הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar
Lecture Hall 6, Wolfson Department of Chemical Engineering,
Wednesday June 21st at 1:30pm

Hila Aloush

MSc student (advisor: Prof. Dany Lewin)
Chemical Engineering, Technion

Heat-integration Synthesis for Real Process Streams using a Genetic Algorithm

An effective heat exchanger network (HEN) is a key element in reducing both external energy consumption, as well as CO_2 emissions. Over the past decades, the field of HEN study has developed extensively, from sequential methods in the 1970's to simultaneous methods in the 1990's. But while the computational means and techniques continued to evolve, the process problems handled remained largely the same – constant heat capacity process streams with no phase changes. During the last decade, a new generation of HEN studies have emerged, taking into account the non-constant values of the thermodynamic properties of the process streams, either by dividing the stream to linear segments, or by adopting a cubic correlation, thus providing a HEN that can be implemented in real processes with a better fit. However, using cubic correlation might result in violations in the minimum temperature driving force, in the actual process.
This work proposes a more realistic representation of the thermodynamic properties, using actual data points for each process stream as provided by a simulation program. The T-H curves are fitted using a cubic spline, enabling closer matching of phase changes as well as non-linearity in the flowing heat capacities, while maintaining the minimal driving force within the exchangers. The actual HEN structure is determined using a genetic algorithm, which progressively improves a population of solutions, such that those with lower total annual cost are retained and refined. This seminar will demonstrate the application of this approach on a medium-scale industrial case study, with multi-component streams and phase changes.

David Waisman

MSc student (advisor: Prof. Avi Marmur)
Chemical Engineering, Technion

Development of a characterization method for surface energy of carbon fibers in a phenolic matrix

During an organized process of manufacturing a composite material exists a phase where fibers are soaked in a polymeric matrix. The ultimate goal is for a total wetting of the fibers. This phase is critical and essential, since it determines the composite material properties. The quality of matrix-fiber interaction is characterized by the surface tension of the fiber. There are many techniques to characterize the surface tension and contact angle. Still when it comes to fibers, the techniques have their drawbacks. Therefore during this research, an attempt to develop a characterization technique to the extent of fiber wetting (surface energy), of different fibers, was made. The main principle is to find empirically the extent of wetting by the lowest concentration of the less polar component in the solution, for which a total wetting situation is achieved (the contact angle θ is equal zero). This concentration is called CSC, critical spreading concentration. This parameter is much more sensitive than a measured contact angle, when the extent of surface wetting is the relevant issue (and recognizing changes which are caused due to various surface treatments).
The seminar will cover common methods of characterization and the researched technique principals. Experimental results the main drawbacks will be presented.

Refreshments will be served at 13:15