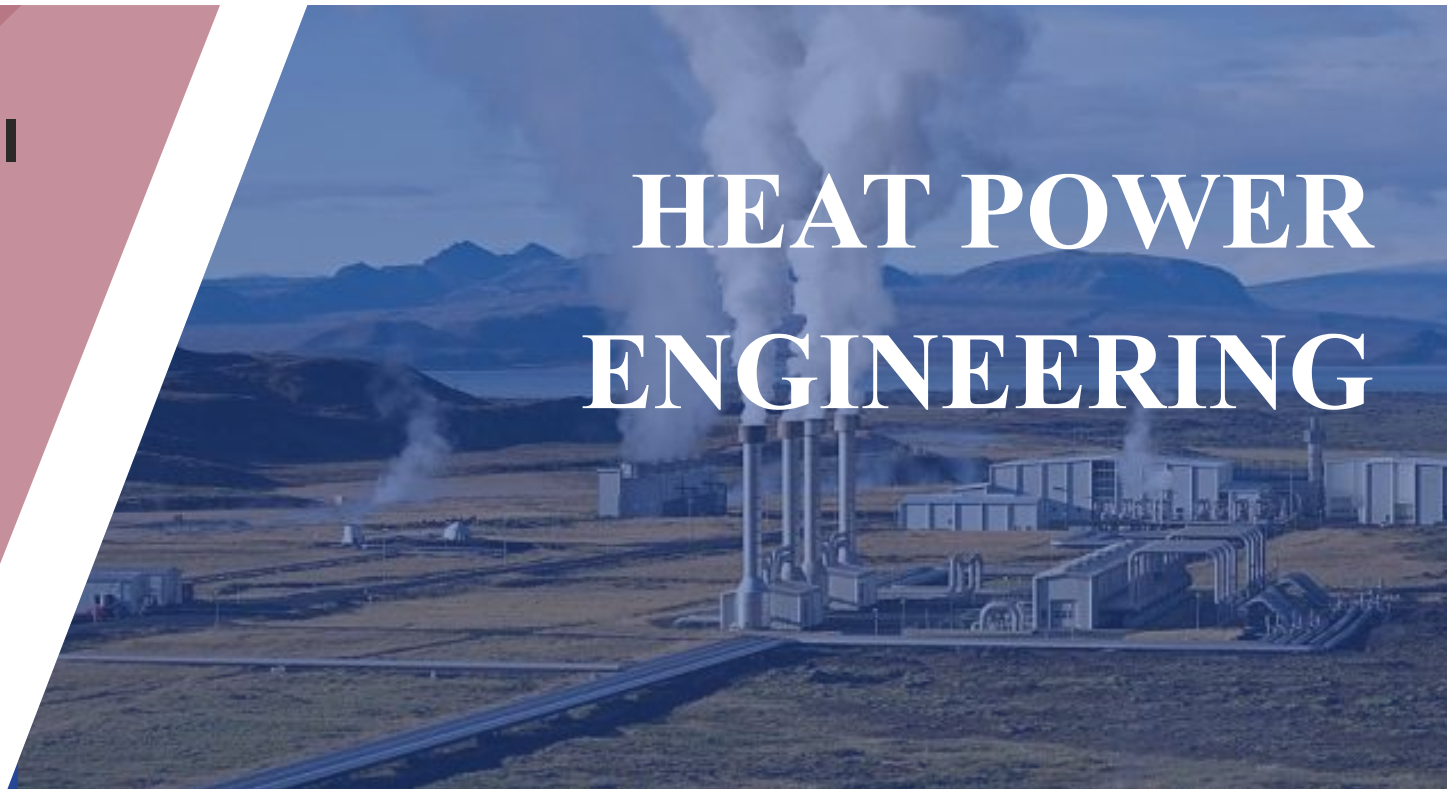


**Program:**  
**13.04.01 Heat Power  
Engineering, MSc**



South Ural State University  
National Research University

**Commitment: Full-time**  
**Department: of Thermal  
power engineering**



# HEAT POWER ENGINEERING

**Lecturer: Alabugina Rimma,**  
**Department: of Thermal power engineering**

## **Course: Refrigeration and cryogenic equipment**

The course is worth 4 ECTS; it is designed for the students interested in Heat Power Engineering.



**LEARNING  
Objectives**

Upon completion of this course, students

- ▶ will be able to make calculations for industrial combined cycle plants, distillation columns, furnaces, compressors, pumps, fans, steam generators, oil and gas exploration equipment, gas pumping units, gas/water/heat/air supply, heating, ventilation, air conditioning, heat pumps, refrigeration and refrigeration equipment, cryogenic equipment, wind turbines, biomass, fluidized bed devices, water-carbon fuel, organic Rankine cycle, biochemical plants for industrial and wastewater treatment.
- ▶ will be able to develop algorithms, model and simulate heat engineering processes.

## Lectures

<b>1</b>	Introduction	Advantages and disadvantages of different renewable energy sources. Global and local renewable energy Indicators
<b>2</b>	Biomass energy	Use of biomass energy. Global biomass statistics
<b>3</b>	Solid Waste Energy	The use of solid waste energy. Global Solid Waste Statistics
<b>4</b>	Energy saving	How to save energy
<b>5</b>	Refrigeration equipment. Environmental Impact	Freons. Carbon dioxide. Ammonia. Environmental impact of the refrigerant
<b>6</b>	Pyrolysis	Pyrolysis gas
<b>7</b>	Gasification	Obtaining components during the gasification reaction
<b>8</b>	Water-coal fuel	Coal-water slurry in energy sector

## Practice tutorials

<b>1</b>	Introduction	Regimes and problems of exploitation of renewable energy sources
<b>2</b>	Biomass energy	Biogas plant: calculations
<b>3</b>	Solid Waste Energy	Calculation of a steam boiler with burning solid waste in a fluidized bed
<b>4</b>	Energy saving	Calculation of energy consumption of industrial enterprises and civil buildings
<b>5</b>	Refrigeration equipment. Environmental Impact Overview	Calculation of a single-stage compressor vapor-liquid refrigeration unit
<b>6</b>	Pyrolysis	Calculation of chemical reactions during pyrolysis
<b>7</b>	Gasification	Calculation of chemical reactions during gasification
<b>8</b>	Water-coal fuel	Calculation for the coal-water fuel combustion

## Lab tutorials

<b>1</b>	Introduction	Operation modes of the heat pump installation
<b>2</b>	Biomass energy	Optimization of biomass conversion to fuels
<b>3</b>	Solid Waste Energy	Solid waste-to-energy technologies: burning solid waste in a fluidized bed and obtaining biomass/biogas
<b>4</b>	Energy saving	The operation of the coal-fired boiler plants vs. natural gas-fired boiler plants
<b>5</b>	Refrigeration equipment. Environmental Impact Overview	Optimization of refrigeration unit operations: refrigeration unit with a condensate cooler and with a regenerator
<b>6</b>	Pyrolysis	Mathematical modeling for pyrolysis of biomass
<b>7</b>	Gasification	Mathematical modeling of gasification
<b>8</b>	Water-coal fuel	Mathematical modeling of coal-water fuel combustion

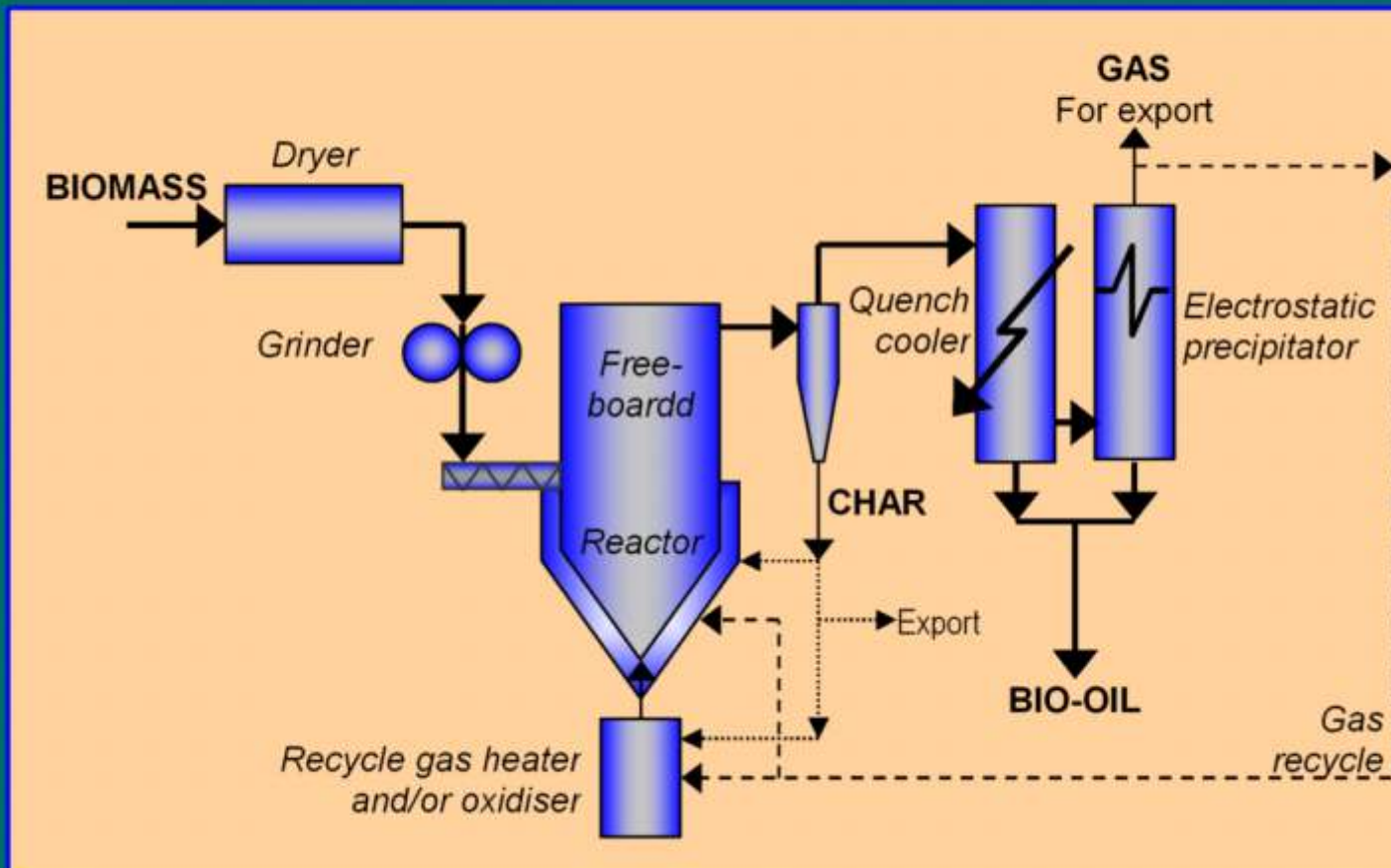
## Laboratory Stands



“Hydraulic test bench for control and shutoff valves”

## Industrial Applications I

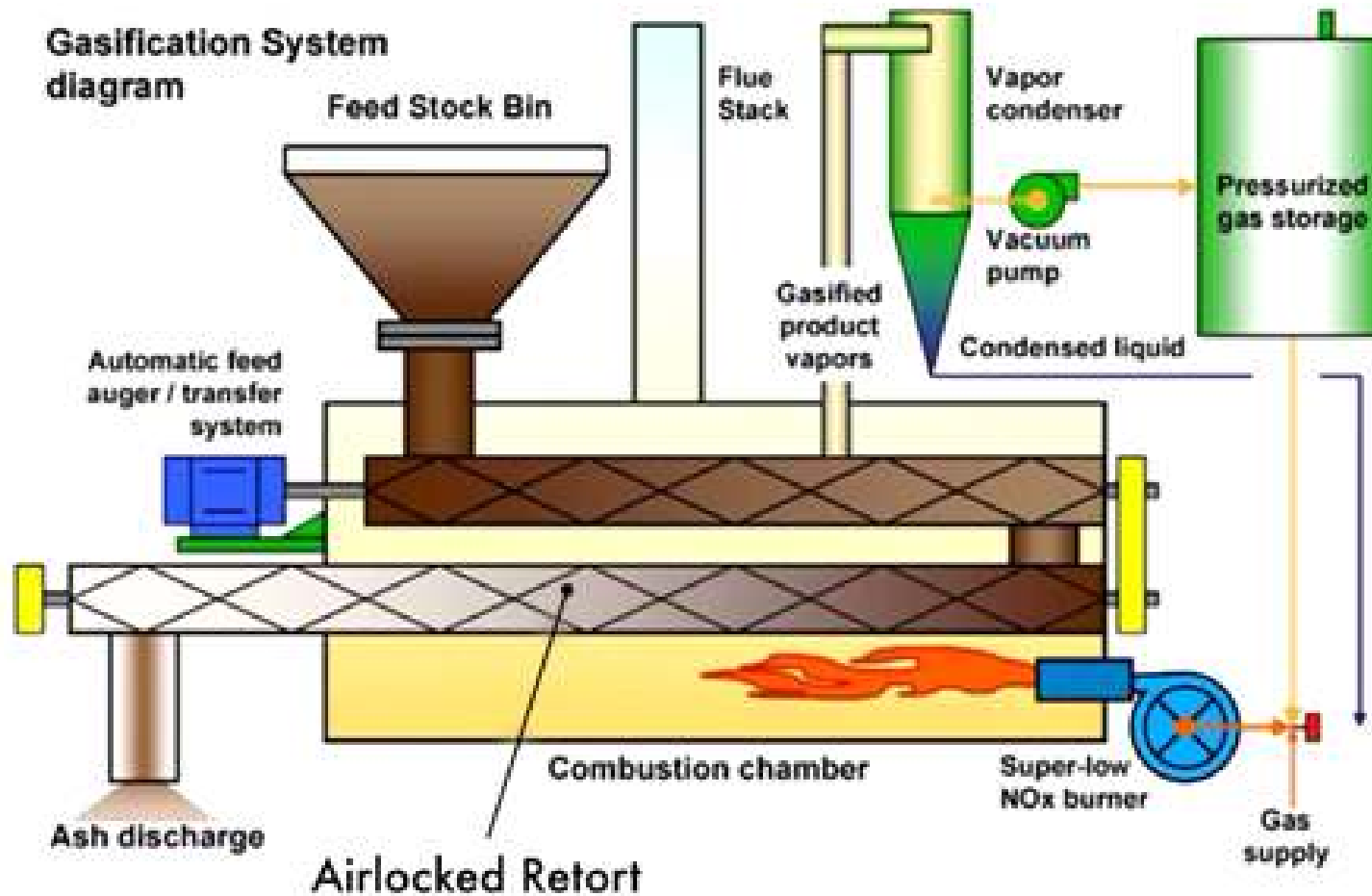
### Conceptual fast pyrolysis process



Design of systems  
]for utilization, recycling  
and energy conversion  
for oil, chemical  
and energy industries

## Industrial Applications II

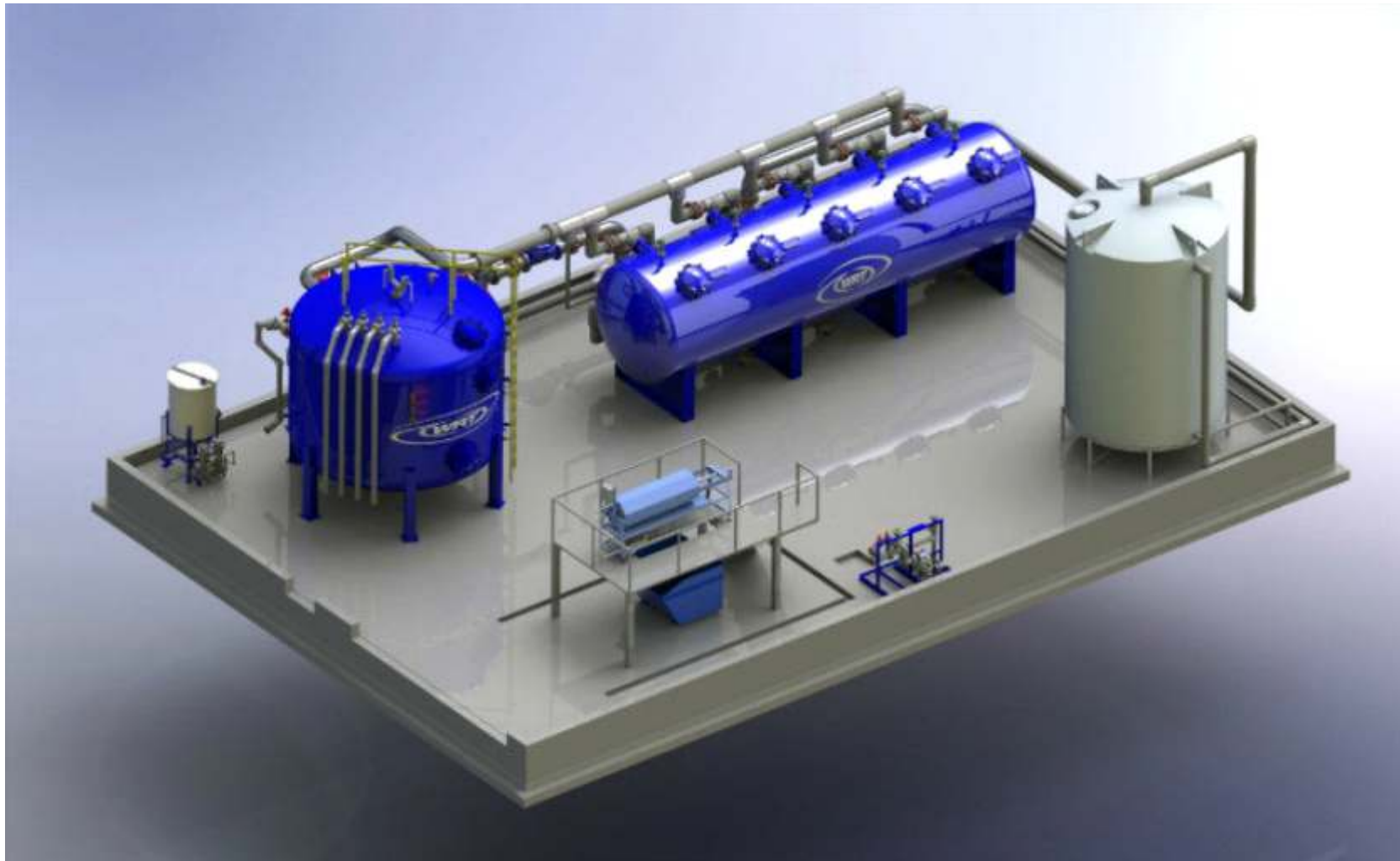
### Chain of chemical reactions, exothermic oxidation





## Industrial Applications III

In labs, students learn how to operate equipment for processing wood waste and coal dust cycles



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**Thanks for attention!**