

Materials of Conferences

**CHOICE OF FREQUENCY
OF AN ALTERNATING CURRENT
FOR ELECTRIC TRACTION MOTORS,
AND FOR LONG DISTANCE
POWER TRANSMISSIONS**

Dubas L.G.

RICHN RAAS, e-mail: sudarih@gmail.com

Some version of railway power supply system with frequency of an alternating current ≈ 10 Hz is offered. The potential risk for health of the person, connected with probable adverse influence of electromagnetic fields, possibly, thanks to symmetry, can be optimum.

In some countries of Europe: Sweden, Austria, Norway, Germany, and Switzerland – for railways power supply systems wide references have been received by system of AC power with semiconductor converters [1]. The Railway is electrified by an alternating voltage $= 15 \pm 4$ kV with frequency of $F/3$, where $F = 50$ Hz frequency on an alternating current of industrial electrification.

The railways power supply system of the reduced frequency possesses advantages. Degree of asymmetry of three-phase currents in industrial electric power system has reduced oneself. Also degree of asymmetry of thermal heating of three-phase symmetric electric circuit has decreases.

Trains can restore also energy, when braking, and are then power sources. Lack of subject is connected by electromagnetic influence on biorhythms of the person and therefore it is desirable to change the frequencies ratio of transformation, for example $F/5$ (if $F = 50$ Hz) or $F/6$ (if $F = 60$ Hz).

Frequency of an alternating current for electric traction motors and for converters of three phases

to one phase is equal in this example ≈ 10 Hz that is out of biorhythms of the person.

At use of two-way road the second phase with frequency ≈ 10 Hz for the electric traction motors which is perpendicular in relation to the first phase of a direct way is on the way back used.

Therefore on this special frequency of an alternating current $\approx 9,8 \pm 0,4$ Hz the long distance power transmission with four symmetric phases, for example with some voltage ≥ 35 kV, can work.

The power transmission at semiconductor converters with effective voltage $\approx 14 \pm 4$ kV in fully symmetric scheme on frequency $\approx 9,8 \pm 0,4$ Hz, possibly, do not influence health of the person.

Worldwide transport systems of electrification differ from other systems of transfer of the electric power. Mainly it is with possibility of regeneration of an electric current when electric trains can be at braking action as electric power sources. The potential risk for health of the person, connected with probable adverse influence of electromagnetic fields, besides is possible.

The choice for frequency of an alternating current for electric traction motors, and for long distance power transmissions with a safe principle of an electric power distribution can be optimum.

References

1. Lars Abrahamsson. Optimal Railroad Power Supply System Operation and Design // Doctoral Thesis, Stockholm, Sweden 2012 – 106 p. URL: <http://www.diva-portal.org/smash/get/diva2:574526/FULLTEXT01.pdf>, (ref. 11.07.14).

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