

ECONOMIC PROCESS DESIGN, OPERATION & PLANTWIDE CONTROL

Brief Course Contents and Schedule, 1-5 Jun 2014

<i>Day</i>	<i>Lecture</i>	<i>Simulation Demonstration</i>	<i>Simulation Exercise</i>
Day 1	ESSENTIAL FUNDAMENTALS <ul style="list-style-type: none"> Design, steady operation and control degrees of freedom Intuitive non-mathematical procedure for DOF Using DOFs for economic design, operation and control Qualitative tradeoffs in plant design and steady operation Process dynamics, PI(D) control, tuning and pairings 	<ul style="list-style-type: none"> Steady state analysis of ternary distillation in Hysys Recycle process steady state simulation in Hysys 	<ul style="list-style-type: none"> Effect of choice of specification variables on convergence of recycle process (Hysys) Snowball effect illustration for the recycle process (Hysys)
Day 2	DESIGN, OPERATION & CONTROL OF UNIT OPERATIONS <ul style="list-style-type: none"> Distillation: simple, complex, heat integrated and azeotropic Heat management in exothermic reactors (CSTR, PFR, PBR) Miscellaneous unit operations 	<ul style="list-style-type: none"> Aspen Plus steady state simulation and control of extractive distillation Hysys steady state simulation and control of Petlyuk column 	<ul style="list-style-type: none"> Single ended and double ended temperature control of a ternary column in Hysys
Day 3	ECONOMIC DESIGN & STEADY OPERATION OF PLANTS <ul style="list-style-type: none"> Steady state economic optimum design and operating policy PLANTWIDE CONTROL FUNDAMENTALS I <ul style="list-style-type: none"> Regulatory inventory (material/energy) management Non-linear steady state and dynamic effect of recycle Conventional plantwide control structure design 	<ul style="list-style-type: none"> Economic optimum design, steady operation and control of a recycle process in Hysys 	<ul style="list-style-type: none"> Using overrides to handle flooding constraint (capacity constraint) on a ternary column (Aspen Plus)
Day 4	PLANTWIDE CONTROL FUNDAMENTALS II <ul style="list-style-type: none"> Handling equipment capacity constraints TPM selection for maximizing throughput Systematic plantwide control design (with examples) 	<ul style="list-style-type: none"> Cumene process steady state economic optimum design and operating policy (Aspen Plus) 	<ul style="list-style-type: none"> Steady state and dynamic simulation of CO₂ sequestration using ethanol amines (Hysys/Aspen Plus)
Day 5	PLANTWIDE CONTROL DESIGN OF REALISTIC PROCESSES <ul style="list-style-type: none"> The cumene, ethyl benzene and isomerization processes 	<ul style="list-style-type: none"> Conventional and top-down plantwide control of cumene process (Aspen Plus) 	<ul style="list-style-type: none"> Discussion on specific industrial problems of interest to delegates.

Detailed Course Contents and Schedule 1-5 Jun 2014

<i>Day</i>	<i>Lecture</i>	<i>Simulation Demonstration</i>	<i>Simulation Exercise</i>
Day 1	ESSENTIAL FUNDAMENTALS Degrees of freedom <ul style="list-style-type: none"> • Design, steady operation and control DOF • Intuitive non-mathematical procedure for DOF Using DOFs for <ul style="list-style-type: none"> • Economic optimum design • Steady economic process operation • Economic CVs for self-optimizing control Economic tradeoffs in plant design and steady operation Process Dynamics, PI(D) Control, Controller Tuning and Pairings	Steady state analysis of ternary distillation in Hysys Steady state simulation set-up and solution Using specification flexibility to understand economic column design and steady operation Control tray temperature location selection using steady state solver Recycle process steady state simulation in Hysys	Effect of choice of specification variables on convergence of recycle process (Hysys) Snowball effect illustration for the recycle process (Hysys)
Day 2	Design, operation and control of common unit operations <ul style="list-style-type: none"> • Simple, complex, heat integrated and azeotropic column sequences • Heat management in exothermic reactors (CSTR, PFR, PBR) • Miscellaneous unit operations 	Aspen Plus steady state simulation and dynamic control of homogenous azeotropic distillation Hysys steady state simulation and dynamic control of Petlyuk column	Single ended and double ended temperature control of a ternary column in Hysys
Day 3	Optimum design and operation of complete plants <ul style="list-style-type: none"> • Steady state economic optimum design • Steady state optimum operating policy Plantwide control fundamentals I <ul style="list-style-type: none"> • Regulatory material and energy balance control • Inventory management (including snowball effect) • Bottom-up (conventional) plantwide control structure design • Choosing economic optimum regulatory setpoints 	Economic optimum design, steady operation and control of the recycle process in Hysys	Using overrides to handle flooding constraint (capacity constraint) on a ternary column (Aspen Plus)
Day 4	Plantwide Control Fundamentals II Handling of equipment capacity constraints TPM selection for maximizing throughput The bottom-up pairing approach Systematic top-down plantwide control design procedure Simple control structure design examples	Cumene process steady state economic optimum design and operating policy (Aspen Plus)	Steady state and dynamic simulation of CO ₂ sequestration using ethanol amines (Hysys/Aspen Plus)
Day 5	Plantwide Control Design of Realistic Example Processes <ul style="list-style-type: none"> • Cumene process • Ethyl benzene process • Isomerization process 	Conventional plantwide control of the cumene process (Aspen Plus) Top-down plantwide control of the cumene process for maximum throughput operation (Aspen Plus)	Discussion on specific industrial problems of interest to delegates.