



ENVIRONMENTAL PROTECTION IN ENERGY SECTOR

4 ECTS

AGH University of Science and Technology

Course responsible: prof. dr. Janusz Gołaś, prof. dr. Teresa Grzybek

Course overview

The main objective of the course is to acquaint the students with the knowledge of the main components of the environment, main sources of contaminations in the environment, methods of reduction the pollution which apply to power and energy sector and their use in technologies and systems which limit the emission of pollutants, selection and creation of environmental friendly technologies with a special attention given to clean and renewable sources of energy.

The course is built of three parts: lectures, laboratory and seminars. During the course the students get fundamental knowledge on main components of the environment and their chemical composition. Biosphere, its role and range. A course gives the foundation to understanding of the behaviour and the migration of chemical substances in the environment, chemical correlations between main components of the environment and chemical cycles of elements. Groups of contaminants both organic (CFCs, PCBs, PAHs, dioxins, BTX, POCs) and inorganic (heavy metals like mercury, lead, cadmium and arsenium as examples and their compounds), main sources of their emission and chemical effects of their presence in the environment are discussed. Phenomena of acid rain, greenhouse effect, smog and ozone layer are presented. Hydrosphere. Water and aqueous solutions . Composition of soil, sediments and atmosphere. Chemistry of bioprocesses like respiration and photosynthesis. Fuels and their sources. Environmental consequences of energy production and consumption. Noise and its limitations. Municipal and industrial sewage. Classification of fuels and energy resources. Biomass and its role in energy production. Nuclear power sources and their impact on environment. The methods of reduction of pollutants in energy sector. Particulate removal devices; primary and secondary methods of SO₂ control; primary and secondary methods of NO_x control . Water requirements for power stations .Water treatment for fossil fuel power generation. Waste water treatment. Solid waste created by power plants. Fly ash and its utilization.

Laboratory:

1. Basic parameters of water analyses and standards for waters and sewage: determination of NO₃⁻, NO₂⁻, PO₄³⁻, NH₄⁺, Fe, CO₂, NH₃. Total and carbonate hardness

- of water, pH. Comparison to environmental standards. Odor, Eh, electrical conductivity, oxygenation
2. Determination of ash content in selected grain classes of coal.
 3. Heavy metals in environment: analysis of total mercury in wastes, dusts and fly ashes
 4. Field trip to Electrical Power Plant Jaworzno III
 5. Field trip to Sewage Treatment Plant of Municipal Sewage and Water Company

Outcome of the course

After completion of the course students should be able to:

- Describe the main dangers to environment resulting from energy industry and the current state of technologies of environmental protection in energy sector.
- Discuss and present to the public the current technological state of the above.
- Be familiar with legal standards for main emissions in energy sector. Propose preventive measures, as well as technologies of reduction of emissions.
- Basing on experimental/technological data, indicate typical methods to protect environment
- Choose an appropriate analytical method to determine most important pollutants
- choose basic analytical methods to determine the influence of pollutants on environment

Course coordinator & teachers

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