Sarun Porsom 2008: Systematic Approach of Simulation and Control of Heat Exchanger Networks using Parametric Programming and Split-Range Control. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Thongchai Srinophakun, Ph.D. 81 pages.

Heat exchanger networks (HENs) are the heart of heat-integrated plants that guarantees the optimum energy recovery. This thesis developed a systematic approach of an optimal operation for HENs. Formulating mixed-integer non-linear programming (MINLP) from given hot and cold stream data, a total annual cost (TAC) can be minimized. Flexibility test is performed using linear programming (LP) in order to propose the final flexible HENs for design the control structure. Next, a parametric programming is used in this step to find active constraint regions. Up to this point, an optimal split-range control structure can be determined by integer linear program (ILP). Finally, a proposed operation and its configuration are verified and studied to understand their dynamics behavior. Four case studies were used to illustrate the proposed procedure. Case study 1 from Zamora and Grossmann (1998), the total annual is 285,916 $/year distributed among the 8 units. Two active constraint regions are found. Biegler *et al.* (1997) as a case study 2 has the total annual costs at 85,290 $/year for 6 unit operations with 3 active constraint regions. For case study 3, from Aaltola (2003), the total annual costs for 4 units is 27,743 $/year, no active constraint can be found. Case study 4 from Yerramsetty (2008) shows the total annual costs at 2.942×10^6 $/year. There are 15 operations with 5 active constraint regions. In all cases, additional periodical data were performed in order to extend operation regions. We noticed that the superstructure cannot be improved upon to the number of periodical data. For dynamics test, all cases show the performance of control structure to keep all target temperatures at the desired values.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature