PETROLEUM FRACTIONATION: SIMULATION, OPTIMAL OPERATIONS, ENERGY EFFICIENCY AND RETROFIT

Crude Units are energy intensive. In addition, they are usually used to process a variety of different crudes and they contain pre-heating heat exchanger networks that are usually inefficient. Many attempts were made in the last 25 years to determine the optimal preheating network structure, without major success. The reasons for this lack of success rely on various obstacles. First, the optimal operation of a crude unit to achieve separation goals, product quality and at the same time reduced energy consumption is not widespread known. Since crude units operate using different crudes at different times, what is efficient for one crude may not be efficient for other. Thus, determining how to best retrofit a unit is complex, because a compromise between different operating strategies needs to be made. The answer to all this relies on putting together some basic concepts on the design flexibility of crude units, the understanding of the role of pump around circuits and heat integration concepts. In turn these concepts help understanding how to best operate these units.

This course will cover the fundamentals of simulation and understanding of the crude units, will overview the basic concepts on heat integration, and will show recent results on their optimal design and will discuss what is known in terms of retrofitting these units.

The instructor is a Professor at the Chemical Engineering Department of the University of Oklahoma. He holds a Ph.D. from the California Institute of Technology, has been a Professor in Argentina and has performed research and teaching at UCLA, USA. His industrial experience includes a six-year project to build a heavy water plant in Argentina, several consulting work and a three years position at Simulation Sciences (SIMSCI). He has several publications in the area of crude design and holds a patent on crude distillation.

Course Duration: Two days

1. Overview of Crude Units design and operations.
    - The role of Pump around circuits in separation and heat recovery.
    - The role of steam injection
2. Simulation of Crude Units.
    - Degrees of freedom
    - Simulation set up in the specification-vary environment.
    - Different simulation modes (Constant flash-zone, constant product quality, constant withdrawal rates, etc).
3. Heat Integration.
    - The concept of Minimum Utility.
    - Pinch Analysis.
    - Demand-Supply diagrams with applications to Crude Units
4. Optimal Design of crude units handling more than one crude.
    - Crude Branching
    - Capital Cost vs. operating costs. Account for uncertainty and financial risks.
5. Retrofit
    - Energy Retrofit Horizons. Uncertainty in future operations. Financial Risk management.
    - Energy Retrofit by inspection.
    - Overview of new technologies for the increase of distillates yield.

The course includes hands on exercises using Pro II, a simulation software for Simulation Science (Simsci), Brea, CA, USA. Student's rating: 5.38 on instructor, 5.63 overall evaluation of course (Maximum of 7). Selected comments: Content very useful for my job. Instructor is patient and friendly. Increase course duration to 3 days. More optimization!