



SUBJECT DATASHEET

Semester:	2010/11/1
Subject:	Hydrocarbon Processing
Code:	VEMKTE3143A
Responsible department:	Department of Hydrocarbon and Coal Processing
Responsible department code:	MKOL
Responsible lecturer:	Dr. László Bartha

Educational objectives:

To give an overall view of the hydrocarbon industry its products and calculation methods.

Detailed content of the subject:

Week 1. The fossil fuels, resources, production. Overall refinery flow. Integrated hydrocarbon processing. 2. Crude oil properties. 3. Products of the hydrocarbon industry. 4. Processes in the hydrocarbon industry. 5. Catalytic refining processes. Hydrodesulfurization. 6. Catalytic reforming process variables. Case-study. 7. Lube oil processing. 8. Supporting processes. Hydrogen and carbon dioxide management. 9. The role and production of petrochemical feedstocks. 10. Petrochemical processes based on ethylene. 11. Production of other intermediates. 12. Polymerisation processes. 13. Production of other oxygen containing compounds. 14. Production of paraffin hydrocarbons. 15. Additives in hydrocarbon industry. 1. Comparison of the hydrocarbon mixtures with simple mixtures. Property estimation of hydrocarbon mixtures (empirical, semiempirical methods; nomogrammes, computer simulation packages). 2. ASTM distillation, densities of petroleum products 3. True boiling point distillation, mid-yield curves, property-yield curves, iso-curves. 4. Average boiling points. Characterization factor. Molecular weight of petroleum fractions. API density. Estimation of these parameters. 5. Phase envelope of defined mixtures. Phase diagram of petroleum fractions. Retrograde phenomena. Critical and pseudocritical properties. Corresponding state. 6. Equilibrium flash vaporization curves. Relations among the distillation curves, their application. 7. Estimation of distillation curves. 8. Equilibrium flash vaporization curves at sub- and superatmospheric pressures. 9. Estimation of liquid and vapour densities. 10-11. Calculation of vapour-liquid equilibrium. 12-13. Enthalpy and heat of vaporisation of hydrocarbon mixtures. Enthalpy diagrams. 14-15. Blending of petroleum products.

Requirements:

Rating the personal performance is done based on an examination paper. The main points of the examination are the following ones: 1. The fossil fuels, crude oil, gas, coal, resources, research, exploration, production, transportation. Overall refinery flow. 2. Crude oil properties, composition of petroleum, crude oil distillation curves, physico-chemical properties. 3. Products of the hydrocarbon industry: gases, motor fuels, lubricants, olefins, aromatics etc., general special properties, performance characteristics, test methods, separation. 4. Process in the hydrocarbon industry. Desalting crude oils. Atmospheric and vacuum distillation. Auxiliary equipments. 5. Catalytic refining processes. Hydrodesulfuration. Catalysts, reactions, process variables. 6. Catalytic reforming process variables. Feed preparation, reactions, catalysts, operation costs. Case-study. 7.



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Requirements:

Lube oil processing. Solvent extraction, dewaxing. Process variables. 8. Supporting processes. Hydrogen production, gas processing, sulphur recovery processes. Product blending. 9. The role and production of petrochemical feedstocks. The structure of petrochemical industry. Steam cracking of naphtha. Production of unsaturate hydrocarbons. 10. Petrochemical processes based on ethylene. Ethyleneoxide, ethanol, polyethylene-glycol production. 11. Production of other intermediates. Alkanol-amines, *-olefines and *-alcohols. 12. Polymerisation processes. Properties of polymers and plastics. Polyethylene, diene based rubbers, polyester processes. 13. Production of other oxygen containing compounds carboxylic acids, ketons, ethers. 14. Production of paraffin hydrocarbons. Separation methods. Selective adsorption. Processes based on synthese gas. 15. Additives in the hydrocarbon industry. Additives for fuels, lubricating oils, plastics, cleaning compositions. In the practical part of the examination the estimation of the main physical and chemical properties of crude oil fractions have to be done, and by using these data the heat and mass balance of a simple distillation unit are to be determinated.

Required and suggested references:

Speight,J.G.: The chemistry and technology of petroleum. Marcell Dekker, 1991. Gary, J.H.: Petroleum refining technology and economocs. Marcell Dekker, 1984. Chauvel,A, Lefebre,G.: Petrochemical processes I-II. Gulf. 1989. Edmister,W.C., Lee,B.I.: Applied hydrocarbon thermodynamics, Gulf, 1985 API Technical Data Book - Petroleum Refining, 1992 PRO/II Input Manual, Pro/II Reference Manual, 1994 Reid,R.C., Prausnitz,J.M.,Poling,B.E.: The Properties of gases and liquids, McGraw-Hill, 1987.