Program:
13.04.01 Heat Power Engineering, MSc

South Ural State University
National Research University

Form of training: Full-time
Department: of Thermal power engineering

CONTROL SYSTEMS FOR HEAT ENGINEERING PROCESSES

Lecturer: Osintsev Konstantin, PhD.
Department: of Thermal power engineering

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Course: Automated control systems for heat engineering

LEARNING Objectives

Upon completion of this course, students will be able to develop control systems for industrial heat power processes

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Lectures

1	Introduction	The concept of an automated control system. Terms and Definitions. Ways to use automated control systems.
2	Automated Power Regulators	Regulation of the power supply of the drum boiler unit with water. Scheme of a three-pulse ATS level in the drum. The structure of the power controller algorithm for PLC. Transients of the power regulator.
3	Automated Temperature controllers	Schematic diagram of the automated control of the superheat steam temperature. Transient characteristics of the TGM-84 boiler in terms of steam temperature with a disturbance of the 1st injection. Algorithm of the PLC program “CONTRAST” BK500 temperature controller (fragment). Examples of flow characteristics of feed valves
4	Quality requirements for the automated maintenance of the boiler technological parameters	Organization standard 70238424.27.100.078-2009 “Instrumentation and thermal automation systems of thermal power plants. Terms of creation. Standards and requirements. " Reliability requirements for the automatic control system of CHP
5	Regulatory Quality Requirements	Quality requirements for the automated maintenance of the technological parameters of the boiler.
6	Boiler combustion controllers	Regulation of fuel supply. Air flow regulation. Traction control
7	Requirements for the steam path of the boiler in terms of the automated control systems	Transients of the rarefaction regulator under the disturbance caused by a change in the load of the boiler
8	Power supply schemes for the control system of the boiler steam path	Power Redundancy Schemes

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Practical tutorials

1	Automated control system	Development of an automated control system.
2	Regulation of water supply to the drum boiler unit	Development of the scheme of a three-pulse system for automatic level control in the drum.
3	Schematic diagram of the automatic control of the superheat steam Temperature	Development of the concept of automatic control of the temperature of superheating of steam.
4	Reliability requirements for the CHP automated control system	Improving the reliability of the CHP control system.
5	Quality requirements for the automatic maintenance of the boiler technological parameters	Improving the quality of automatic maintenance of the boiler technological parameters.
6	Fuel supply regulations	Control and calculation of fuel supply.
7	Regulator transients	Calculation of transients of the vacuum regulator.
8	Power Redundancy Schemes	Development of a redundant power scheme.

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Lab tutorials

1	Ways to use automated control systems	Applications of automated control systems at the stand “Automated boiler room for liquid and gaseous fuels”.
2	Scheme of a three-pulse system of automatic control of the level in the drum of the boiler	Scheme of a three-pulse system of automatic level control in the drum at the stand "Automated boiler room for liquid and gaseous fuels".
3	Automated temperature controllers	Examples of flow characteristics of the feed valves at the stand "Automated boiler room for liquid and gaseous fuels".
4	Quality requirements for the automatic maintenance of the boiler technological parameters	Requirements for the reliability of the automatic control system for thermal power plants at the stand "Automated boiler room for liquid and gaseous fuels".
5	Regulatory Quality Requirements	Quality requirements for the automatic maintenance of the technological parameters of the boiler at the stand "Automated boiler room for liquid and gaseous fuels".
6	Boiler combustion controllers	Regulation of air supply and draft stand “Automated boiler room for liquid and gaseous fuels”.
7	Requirements for the steam path of the boiler	Transients of the rarefaction regulator under disturbance by a change in the load of the boiler at the stand "Automated boiler room for liquid and gaseous fuel.
8	Power supply schemes for the automatic control system of the boiler steam path	Power backup schemes at the stand “Automated boiler room for liquid and gaseous fuels”.

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Laboratory Stands

Automated boiler room
for liquid and gaseous fuels.

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Industrial Applications I

Mathematical modelling of a steam boiler.

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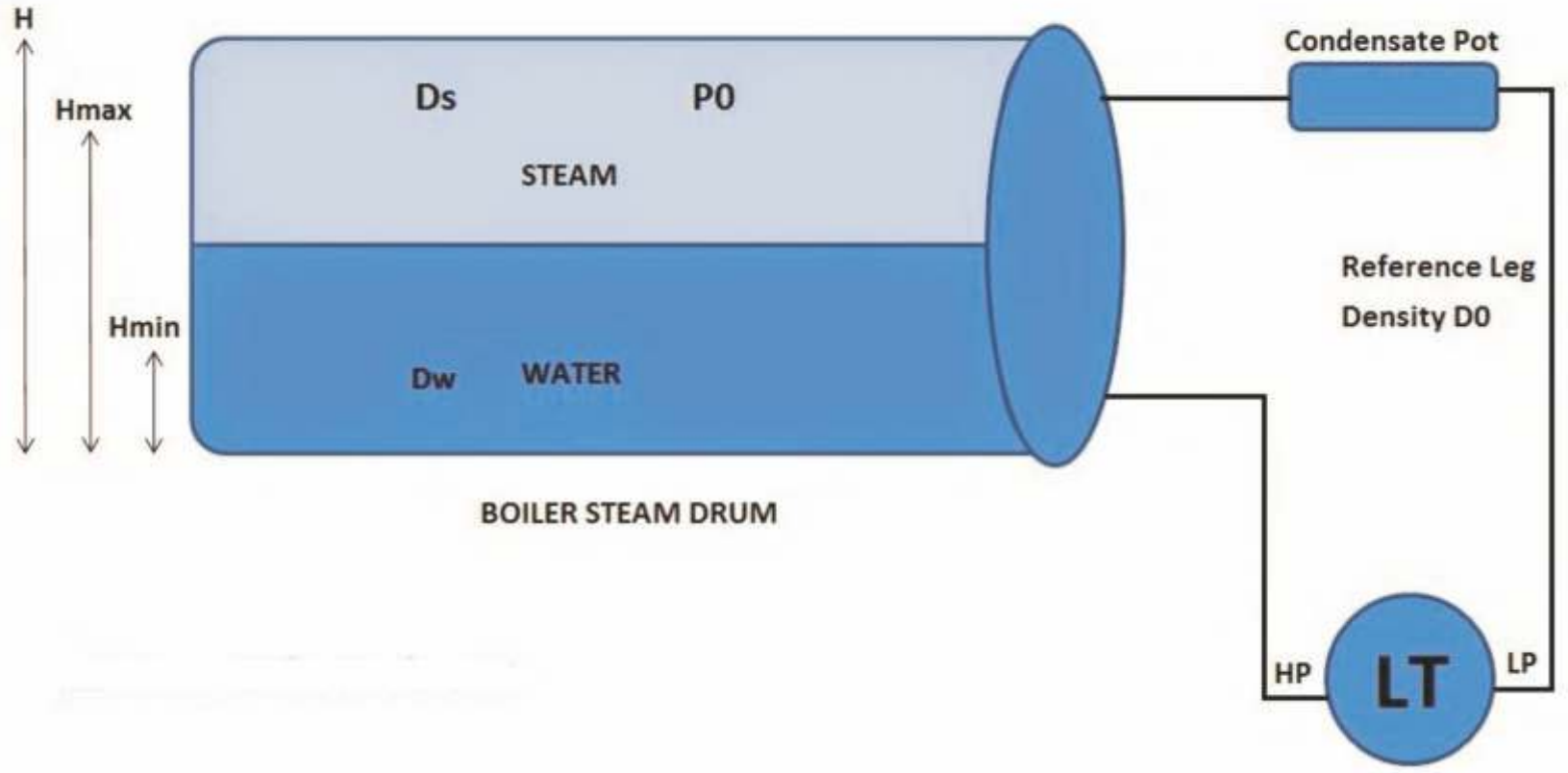
Industrial Applications II

A mathematical model for the operation of feed water systems and steam supply of a thermal power plant



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Industrial Applications III

During the labs, students will learn
how to operate automated heat supply systems.

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Thanks for attention!