power of electric motor of the vibrator is one-order lower than it is required for ball mill with equatable hour performance.

In conclusion, it should be stressed that vibration milling process has considerable advantages in terms of resource- and energy efficiency in comparison with milling in ball mills. In this case, metal intensity of ball mill (BM) performance of 1,6 tones/hour is 13,8 tones, while metal intensity of vibration milling device (VM) is 0,7 tones; volumetric efficiency is 0,04 t/m^3·hour and 4,0 t/m^3·hour for BM and VM, respectively. In regards to energy consumption, the power of electric motor of the vibrator for BM is 55 or 34,375 kW per ton of raw material, and 5,5 or 3,67 kW for VM motor, respectively.

References

1. Fedorchuk Yu.M. Technogenic anhydrite, its properties and applications. – Tomsk: Publishing house of TPU, 2005. – P. 111.

2. Vorobyov Kh.S. Plaster binder products (International practices). – M.: Stroyizdat Publishing house, 1983. – P. 312.

3. Gentili R. “Buss A” company. Patent of Sweden № 495283, 15.10.70.

4. Production of hydrogen fluoride. Patent of USA № 28004, 21.06.77.

5. Method of hydrogen fluoride production. Letter of request of Federal Republic of Germany № 2544572, 07.04.77.

6. Fedorchuk Yu.M. Results of commissioning works and technological testing of unification process of anhydrite obtained from solid wastes of hydrogen fluoride production at OJSC “SCC” // Chemical Industry. – 2004. – Vol. 3. – P. 113–115.

7. Fedorchuk Yu.M., Volkov A.A. et al. Multi-chamber mill with milling elements. RF utility model patent № 86119, 27.08.09.

8. Loskutova Yu.V., Daneker V.A. Changes in rheological properties of high-wax oil induced by vibro-jet magnetic activation // Journal of Engineering Physics, Belarus National Academy of Sciences. – 2004. – Vol. 77. – P. 146–150.

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CONTEMPORARY ART ABOUT THE TRAGIC FATE OF MAN IN GLOBAL CIVILIZATION: REFLECTIOS ON A.P. ZVYAGINTSEV'S FILM «LEVIATHAN»

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This article analyses the philosophical content of A. Zvyagintsev's film «Leviathan» which can be understood only if we use a priori categories. Such a «category» is the image of the biblical Leviathan, allowing interpreting the film from a position of Bible. The misfortune of an ordinary man from Russia proved to go beyond everyday life and takes on common to all mankind sense. The tragedy of an individual becomes a tragedy of the modern global civilization when only God can save man.

Keywords: «God», «Leviathan», «Satan», «A priori categories», «Man», «Person», «Tragedy», «Art», «Pious», «Global civilization», «Church», «The Body of Jesus Christ», «The Body of Satan», «Subjectivism», «Objectivism», «Ordinary man»

A.P. Zvyagintsev's film «Leviathan» makes a deep positive impression in one aspect. One can argue about the artistic merits or demerits of this film, but it is clear that it fulfilled its main philosophical mission – showed people a sense of reality. However, this sense of reality can be discerned only if we use some intellectual «glasses» or, in the language of Kant, *a priori categories*, allowing to see the world from a certain viewpoint. In the endless stream of various empirical events that take place in the film (drunkenness, fornication, cursing, the tyranny of power, murder, dishonesty, etc.) they help us see a general picture, in a coordinate system where everyone can occupy their place in life, in other words, to solve the main philosophical question about the relations between man and the world.

In most cases, modern artists adhere to the position of subjectivism, that is, they are trying to give their own subjective vision of a problem, put their experiences, feelings and emotions on public display. Such protrusion of the «I», self-searching in the depths of their psyche is usually interesting only for a narrow circle of friends and aesthetes. Other artists adhering to the position of objectivism are trying to follow the path of the primitive realism allegedly allowing to reflect objectively the reality in the form in which it exists. But, as it is well known, facts as themselves do not exist. They are always interpreted, depend on the context, the theory, some of the common attitudes and perceptions. Therefore, both subjective and objective trends are of little use. They are unproductive. The task of the real art is that, firstly, the subjective and objective factors are to be given in dialectical unity, and, secondly, are to be examined in the light of the Absolute Truth, which will give a spiritual sense to the whole. A.P. Zvyagintsev quite succeeded in showing it. He sees modern life through the well-known image of the biblical Leviathan («twisted»), which is the symbol of the enemy of God, or Satan (from the Hebrew. שָׂטָן, Satan – «enemy», «slanderer»).

The Image of the Leviathan

In the book of Job (Bible) there is the only description of Leviathan (Satan). We are presenting this description of Leviathan because of its great importance: «I will not conceal his parts, nor his power, nor his comely proportion. Who can discover the face of his garment? Or who can come to him with his double bridle? Who can open the doors of his face? His teeth are terrible round about. His scales are his pride, shut up together as with a close seal. One is so near to another that no air can come between them. They are joined one to another; they stick together, that they cannot be sundered… The flakes of his flesh are joined together: they are firm in themselves; they cannot be moved... The sword of him that layeth at him cannot hold: the spear, the dart, nor the habergeon. He esteemeth iron as straw, and brass as rotten wood. The arrow cannot make him flee: sling stones are turned with him into stubble. Darts are counted as stubble: he laugheth at the shaking of a spear…Upon earth there is not his like, who is made without fear. He beholdeth all high things: he is a king over all the children of pride» [7, Job 41: 12–34].

This Leviathan in the history of culture and philosophy, according to the English philosopher Thomas Hobbes (1588–1679), is usually identified with the State or «mortal god» [8], who brings to man peace and security. But this interpretation is not correct. The true meaning of the Biblical image of Leviathan is that it gives the image of Satan, or rather, «the body of Satan» by analogy with «the body of Christ» [7, Eph. 4: 12] – the Orthodox Church. And as «the body of Christ» is not just a collection of people, but a living divine-human organism, consisting of Christ Himself, angels and

believers in Him, so «the body of Satan» is based on the unity of its members, interconnected with feelings, thoughts, actions and sinful way throughout life. This connection is so strong and thick that it is quite impermeable to external influence. It is the self-enclosed organism living by its own internal laws.

Leviathan is the symbol of our global civilization

The producers of the film through this image of Leviathan show the current global civilization that has formed before our very eyes in the last decade. This is the civilization of the Apocalypse, in which there are two main forces – on the one hand, the golden calf, fused with the State power and, on the other hand, disordered, often perverted sex and fornication. And both forces, each in its own way, turn the world into a single economic and sexual entity [7, 1 Cor. 6: 16–17], which is called the second Babylon (the Apocalypse of John the Theologian), or the mystical «body of Satan». We would remind you of it being the antithesis of the Orthodox Church, the mystical «body of Jesus Christ».

In this global world, everything from the life of the individual to the countries and peoples, is measured, weighed, bought and sold being on the balance of certain financial institutions [3]. A series of «orange revolutions», the war in the Ukraine, in the Middle East for the redivision of the world, the separation of civil society in many countries of the world between to «two Cities» [6] on the principle of «traditional» and «non-traditional» morality, and some other events demonstrate the final act of the world tragedy [3; 4].

Therefore A.P. Zvyagintsev could present the problem after the example of every country and every people, drawn into the maelstrom of today's events. By the way, the producer of the film used to say he made a start from a similar situation that happened with an American man in the United States. A.P. Zvyagintsev got the idea of the film in 2008 when he heard a story of an ordinary American who came into conflict with the state of Colorado authorities that denied his rights. Then it became clear that this story could happen anywhere. This film is about an ordinary man coming into collision with State system. That's why A.P. Zvyagintsev moved the plot into Russia. The producer is unlikely wanted to discredit Russia but he wanted to emphasize the fact that in Russia all these global events occur particularly bright and dramatic. This plot reminds us of the history of pious Job. His misadventures may be compared with those of the main hero of the film – car mechanic Nicolai Sergeev. Hence the name «Leviathan».

The pious Job and the tragedy of ordinary man

This theme was affectively tackled through the medium of A.P. Zvyagintsev's film, which moved the story into Russian reality. In the case of Russia such conflicts between people and authorities are particularly bright and dramatic for the simple reason that Russian Orthodox Church is the last bastion of Truth which the enemy could not overcome. Christ says: «I will build My Church, and the gates of Hades shall not prevail against it» [7, Mat. 16: 18]. But this does not mean that the enemy would not try to overpower the Church. In the film, the storyline is clearly displayed in the attempts of Leviathan to penetrate the Church gate under the guise of orthodox Bishop, having a pious sermon on every occasion, and the criminal mayor, «laundering» his pangs of conscience through stolen money which he occasionally donates to the improvement of the Temple.

But let's not forget that the first to enter the Paradise, as you know, was a repentant thief, hanging on the cross next to Christ. The Lord says: «I have not come to call the righteous, but sinners, to repentance» [7, Luk. 5: 32]. The Mayor of the town Vadim Shelevyat, although with great difficulty, under the pressure of external circumstances, makes the first small steps for moral support in the direction of the Church. He is in his own way trying to stifle pangs of conscience to find peace of soul. Of course, these attempts are clumsy, wrong, distorting the essence of repentance, but historically tested – for centuries Catholics had bought indulgences. Moreover, they had bought them not only for sins committed, but also for the future ones.

Our protagonist, car mechanic Nikolai Sergeev, though not an angel, naively imagines himself a righteous man innocently offended, who is struggling against unjust corrupt town authorities. But, alas, he is not a righteous Job, and therefore a priori doomed to failure. The orthodox priest, Father Vasily, reminds him of this and cites as an example the relevant passage from the Book of Job, comparing the misadventures of the contemporary hero with the sufferings of the righteous man of the Old Testament. Answering the main question of Nicholas, «Where is your God the Merciful ...?» Father Vasily says to Nicholas, «Mine is with me. And where is yours I do not know. Who do you pray? I have not seen you in the Church. You do not keep the fast, do not take Holly Communion, do not go to Confession», hinting heavily drunken Nicholas, what god he serves. «Satan reigns there».

However, Nikolai, unbeliever in God, proudly challenges mayor, who represents the evil forces, not realizing that he himself, his wife and his friend are the cells of the mystical body of Leviathan. But a man must be perfect in such a struggle. Even if the biblical Job admitted to being in the wrong before God and lack of strength before Satan, our hero is not going to admit it. He does not realize his weaknesses and does not want to consider himself a sinner. At the end of the film Nikolai is sentenced to fifteen years of imprisonment, perhaps during which his moral renewal and spiritual revival through the pain and suffering would take place. But for that the second series of the film is required [5].

Conclusion

This tragic situation is hopeless as many people believe. And they are right. Neither the combined efforts of outstanding individuals nor the whole mankind could overcome the power of Leviathan, no one can «draw out Leviathan with a hook, or snare his tongue with a line which you lower… Indeed, any hope of overcoming him is false» [7, Job. 41: 1–9]. And that is why «on earth there is nothing like him… He is king over all the children of pride» [6, Job. 41: 33–34]. But the fact that «what is impossible with man is possible with God» [7, Luk. 18: 20]. For only God can hold Leviathan in obedience and He has been doing it for several millennia from time to time loosening the reins of the monster because of the sins of mankind. So thanks to A.P. Zvyagintsev for presenting the problem in its religious fullness, having exposed all the weak points of our common human life. Knowledge makes man strong and helps us endure tragic moments of life without losing faith in divine justice.

References

1. Chelyshev P.V. Ordinary consciousness or it is not just bread that keeps people alive. – M.: MGGU, 2007. – 359 p.

2. Chelyshev P.V., Chelysheva P.V., Koteneva A.V. Essays on social Philosophy: utopian idea from ancient times to modern days. – M.: MGGU, 2012. – 352 p.

3. Chelyshev P.V. Biblical paradigm of globalization in «The revelation» of St. Johan // European Journal of Natural History. – 2013. – № 6. – P. 71–72.

4. Chelyshev P.V. Everyday consciousness in global civilization // European Journal of Natural History. – 2015. – № 1. – P. 18–20.

5. Chelyshev P.V. Attempts to improvement of ordinary consciousness in the history of culture // International Journal of applied and fundamental research. – 2015. – № 3–1. – P. 110–113.

6. Chelyshev P.V. Orthodox understanding of society in the middle ages // European Journal of natural history. – 2013. – № 6. – P. 68–70.

7. Holy Bible. New King James Version. – Tomas Nelson Publishers Nashville, 1990. – 1204 p.

8. Hobbes T. Leviathan: Or the Matter, Forme, and Power of a Common-Wealth Ecclesiasticall and Civill. – Yale University Press; Reprint edition, 2010. – 576 p.

KAZAKHSTAN CITIZENS IN THE 455TH SHOOTING REGIMENT. THE BREST FORTRESS. JUNE – JULY, 1941

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Article is devoted to actions of Kazakhstan citizens – the defenders of the Brest fortress serving in the 455th shooting regiment. According to all available data from searchers of 100 Kazakhstan citizens from about 1000 people 3 rifle battalions and the regimental divisions which were on June 22, 1941 in fortress had their first battle there. A half of them were lost in the same place. For the others it was the difficult way of war. 29 people came back home, from them 26 soldiers were in captivity therefore in Soviet period didn't speak about them. Thus, only today we can restore historical justice and tell about heroes from Kazakhstan of June-July, 1941 in the Brest fortress.

Keywords: the Brest fortress, 455 shooting regiment, the Great Patriotic War, on June 22, 1941, Kazakhstan, Kazakhstan citizens – defenders of the Brest fortress

For January 20, 2016 I have in the lists of 455 of a shooting regiment 100 names of Kazakhstan people – defenders of the Brest fortress. That was typical for most of Kazakhstan people of 455 shooting regiment that 86 people were recruits from the North Kazakhstan area.

According to different data in the 455th shooting regiment there were about 3500 people, mostly they have been out of fortress walls. There could be approximately one thousand fighters of 455 shooting regiment inside the fortress. However anywhere there are no full data on this figure.

455 shooting regiment was created during the Soviet-Finnish conflict (1939–1940). The regiment became a part of the 42nd shooting division of 28th shooting corps of the 4th army of the Western Special military district. After the termination of military operations on the Soviet-Finnish border as a part of the 42nd shooting division, the regiment is transferred to Latvia, and since August, 1940 – in Kartuz-Berezu of the Brest region.

In March, 1941 455 shooting regiment had arrived to a new place of a dislocation – to Brest.

The first rifle battalion of a regiment was placed in the 8th fort (4–5 kilometers to the south of Brest). The second rifle battalion for June, 1941 was constructing a fortified area at the Melniki village (nowadays territory of Poland). The third rifle battalion and regimental divisions were placed in defensive barracks of the Citadel, in the western direction of the Brest (Three-arch) gate.

Their arrangement for June 22, 1941

Beginning from the Brest gate the kitchen and the dining room, headquarters of a regiment, division 3 of a shooting regiment and other divisions took place on the first floor.

Barracks of a regiment came to an end at an arch, connecting defensive barracks to barracks of 333rd shooting regiments. In this area on the second floor there was a hostel where lived the young commanders who arrived to military units on the eve of war after the graduating from military colleges. Then, there were the barracks of 44th shooting regiment**.** The artillery park of a regiment was placed out of fortress, around a garrison cemetery that, naturally, complicated military operations of fighters on the first minutes and hours of war.

The commander of 455 shooting regiment, the major Litsit Jan Adamovich (1898-22.06.1941) stayed with his family on Terespolsky strengthening. He was lost during the first hours wars in attempt to break to the regiment. Other commanders and officers lived with families in Brest or in nearby villages on rental apartments therefore on the night of June 22 they weren't and couldn't head a regiment exit from fortress or defense of fortress. In fortress on the night of June 22 there were only persons on duty on a regiment, and group of young lieutenants in the hostel who arrived some days before war from military colleges.

Veterans remember that several days before war something unclear occurred, it was ordered to them to hand over all types of weapon and even the untouchable stock (US), in exchange promised to give out the new weapon. However didn't give out …

Today it is known that fights in the territory of barracks of 455 shooting regiments lasted 3 days, and on June 24 were almost finished. However it didn't mean that everything was in an order and in other days.

Before war, 1941

The private Yankov Vasily specifies in the autobiography that in May, 1941 he was accepted in ranks of Communist party [1].

Pavel Shulga's letter, staff clerk in the summer of 1941:

– The service goes well. Only the brother Ivan and the nurse Sasha: it is restless and disturbing somehow on border …

June 21

Lukanin A.A. remembers.:

– Began commonplaces in the morning, physical charging, a breakfast, political education, then there was a practical training which passed behind fortress. It was Saturday, warm day. In free time everyone went about the own business, trying to put simple soldier's economy in order.

In the evening (on June 21) the commander of a company of air defense lieutenant Polyakov caused all calculations of installations on instructing. The meeting passed in the Lenin room. To the right of Polyakov the commander of 1 platoon lieutenant Soroka sat. As usually, the assistant to the commander of a platoon Osipenko sat down close to them. But he received holiday and went home to the village of Ruzaevka, nowadays Tselinograd area, and his place was taken by the sergeant Pugachev...

It was talked of that for June 22nd the inspection on verification of the maintenance of the equipment was outlined. The task was to check rifles, machine guns, cars and staff of platoons and offices again and again.

After meeting me and my fellow countrymen Stulintsevy, Chentonovy, Balashevy, Nedosekov and Kozhushko went to the cinema. Movies were shown open-air in the summer. Usually on a wall of barracks the white square piece of a cloth was hung up, and against the screen on wooden tripods the movie camera was established.

Red Army men, free from service, watched the movie "Ruslan and Lyudmila" in the evening. Nearby neighbors from 33 engineering regiments watched the movie "Circus".

A. Lukanin had a joyful mood, just he received the letter from the familiar girl. He tremblingly waited for it letters. Colleagues Volobuyev, Zakharin, Rudnev, Lagutin and Matveev knew about it and quite often joked on it. Mail was brought without it, and when Arkady came, his colleagues forced him to dance, so he danced, there was such an order [2].

Chief of headquarters of the 4th army L.M. Sandalov writes:

– …till 24 o'clock on June 21 there were no any events for reduction of troops in combat readiness.

At 24 o'clock the commander, the chief of headquarters of army, generals and officers of army management were called on an order of the chief of headquarters of the district in headquarters of army. The headquarters of the district didn't give any concrete orders, except as "everybody to get ready".

The commander of army general-major A.A. Korobkov under the responsibility ordered to dispatch in all connections and separate parts the sealed "red envelopes" with instructions about an operations procedure on fighting alarm. However commanders of connections knew contents of documents in packages as participated in their development.

Approximately at 2 o'clock in the morning wire communication of headquarters of army with the district and troops stopped on June 22. Communication managed to be reestablished only at 3 hours and 30 minutes. Break of wires was found by our operators in Zaprudy and Zhabinke.

After communication restoration the commander of army received the order of the top military commander of the Western Special military district transferred clear text on telegraph (BODO) about reduction of troops in combat readiness. At the same time it was specified to bring first of all silently out of the Brest fortress the 42nd shooting division and to alert the 14th mechanized corps; the aircraft was allowed to transfer the base on the background airfields.

Till 3 hours 45 minutes the commander of army personally by phone gave two orders: to the chief of headquarters of the 42nd shooting division to alarm a division and to bring it out from fortress to the area of collecting; to the commander of the 14th mechanized corps to get in combat readiness.

At 4 hours 15 minutes or 4 hours 20 minutes the chief of headquarters reported that the opponent began a shelling of Brest. These minutes the reception from headquarters of the district of the following order came to an end:

– The order of the national commissar of defense for immediate execution …

Having adopted the order, the commander of army at the same time reported on the top military commander of the district about an artillery raid to Brest, the short battle-order № 01 was immediately given to troops of the 4th army about reduction them in combat readiness.

The commander of army personally told by phone to the commandant of the 62nd strengthened area and chiefs of headquarters of the 42nd and 6th shooting divisions, the order was transferred to the others with couriers.

But orders and commands on reduction of troops in combat readiness were late. War already began, having taken troops of the 4th army unawares [3–1].

June 22

Arkady Lukanin woke up at a quarter to four. All serenely slept. Volobuyev smiled to something in a dream. On a bed of the foreman Hrenov who asked to leave to the city the day before, the commander of a company Polyakov slept.

Suddenly, the earth began to shake and shudder. Huge force explosions shook barracks. Plaster and glasses broke up. The barracks were filled with ashes and dust. The command was sounded: "Alarm! Arm yourselves!".

In some seconds all were in formation.

– Company, listen to my command! – Polyakov shouted and took two steps backwards and aside. But he didn't manage to finish speaking. Enemy machine gun fire shot his breast. The lieutenant fell dead.

We ran out from barracks, we went to Three-arch gate. But we heard machine gun fire from a church. There were killed and wounded people. Arkady helps the wounded commander to reach the cellars of 33rd regiment. A lot of wounded people were already there [2].

L.M. Sandalov writes:

– At 4 o'clock, when dawn only began, German-fascist troops suddenly opened the gun-fire …

The most intensive gun-fire was conducted on military camps in Brest, and especially on the Brest fortress which was literally covered with ruptures of artillery shells and mines [3–2].

Many people rushed to fortress gate on an exit, but there were already Germans. The first battle was accepted at the river Mukhavets. Fighters saw logs, and with their help began to transport on the other coast, including the private of a company of air defense Ilya Labutin.

The lieutenant Anatoly Vinogradov tries to phone to Brest. Unsuccessfully. On the second floor at regimental school all prepare for defense. The gun-fire began again. People hide in cellars.

Then confusion passed. It came time to work. Fighters start taking advantageous positions, release windows, doors.

Matukhna Mikhail on the night of June 22 was a man on duty. He accepted the first battle at the church building, then defended at windows and doors. He participated in fights for the officers' dining room [4].

Yankov Vasily – during the first hours of war tried to break through to the artillery park, unsuccessfully. He participated in fights under command of lieutenant Vinogradov.

Vasily Yankov remembers:

– From the first minute under a continuous gun-fire and fire from air many, many of our fighters were lost, those who couldn't come round, from what had occurred on the earth, as there was a clear morning, and suddenly there came the second night from ruptures of bombs and shells, the atmosphere of fortress was filled with a smoke and dust, there was nothing to breathe. Our regiment was located at the central entrance, passing the bridge through Mukhavets on the right side. The first counterattack was beaten off. On the first floor we installed anti-tank tools for reflection of tanks on a main entrance in fortress. During reflection of the tanks moving to a main entrance the commissioner Fomin came to us, one captain and two political leaders came – I don't remember their surnames – and courageously began to work for tools with us [1].

Kovtyukh Fedor [5], Moskalyuk Mikhail [6], Protsenko Afanasy [7] and Lukanin Arkady [1] also specify in the memoirs that battled near barracks of 455th shooting regiment under command of lieutenant Vinogradov.

A.D. Romanov in the book "The Bug on Fire" remembers an episode: "... Three-arch gate. Fascist tanks several times tried to get here. Under the arches of gate, the corporal Pyotr Krapivin and tens more heroes fell and died not giving the way to the armored machine…"

But for a long time it wasn't possible to identify the personality of this defender. And only after comparison of all available options from the memoirs of A.D. Romanov it at last worked well.

From A.D. Romanov's memoirs:

– ...at the coast we got under machine gun fire of fascists, three men died. It was necessary to crawl away. To one of fighters, obviously explosive bullet, pulled out all lower part of his face. Being covered with blood, without bandaging, he continued to shoot back.... Meanwhile, having passed the bridge, one more tank rushed to the way of central drive of Three-arch gate. And here on its way a fighter with a manual machine gun blocked its way. He lied to the earth and opened fire at once. The steel machine ran on him when the fighter fired on one of tank caterpillars. The face of the hero was crippled: he had a bloody medley instead of the lower jaw. So he died under the caterpillars of the enemy tank, without having given way to it. Later the hero was identified by the Komsomol ticket which was found in his soldier's blouse pocket. It was the cadet of regimental school of 455th regiment – Pyotr Krapivko. He had armor-piercing cartridges in the disk of machine gun. And the tank which sustained serious damage was compelled to stop in the Citadel courtyard. Here it was set fire, and the crew was destroyed [8].

It is hard to say – could be this way, or maybe a little in a different way a combat between a Red Army soldier and SHTUG tank happened at the Three-arch gate. Except Romanov none of defenders of the Brest fortress don't mention this episode. But here the name of the hero defender can be told:

– Red Army soldier Krapivka Pyotr Spiridonovich – born in 1920, the birthplace – the village of Smirnovka

of the Mamlyutsky district of the North Kazakhstan Region. Called to the Red Army by Mamlyut regional military office 20th of October, 1940. Cadet of a machine-gun platoon of regimental school of 455 shooting regiment. Died on June 22, 1941.

Probably, as there were no other witnesses of his death, according to registration data of Brest fortress memorial complex he doesn't pass.

Pyankov Victor, the private, broke through. He didn't like to remember this day. He considered that this day there was a big treason; the administration took away all weapons before this day. All commanders were in the city. There was a panic. All looked for and collected the weapons. Victor was a good athlete therefore with several soldiers from the regiment, whom he knew badly, not his fellow countrymen, crossed the river Mukhavets and began to make the way to their colleagues. This time he didn't get captivated and managed to unite to parts the receding Red Army.

Galiyev Yakov, Yemelyanov Vasily, privates, were captivated.

June 23

In a card file of the mentioned **MK BKG** there is a surname Shulga. Burlakov N.N. remembers:

– …on the night of June 23rd arrived the clerk of a regiment Shulga and says that many men escaped from fortress, and that the chief of a regiment senior lieutenant Scriabin told that we don't have enough forces to keep the fortress, it is necessary to leave and connect to troops … [9].

The whole day on June 23 – an artillery fire and then propaganda, the leaflets with appeals to surrender appear.

Lukanin Arkady remembers:

– Also such case is remembered. Fomin's command was transferred from one soldier to another: "Not to put on helmets. It will be easier to distinguish enemies".

The command appeared very opportunely. Fascists advanced to the next attack. I lay down at an entrance to barracks. I saw his helmet and distinguish that the fascist creeps on a lawn. After a while there comes the second fascist. He is very well visible against the twilight. Our shots were well-aimed. The enemy didn't break through to barracks [2].

Germans are close to the fighters of 455 shooting regiment in church and the officers' dining room. They make the way through the attics and throw grenades. There was a hand-to-hand fight.

Vasily Yankov remembers:

– The major came to us on the second day in the evening. I saw him for the first time, then I was told that it was Gavrilov. The major was very calm like there is no war. He greeted us, passed, looked at our arrangement and asked who we have from commanders. We answered: "Nobody". At night the major Gavrilov and three commanders with him came to check our arrangement. After checking the major told: "Here is your commander, political leader, comrade Kashkarov" 1].

A group of volunteers consisting of 13 people on the night of June 24 had to get through the neighboring buildings to warehouses of ammunition supply and stock up with cartridges, grenades, etc.

The group of fighters tried to escape from fortress. Stulintsev Nikolay, the private broke out from the Brest fortress.

Badayev Nikolay, Vaganov Vasily, Zhukov Yakov, Petukhov Ivan, Filimonov Vasily, Chernoskutov Nikolay, Shibanov Vasily, privates, Shileyko Georgi, the deputy political leader were captivated.

June 24

Since morning again the gun-fire, radio calls for surrendering. There are fighters with a white rag.

Connection with the regimental commissar Efim Fomin is established. Was decided to gather for meeting in the evening.

Fascists occupy kitchen of a regiment.

Powder warehouses blow up. Shelling of terrible force.

Attempt of break on the bridge at the Brest gate was carried out.

Vasily Yankov specifies in the autobiography:

– For two days I was in heavy fighting, then during the short rest the regimental commissar Fomin read the order on rewarding of many fighters with awards of the Red Star, including me, and to me gave the rank of the junior political leader [1].

The break out under the leadership of the lieutenant A. Vinogradov began after a lunch is remembered by many defenders who survived after war. The Germans also wrote that not more than a company of Russians tried to escape after a lunch.

– The senior soldier of a group decided to organize a break of an enemy military round and to go to the forest. Day tended to the end. The river was well seen to fire. As soon as fighters plunged into the water, machine gun fire was distributed, bullets whistled. Shouts of wounded men were heard. The survived fighters got out on the coast. They tried to get to the forest, but it was light, and they are surrounded. The fight goes on. Obornev and Lagutin were lost, Kakokin and Tyunin are fatally wounded. The lieutenant Vinogradov and the private Nedosekov are seriously injured. Wounded Lukanin faints. He woke up already in some warehouse where many wounded fighters were [2].

Davydov Pyotr, Tyunin Vasily, privates were lost in fortress.

Zhdanov Vasily, Zakharin Pavel, Lukanin Arkady, Mitin Vasily, Nedosekov Alexander, Yankov Vasily, privates are captivated.

Kozhushko Afanasy broke out from the Brest fortress.

June 25

Mishonin, Protsenko Afanasy, privates are captivated.

Some part of fighters on the night of June 26 again unsuccessfully attempt of break out.

June 26

Together with his comrades, Starodumov Andrey left on break. He was captivated.

– on June 26th, the headquarters of temporary group made the decision to organize the break. The vanguard is formed… Fighters who couldn't swim adapted wood desks. The fight began again. I plunged into the water in full equipment, but soon understood that I won't reach the coast, the clothes became heavy and pulled me down. I got back to the shore, took off clothes and again plunged into the water. There were three of us on the opposite coast. We decided to reach the artillery park of a regiment one by one. I reached a garage and decided to wait, voices of Germans were audible. Then I got through the bypass channel and was surrounded by fascists, – Andrey Starodumov remembers [10].

Matukhna Mikhail:

– on June 26th the commander gave the order to force the river. Military march under cover of two machine guns. The frontier guard leaded our group. We had big losses during the march through the bridge. Here on the bridge through the river Mukhavets we lost my fellow villager Vasily Kalugin [4].

Burlakov Nikolay, Matukhna Mikhail, Orlov Vasily, privates, Lipkin Konstantin, the sergeant, Sedletsky Ivan, the lieutenant are captivated.

June 27

Teplyakov Ivan, Nochevny Pavel, Starodumov Andrey, Shanaurin Nikolay, Ibrayev Kurmangali, privates are captivated in the Brest fortress.

June 28

Moskalyuk Mikhail, the private of 76 mm tool battery, from the first day participated in fights under command of lieutenant A. Vinogradov. Since June 26 repeatedly went to attacks under command of the junior political leader from 333 shooting regiment.

– On June 28th after bombardment the junior political leader gave the order to re-establish communication with headquarters. Performing this task we faced fascists. I was wounded and captivated. Junior political leader was killed in this battle [6].

Moskalyuk Mikhail, the private, Kacharovsky Vasily, the senior sergeant are captivated.

June 30

Kovtyukh Fedor, the private is captivated

July 2

Balashov Leonid, the private is captivated

July 4

Neukrity Fedor, the private is captivated.

Almost dead, hungry, without weapons. Fighters stood three days, then there were separate fights. The maps of capturing of our fighters testify it. As we see in the last researches of R. Aliyev certain fighters have been killed and captivated even in August, 1941 and Germans already were in every place of the fortress.

The inscription: "We will die, but we won't leave fortress" was found in September, 1949 in these battlefields.

The war for prisoners

Galiyev Yakov, the wounded, passed camp of Germany from 1941 to 1943, since 1943 was in Holland in a working battalion, in one and a half months prior to arrival of British army he ran away with his German colleague and hided for one and a half months with the help of the Dutch gendarmerie; he got to British, was in Liverpool, in Great Britain. In March, 1945 he was sent to Odessa to transit point [11].

In a card file of the mentioned memorial complex the Brest fortress-hero the defender of fortress M.E. Beloveshkin remembers: "…in 1941 we made attempt to run from a chemical place (camp for prisoners of war). The sergeant Tsibulsky... and Shulga were in our group. Shulga was killed in attempt of escape" [12].

Starodumov Andrey was in concentration camps in Poland and Germany, in the spring of 1945 he was taken out to the Danish city of Arhus, from where escaped to local guerrillas [10].

Lukanin Arkady passed the extermination camp of Byalo Podlyask. Escape. There were 10 people: Lukanin, Kovalyov, Zakharin, etc. Till the night they made the way to the east, but they were captivated and sent to the north Poland to Lublin prison. And again escape. This time successfully. They went to Belgium, and then they got over to Holland [2].

Stulintsev Nikolay broke from fortress. Then receded. In July, 1941 fighters were handed over in captivity by the commander traitor. In an echelon it is sent to Germany, in captivity I was till 1945 It was released by the Soviet soldiers. Then he was enlisted

in the 435th regiment of the 8th guard division. He protected a prisoner-of-war camp of Vlasov's soldiers. After demobilization in 1946 he came back home [13].

Vasily Yankov in captivity was in camp of Mosburg, and then made unsuccessful escape, for what he was put into a concentration camp of Ulm city (the Western Germany). In 1945 he was released by allies [1].

War for those who could unite to the receding parts of Red Army

At the end of 1941 Vasily Pyankov was wounded in hand. Hospital. Then he worked in a food supply station. He studied. He was called again already as an officer. According to documents of "The Memorial" organization on request for him appeared a number of documents. But for the end of 1944 there was some oddity. He was missing. And then it becomes clear that he was taken prisoner. He was released and repatriated home later.

The private Samofalov Fedor broke from Brest Fortress. He is mentioned at defense in M.A. Moskalyuk memoirs. According to the last letter № 3142 and date 29.09.41, he succeeded to break from the fortress and to connect to parts of Red Army. Probably, he was lost at the fronts.

Labutin Ilya, private, driver of 2nd company of air defense of 455 shooting regiment. He broke from Brest Fortress. He was at war at the front. He stayed alive. 17.05.1945 he was awarded by the medal "For Services in Battle" as the Red Army man.

Studying the Table it is possible to note that the conscription of 1940 was in Northern Kazakhstan. A number of fighters of nearby areas could get to this team, however recruits of 1939 and recruits of different regions in single quantity couldn't get on service to the Brest fortress. It means that the ways of getting on service in the fortress and conscriptions from different regions of Kazakhstan aren't rather studied. I believe that documents of those years, reminiscence of the survived people can still be found lying in archives, military registration and enlistment offices which will give new materials for studying of heroism of defenders of the Brest fortress.

From 100 Kazakhstan citizens of 455 shooting regiment who we found – 50 fighters died in the fortress.

16 people were captivated and died.

26 people were captivated and survived.

5 people broke out and died.

3 persons broke and fought at war on different fronts, remained alive.

My search

In 2013 I addressed with letters on the help in searches of defenders of the Brest fortress to Akim of the North Kazakhstan area, to heads of department of defense, regional committee of national security.

Kazakhstan citizens defenders of the Brest fortress. 455 shooting regiment

Number	Region	Conscription of 1939	Conscription of 1940	Total
1.	North Kazakhstan area	2	84	86
2.	Semipalatinsk area	–	2	2
3.	Pavlodar region	2	–	2
4.	Kokchetav area	2	–	2
5.	Almaty	1	–	1
6.	Akmolinsk area	1	–	1
7.	Aktyubinsk area	1	–	1
8.	East Kazakhstan region	–	1	1
9.	Kustanay area	1	–	1
10.	Turgay area	–	1	1
11.	From other regions of the USSR. Born in Kazakhstan	1	–	1
12.	Officers – 1 person from North Kazakhstan area	–	1	1
	Total	11	89	100

The answer to the letter addressed to a virtual reception on the website of Akim of the region.

Dear Laila Seysenbekovna.

On your initiative the question of the publication of names of Kazakhstan citizens defenders of the Brest fortress is considered. Data on North Kazakhstan citizens defenders of the Brest fortress will be published in regional newspapers "Soltustik Kazakhstan" and "Northern Kazakhstan" on June 15, 2013, and also in regional newspapers of area.

As a result of this work the widow of the defender V.F. Pyankov, the relative Aleksandra Osminkina – Natalya responded; we were written by employees of the museums and archives, journalists.

Still it is necessary to search a lot. As well as in all history of defense of the Brest fortress in summer of 1941, there are a lot of white spots in fights at barracks of 455 shooting regiment and participations of Kazakhstan citizens in them.

Eternal glory to heroes!

I express gratitude to employees of the Memorial complex "Brest Fortress-Hero".

References

1. Yankov V.K. Inventory of 455 shooting regiment, personal case 38.

2. Lukanin A. The last peace day // On coast of Bug. – Alma-Ata: Kazakhstan, 1967 – the 248th. – P. 15–19.

3. Sandalov L.M. 1941. On the Moscow direction. First days of war. – Veche, 2010. – The 576th P. 3–1 – 424–426; 3-2-426.

4. Matukhna M.T. The lists of 455 shooting regiment, personal case 108.

5. Kovtyukh F. The lists of 455 shooting regiment, personal case 41.

6. Moskalyuk M.A. The lists of 455 shooting regiment, personal case 74.

7. Protsenko A.T. The lists of 455 shooting regiment, personal case 136.

8. Bug on fire. Collection. A.D. Romanov's memoirs. – Minsk: Belarus, 1965. – http://militera.lib.ru/memo/russian/sb_bug_v_ogne/14.html.

9. Burlakov N.N. Card file of the mentioned. Shulga P. – the memorial complex Brest fortress-hero.

10. Starodumov A.S. The lists of 455 shooting regiment, personal case 135.

11. Galiyev Yakov "Memorial", card of the prisoner of war.

12. Beloveshkin M.E. Card data of the mentioned. Shulga P. – Memorial complex the Brest fortress-hero BKG.

13. Stulintsev N.S. "Memorial", card of the prisoner of war.

QUALITY ASSURANCE OF HIGHER EDUCATION: NATIONAL TRENDS OF DEVELOPMENT AND ACCREDITATION IN KAZAKHSTAN

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The article deals with current trends of development of quality issues in higher education. Due to the introduction of latest educational strategies in Kazakhstan higher educational institutions have to develop its quality assurance and develop change management systems in order to know how to coup with reforms. Accreditation is considered as one of the most effective tools for measuring quality. Accreditation criteria and requirements can be taken for creation systems for building internal quality system. Current educational standards have to be replaced by national quality standards.

Keywords: international developments, change management, quality assurance, accreditation, quality standards

Recent international developments, including entering of Kazakhstan into international educational space determine the aims and main emphasis for higher education policy due to new challenges. The introduction of a market economy is a precondition for reconsidering the content of higher education. Curricula and their content have to be reviewed from the perspective of best world practice, strengths, weaknesses of research, compared to institutions worldwide, are to be analyzed, and the necessary strategies for an increasingly intensive completion are to be created.

It is a predominant task for institutions of higher education to develop, in accordance with their respective responsibilities, the necessary measures so as to ensure and improve the quality of research and academic teaching.

The educational market has dramatically changed and requirements to the quality of graduates have been increased so that the job market requires very well trained graduates in specialized professional areas, and the market itself in its turn have become very integrated.

So these problems and their solutions require development of quality standards applying to issues of scope, structure and contents in the areas of educational programs, training and research. It has to bring about decisions on the key parameters for contemporary policies of higher educational institutions aimed at improvement and development of its quality.

Strategic policy

Currently, the education system of our country, as well as in the whole world, actualized the issue of quality of education. Quality is traditionally perceived as an abstract category (currently there are over 2,000 definitions of quality), but the current policy of education, particularly educational strategies of different education systems of the world are trying to determine a practical *mechanism* for achieving quality, identify *methods* for measuring the quality and use of specific *tools* of measuring quality of education.

Change is an ever-present feature of organizational life, both at the operational and strategic level. Therefore, in any organization it is important to know how to manage the changes required. Change management as defined by Moran and Brightman [4]is the "process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers". In the Message of President N. Nazarbayev to the People of Kazakhstan "[1], the state has been formulated strategic objective, which must continue to modernize the system of education and ensure qualitative growth of human capital in Kazakhstan, train specialists of a new generation, with modern thinking corresponding to the relevant requirements of a labor market [2].

The analysis of international practice shows that every HEI is doing diverse and extensive work on QA around the world. In general, the world practices put a student at the center and students' survey is considered as the key factor in university development. Most of Western universities have strong relationships with employers that can also provide information on quality of graduates. It is also important to note the role of each teacher who is looking for ways to self-improvement of quality of courses, introduction of new innovative strategies in teaching. Universities of the world take educational programs through evaluation of professional associations, where the university receives recognition on the quality of programs and gets feedback on the quality of graduates from employers.

Evaluation and internal monitoring processes are vital to the ongoing improvement of the education provided by institutions. The best way to ensure quality is to develop a system of internal quality control and external assessment by peers. Improper management of the change process can cause resistance to innovative assessment practices. To minimize this occurrence, evaluation and monitoring of the change process is essential [3].

Quality through accreditation

While taking educational programs through accreditation, components, organizational processes and institutional elements may affect the quality of educational programs. From this perspective, the quality of higher education institution with all its components and activities, representing a very complex process depends on the actors involved and the stakeholders in the educational program. The contribution of each member within the institution and the external environment also determines the quality, where the quality of results of the educational process can also be measured by successful achievement of graduates after they join the professional environment.

Thus, the accreditation assessment, as the effective tool for measuring quality, defines the logics and effectiveness of the educational process, starting from the formation of its tasks, the implementation of these tasks, which play an important role in the accreditation, including its strategic objectives, priorities and degree of integration of the results into the society.

The very process of preparing for accreditation effectively helps to analyze the university, to carry out an internal self-assessment in accordance with the requirements for assessing the quality of educational programs. This practice has an effective influence on the critical review of existing educational programs of the University and provides an opportunity for dramatic qualitative changes and to improve compliance with current requirements of HEIs.

Accreditation in the field of education is used to *recognize and validate the quality of* educational programs, as a tool to measure the quality.

It should be understood that accreditation is not rating. This is a tool that makes it possible to measure quality and assess for evidence of programs quality that meet required standards, which are set by associative professional bodies, composed of representatives from academic and professional institutions.

At present, the need for accreditation of educational programs and institutional assessment in international agencies justified by the fact that Kazakhstan's higher education institutions must meet the quality standards set by international *professional* societies. This makes it possible to provide quality in accordance with the requirements of the labor market.

To do this, universities need to establish close links with industry. Curriculum should be developed in conjunction with professionals from industry.

In order to develop a system that ensures quality assurance, it is necessary to develop culture *of quality* that involves active participation of all professionals from academic community in quality, critically perceive self-esteem, responsibility for the quality of professionals at every level and sector, providing objective feedback ties and reactions, desire to share good practice and improvement of management of the whole process of university activities. Kazakhstan's education strategy is trying to adequately respond to modern challenges in education by taking universities through international accreditation.

In the process of accreditation higher educational institutions of Kazakhstan, on the example of international practice study in detail the operation of quality assurance systems for various HEIs where the system of internal and external evaluation of educational programs makes it possible to recognize the quality of the university. Analysis of international experience in quality and requirements for accreditation give the university an opportunity to critically examine and review degree programs and use them to update and upgrade, and thus improve the system of training in general. There are number of ongoing projects related to quality assurance and accreditation within Tempus as DOQUP [6] and CANQA [7] that may effectively help to enhance quality and international recognition of HEIs of Kazakhstan on global level.

The accreditation assessment conducted by agencies is not an *inspection,* but it *assists in improving the quality of* university programs or activities institutionally. Accreditation or recognition of quality of educational programs or institutional evaluation requires quality *assurance, support and development systems*.

The concept of quality assurance in higher education may be the scientific and theoretical, methodological vision, defining goals and objectives, structure, content

and key strategic tools of its development as one of the key components to improve the quality of education.

The concept involves the transformation of not only quality education, but also develop a system for monitoring and improving quality through critical analysis and recommendations for further improvement. The purpose is to give flexibility and adaptability of the learning process and methods for assessing the quality of students' knowledge in accordance with the requirements of the labor market, bringing the training system in line with the direction and dynamics of social and professional activities of the future specialist.

Conclusion

In world practice, the system of quality assurance includes the assessment of university management, quality of each educational programs in accordance with the requirements of the market, each teacher has their own search for ways to improve the program, defines innovative teaching strategies. Quality of education also requires creation of new quality control system where the teacher and the student would have been an active part of the system.

Kazakhstan is still following *state overall educational standards*. Due to the change of the market, these standards have to be changed to the next phase of its development, and therefore it is recommended to introduce *standards of quality.* The challenges of modern higher education institutions require adequate reaction, which, above all, is defined by the labor market. Universities should create a modernized model of training, study international practice and introduce modern technologies of quality.

References

1. Moran J.W., Brightman B.K. Leading Organizational Change // Career Development International. – 2001. – Vol. 6, № 2. – P. 111–118.

2. Message from the President of the Republic of Kazakhstan Nursultan Nazarbayev of Kazakhstan. January 29, 2010 // A new decade, new economic growth, new opportunities. – http://www.akorda.kz.

3. Burnmi S. Malau-Aduli, Craig Zimitat and Aduli E.O. Malau-Aduli Quality Assured Assessment processes: evaluating staff response to change // Journal of Higher Education Management and Policy. – 2011. – Vol. 23, № 1. – P. 105–120.

4. Moran J.W., Brightman B.K. Leading Organizational Change, Career Development // Journal of Higher Education Management and Policy. – 2001. – Vol. 23, № 1. – P. 105–120.

5. Burnmi S. Malau-Aduli, Craig Zimitat and Aduli E.O. Malau-Aduli Quality Assured Assessment processes: evaluating staff response to change // Internationall. – 2011. – Vol. 6, № 2. – P. 111–118.

6. Tempus project DOQUP. – http://tempus-doqup.unige.it/project-description.

7. Tempus project CANQA. – http://www.emu.kz/en/info/news/6269.

Materials of Conferences

GENERAL SCIENTIFIC RESEARCH METHODS AS A THEORETICAL BASIS FOR IMPROVING THE QUALITY OF THE EDUCATIONAL PROCESS

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Preparing students of various specializations, except the biological and medical ones, biological sciences are studied in passing, during one, maximum two terms and then recede to the background. Even in this case, they can be used in the educational process, not only for the formation of attitudes and expanding horizons, but also as a tool to improve the quality of the educational process for profile specialties.

In the development of any science, including the biological one, an important role belongs to the methods of scientific research which is a means of understanding the subject under study and the way to achieve this goal. Nowadays such methods as ordering, integration, differentiation, abstraction, idealization, systems analysis, comparison and generalization are widely used; they are common to all disciplines and help to reveal the essence of an object or phenomenon, and their internal communications.

The study evaluating the biological significance of harmful substances' threat entering the food and water from the environment to human health was held by bacteriological and chemical analysis of drinking water, raw materials and food together with students. This topic has been divided into theoretical methods and students from different groups (such as TPC, Commerce, Finance and credit) attending a biological circle, were combined into three groups for convenience. Each group worked out one of the proposed theoretical methods on the topic.

It is known, that one of the main theoretical methods is the analysis, the decomposition of the experimental whole into parts, the selection of individual traits and qualities of a phenomenon or a process [1].

The analysis of the problem implemented by the first group of students showed that rapid urbanization and industrial development have led to the fact that the circulation of substances in nature includes nowadays such substances that are not peculiar to it, that can be found in the sediments. People began to call the emergence of these unusual substances in the biosphere the pollution of water, air and soil. And the intensity of pollution began to grow rapidly. Permanent presence of large amounts of chemicals in the environment leads to the fact that these harmful substances get into the body with food.

Another daunting problem is the growing of population of the planet. In the 20th century, the population was doubling in every 33 years. In connection with this the number and the rate of malnourished and starving people are rocketing. This number is verging towards half a billion [2]. To compensate the lack of food the third of the world crop is grown using chemical fertilizers, 15% of the Earth's harvest is represented by GMOs [3]. The volume of the use of synthetic pesticides in the world reaches 5 million tons per year, or nearly 1 kg per each person of the Earth [4].

Thus, the behavior and health of the people are greatly affected by the environment and unbalanced nourishment, which is also one of the main causes of cardiovascular diseases, digestive diseases and diseases relating to metabolic disorders. It is proved that the hydrocarbons affect the cardiovascular system, blood parameters, affect the liver, cause skin dermatitis, eczema, etc.

The next method of the research is synthesis, the combination of various elements of the item in the whole (system) [1].

Here the important point is to put across the students the thought that synthesis is not a simple summation, but a meaningful connection. To evaluate the quality of drinking water its samples were measured for chemical and microbiological parameters, they were selected from underground sources of water supply and distribution networks of the city and its districts. The quality of raw materials and food products was also appraised. As a result, the second group of students formed a matrix with systematized data.

Comparison is a cognitive operation underlying the judgments about the similarities or differences of objects. Comparison helps to reveal the quantitative and qualitative characteristics of objects, ordering and evaluation [1].

For example, by comparing the concentrations of heavy metals, bacterial contamination of water, pesticides applied to soils in several areas, the third group of students identified the areas that are much contaminated with toxic substances and identified adverse areas for people's residence.

After the preliminary stage a round-table discussion was arranged; each group of students indoctrinated the others with their results for all of them to discuss the possibility of using other methods to achieve the objective stated.

The choice of the following research methods such as the specification, formalization, simulation, analogy became the result of the discussions.

The concretization: while reading the lectures and, in particular, during practical and laboratory work, the students, should make the examples displaying the whole on a small subject in their environment. The paper discusses specific areas of research (they are Buynaksk and 3 settlements of Buynaksk District – Nizhny and Verkhny Dzhengutay and Erpeli).

The formalization: to calculate the concentration of heavy metals and the number of coli titer in water the formulae were used.

Modeling: we used in our work different models and solutions with known concentrations of heavy metals, samples of colonies of Gram-negative and Gram-positive bacteria to calibrate immunoassays and inversion-voltammetric measurements.

Analogy: there was an analogy with the research of Federal service on customers' rights protection and human well-being surveillance in Buynaksk and Buynaksk district, that had been conducted earlier; the results did not coincide completely. Relevant literature, the results of the activities carried out in other regions, the experiments and other measurements were studied during this process.

Thus, this knowledge and this skilled use of the methods of scientific research can help any students in any field to set the available arsenal of required methods and to decide the task of any complexity. In this case we must highlight not only the theme itself and its development, but the knowledge of methods as tools for a particular purpose. The practice shows that such students become more trained, independent and creative-minded for the course and diploma works in their specialties.

References

1. Novikov A.M., Novikov D.A. Methodology. – M.: SIN-TAG, 2007. – 668 p.

2. Kabysh N.F. Problems of feeding ecology in Russia // Problems of rational use of natural resources and the environment (environmental and legal aspects): The Materials of the 3rd International Conference. – Makhachkala, 2014. – P. 497–499.

3. Koldunov I.N., Rakhmanov R.S. The analysis of dietary intake and energy expenditure of persons with diseases of the circulatory system in a state of remission // Hygiene and sanitation. – 2010. – № 4. – P. 69–71.

4. Maximova M. To the 21st century with the old and new global challenges // World Economy and International Relations. – 2008. – № 10. – P. 32–38.

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Materials of Conferences

PHYSICO CHEMICAL PROPERTIES OF MIXED OXIDE COPPER ORE OF KAZAKHSTAN

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In this paper the characteristic of mixed copper ore and tailings in Kazakhstan. By mineralogical composition of waste are mainly represented by calcite, quartz, bornite, and with the inclusion of the individual grains, nedoizvlechennyh ore minerals (chalcopyrite and chalcocite). The chemical composition of the waste contained in these (in %): S_{obsch} = 2,5; $S_{sulfidn}$ = 0,9; Fetotal = 1,9; Cu = 0,15; Pb = 0,04; Zn = 0,03; Re = 0,61 g/t; Mo = traces.

Introduction. Analysis of technical and scientific literature shows that it is complex composition of the raw materials processed in the non-ferrous smelters as well as low content of commercial components in them causes the biggest volume of specific yield of wastes i.e. man-made mineral formation in the extractive industries [1]. That is why they are still accumulated and cause extremely high man-made loads on the environment.

Physical-chemical study of oxide copper ore and mill tailings is required to justify and select the suitable methods of experiments.

The ore tical justification for sulfurizing of oxide materials is based on physical-chemical properties of compounds under study, namely, oxide compounds of copper and rhenium in the study materials. Selection of the process terms, such as temperature, ratio and feed size etc., is also based on copper and rhenium speciation.

Materials and methods. We studied the chemical and phase composition of mixed oxidized copper ores and tailings.

X-ray spectrum analysis (definition of elemental composition and major phase), grain size analysis (definition of distribution of the main components on speciation class) were applied for identification of the source materials.

Results and discussion. The main components of the ores are copper and molybdenum. The copper content in the ores varies from the first tenths of a percent to as much, reaching a maximum of 4,1 %, molybdenum content of thousandths of up to 0,28 % [2]. Also copper and molybdenum ores has zinc, lead, gold, silver, selenium, tellurium, rhenium. These elements are found in the field of minerals in the form of its own or as admixtures isomorphic chalcopyrite, pyrite and molybdenite [3].

Physical-chemical properties (chemical and phase composition, thermal properties) of the materials were detected. Tails are basically small grey sand, containing more than 90 % particles of size less than 0,15 mm [4]. As per mineralogical composition these tails are mostly calcite, quartz and bornite with particular grains, underextracted ore minerals (chalcopyrite and chalcocite).

As per chemical composition, the considered tails contain the following (in %): S = 2,5; $S_{sulfide}$ = 0,9; Fe = 1,9; Cu = 0,15; Pb = 0,04; Zn = 0,03; Re = 0,61 g/t; Mo = show. Tails are not soluble in the water, non-inflammable, non-explosive.

The results of X-ray analysis of ore deposits Bozschakol Dzhezkazgan and again proves the literature data, the copper content ranges from 0,2–0,9 % oxygen and 50 % in the form of oxides (Table 1, 2).

Table 1

Results of X-ray spectrum analysis of the Bozschakol field ore

Number phase	O	Mg	Al	Si	K	Ca	Fe	Cu	Total
1	51,41	2,25	13,01	25,90	5,22	0,27	1,73	0,21	100,00
2	48,36	1,40	12,84	19,80	2,09	2,11	12,48	0,92	100,00
3	49,88	1,83	12,92	22,85	3,66	1,19	7,11	0,57	100,00

Table 2

Results of X-ray spectrum analysis of the Zhezkazgan mixed ore

Number phase	O	Na	Al	Si	K	Fe	Cu	Total
1	49,03	2,66	5,16	40,57	0,80	0,82	0,96	100,00
2	54,34	7,21	9,42	27,30	0,34	0,73	0,66	100,00
3	51,69	4,94	7,29	33,93	0,57	0,78	0,81	100,00

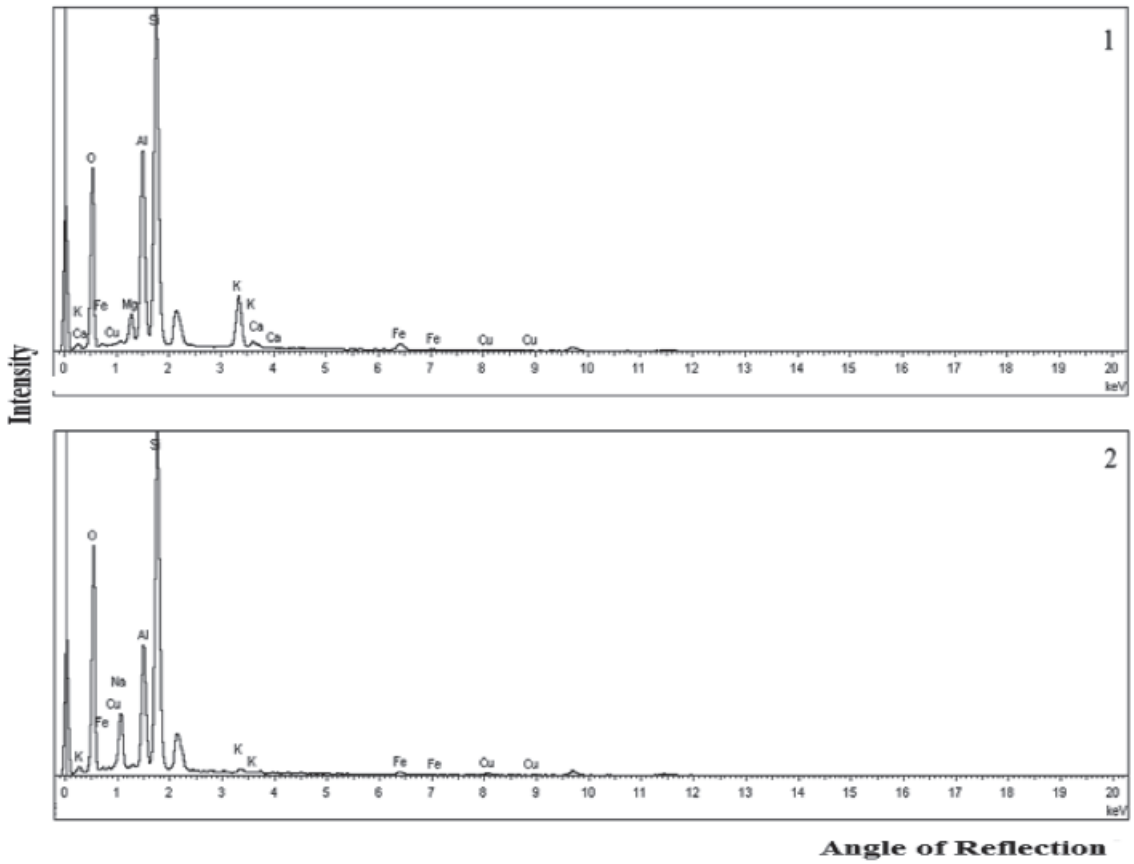

Fig. 1. Spectrum Analysis of Oxide Materials:
1 – Bozshakol oxide ore; 2 – Zhezkazgan mixe dore

Study of material composition of the source material with definition of chemical and grain size composition

Laboratory research was performed with ore sample [3]. The sample was selected and passed for full chemical and phase analysis for follow-up study. The results of phase analysis of oxide ore areshown in the Table 3; the results of the X-ray spectrum analysis are shown in the Table 1. Magnesium and calcium compounds in the source sample are shown in the Table 4.

Commercial components in the source material include copper in an amount of 0,96 % and silver – 10 g/t, and contain other chemical components (Table 4). Grain size distribution of the minerals is presented in the Table 5.

Table 3 shows that the highest copper content is in the class of –1 + 0, so the output is also more than in the rest of grain-size classes. Copper content starts increasing in the class of –25 + 10.

Mill tailing of copper oxide ore of the Zhezkazgan field represents small grey sand, containing more than 90 % particles of the size less than 0,15 mm [4]. As permineralogical composition the setails are mostly calcite, quartz and bornite with particular grains, underextracted ore minerals (chalcopyrite and chalcocite) (Fig. 2).

Table 3

Results of the phase analysis of oxide ore

Copper-total	Sulfates		Carbonates		Oxides, silicates		Secondary sulfides		Chalcopyrite	
	Abs.	Rel.	Abs.	Rel.	Abs.	Rel.	Abs.	Rel.	Abs.	Rel.
1,00	< 0,2	–	0,35	35,00	0,12	12,0	0,47	47	< 0,2	6,0

Table 4

Magnesium and calcium compounds in the sample

Name	Abs.	Rel.
Calcium		
Sulfates	6,14	55,8
Carbonate	4,86	44,20
Total	11,00	100,00
Magnesium		
Carbonate	3,56	87,7
Oxides	0,5	12,3
Total	4,06	100,00

Table 5

Grain size distribution of main components on grain-size class

Grain-size class, mm	Output, %	Content		Extraction	
		Cu, %	Ag, g/t	Cu, %	Ag, g/t
+ 25	3,10	0,39	8,60	1,28	2,70
–25 + 10	16,99	0,87	3,60	15,52	6,12
–10 + 5	11,17	0,83	8,90	9,74	9,94
–5 + 3	9,32	0,88	9,0	8,61	8,40
–3 + 1	18,49	1,02	12,0	19,78	22,20
–1 + 0	40,93	1,05	11,5	45,07	47,10
S	100,00	0,96	10,0	100,00	100,0

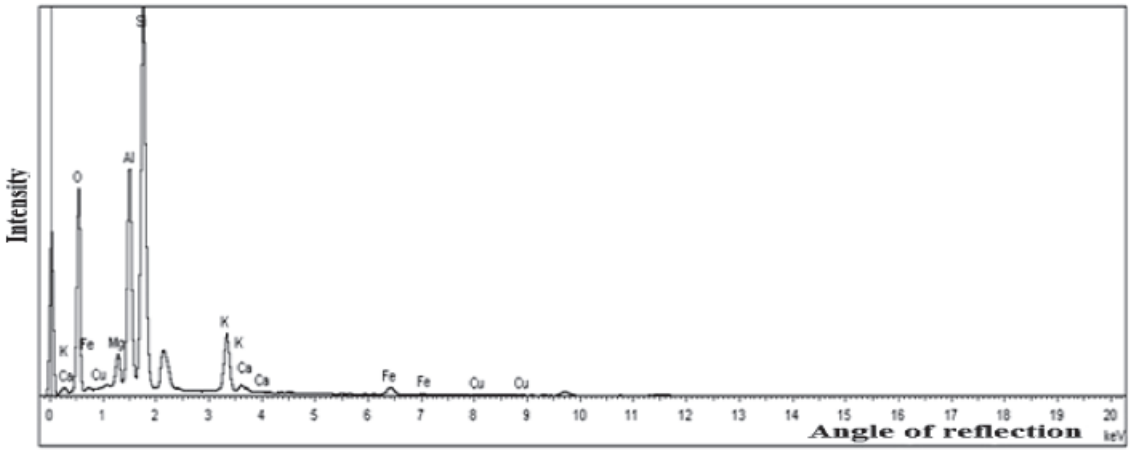

Fig. 2. Spectrum analysis of mill tailing

As per chemical composition, the considered tails contain the following (in %): S_{ttl} = 2,5; $S_{sulfide}$ = 0,9; Fe_{ttl} = 1,9; Cu = 0,15; Pb = 0,04; Zn = 0,03; Re = 0,61 g/t; Mo = show. Tails are not soluble in the water, non-inflammable, non-explosive. Classof hazard – 3.

Milltailing after processing of copper lead ore of Ridder-Sokol, Tishinsk and Zhairem fields contains up to 0,01 % molybdenum. These man-made fields are basically sands with humidity of 20–35 % and volume weight of 2,75 t/m^3, containing (in %) Zn = 0,16; Pb = 0,063; Cu = 0,03; Bi = 0,004; Mo = 0,001; Mn = 0,07. Mill tailings are not soluble in water, non-inflammable, non-explosive. Class of hazard – 3. Chemical composition of the Zhezkazgan tailing is shown in the Table 6.

Table 6

Chemical composition of the Zhezkazgan mill tailings

Number phase	O	Na	Mg	Al	Si	K	Fe	Cu	Total
1	49,54	1,17	0,83	7,34	35,73	3,87	1,47	0,05	100,00
2	43,41	0,72	2,00	9,94	32,82	4,69	5,38	1,04	100,00
3	46,48	0,94	1,42	8,64	34,27	4,28	3,43	0,54	100,00

Conclusion

Thus, mill tailing of sulfide and oxide copper and copper lead ore contains significant amount of copper, lead, silver and rhenium.

The man-made fields are based on silicon oxide (up to 70%). With this respect, it is necessary to develop the methods of milling and separation of rare metals into the separate concentrate.

The development of effective technology for processing of man-made fields allows decreasing ecological tailing loads and ensures extraction of rare and rare-earth metals from the tailings of mining and smelting enterprises.

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References

1. Aytzhanova D. Implementation of modern programs use industrial waste // Industry of Kazakhstan. – 2012. – № 3. – P. 23–24.

2. The copper deposit in Kazakhstan. Directory. – Almaty, 1997.

3. Poletaev A.I., Kalmykov T.V. et al. Report on “mineralogical and petrographic and morphostructural especially molybdenum- copper deposit Aktogay” . – Alma-Ata, 1979. – Vol. 2.

4. Krivtsov A.I., Bogdanov Y. and others. copper deposit The types and conditions of formation – M., Nedra, 1987. – 197 p.

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Materials of Conferences

LONG-TERM STRATEGY FOR THE MARKET FORECAST IN PRODUCT ENGINEERING

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The objectives of the study and forecasting of demand and sales are identifying prospects for development of the enterprise, competition, economic conditions and other factors affecting the sales of products. On the basis of these predictions the following processes are done: production planning and financial activities, decisions about the scope and targeting of investment, the need for production facilities, and, consequently, new sources of supply companies, engineering development, etc.

The demand for some products is easy to predict. This applies mainly to goods with stable or growing sales in a stable competition. But most of the markets in the different realities of the unstable domestic aggregate demand or demand for certain goods companies, so quality of forecast preparation may be a key factor determining the success of the enterprise. Poorly same prediction leads to the accumulation of large inventories, a drop in commodity prices, or, conversely, to the impossibility of sales due to the sale of goods and the rapid depletion. The greater the volatility of demand, the greater the need for accurate forecasting and the development of methods of forecasting the company is experiencing. In short, demand forecasting and sales should be considered as an important means of improving the control system engineering company, to optimize its activities, enhance vitality and competitiveness, which determines the manifestation of great interest in this issue at the Russian enterprises.

The problem analysis and forecasting of demand and sales of engineering production is relevant and requires new modern methods, approaches, methods and recommendations to implement the mechanism of sales management engineering production in market conditions.

The main purpose of the work is to study the problems of analysis and forecasting of sales and development of methodological and practical recommendations for improving the organizational-economic mechanism of forecasting sales of enterprise engineering industry.

Thus, it is necessary to solve the following tasks: development of a strategy of long-term market forecast of engineering products; a study of the theoretical aspects of the definition of current and future demand and sales in a market economy; analysis of the current state of the organization of research and forecasting of demand and sales in the mechanical engineering enterprises, identify common trends in the development of this sphere; identify ways to improve the existing enterprise technology research and forecasting of demand and sales of finished products.

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DEVELOPMENT OF THE FINANCIAL-ECONOMIC INCENTIVES TO IMPROVE INVESTMENT CLIMATE IN REPUBLIC OF KAZAKHSTAN IN THE CONDITIONS OF THE NEW GLOBAL REALITY

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Purpose of the research. To work out complex measures to develop the financial-economic incentives to improve the investment climate in Kazakhstan in the new global reality, based on the results of the research, which are presented in table form the SWOT-analysis of the investment climate in Kazakhstan, which demonstrates the strengths and weaknesses, threats and opportunities of Kazakhstan in this issue.

Results of the research. Package plan for the implementation of the financial-economic incentives was proposed to improve the investment climate in Kazakhstan considering the world experience on the basis of the SWOT-analysis method the investment climate of the Republic of Kazakhstan. In particular, to overcome technological backwardness were offered:

– assignment to deduct the cost of purchase intangible assets used in the production of high and medium technology products;

– tax exemption of royalties received by the results of scientific research, scientific and technical developments, and development activities;

– provision of tax holidays for 5 years of corporate income tax, land tax, property tax, social tax for legal entities whose income from the activities of production of high and medium technology products is not less than 90 per cent of the total annual income from all activities.

Purpose of the research. To work out recommendations to develop of the financial-economic incentives to improve the investment climate

in Kazakhstan in the new global reality taking into consideration.

Methods of the research. The research is based on the methodology of the system analysis and the SWOT-analysis of the investment climate in Republic of Kazakhstan, involving structural and functional approach is to allocate objects in the system of structural elements and determining their roles (functions) in the system.

Results of the research. Complex measures to develop the financial-economic incentives to improve the investment climate in Kazakhstan in the new global reality was worked out taking into consideration.

Contents

New challenges appear to Republic of Kazakhstan in the conditions of modern reality*:*

– decline of demand for Kazakhstan's exports as a result of the economic slowdown in the world economy;

– absence of oil excess revenues as a result of the decline in world oil prices from $ 120 per barrel to $ 50 or less in 2014–2016;

– deterioration of the geopolitical situation in the world as a result of the implementation of sanctions by Western countries towards Russia.

Only diversified economy can effectively counter the consequences of the global crisis in the new global reality. It is important to draw enormous financial resources to solve this issue.

The new Address of the President of the Republic of Kazakhstan to the nation on November 30, 2015 the investment climate is designated as one of the most important areas of complex anti-recessionary and structural measures.

Attracted foreign direct investment have significant role in the economic growth of Kazakhstan. Annual inflows are more than 10 billion dollars USA since 2006. According to the Statistics Agency of Kazakhstan, the scope of foreign direct investment in Kazakhstan in 2008–2009 was attracted in the amount over 21 billion dollars USA notwithstanding the global crisis. In 2010–2013 attracted investments provide annual GDP growth on average 7% per year.

Unfortunately, the high rates of economic growth observed over 2010-2013, did not accommodate significant change in the economic structure. Non-manufacturing business remains the main driver of economic growth in Kazakhstan in recent years. Thus, according to the National Bank of Kazakhstan for 2013–2014 years, the contribution of services to GDP growth is estimated at 67% (trade, transportation, communication services, financial and insurance activities, etc.).

The contribution of industry and agriculture in real GDP growth was only 14%. Slight increase in manufacturing by 1,6% was mainly increase the production of food products and beverages (12,5%) and engineering (14,7%) **[2].**

The total amount of FDI attracted in 2005–2013, respectively, 58,8%, or 108,2 billion. There are ***commodity sector and share of manufacturing industries*** accounted for only ***11%, or 20,2 billion dollars USA*** **[3].**

In 2012, FDI flows reached a record high index of 28,9 billion dollars USA, which is 49% more than the pre-crisis level and 9% or 2,4 billion dollars USA more than in 2011.

Main investors in the economy of the Republic of Kazakhstan: the Netherlands, the USA, Switzerland, China, France, the United Kingdom [4].

State program of forced industrial-innovative development of Kazakhstan was developed to escape from dependence on raw materials in Kazakhstan as well as development of FEZ and export promotion in the Republic of Kazakhstan for 2010–2014. In the framework of this program favorable conditions were created for the development of priority sectors: agribusiness; refining; energy; the construction industry; mechanical engineering; tourism and others [5].

However, significant resources aimed to modernize the economy, **do not have proper influence on its diversification**. Since the implementation of SPFIID the part of manufacturing in GDP structure has not undergone any significant changes, and in 2012 it even decreased compared to 2011 and amounted only 11,3% of GDP.

Analysis data also indicates that GDP growth rate still largely depends on the growth of the mining industry and is provided mainly by the export of raw materials – oil and gas, and other raw materials. At the same time more than half of all revenues of the consolidated budget of the state are provided by commodity revenues.

Currently, there are positive trends and *drivers of economic growth in Kazakhstan, becoming the new economy created in the framework of innovative industrialization. Many manufacturing sectors are showing growth.* During the years of implementation of the State Program of Forced Industrial-Innovative Development of Kazakhstan during 2010–2014, the manufacturing industry grew

Table 1

GDP growth rates in Republic of Kazakhstan 2010–2015 (percentage)*

Name	2010	2011	2012	2013	2014	2015
Real GDP	7,3	7,5	5,0	6,0	4,3	1,5

N o t e . *Compiled by the author according to the Statistics Agency of RK [1].

by 1,3 times, chemical industry and construction materials – by 1,7 times. Release of engineering products increased by 2,2 times, and exports – by 3 times. There were 800 industrial projects realized. In 2015, the steel industry grew by 15%, chemicals – by 3,2%. Manufacture of mineral products – by 3,2%, clothing – by 4%. The World Bank and the Asian Development Bank forecast high rates of economic growth in Kazakhstan in 2016 [4].

In response to the global challenges and the global crisis of 2015–2016 Kazakhstan first adopts preemptive anti-crisis strategy, which was announced in the new Address of the President of Kazakhstan "Kazakhstan in the new global reality: growth, reforms, development" dated November 30, 2015.

Firstly, a second five-year industrial-innovative development has been launched, i.e. Kazakhstan creates economy which is not dependent of raw materials.

Secondly, the State Program of infrastructure development "Nurly Zhol" was adopted. An important aspect of anti-crisis measures is also linked with the transition of the national currency to a floating exchange rate.

Thirdly, Kazakhstan implements the "Plan of the Nation. One hundred concrete steps to implement 5-institutional reforms". Parliament has almost completed the work on the law-making provision of the Plan of the Nation. Approximately 80 laws were adopted. They came into effect on January 1, 2016, as it was planned. In particular, administrative barriers to small and medium-sized businesses are being removed, state administration, education and healthcare are improving. All these measures will give a safety margin to the state, society and the national economy.

Despite the negative impact of the global crisis, ***Kazakhstan in terms of global competitiveness of the Davos Economic Forum, currently ranked 42 in the world and took the 41 position in the global rating of the countries which create the most favorable conditions for business.***

Alongside with that, much remains to be done. Within the next decade Kazakhstan needs to [6]:

– provide an annual growth rate at 5 percent;

– increase exports of the processed goods by at least 2 times compared to 2015 and bring it up to 30 billion dollars USA a year;

– increase the annual volume of investment into the economy by more than 10 billion dollars USA, and in general for 10 years – not less than 100 billion dollars USA;

– Create more than 660 thousand new jobs, increase productivity by 2 times.

Such growth rates can be achieved only through structuring of the new drivers to ensure the inflow of export revenues. In this regard, ***it is important to improve the investment climate in Kazakhstan and to attract private investment with a focus on transnational corporations. It is necessary to generate a favorable environment for attracting "sophisticated investment***" [7].

Certainly, the countries seeking to attract significant foreign direct investment (FDI), should take measures to promote investment. Promotion of investment combines the development of a favorable investment policy, the creation of a positive image in the eyes of potential investors, implementation of targeted FDI attraction by identifying prospective foreign companies and providing services to investors. Successful examples of methods by which you can achieve "the favor" of investors among the states – participants of the OSCE are the Czech Republic, Ireland and the Baltic states. Eventually, than the more favorable investment climate appears in the country, even more attractive business proposals allow to present to investors [8, p. 15].

Positive and negative aspects of the investment climate in Kazakhstan and prospects for improvement were revealed during the research of investment climate in Republic of Kazakhstan on the basis of modern trends analysis in the country's investment activity, as well as the analysis of the factors influencing the state's position in the global competitiveness index. Results of the research are presented in the form of the SWOT-analysis (Table 2).

Based on the performed SWOT-analysis, we have developed a set of measures realization which will allow Kazakhstan to improve the investment climate and attract foreign investment in priority sectors of the economy (Figure).

At the modern stage, it is necessary to use the following financial and economic incentives and mechanisms to improve the investment climate in the Republic of Kazakhstan according to our scheme (Figure).

1) Infrastructure improvement

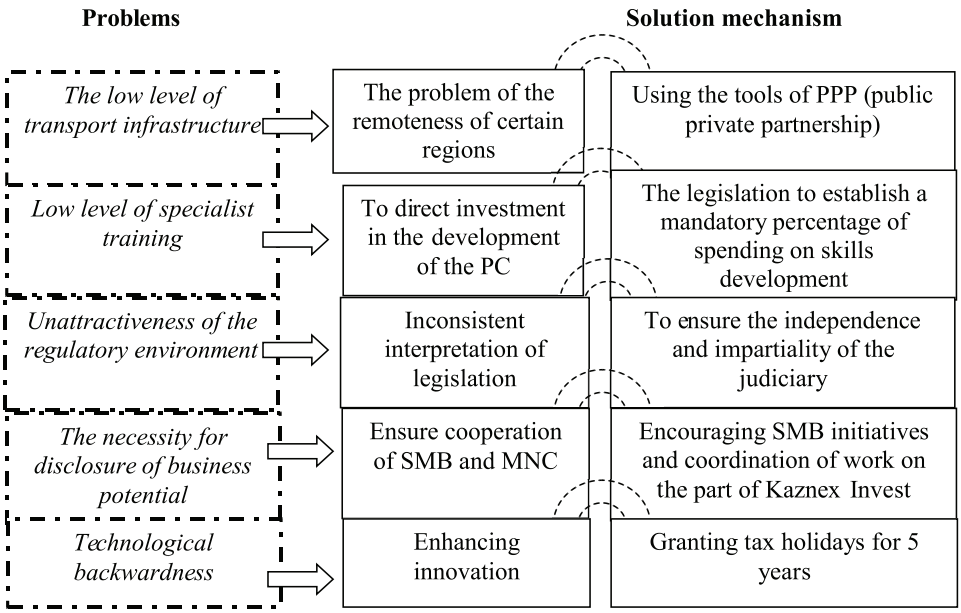
The further development of transport infrastructure taking into account the size of the country and the remoteness of some regions is particularly important. Coverage of the territory of Kazakhstan by roads and railways remains at relatively low level, and the ground areas allocated to enterprises often do not have engineering and communication infrastructure. In order to solve this issue it would be appropriate to use the mechanism of public-private partnership (PPP), providing attraction of the capital, to use technology, experience and knowledge, as well as increasing operational efficiency. It is also necessary to reduce the costs of running a business, as well as to improve the interaction between the domestic market and in the framework of the Common Economic Space. Public-private partnership is one of the tools in the state's arsenal, thanks to which it is expected to increase investment in infrastructure and deliver value. ***Financing of projects through the PPP mechanism*** *may involve the use of the state support, reflected in the fact that the state assumes part of the risk that it can manage more efficiently than private investors, and supports those projects that are economically feasible, but inviable. Besides, the PPP mechanism may contribute to more effective involvement of the private sector in public projects* [9, p. 23].

Table 2

SWOT-analysis of the investment climate in Republic of Kazakhstan

Strengths	Weaknesses
1. The presence of rich natural and mineral resources 2. Favorable geographic position of Kazakhstan to major consumer markets of Central and Western Asia, Russia, India and China 3. Macroeconomic and political stability in the country 4. The presence of tax holidays (privileges) and investment incentives in priority activities 5. High level of literacy 6. Service Support for investors JSC «National Agency for Export and Investment Kaznex Invest »	1. The low level of transport infrastructure and logistics 2. Professional qualification of the specialists does not correspond to the level, provides competitiveness 3. Inconsistent interpretation of legislation and its selective use 4. The insufficient degree of independence of judicial system 5. A complex system of tax administration 6. Technological backwardness 7. Bureaucracy and corruption
Opportunities	**Threats**
1. The emergence of additional opportunities in the framework of the Customs Union and the Common Economic Space 2. Modernization of the economy and the creation of incentives for the introduction of new technologies and processes 3. Development of business in order to expand opportunities for cooperation between local and international companies 4. Expansion of transportation inside the country and the connection to the main destinations abroad 5. Development of agriculture with the use of cluster initiative 6. Development of own indicator of investment activity around the world, which will be able to raise the country's investment image in the eyes of investors.	1. Exhaustion of state's raw material base 2. Keeping high-risk economy due to the presence of raw materials disproportion of the economy and investments 3. New laws and regulations may be impracticable for the business community or have a fuzzy interpretation 4. Inconsistent interpretation of legislation and its selective use by state authorities representatives may adversely affect to the level of confidence of the business community and foster the ideas about corruption

N o t e . Developed by the author.



The set of measures to improve the investment climate in the Republic of Kazakhstan. Note. Developed by the author

2) Development of human resources capacity for the implementation of large-scale economic plans of the country remains a key challenge against the background of the current working age population and the growing demand for qualified personnel. Lack of investment in human resources and material resources led to a decrease in labor productivity and quantity of created work places, economic stagnation and low incomes. For example, pinpoint investment in human resources successfully combines with investment in tangible funds and industry in Ireland .

Financial incentives are an important tool to attract investments of companies (businesses) and individuals in education and training. In the Netherlands, for example, citizens can deduct from the annual taxable income the amounts (at a rate of up to 15 000 euros) spent on improvement of their ability to employment in the present or future workplace. Employers have the right to reduce their taxable income by a certain percentage, depending on the amounts spent on the training of low-skilled workers or employees of older age groups (over 40 years), as well as workers of small enterprises. Furthermore, all participants of the "apprenticeship" program receive tax benefit in the amount of 2 500 euros during the course of the NGO [10, p. 10].

In accordance with the Tax Code in the Republic of Kazakhstan, the costs of employees' education are subject to deductions from taxable income [11, p. 58]. *However, realizing the importance of this incentive and its underestimation by Kazakhstani enterprises and companies, it is necessary to reveal* ***legally fixed percentage of expenditure on advanced training from taxable income.***

3) Ensuring transparency of legal and regulatory environment.

A stable political environment is a solid basis for economic development, and particularly for FDI. Its absence creates risks that discourage investors. The government should take the following measures to ensure a favorable political situation:

– Protecting the rights of investors to ensure fairness with regard to their economic interests and business conditions.

– Independence of the judicial system must be guaranteed to prevent a financial, political or other exertion of inappropriate influence, regardless of whether it is actual or perceived. The independence of the judicial system will help to separate business from politics and at the same time to reduce suspicions about the possibility of corruption. Possibility of international arbitration is an important tool for increasing confidence.

– Investors planning the creation of long-term sustainable business, require predictable and stable environment. Frequent changes in the legislation, coupled with an inadequate assessment of their effect deprive such strategic investors of motivation.

– The effectiveness of new laws and regulations depends on whether they contribute to the formation of fair and equal conditions. Thus, all interested parties should be involved in the process of drafting and provided with sufficient for the consultation time. In recent years there has been considerable progress in this area. However, there are cases when only part of interested parties is invited for participation in the public debate and the draft of law is sent to interested parties for comments and proposals directly before its submission to Parliament. As a result, there is not enough time to study and comment these drafts.

– Corruption is often a result of high administrative barriers. The government is constantly work on reducing administrative barriers to ensure the smooth and efficient conduct of business. ***It is necessary to accelerate the implementation of measures on struggle against corruption through the introduction of codes of conduct, reduce bureaucracy, provide a decent level of wages state employees.***

4) *Unlocking the potential of business* (especially SMBs) by reducing administrative barriers and costs related to compliance with legal requirements, and by ensuring transparent conditions for fair competition. The Government recognizes the importance of entrepreneurship, but the level of economic and social infrastructure development is insufficient to support the business.

Entrepreneurship plays a key role in formation of sustainable economy.

At the same time, investors need presence of local entrepreneurs with whom they could form partnerships, and which could contribute to the development of business within the supply chain (production-distribution chain). In the current environment, mistakes carry penalties, but the initiative is not rewarded. This deprives the motivation both investors and entrepreneurs.

The reforms to support entrepreneurship are generally similar to the reforms in support of investors: reduction of bureaucratic barriers, clear and consistent policy in the field of tax administration, development of competitive human resources, construction of infrastructure (transport, communications, banking, technology, etc.).

5) Elimination technological backwardness

The widespread development of innovative technologies based on advanced scientific and technological achievements in all areas of industrial production is a key area for economic growth. There are two main ways to stimulate R & D in the private sector are used in the world practice: direct subsidies through grants and government programs and indirect subsidies through tax exemptions.

According to the Law "On state support of industrial and innovative activity" dated 26.01.2012 innovation grants are provided for the following purposes in Kazakhstan: performance of experimental – design developments; preparation of technical – economic feasibility of the innovative project; patenting of industrial property in foreign countries, and (or) international patent organizations [9].

As the measures of tax stimulation of the innovation activity it was provided: decrease in taxable income to 0,5 times the costs incurred for the research and development (R & D), science and technology development (RTD) and experimental development (R & D) accumulated until the implementation of the results according to the type of work; assignment to deduct actual expenses for compulsory contributions to the subsoil research, STD & D (1 % of total annual income) [11, p. 51].

However, these measures are not sufficient for successful innovation at the present stage. Kazakhstan took 83 place out of 141 as the global index of innovations' development in 2012 shows. China and India are leaders of the index among countries [12]. It should be noted that in order to stimulate innovations these two countries actively use tax holidays. For example, there is entire (100 %) exemption from paying major taxes after receiving the first income in the first 2–5 years in China. And there are tax holidays granted for 7 years after receiving the first revenue in Israel.

Conclusion and recommendations. Based on conducted analysis we propose:

1. Transition to deduction of costs for acquisition of intangible assets used in the production of high and medium technology products

2. Exemption from taxation of royalties obtained as a result of research, R & D, STD & D.

3. Granting tax holidays for the term of 5 years to corporate income tax, land tax, property tax, social tax for legal entities whose income from the activities of production of high and medium technology products is not less than 90 per cent of the total annual income from all activities.

The entire complex of the above-mentioned problems should be resolved at the same time as an isolated solution of certain problems could not achieve his goal – improving the investment climate for multidirectional other factors.

References

1. Osnovnye socialno-ekonomicheskie pokazateli Kazakhstana. Statisticheskiy ezhegodnik. Agentstvo RK po statistike [The main socio-economic indicators of Kazakhstan. Statistical Yearbook. Agency on Statistics of Kazakhstan], Astana, 2011–2015. – http://www.stat.kz.

2. Otchet o finansovoy stabilnosti Kazakhstana [Financial Stability Report of Kazakhstan] 2011, 2012, 2013, 2014, 2015, Available at official website of National Bank of Kazakhstan http: // www. nationalbank.kz.

3. Kazakhstan, 2014, № 2, P. 13.

4. Godovoy otchet AO «Natsionalnoe agentstvo po eksportu i investitsiyam "KAZNEX INVEST" [Annual report of JSC "National Agency for Export and Investment "KAZNEX INVEST"] for 2013, Available at http://www.kaznexinvest.kz/about/report/annualrep_2013_rus1.pdf.

5. Gosudarstvennaya programma forsirovannogo industrialno-innovatsionnogo razvitiya Kazakhstana na 2010–2014 gody [The state program of forced industrial-innovative development of Kazakhstan for 2010–2014], Available at http://www.zakon.kz.

6. Poslanie Prezidenta Respubliki Kazakhstan Nursultana Nazarbaeva narodu Kazakhstana. 30 noyabrya 2015 goda. "Kazakhstan v novoj globalnoy realnosti": rost, reformy, razvitie" [Address by the President of the Republic of Kazakhstan Nursultan Nazarbayev to the people of Kazakhstan. November 30, 2015. "Kazakhstan in the new global reality": growth, reform, development"].

7. Rukovodstvo po nailuchshey praktike v oblasti formirovaniya pozitivnogo delovogo i investitsionnogo klimata OBSE [Guidelines on best practices for a Positive Business and Investment Climate OSCE], 2006. – P. 188

8. Dzheffri Delmon. Gosudarstvenno-chastnoe partnerstvo v infrastrukture: prakticheskoe rukovodstvo dlya organov gosudarstvennoy vlasti [Jeffrey Delmon. Public-private partnership in infrastructure: A practical guide for public authorities], 2010. – P. 250.

9. Oleynikova O.N., Muraveva A.A., Aksenova N.M. Obuchenie v techenie vsey zhizni kak instrument realizatsii Lissabonskoy strategii [Oleinikova ON, Muraveva AA Aksenov, NM Education throughout life as a tool for the implementation of the Lisbon strategy]. Moscow, RIO named after Konyaeva, 2009 – P. 131.

10. Kodeks Respubliki Kazakhstan o nalogah i drugih obyazatelnyh platezhah [The Code of the Republic of Kazakhstan on taxes and other obligatory payments] dated 10.12.2008 № 99-IV – P. 460.

11. Zakon Respubliki Kazakhstan "O gosudarstvennoy podderzhke industrialno-innovatsionnoy deyatelnosti" [Law of the Republic of Kazakhstan "On state support of industrial innovation"] dated 26.01.2012, Available at http://camng.kz.

12. Issledovanie INSEAD: Globalnyy indeks innovatsiy 2012 goda [Research INSEAD: The Global Innovation Index 2012], Available at website Center of Humanitarian Technologies http://gtmarket.ru.

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DEVELOPMENT OF INNOVATION

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Innovation is a new idea, more effective device or process. Innovation can be viewed as the application of better solutions that meet new requirements, inarticulated needs, or existing market needs. This is accomplished through more effective products, processes, services, technologies, or ideas that are readily available to markets, governments and society. The term innovation can be defined as something original and more effective and, as a consequence, new, that "breaks into" the market or society.

While a novel device is often described as an innovation, in economics, management science, and other fields of practice and analysis innovation is generally considered to be a process that brings together various novel ideas in a way that they have an impact on society.Innovation differs from invention in that innovation refers to the usage of a better and, as a result, novel idea or method, whereas invention refers more directly to the creation of the idea or method itself. Innovation differs from improvement in that innovation refers to the notion of doing something different rather than doing the same thing better.

Sources of innovation. There are several sources of innovation. It can occur as a result of a focus effort by a range of different agents, by chance, or as a result of a major system failure.

According to Peter F. Drucker the general sources of innovations are different changes in industry structure, in market structure, in local and global demographics, in human perception, mood and meaning, in the amount of already available scientific knowledge, etc.

Original model of three phases of the process of Technological Change

In the simplest linear model of innovation the traditionally recognized source is *manufacturer innovation*. This is where an agent (person or business) innovates in order to sell the innovation.Another source of innovation, only now becoming widely recognized, is *end-user innovation*. This is where an agent (person or company) develops an innovation for their own (personal or in-house) use because existing products do not meet their needs. MIT economist Eric von Hippel has identified end-user innovation as, by far, the most important and critical in his classic book on the subject, *Sources of Innovation*.

The robotics engineer Joseph F. Engelberger asserts that innovations require only three things:

1. A recognizedneed.
2. Competent people with relevant technology.
3. Financialsupport.

However, innovation processes usually involve: identifying customer needs, macro and meso trends, developing competences, and finding financial support.The Kline chain-linked model of innovation places emphasis on potential market needs as drivers of the innovation process, and describes the complex and often iterative feedback loops between marketing, design, manufacturing, and R&D.

Innovation by businesses is achieved in many ways, with much attention now given to formal research and development (R&D) for "breakthrough innovations". R&D help spur on patents and other scientific innovations that leads to productive growth in such areas as industry, medicine, engineering, and government. Yet, innovations can be developed by less formal on-the-job modifications of practice, through exchange and combination of professional experience and by many other routes. The more radical and revolutionary innovations tend to emerge from R&D, while more incremental innovations may emerge from practice – but there are many exceptions to each of these trends.

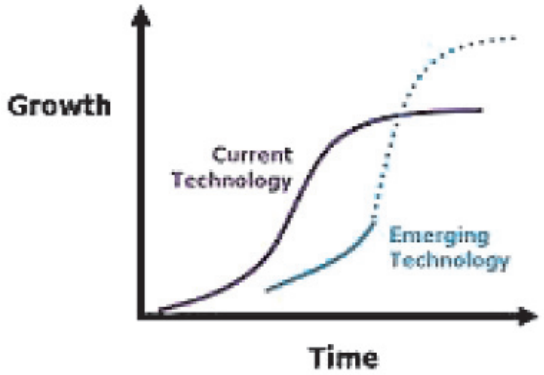
Information technology and changing business processes and management style can produce a work climate favorable to innovation. For example, the software tool company Atlassian conducts quarterly "ShipIt Days" in which employees may work on anything related to the company's products. Google employees work on their own projects for 20% of their time (known as Innovation Time Off). Both companies cite these bottom-up processes as major sources for new products and features.

An important innovation factor includes customers buying products or using services. As a result, firms may incorporate users in focus groups (user centred approach), work closely with so called lead users (lead user approach) or users might adapt their products themselves.

The lead user method focuses on idea generation based on leading users to develop breakthrough innovations. U-STIR, a project to innovate Europe's surface transportation system, employs such workshops. Regarding this user innovation, a great deal of innovation is done by those actually implementing and using technologies and products as part of their normal activities.

In most of the times user innovators have some personal record motivating them. Sometimes user-innovators may become entrepreneurs, selling their product, they may choose to trade their innovation in exchange for other innovations, or they may be adopted by their suppliers. Nowadays, they may also choose to freely reveal their innovations, using methods like open source. In such networks of innovation the users or communities of users can further develop technologies and reinvent their social meaning.

Diffusion of innovation



Main article: Diffusion of innovations

Diffusion of innovation research was first started in 1903 by seminal researcher Gabriel Tarde, who first plotted the S-shaped diffusion curve. Tarde (1903) defined the innovation-decision process as a series of steps that includes:

1. Firstknowledge.
2. Forminganattitude.
3. A decision to adopt or reject.
4. Implementationanduse.
5. Confirmationofthedecision.

Once innovation occurs, innovations may be spread from the innovator to other individuals and groups. This process has been proposed that the life cycle of innovations can be described using the 's-curve' or diffusion curve. The s-curve maps growth of revenue or productivity against time. In the early stage of a particular innovation, growth is relatively slow as the new product establishes itself. At some point customers begin to demand and the product growth increases more rapidly. New incremental innovations or changes to the product allow growth to continue. Towards the end of its lifecycle, growth slows and may even begin to decline. In the later stages, no amount of new investment in that product will yield a normal rate of return

The s-curve derives from an assumption that new products are likely to have "product life" – i.e., a start-up phase, a rapid increase in revenue and eventual decline. In fact the great majority of innovations never get off the bottom of the curve, and never produce normal returns.

Innovative companies will typically be working on new innovations that will eventually replace older ones. Successive s-curves will come along to replace older ones and continue to drive growth upwards. In the figure above the first curve shows a current technology. The second shows an emerging technology that currently yields lower growth but will eventually overtake current technology and lead to even greater levels of growth. The length of life will depend on many factors.

Many scholars claim that there is a great bias towards the "science and technology mode" (S&T-mode or STI-mode), while the "learning by doing, using and interacting mode" (DUI-mode) is widely ignored. For an example, that means you can have the better high tech or software, but there are also crucial learning tasks important for innovation. But these measurements and research are rarely done.

A common industry view (unsupported by empirical evidence) is that comparative cost-effectiveness research (CER) is a form of price control which, by reducing returns to industry, limits R&D expenditure, stifles future innovation and compromises new products access to markets. Some academics claim the CER is a valuable value-based measure of innovation which accords truly significant advances in therapy (those that provide "health gain") higher prices than free market mechanisms. Such value-based pricing has been viewed as a means of indicating to industry the type of innovation that should be rewarded from the public purse. The Australian academic Thomas AluredFaunce has developed the case that national comparative cost-effectiveness assessment systems should be viewed as measuring "health innovation" as an evidence-based concept distinct from valuing innovation through the operation of competitive markets (a method which requires strong anti-trust laws to be effective) on the basis that both methods of assessing innovation in pharmaceuticals are mentioned in annex 2C.1 of the AUSFTA.

Future of innovation. Jonathan Huebner, a physicist working at the Pentagon's Naval Air Warfare Center, argued on the basis of both U.S. patents and world technological breakthroughs, per capita, that the rate of human technological

innovation peaked in 1873 and has been slowing ever since. In his article, he asked "Will the level of technology reach a maximum and then decline as in the Dark Ages?" In later comments to *New Scientist* magazine, Huebner clarified that while he believed that we will reach a rate of innovation in 2024 equivalent to that of the Dark Ages, he was not predicting the reoccurrence of the Dark Ages themselves.

His paper received some mainstream news coverage at the time.

The claim has been met with criticism by John Smart, founder of the Acceleration Studies Foundation, who asserted that research by technological singularity researcher Ray Kurzweil and others showed a "clear trend of acceleration, not deceleration" when it came to innovations. The foundation issued a reply to Huebner in the pages of the journal his article was published in, citing the existence of Second Life and eHarmony as proof of accelerating innovation; Huebner also replied to this. However, in 2010, Joseph A. Tainter, Deborah Strumsky, and José Lobo confirmed Huebner's findings using U.S. Patent Office data. Additional verification was provided in a 2012 paper by Robert J. Gordon.

References

1. Ivanov V.V., Ivanova N.I., Roozeboom J., Haysbers H. National innovation systems in the EU and Russia. – M.: TSIPRAN RAS, 2006. – 280 c, S. 9.

2. The Russian Federation Innovative Development Strategy for the period up to 2020. Electronic resource. – URL: http://innovation.gov.ru/taxonomy/term/586 (reference date: 04.28.2014). – 122, S. 114.

3. Haschin SM, DM Zozulya, AE Safronov Management of innovative projects. – Rostov n/D: Publishing Center DSTU, 2013. – 226, S. 124.

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LIGHTING TECHNOLOGIES USING LED

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Lighting is an integral part of the infrastructure of the city, region and country. The security of the population and its operability depend on the lighting. Street outdoor lighting – means of artificially increasing the optical visibility on the street at night to ensure the safe movement of vehicles and pedestrians. Outdoor lighting system consists of the following parts:

– exterior lighting of buildings in residential areas;
– street lighting township, city and main roads;
– lighting of city parks and recreation areas.

Outdoor or exterior lighting should ensure that the functional and security needs of a development are met in ways that do not adversely affect the adjacent properties or neighborhood. The degree to which outdoor night lighting affects a property owner or neighborhood shall be examined considering the light source, level of illumination, hours of illumination and need for illumination in relation to the effects of the lighting on adjacent property owners and the neighborhood.

With the exception of lighting for public streets, all other project lighting used to illuminate buildings, parking lots, pedestrian walkways, bikeways or the landscape shall be evaluated during the site plan review process. The following Table A gives maximum lighting levels for outdoor facilities used at night averaged over the entire activity area.

Table 1

Maximum Lighting Levels

Area/Activity	Foot-candles Maximum unless otherwise noted
Building surrounds	1,0
Bikeways along roadside:	
Commercial areas Intermediate areas Residential areas	0,9 0,6 0,2
Bikeways distant from roadside	0,5
Walkways along roadside:	
Commercial areas Intermediate areas Residential areas	0,9 0,6 0,5
Park walkways	0,5
Pedestrian stairways	0,3
Loading and unloading platforms	5,0
Parking areas in residential zoning district	1,0
Parking areas, including outdoor display and retail areas	2,0
Playgrounds	5,0

Sources: Illuminating Engineering Society of North America (IESNA), Lighting Handbook (1987 and 9th (2000) editions) and Lighting for Exterior Environments (RP-33-99).

All other illuminance shall not exceed IESNA recommendations as published in the Lighting Handbook (9th ed. 2000), Lighting for Exterior Environments (RP-33-99), Recommended Practice for Lighting Merchandising Areas (RF-2), or other applicable IES publications, as these publications are amended; and The amount of nuisance glare (light trespass) projected onto a residential use from another property shall not exceed one-tenth (0,1) footcandle at the property line.

All exterior lighting, including public street lighting as applicable, shall meet the following design standards:

1. Background spaces like parking lots shall be illuminated as unobtrusively as possible to meet the functional needs of safe circulation and protection of people and property. Foreground spaces, such as building entrances and outside seating areas, shall utilize local lighting that defines the space without glare.

2. Light sources shall be concealed or shielded to the maximum extent feasible to minimize the potential for glare and unnecessary diffusion on adjacent property and rights-of-way. At a minimum, on-site parking areas, pedestrian walkways and sidewalks shall use full cutoff-type lighting that provides consistent illumination of at least one (1) foot-candle.

3. The style of light standards and fixtures shall be consistent with the style and character of architecture proposed on the site.

4. All outdoor lighting not necessary for security purposes shall be reduced, activated by motion sensor devices, or turned off during nonoperating hours.

5. Light fixtures used to illuminate flags, statues or any other objects mounted on a pole, pedestal or platform shall use a narrow cone beam or light that shall not extend beyond the illuminated object.

6. For upward-directed architectural, landscape and decorative lighting, direct light emissions shall not be visible above the building roofline.

7. Light fixtures shall be located on the periphery of the areas with light sources directed into parking areas. No light sources shall be located on building facades directed outward toward property boundaries or adjacent rights-of-way.

8. Lighting sources shall be color-correct types such as halogen or metal halide, and light types of limited spectral emission, such as low-pressure sodium or mercury vapor lights, are prohibited even in service areas.

Installation of artificial lighting are the most massive engineering devices (more than 1,5 billion. of light points total capacity about 150 million. KW) and consume about 20% of all electricity generated (over 220 billion. KWh). Therefore a professional approach to their implementation and operation is directly related to energy saving and reduction of labor costs.

Compliance with science-based lighting standards contributes to the exclusion of any interference with the objective of solving a particular problem and comfortable visual perception of visual information without eye strain and fatigue. If these standards are not carry out, a significant part of human vitality is spent on overcoming the consequences of "bad lighting".

High-qualitative, "good lighting" that satisfies the standards of lighting, allows a person navigate safely, easily and quickly, move in the environment and perform a particular work.

The theme is relevant because the lighting systems in cities must be ensure the requirements of safety movement of the transport and people and be part of harmonious composition of evening look of the city, and also to be costeffective and have ergonomic features.

To solve the problem regarding security can be in the same way as many years ago – using of lanterns (in other words, the console lights). These lanterns require estimation of power, they should be given an amount of light onto the sidewalk or driveway, which will be enough to not dazzle drivers and help pedestrians.

Outdoor lighting helps to improve security level. Thus, according to a number of investigations (unfortunately, conducted mainly in Europe and the United States), road lighting leads to a decrease of the number of deaths in road accidents by about 65%, while the number of accidents with injuries – by 30%. The strongest influence on the number of accidents involving pedestrians in the dark – a decline of about 50%.

Over the past two to three decades, artificial lighting has become an integral part of urban planning to create new and reconstruction of old cities. Naturally, in this regard, there is a need in the theoretical understanding of issues related to its design in the architectural and art, lighting and electrical, economic aspects (for architectural and artistic aspect refers not only aesthetic issues, but also the convenience and comfort of city life).

The choice of a illumination source is determined by the requirements for lighting (chromaticity emitting, visual comfort, glare index and others.) and is performed by comparing the advantages and disadvantages of existing light sources. In this case, preference should be given discharge illumination source as the most cost-effective, having luminous efficiency of more than 50 lm/W, and in this regard to ensure minimum power consumption. Therefore, it was offered the option of LED lamps.

Let's try to compare such different light sources. The main parameter, we assume the effectiveness of the illuminator source, that is, how much light it produces requiring 1 watt (lm/W).

Table 2

Number	Name of the light source	luminous efficiency
1	Incandescent lamp	20 lm/W
2	Discharge gas lamp (Energy Saver).	90 lm/W
3	LED lamp	130 lm/W
4	Sodium lamp	150 lm/W

Relatively recently, the revolution in lighting has been the development of innovative LED technology provided by global manufacturers of LEDs such as the Cree Lighting (USA), OSRAM Opto Semiconductor (Germany), Philips Lumileds Lighting (USA), Nichia (Japan). and others. The new Russian projects use LED lighting company «Hella», «Lighting Technologies», «Osram». Thus, we get a lot of advantages. When designing outdoor lighting using LED lamps are provided: the normalized value of quantitative and qualitative indicators of lighting installations; efficiency installations and rational use of energy; reliability of lighting installations; security staff and the population; convenience of maintenance and management of lighting systems. And a warm and comfortable light in front of the entrances provides by the sodium lamps.

Selecting any of the light source is determined by the lighting requirements (color light, visual comfort, dazzling brightness index et al.) And is performed by comparing the advantages and disadvantages of existing light sources. In this case, preference should be given discharge light sources as the most cost-effective, having light output of more than 50 lm/W, and in this regard to ensure minimum power consumption. Therefore, it was offered the option of LED lights.

LED lighting has several advantages: the consumer can save energy; not need to frequently change incandescent bulbs, which further reduces the cost of their operation and maintenance; all power-saving devices of light that are used today have a much shorter life, they are very vulnerable to shock and vibration and poorly tolerate the frequent turning on.

Distinguish between street and interior LED lighting. Now they are used in lighting of buildings, vehicles, as well as for street advertising billboards, fountains and bridges. A distinction is also office LED lights (which are used for industrial and office buildings) and lighting fixtures for homes (which are used for interior and furniture). Lighting using LEDs became relevant in translating design ideas in modern interiors. Decorative LED lights are used mainly for holiday illumination on the streets of the city (such as garlands), as well as to decorate the facades of houses and trees.

Among new products include LED spotlight, which is used for illumination of advertising billboards, different landscapes and architectural structures. It is also used for industrial buildings, streets, squares and others. This spotlight can operate for several years All LED street lamps are resistant to adverse weather conditions (freezing temperatures, rain, ice and snow). Moreover, their service life and the light intensity at low temperatures even increase. Reliability of LEDs that can operate up to 50 000 hours, dramatically reducing operating costs.

Cost effectiveness of such lamps is not their only advantage over traditional lighting systems. It should also mention their ability to provide more uniform brightness and higher quality light. Because of these qualities perception of objects is improved and as a result, increased safety. Due to the small size of the LED manufacturers get more opportunities in the design of lighting fixtures. In addition, LEDs do not contain harmful substances (such as lead, mercury, etc.), allowing you to use them in the perspective of sustainable technologies, outdoor lighting, and also solves the problem of disposal of obsolete lamps.

Today LED lamps on the market in the broadest range. With their help, there are illuminated streets, tunnels, car parks and public areas. For each application has its own types of lamps. Modern technologies allow to renounce the use of secondary optics through the integration of reliable silicone lenses in the design and formation of the oval LED directional characteristics of radiation. This eliminates the need for a reflector system that greatly facilitates the task lighting designers and improves the efficiency of the light source since it now covers only the portion which requires. Compound LEDs made using conventional soldering. To more accurately and efficiently distribute light, they can be combined in a system.

Modern LEDs for use in street lamps, have a wide angle of illumination (up to 170 degrees) and high color rendering index value (up to 80). The design of the body contributes to the efficiency of heat dissipation and low cost installation.

The value of rationing illumination is set depending on adopted light sources and illumination system. LED lamps as more efficient allow to obtain lighting at the same power setting several times higher than incandescent lamps. Therefore, we will use the first as the main and only source of light on the roadway.

Circuit Breakers Series VA47-63 most widely used to protect electrical circuits from overload and short-circuit currents with maximum switching capacity range from 4500A to 6000A. Circuit breaker VA47-63 is a reliable and cost-effective solution for a wide range of applications.

Circuit Breakers Series VA47-63 suitable for use in the residential sector (apartments, villas, cottages, houses, etc.), as well as in office buildings and commercial sector (offices, shops, restaurants, hotels, etc.)

In conclusion we can say that we can designe the lighting and electrical lighting of the residential building as a whole.

We can achieved efficiency, environmental friendliness and comfort by lighting modern lighting LED lights.

Economical use of energy, electrical engineering, creating an economical system operation and control of lighting.

All evening painting, composition of light spots of different functional and artistic values combined pattern constituting the basis of the picture. Drawing of all the architectural details associated with artificial lighting will become expressive, modern, in accordance with a large architectural form.

References

1. Eisenberg Y.B. Reference book on light engineering.

2. Vernesku D. Natural light in architecture and town planning. Stroyizdat.

3. Yunovich A.E. Magazine "Light engineering".

4. http://www.eatonco.org/section-x-article-ii---outdoor-lighting.htm.

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LIQUID COOLING VS. AIR COOLING

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What will happened to your PC, if you let it to be overheated? The PC will just burn out. When the processor's temperature increases by 10 degrees, its shelf life is reduced by half. But even half a reduced life spans CPU longer than its "relevance".

The main reason for cooling CPU is its unstable work and, as a result, the output of the processor down above a certain critical temperature for a certain period of time (often quite long). You can't escape from heat, but this problem has many solutions. Currently there are many cooling systems, they all use a common principle of operation – the transferring of heat from a hot body (cooled object) to the less hot (water cooling system). Don State Technical University students are working on improving one of the cooling methods – a liquid cooling system. They are proving that a liquid cooling system is better than a traditional air cooling system, and it is worth an effort putted in researches for improving it.

The secret to harnessing the cooling power of air lies in fans. Your typical air-cooled PC is packed with case fans, graphics card fans, and a CPU fan. They are positioned atop a big metal heat sink to keep computer expensive components nice and frosty.

A water-cooling system, on the other hand, employs a series of coolant-filled tubes, a radiator, water blocks (the equivalent of heat sinks), and a couple of other components to keep your PC being refreshed. However, that system will cost up to $500, while air cooling will cost about $120.

Let's compare both of these systems: thermal conductivity of water is 25 times better than thermal conductivity of air. It means that it will be much more efficient, plus, water pumps are less noisy than fans (25–40 dB – water cooling against air cooling, that can make noise louder than 42 dB).There is also the issue of space. A huge heat-sink/fan combination might perform well enough, but the best CPU coolers eat up a ton of real estate inside your computer case. Liquid cooling requires less space, and it looks a lot niftier to boot. You can't discount the cooling factor of a case full of colorful, liquid-filled tubes.

There are two reasons why a computer might need the increased thermal conductivity and heat capacity of water:

1. Its electronic components produce more heat than the air around them can absorb.

2. The fans required to move enough air to cool all the components make too much noise or use too much electricity.

In liquid-cooling systems water in pure form is rarely used as a coolant (it is connected to the electrical conductivity and corrosion activity of water). It is often distilled water (with various additives anti-corrosive nature), sometimes – oil and other special fluids.

Most computers dispel heat with heat sinks and fans. Heat sinks are basically pieces of metal that provide lots of surface area for the air to touch. The chip warms the heat sink, the heat sink warms the air, and the fan moves the warm air out of the PC case.

This system works most of the time, but sometimes, electronic components produce more heat than simple air circulation can dispel. High-end chips with lots of transistors can overwhelm an air-cooling system. So can chips that have been overclocked, or manually set to work at faster than their default speed.

There is also a way to get into liquid cooling with an all-in-one loop. It consists of a single closed loop with a radiator on one end and a pump/water block combo on the other. It is fairly easy to use.

So, which is better air cooling or water cooling? The answer depends on your particular usage needs.

One size does not fit all when it comes to case cooling, but most people can get by with fans alone. It is easy, and it is cheap. If, on the other hand, you are an enthusiast who needs the best cooling possible for your flaming CPU and a gaggle of graphics cards, a DIY water-cooling setup is in your future. Finally, try a sealed liquid cooler if you are considering liquid cooling either to keep your overclocked processor chilled or simply to benefit from reduced system noise.

References

1. Burek John A. Water-cool your PC // CNet. – 2005. – 8/24. – http://reviews.cnet.com/4520-11319_7-6291064-1.html

2. Burns Simon. Liquid Metal So Cool it May Be on Ice // The Inquirer. – 2005. – 8/4. – http://www.theinquirer.net/default.aspx?article=25164.

3. Case Loyd. ExtremeTech's Best of Computex. – 2005. – 6/3. – http://www.extremetech.com/article2/0,1558,1823785,00.asp.

4. Case Loyd. Notes from the Lab // Extreme Tech. – 2004. – 5/10. – http://www.extremetech.com/article2/0,1558,1611148,00.asp.

5. Modthebox.com. Introduction – Pumps. – http://modthebox.com/review221_1.shtml

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Short Reports

PRODUCTION TECHNOLOGY OF FUNCTIONAL BAKERY PRODUCTS

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Below are the results of research into quality and nutritive value indices of enriched bakery products. This paper focuses on use of such enriching agents as coarse whole meal and pureed vegetables (carrot, beet, pumpkin). It has been found that these enriching agents help to intensify production process, improve quality indices, and increase nutritive value and functionality of the products. The result has been the development of bakery products made of first grade white flour mixed with coarse whole meal, namely Olimpiets with 4,5% of pureed carrots, Marshal with 5% of pureed beets, and Patriot with 10% of pureed pumpkin. Compared to traditional types of bread made of first grade white flour protein content in the developed products has increased by 6%, dietary fibers content – by 53%. In addition, quantitative composition of vitamins and mineral substances has been expanded, and biological value has improved. Antioxidant activity level is by 1,5–2,5 times higher than control level. The developed products are recommended for enrichment of the food ration with protein, dietary fibers, vitamins, and mineral substances.

Bakery products play an important role in the food ration in Russia. Being everyday mass-consumption products, they can be used as a basis for development of enriched and functional products. We have determined the rationale for the use of coarse whole meal and concentrated vegetable purees in bakery technology in order to expand the range of products and increase their functionality [1].

For the purpose of this paper, we have conducted research into quality and nutritive value indices of enriched bakery products.

Coarse whole meal is characterized by high content of protein, dietary fibers, and micronutrients [4]. In bread production, we replaced 40% of the total weight of first grade white flour with coarse whole meal.

Pureed vegetables (carrots, beets, and pumpkins) have been produced from the corresponding purees concentrated until dry solids weight ratio of 40–50% is reached [3]. They are rich in mono- and disaccharides, vitamins, mineral substances, dietary fibers, including pectic substances. The choice of vegetables for the research was based on their specific chemical composition and physiological characteristics. Beet contains betanin and betaine that facilitate reduction of blood pressure, improve fat metabolism, and prevent atherosclerosis. Carrot is a polyvitaminic vegetable that is used as a preventive measure and treatment of hypovitaminosis and avitaminosis, visual impairment issues. Pumpkin helps in case of heart and kidney diseases, obesity, and high blood pressure [2].

This paper analyses quality of dough and finished products with the share of pureed vegetables of 2–10% of total flour weight. It has been found that adding enriching agents intensifies biotechnological processes related to microorganism activity, influences the development of flow properties of the dough, and allows getting products with high organoleptical and physical and chemical quality indices. Rational doses of purees have been calculated using mathematical planning and experiment optimization methods. Relevant formulas and production methods have been developed for the following bakery products: Olimpiets with 4,5% of pureed carrots, Marshal with 5% of pureed beets, and Patriot with 10% of pureed pumpkin.

The resulting products have higher quality, nutritive and biological value compared to traditional types of bread made of first grade white flour. They have pronounced taste and flavor as they are enriched with volatile acids and spirits; specific volume of the products has increased by 4–8%.

Protein content in the developed products has increased by 6%, dietary fibers content – by 53%. In addition, quantitative composition of vitamins and mineral substances has been expanded. The average biological value of the products is 58%, exceeding control level by 13%. It has been estimated that consumption of average of 100 grams of bread satisfies the recommended daily needs in the food ration in: protein – by 10%, dietary fibers – by 23%, phosphorus and B_1 vitamin – by 15%, ferrum – by 13%.

Antioxidant activity of the products has been determined using TsvetYauza-01-AA analyzer. The content of antioxidants in bread has been set as follows (mg/100 g): Marshal-1.7, Olimpiets-1.1, Patriot-1.2, which is 1,5–2,5 times higher the control level. The developed products are characterized by improved functionality and recommended for enrichment of the food ration with protein, dietary fibers, vitamins, and mineral substances.

References

1. Lukina S.I., Ponomaryova E.I., Magomedov M.G., Vavilova A.A. Concentrated semi-finished vegetable products in bakery technology // New and unconventional plants and their potential usage: materials from XI International symposium. – Pushchino, 2015. – P. 464–467.

2. Magomedov G.O., Oleinikova A.Ya., Plotnikova I.V. and others. Functional nutritive ingredients and additives in production of confectionery products. – St. Petersburg: GIORD, 2015. – 440 p.

3. Patent of the RF № 2528686. Production facility for concentrated fruit, vegetable and berry purees // G.O. Magomedov, M.G. Magomedov, A.S. Shcherbachenko. – 2014. – Bul. № 26.

4. Zastrogina N.M. Use of coarse whole meal in production of bread of different functionality // Agricultural goods production and processing: quality and security management: materials from III International theoretical and practical conference. – Voronezh, 2013. – P. 137–140.