



Process Design Practices

Cilliers Kruger

OVERVIEW

- Intensive 5 day training course for chemical engineers with 0.5-5 year's experience.
- Bridges the gap between university education and practical process engineering.
- Emphasizes calculation methods and techniques to troubleshoot and design process units.
- Presentation includes high quality handouts and numerous examples.

CONTENT

- **SIMULATION.** Flash calculations; Equations of state; Mass, energy and entropy balances; Simulation of typical equipment; Phase equilibrium; Immiscible systems; Critical and retrograde phenomena.
- **DESIGN CONDITIONS.** Relief valve locations; Design pressure, including typical margins, pumps shut off head, 10/13 rule; Vacuum design pressure; Test pressure; Design temperature, including typical margins; MDMT; Minimum pressurization temperature; Flanges, including type, facing and rating; Pipe specs; Pipe spec breaks.
- **HYDRAULICS.** Pipe sizing techniques; Equipment nozzle sizing; Typical equipment pressure drops; Hydraulic cases; Hydraulic circuits.
- **PIPING.** Pressure drop calculation; Incompressible flow; Compressible flow; Two-phase flow; Two-phase flow regime maps; Friction factors; Pipe roughness; Insulation and tracing; Hot taps and stopples; Hand valves.
- **FLOW ORIFICES.** Types; Orifice construction, taps, straight run requirements and wiring diagram; Orifice sizing; Beta ratio limits; Orifice/nozzle equations; Choke flow; Two-phase flow; Discharge coefficients; Expansion factors; Permanent pressure drop; Flow correction.
- **CONTROL VALVES.** Components; Body types, size, trim, action, direction and characteristics; Actuator type and action; Positioners; Failure mode; Installation; Wiring diagram; Valve sizing; Eqn for liquids, gases and 2-phase flow.
- **VESSELS.** Types; Sizing and rating techniques and equations; Level configurations; Vessel nozzles and heads; Vertical and horizontal vessel layout; Inlet piping; Elevation and supports; Volumes.
- **TOWERS.** Simulation; Tray types; Efficiency; Column sizing criteria; Jet and Downcomer flooding; Derating factor; Tray spacing; Tower layout; Tray and piping layout at feeds, draw offs, transitions and reboilers; Types and layout of reboilers/condensers.
- **PUMPS & COMPRESSORS.** Pump/compressor components and types; suction/discharge piping; Stuffing box pressure; Typical pump/compressor curves; Spillback options; NPSHA and NPSHR; Seal systems; Horsepower; Capacity/pressure control; Surge control; Drivers.
- **EXCHANGERS.** Heat transfer basics; Typical U-values; Temperature difference; F_T factor; Approach; Heat release curves; Pressure drop; TEMA types and guidelines; Tube and pass arrangements; Baffles; Typical layouts.
- **HEATERS.** Heater types; Heater components; Radiant/Convection sections; Sootblowing; Decoking; Dryout and Startup/Shutdown; Burners; Fuel piping and shutdown systems; Simulation practices; Efficiency; Excess air/oxygen; Flue gas dew point and ash corrosion; Process inlet piping.
- **RELIEF VALVES.** Set, accumulated and back pressures; Relief valve types; ASME 1 & 8 issues; Relief valve sizing; Inlet and outlet piping; Relief cases and loads; Instrumentation and double jeopardy.
- **METALLURGY.** Design life; Common refinery materials and ASTM designations; Refining corrosion mechanisms, including high temperature hydrogen, sulphur and hydrogen sulphide corrosion; HIC; PWHT; CUI; Temper embrittlement; Flue ash corrosion; PTSCC and CISCC; Non-destructive testing.