

Prorosals

for cooperation

of «Automated electromechanical systems» Department
of NTU “KhPI”

Department Automated electromechanical systems

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Department specialties

14.9 Electromechanical systems of automation and electric drive

14.10 Mechatronics and Robotics

Activity in area of the energy and resource saving by means of electric drive

2007 – Scientific research work according to The National Academy of Sciences of Ukraine plans

“Development of energy saving technologies and methodological basis of electric drives modernization in Ukraine”

We ranked **17 technologies of energy saving by means of electric drive**

$$N = \left(1 + \frac{q}{Q \cdot \eta_{\text{эс}}} \right) / \eta_{\text{эс}}$$

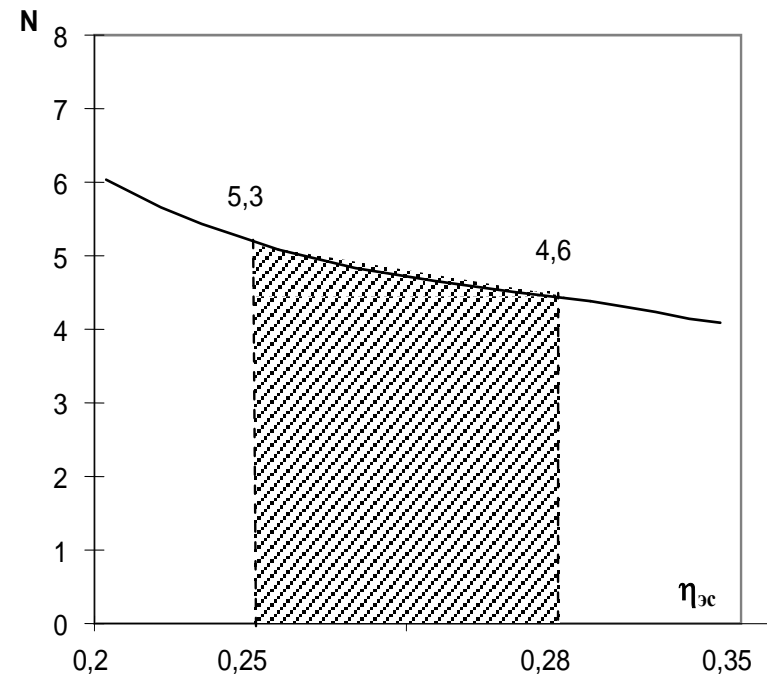
Q – heat build-up ability of fuel

$q = q_m + q_t$ – charge of the electric power for one ton (mining – q_m , transportation – q_t)

$\eta_{\text{эс}}$ – efficiency factor of thermal power station

Specificity of Ukraine:

- thermal power plants equipment wear
- instability of energy consumption schedule
- poor quality of bituminous coal



1 unit of the saved electric power saves 5 units of primary power resources in a power equivalent

Example of frequency-regulated electric drive commissioning of the water supply pump unit designed on «Automated electromechanical systems» department

Solomitsevka water station, 2008, $P=15$ kW:

7 years no-failure operation

Electric power saving 40,2%

Water saving 25%

Water-supply network breaks reduction from 60 to 8-10 per year

Only **non manufactured charges of the electric power** for transportation, preparation, the water drain and restoration of the saved water **have 6-fold excess of electric power economy according the register device** on an electric drive input.

It corresponds to **30-fold economy of hydrocarbolic fuel resources** in a power equivalent.

Automated electromechanical systems Department energy and resource saving designing

Microprocessor control frequency converter ПЧРТ-3 $P=5\div 22$ kW for energy and resource saving electric drive (manufactured experimental series 50 units) at Kharkov plant is named Shevchenko, using described above.

Off-line power supply $P=10$ kW (turboexpander - asynchronous generator – rectifier - self-commutated inverter). 4 units delivered to public corporation “Turbogas”

Energy and resource saving **electric drive for metro escalator**

Electric vehicle electric drive with ionistor recuperation during braking, accumulator power saving in the city cycle 22%



Automated electromechanical systems Department could carry out following works

- 1 Life time and reliability increase of electric vehicle electric drive components and systems on the basis of the first electric vehicle in Ukraine with the ionistor battery created on department AEMS
- 2 Creation of small and medium enterprises network on re-equipment cars in electric vehicles and their service in Ukraine
- 3 Development of an independent power supply source on the basis of turbo-expander for gas-distribution stations long-distanced from power lines
- 4 Development of the electric drive for precision machine tools and mechanisms with iterative control
- 5 Development of remote training on the basis of the removed access laboratory created on department on the basis of National Instruments equipment
- 6 Pumps start process optimizing calculations taking into account wave processes in electric-mechanic-hydraulic system, excluding impulses in water supply systems
- 7 Edition in English monograph
Klepikov V.B. Dynamics of electromechanical systems with nonlinear friction, 500 p.
- 8 Development of mobile robots for precision agriculture
- 9 Development of mobile robots for enterprises and electric power substations power ground automated diagnostics