

**ONLINE**

# Process Design Practices

*for design, optimisation and troubleshooting*

Presenter: Cilliers Kruger

**8 to 19 November 2021**

**Weekdays Daily from 11:00 to 16:00 UTC**

**Register before 1 October 2021**

## Overview

Cilliers Kruger has a life time experience in process engineering ranging from operational support and troubleshooting, through process design, construction and manufacturing to commissioning and full production again.

This 5 day intensive course emphasizes engineering calculation, methods and techniques. It illuminates the fundamentals and practical tricks-of-the-trade of process equipment design. These design practices are put within the context of real operational environments – unlocking the ability of troubleshooting and problem solving from a fundamental understanding of how equipment works.

The course material collates a lifetime of comprehensive process equipment knowledge and information focused at the design of new equipment as well as the optimisation, troubleshooting and problem solving of equipment in operation.

The course has been approved as an IChemE Approved course with a credit of 30 CPD hours.



***“The course was excellent and I think you did an amazing work presenting it online “***

*[Process Engineer, International Company]*

***“This course is a must for all process support and process design engineers.”***

*[Process Manager, International Oil Company.]*

***“Great course from somebody with real life experience in design and plant operations and troubleshooting. You are never too old to learn how stuff really works!***

*[Process Engineer, 25 years’ experience, International Petrochemical Company]*

***“This course cuts through all the fuzz universities taught us to give a PRACTICAL overview of process engineering. I would recommend it to all young engineers as a starting point for their careers. IT IS LIFE CHANGING!”***

*[Process Engineer, 2 years’ experience]*

## Learning Outcomes

- An understanding of the role of Process Engineers, emphasising calculation methods and techniques to troubleshoot and design process equipment. *“What set engineers apart from operators and managers is our ability to do calculations. If all you do is analyse process trends and talk in meetings, then you add no value. Make time to do calculations, check them, verify them against plant data and then believe them.”* [Cilliers Kruger, presenter]
- A working knowledge of practical design practices for the following process equipment: General Design Conditions, Plant and equipment simulation, Hydraulics, Piping, Flow Orifices, Control Valves, Vessels, Towers, Pumps, Compressors, Heat Exchangers, Fired Heaters, Relief Valves and Metallurgy.

**Who will benefit most?** Process Engineers with 1 to 5 years’ experience working in both operational support (start-up, optimisation, troubleshooting) or process design (new or de-bottlenecking of existing equipment).

## Presenter



Cilliers Kruger, currently residing in Canada, is a chemical engineer with 25 year’s international experience in process plant simulation, design and operation. His experience covers the entire design process, from conceptual design to commissioning and operation. He has prepared design specifications for numerous plants and has a comprehensive knowledge of typical design practices.

His course emphasizes the methods actually used by design companies, and includes high quality handouts.

## Course 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; Equations for liquids, gases and two-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.** Simulations, 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.** Typical pump components; Performance Curves, Minimum flows and spillback options, Stuffing box Pressure, NPSH, Cavitation, Suction and Discharge Circulation, Suction/Discharge Piping, Venting, Sparing, High temperature Service, Lubrication, Seal systems and seal piping plans, Drivers
- ✓ **Compressors.** Typical compressor components and types; Simulation, Single and multiple stage Reciprocating Compressors, Spillback, Valve unloaders and Cylinder Pockets, Centrifugal Compressors, Layout, Multiple Stages, Capacity Control, Surge and Surge Control, Vacuum Ejectors.
- ✓ **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; Instrumentations 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 CSCC; Non-destructive testing.

## Presentation Detail and Course Fee

Online Schedule: **Online sessions DAILY on Weekdays from 11:00 to 16:00 UTC** (Coordinated Universal Time)  
(That is 11:00 to 16:00 in the UK, 13:00 to 18:00 in SA, 06:00 to 11:00 in Canada)

**Monday 8 November 2021 till Friday 19 November 2021**

Course Material: Course File will be delivered before course starts.

Attendance Fee: £ 1 500 (excluding VAT) per attendee.  
£ 1 400 (excluding VAT) for IChemE members.

Registration: Strictly before 1 October 2021. (NO CANCELLATION AFTER 1 OCTOBER 2021)

Invoices will be issued on 1 Oct 2021 for full payment before course commences.

Payment should be made by EFT. Credit Card payment is available via PayPal with an additional transaction fee.

## Registration and Rights Reserved

Total attendance is limited to ensure value addition to attendees. Registration before 1 October 2021 is crucial in order to ship the training material in time for the course.

Completed registration forms can should be e-mailed to [andries@proceng.co.uk](mailto:andries@proceng.co.uk).  
Registration Forms can be obtained from the *ProcEng* website ([www.proceng.co.uk](http://www.proceng.co.uk)).

Full payment is required for access to the presentation, unless specifically arranged before 20 October 2021.

Cancellation after 1 October would remain eligible for full payment since course material would already be sent. Arrangements for substitute attendees (if registered attendee can not) should be done before 18 October 2021.

The presentation date or presenter of the same material is subject to change in the event of unforeseen circumstances like illness.

## HOST

This excellent opportunity for development of Process Engineers is proudly enabled and hosted by *ProcEng Limited*, established by Andries Burger to offer and share practically oriented Process Engineering and related experience and knowledge.

Andries Burger, residing in South Africa is a professional chemical engineer with 35 years' experience in the petrochemical industry including process optimisation; concept development; production optimisation and scheduling; operation; maintenance and project management; personnel development, change management; coaching and mentoring.



In collaboration with other professionals (like Cilliers Kruger) *ProcEng* focusses on transfer of experience and Engineering Practices. Refer to [www.proceng.co.uk](http://www.proceng.co.uk) for more information.

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## 2021 ONLINE PROCESS DESIGN PRACTICES COURSE for design, optimisation and troubleshooting



8 to 19 November 2021; ONLINE Weekdays from 11:00 to 16:00 UTC

Download from [www.proceng.co.uk](http://www.proceng.co.uk) and e-mail complete registration form to [andries@proceng.co.uk](mailto:andries@proceng.co.uk)

Find herewith a request for the following reservation for the above training course:

### REGISTRAR DETAIL:

Name: [ ] e-mail: [ ] Tel: [ ]

### INVOICE DETAIL:

Company Name: [ ] VAT Nr. [ ] Quotation Required? (Yes / No): [ ]

Company Invoice Address: [ ] Order Nr. [ ]

Invoice Contact Name: [ ] Invoice Contact e-mail: [ ] Invoice Contact Tel: [ ]

### ATTENDEE DETAILS:

	Name	Surname	ID Nr	e-mail	IChemE Nr	Dietary Limitations
1						
2						
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### Course Fee:

The attendance fee (excluding VAT) is set at £ 1 500 per person (£ 1 400 for IChemE members) and this excludes employee specific internet access.

**Payment:** Invoices will be issued from 1 October 2021 for full payment before the course presentation starts. Payment is preferred by Electronic Fund Transfer (EFT) but Credit Card Facility via PayPal is available at an additional transaction fee. Late payment could put attendance reservation at risk.

**Rights Reserved:** If you registered and are unable to attend the event you may substitute at any time. Such substitution and name changes must be communicated to *ProcEng* by e-mail. No refund for cancellation after 1 October 2021. The presentation date or presenter could be subject to change at the discretion of Cilliers Kruger or *ProcEng* in the event of unforeseen circumstances like illness.