Program:
13.04.02 Electric Power Engineering, MSc

South Ural State University
National Research University

Mode of study: Full-time
Department: Automated electric drive

EXPERIMENTAL RESEARCH OF ELECTRIC DRIVES

Lecturer: Dmitry Sychev, PhD, Associate Professor

Description

The course is worth 5 ECTS. The skills of adjustment and diagnostics of electric drives are certainly necessary for a specialist in the electrical industry. As a result of learning the student will get knowledge and experience of work with modern systems of automated electric drives of various world manufacturers.

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LEARNING Outcomes

Upon completion of the course a student will know:

- fundamental elements of control systems;
- the steady-state and dynamic characteristics of drives; advantages and
- disadvantages of position feedback sensors;

be able to (SWBAT):

- independently carry out research work;
- operate and maintain drive systems delivering a specific performance
- describe the differences of duty cycles;
- use appropriate technical terminology;

have a good command of:

- calculation methods for dynamic characteristics of drives;
- calculation methods used to find out sensor coefficients.

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Lectures

Module number	Name of the Module	Content of the Modules
1	Installation and maintenance of drives and control systems	Electronic equipment (Location of equipment, Ventilation systems and filters, control systems, controllers)
2	Position control	Position and speed feedback, Feedback quantity, Distance between t he feedback device and the drive, Position feedback sensors
3	Application and drive characteristics	Typical load characteristics and ratings, Drive characteristics
4	Drive functions. Duty cycles	Continuous duty, Short-time duty, Intermittent duty, Intermittent duty with starting, Intermittent duty with starting and electric braking, Continuous operation periodic duty
5	Thermal management	Motor cooling, Drive cooling: the thermal design of enclosures
6	Industrial application	Centrifugal pumps, Centrifugal fans and compressors, Heating, ventilation, air conditioning and refrigeration, Cranes and hoists, Elevators and lifts, Metals and metal forming

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Workshops

Task number	Module number	Name of the workshop
1	3	Characteristics of AC electric drives
2	3	Loss calculation of induction motor
3	5	Bode diagram of closed-loop system

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laboratory research

Lab #	Module number	Name of the Lab
1	2	Position feedback sensors
2	2	Position and speed control (A.C. motor)
3	3	A.C. electric drives characteristics (asynchronous and synchronous motors)
4	4	Motor and Drive cooling

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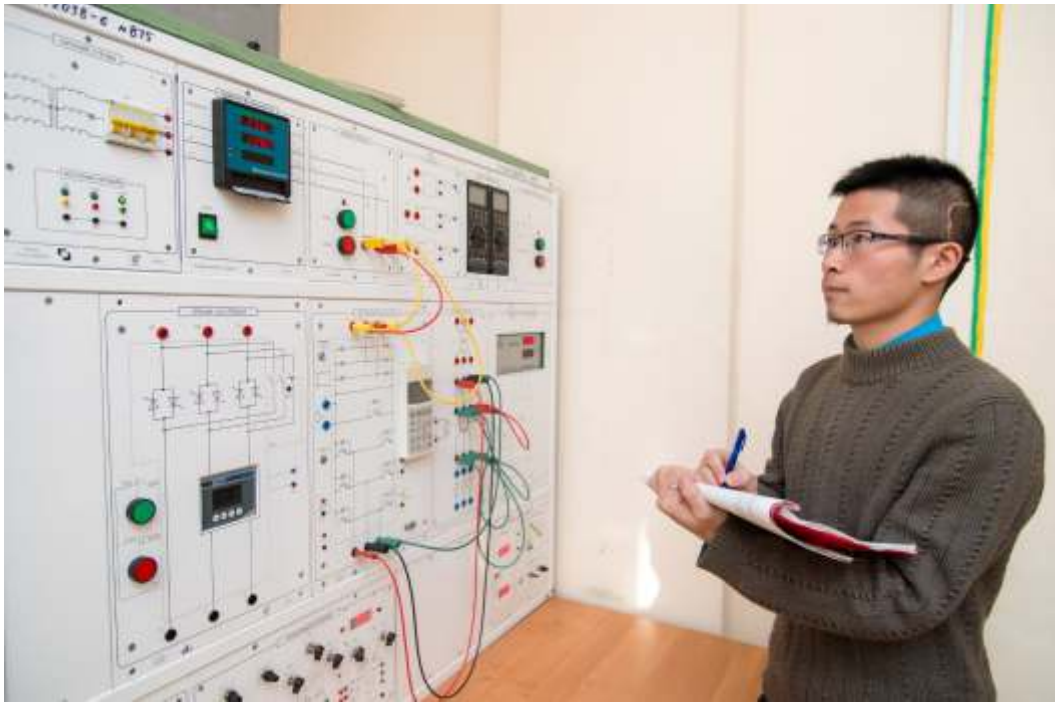
Laboratory of automated electric drive



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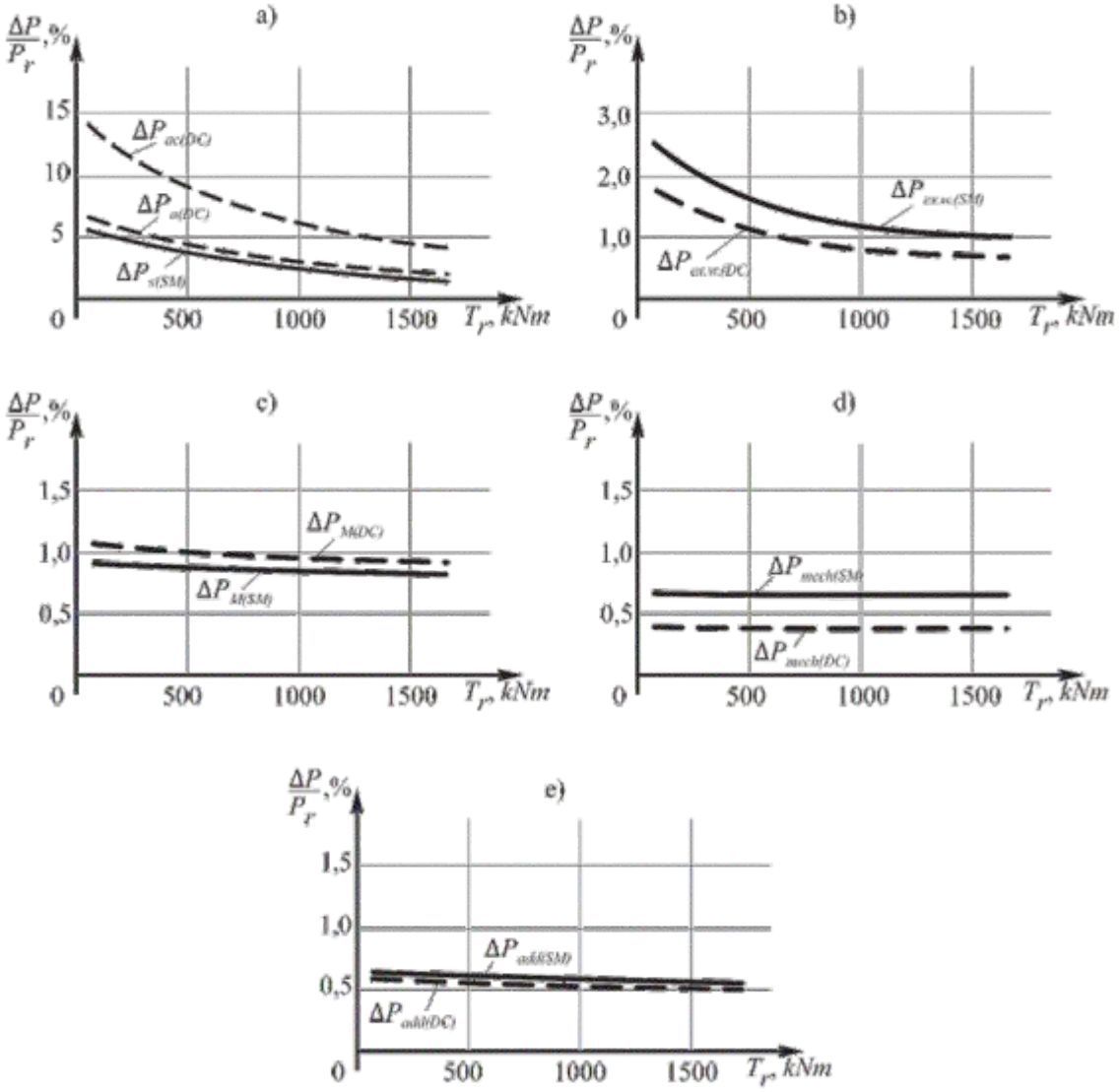
Industrial application I



Calculation of components of losses and total losses (rolling mill electric drive)

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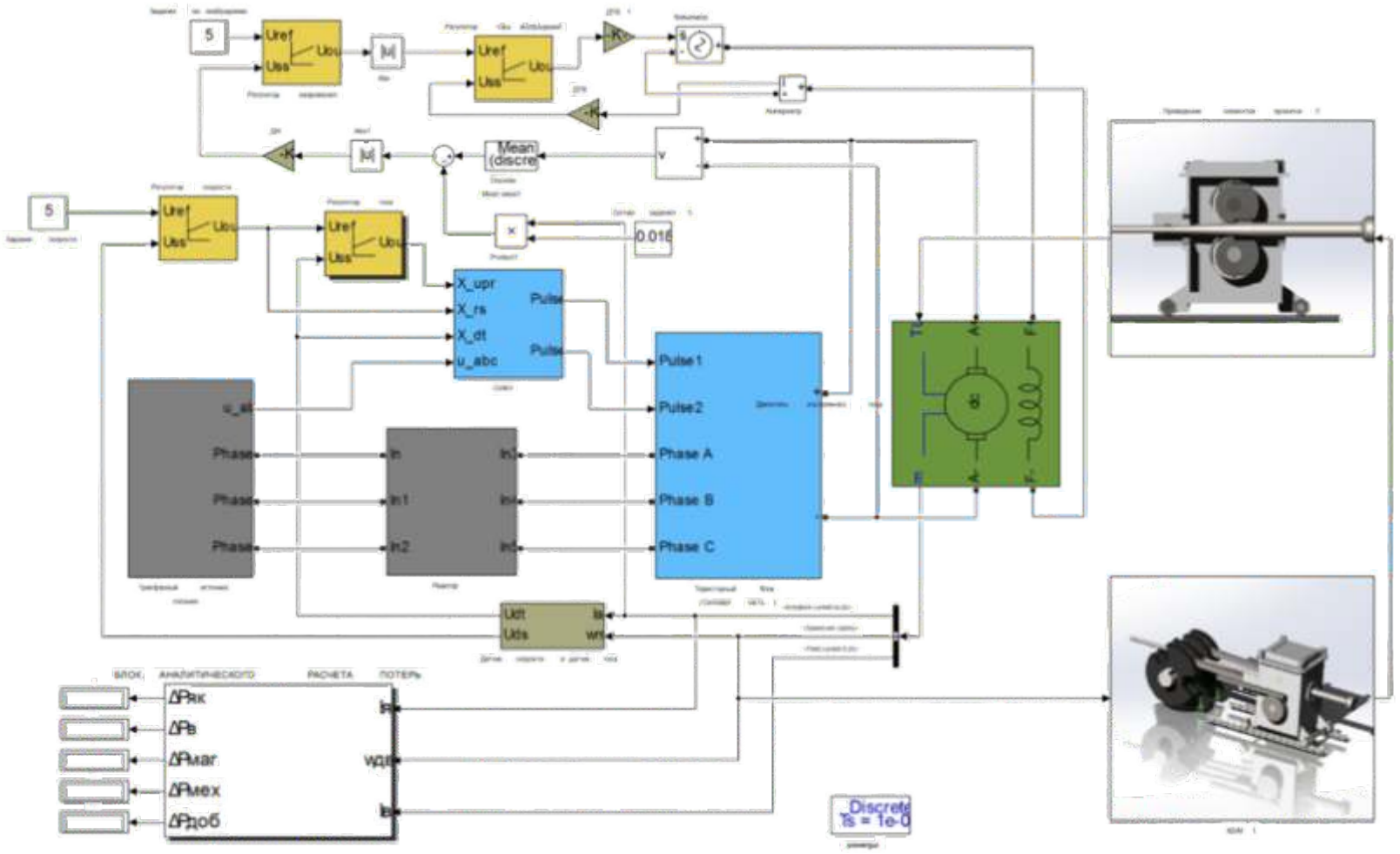
Industrial application II (workshops)



Mathematical model: synthesis of electric drive (evaluating energy efficiency)

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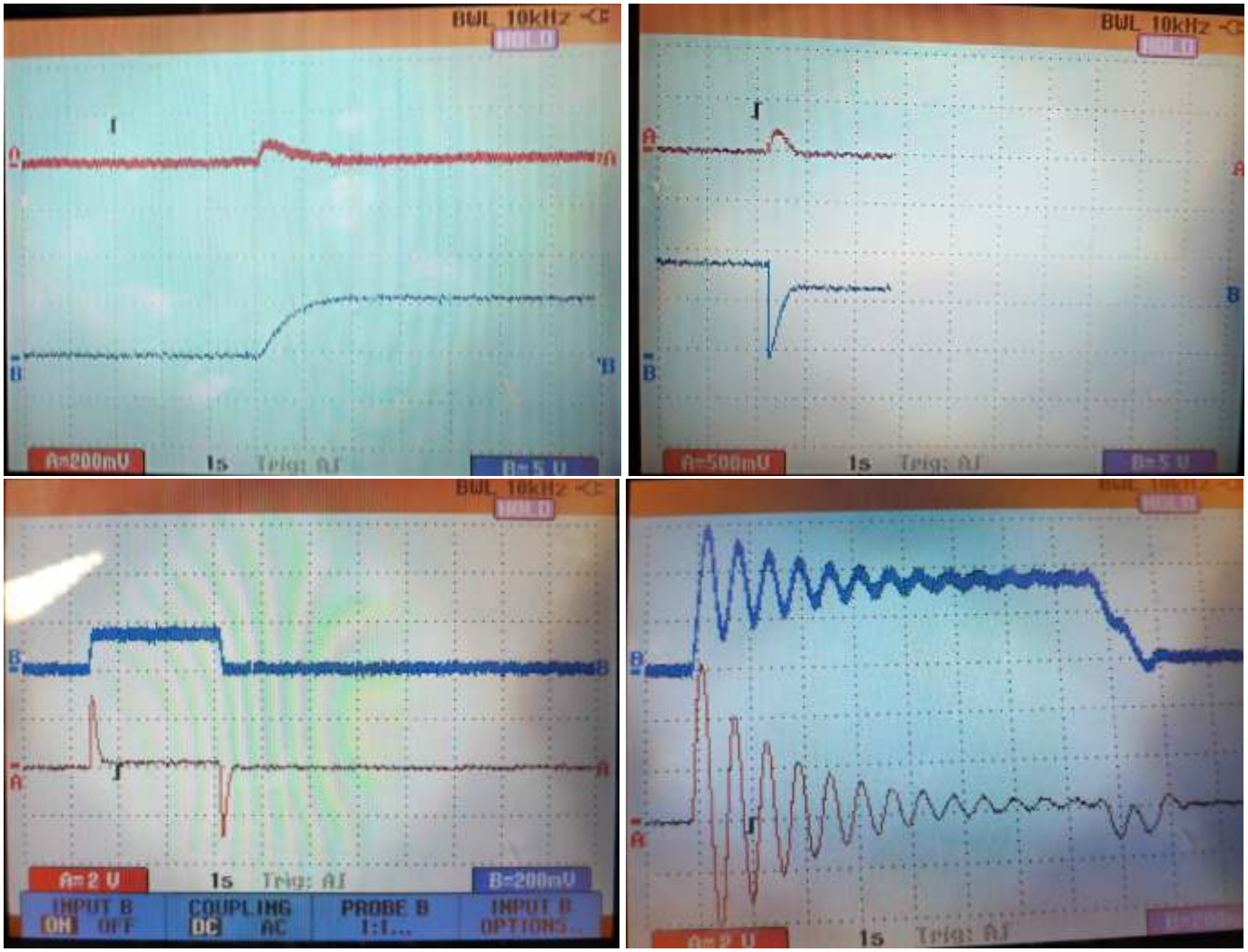
Industrial Applications III



Controllers adjustment
(position electric drive
of pipe rotation mechanism)