Advanced ASPEN-HYSYS Process Simulation: From Fundamentals to Complex Systems Design

Course general description:

This comprehensive 5-day training course provides advanced knowledge and hands-on experience in process simulation using ASPEN-HYSYS. The course focuses on advanced simulation techniques, optimization strategies, and practical applications in the chemical, petrochemical, and oil & gas industries. Participants will develop expertise in modelling complex systems, troubleshooting simulation problems, and implementing advanced process control strategies.

Audience:

This course is designed for:

1. Process Engineers with basic HYSYS experience
2. Chemical Engineers involved in plant design and optimization
3. Production Engineers seeking to enhance process efficiency
4. Technical professionals involved in process simulation and modelling
5. Plant operators interested in advanced process control and optimization

Course objectives:

1. Master advanced thermodynamic property packages and their appropriate selection
2. Design and optimize complex process flowsheets using advanced HYSYS features
3. Implement dynamic simulation strategies for process control and optimization
4. Develop custom unit operations and reactions using built-in tools
5. Analyze and troubleshoot convergence issues in complex simulations
6. Create effective simulation reports and documentation

Course duration:

5 days

Course location:

Dubai

Course contents:

Day 1: Advanced Thermodynamics and Property Methods

- Thermodynamic Principles & Property Models – Review of fundamentals, advanced property package selection, and estimation methods.
- Complex System Characterization – Binary interaction parameters, regression analysis, and custom component creation.
- Phase Behavior & Electrolyte Systems – Electrolyte modeling, flash calculations, and phase envelope analysis.
- Hands-on Applications – Case study on property package selection and crude oil characterization.
- Assessment & Discussion – Thermodynamic calculations quiz and discussion on common property package issues**.**

Day 2: Advanced Steady-State Simulation

- Complex Equipment Modeling – Distillation columns, advanced reactor configurations, and heat exchanger networks.
- Flow & Pressure Analysis – Pressure-flow network analysis and recycle stream convergence techniques.
- Sizing & Economic Evaluation – Equipment sizing, cost estimation, and energy integration strategies.
- Hands-on Applications – Case study on complex distillation systems and reactor network optimization.

- Assessment & Discussion – Quiz on equipment sizing and troubleshooting convergence issues.

Day 3: Dynamic Simulation and Control

- Dynamic Modeling Fundamentals – Pressure-flow dynamics and safety system implementation.
- Advanced Control Strategies – PID tuning, cascade, override control, and level/temperature control systems.
- Real-Time Process Behavior – Controller tuning, dynamic response analysis, and system adjustments.
- Hands-on Applications – Practical session on PID controller tuning and dynamic response analysis.
- Assessment & Discussion – Control system design quiz and discussion on common control challenges.

Day 4: Custom Modeling and Optimization

- Custom Unit Development – Spreadsheet integration, user unit extensions, and advanced reaction kinetics.
- Process Optimization – Sensitivity analysis, data reconciliation, and optimization techniques.
- Industrial Case Studies – Case study management and advanced modeling applications.
- Hands-on Applications – Custom unit operation development and optimization case studies.
- Assessment & Discussion – Quiz on advanced modeling techniques and discussion on optimization strategies.

Day 5: Advanced Applications and Project Work

- Specialized Simulations – Pipeline networks, batch process simulation, and real-time optimization.
- Economic & Environmental Considerations – Economic analysis tools and environmental impact assessment.
- Reporting & Best Practices – Documentation, report generation, and industry best practices.
- Final Project & Review – Project presentations, assessment, and feedback.
- Certification & Conclusion – Final review, certification ceremony, and closing discussions.

Final Project Requirement

Participants must complete a simulation design project that demonstrates:

- Application of advanced simulation techniques
- Implementation of control strategies
- Economic and optimization analysis
- Technical documentation and presentation skills

Methodology:

- 50% lectures & concepts
- 10% Videos
- 15% Case studies
- 15% Exercises & Quizes.
- 10% Discussions

Course code: (TPR0016)