Clean Coal Technologies

The programme is a unique blend of energy and chemical technologies, and focuses on the important problems of energy production from coal. On one hand, coal, although a fossil fuel, is believed to be a good medium term solution for energy industry as it is an abundant energy resource, and widely available, thus guaranteeing energy security, but its application is perceived as environmentally unfriendly due to the formed by-products: SO_2, NOx and CO_2. Therefore the knowledge and further development of modern energy technologies are required (Clean Coal Technologies) in order to produce energy in environmentally friendly way. On the other hand, energy production is only one of the aspects of coal use. The other aspect is the possibility of processing of coal, or a by-product from energy production CO_2, to valuable chemicals. Thus special stress is laid in the program on gasification, and CO_2 removal and chemical reprocessing. Gasification is a modern chemical method with bright technological future, which allows to produce energy in environmentally firendly way, but may also supply valuable chemicals (such as e.g. syngas) for numerous industries. It provides thus an indirect way to produce liquid fuels following the routes: (i) coal →syngas →gasoline and Diesel oil (through Fischer Tropsch process), (ii) coal →syngas→ methanol→ gasoline (through MTG process) etc. CO_2 extracted from flue gases of power industry has been believed a problem and a pollutant until now, but new technologies are emerging which make use of CO_2. Along these lines new specialists are educated who do not only understand but may also apply and further develop methods which may use coal to produce energy in environmentally friendly way *and chemicals, among them liquid fuels*. Such specialists will have knowledge both in energy technologies and in chemical technologies, will gain valuable skills, including use of design and modelling software such as Matlab, Hysys, ChemCAD and AspenPlus, practical knowledge of preparation of the process design of coal and biomass gasification, metods of catalysts preparation and testing, analytics of pollutants and their removal etc. The program is not aimed, however, at educating a narrow (coal) specialist – a series of electives is focused on alternatives: sustainable energy development, renewable energy and fuel cells, as well as several aspects of energy management and policy.

The academic part of the program is focused on "learning by doing". ca. 2/3 of all contact hours are in the practical form (laboratories, seminars, projects). **The business perspective** is an important component of MSc studies and was directly included in the curriculum as the course "Business planning", consisting of only small number of introductory lectures and a project which will teach the students how to develop their entrepreneurship abilities.

In order to increae the contact between academic teaching and industry, special lectures prepaared by non-academic specialsts will be additionally provided.

For the described 3-smester program the best students may according to their preferences prepare their MSc thesis either (i) abroad within LLP Erasmus program at one of partner universities (UMPC Paris, France; IST Lisbon, Portugal; Policnico di Milano, Italy; Technische Universitaet Wien; University of Leipzig, Germany; etc), or (ii) by non-academic partners.

There is a possibility to include and enlarge this program into 4-semester program with a double diploma of one of the followinf universities: KTH Stockholm, Sweden; KIT Karlsruhe Insitute of Technology, Germany; IST Institut Superiro Tecnico, Lisbon, Portugal; the progra is under organization by Knowledge and Innovation Communities (KIC) InnoEnergywithin the framework of EIT (European Institute of Technology). The decision on theimplementation will be taken in the nearest future, in case of interest , please, contact prof. T.Grzybek, AGH, e-mail: grzybek@agh.edu.pl.