

# Mass Transfer School

## VALUE CREATION



**YOU CAN RELY ON US.**

Koch-Glitsch 5.5 ft [1.7 m] diameter hydrocarbons distillation tower, Wichita, Kansas

Participate in a unique 5-day course taught by chemical engineering professionals with extensive mass transfer experience. The course combines **classroom lectures** and practical application through **hands-on experiments** in a world-class pilot plant.

# Mass Transfer School – Description and Course Content

## Who should attend?

Engineers in the refining, petrochemical, chemical, and EPC industry involved in the design, selection, or operation of distillation and/or absorption towers. This course will be most beneficial to persons who have experience working with mass transfer equipment.

## Course objectives

Upon completion of this course, the participants should have a better understanding of:

- ▶ The underlying fundamentals of different types of mass transfer devices
- ▶ The operation of trays, packing, and distributors (including hands-on training in a pilot plant)
- ▶ How to do basic mass transfer equipment calculations
- ▶ The ranges of applicability of different mass transfer devices
- ▶ Equipment design and selection

## Course structure

What makes this course different is the hands-on component. Approximately 50% of the course consists of classroom training sessions and about 15% is devoted to attendees working on examples. The other 35% is devoted to hands-on sessions in the pilot plants where the attendees have the unique opportunity to see mass transfer equipment in action. Tray, packing, and distributor demonstrations are conducted in large diameter simulators and distillation towers equipped with sight ports. This gives the attendees the ability to see the hydrodynamic behavior of mass transfer equipment over a wide operating range.

## Session 1

### Distillation fundamentals

- ❑ General concepts
- ❑ Phase equilibria
- ❑ Thermodynamics and phase equilibrium calculations (including 2 tutorials)
- ❑ Flash distillation
- ❑ Equilibrium stage concept
- ❑ Binary distillation calculations (including 1 tutorial)
- ❑ Distillation calculations using process simulation software (including 2 tutorials)
- ❑ Extracting hydraulic information from simulations (including 2 tutorials)

## Session 2

### Packed towers

- ❑ Underlying fundamentals that drive packing performance
- ❑ Interfacial mass transfer fundamentals
- ❑ The concepts of HTU, NTU, and HETP (including 1 tutorial)
- ❑ Packing efficiency
- ❑ Entrainment and Flooding in packed towers (including 3 pilot plant demonstrations)
- ❑ Models for predicting packed tower capacity
- ❑ Pressure drop in packed towers – predictive methods
- ❑ Liquid hold-up in packed towers
- ❑ Packing types and selection criteria (including 2 tutorials)
- ❑ Design of a packed towers (including 2 tutorials)

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## Session 3

### Distributors, internals and mechanical design

- Fluid flow fundamentals and basic flow calculations
- The design of feed pipes for packed towers
- Trough distributors (including 1 pilot plant demonstration)
- Pan & Deck distributors
- Liquid collectors
- Support grids and hold-down grids
- Vapor inlets for packed towers
- The design of feed pipes for tray towers
- Vapor inlets for tray towers
- Mechanical design – supports, clips, beams

## Session 4

### Towers equipped with trays

- Cross-flow tray fundamentals
- Bubbling devices
- Downcomer options
- The effect of liquid rate on tray performance (including 1 pilot plant demonstration)
- Capacity limits (including 2 pilot plant demonstrations)
  - entrainment flooding
  - downcomer choke flooding
  - downcomer backup flooding
- Performance of different bubbling devices (including 2 pilot plant demonstrations)
- Pressure drop
- Weeping
- Tray efficiency
- Fouling
- Tray design and equipment selection (including 2 tutorials)
- Ultra high-capacity tray devices

## Session 5

### Rate-based simulation

- Fundamentals of rate-based simulation
- RATEFRAC™ software utility - rate-based simulation training (including 1 tutorial)
- Gamma scanning of 5 1/2 ft trayed tower
- Interpretation of gamma scan results

### Tower diagnostics

- Fundamentals of gamma scanning, neutron back scatter scanning
- Packed tower case studies
- Trayed tower case studies

### Mist elimination

- Fundamentals of impaction and Brownian diffusion mist eliminators
- Types of mist eliminators and choosing the right device
- Liquid coalescing and choosing a coalescer device
- Case studies

## Session Durations

<b>Session 1</b>	Monday	6 hours
<b>Session 2</b>	Monday	2 hours
	Tuesday	6 hours
<b>Session 3</b>	Tuesday	2 hours
	Wednesday	5 hours
<b>Session 4</b>	Wednesday	3 hours
	Thursday	8 hours
<b>Session 5</b>	Friday	7 hours

**Course fee: \$2,700**

### “The larger the pilot plant the lower the scale-up risk”

Koch-Glitsch and Koch Heat Transfer have constructed commercial scale demonstration units in Wichita, KS, USA. The units are industrial scale but are instrumented like laboratory units. The units are being used to demonstrate performance of a wide range of mass transfer and heat transfer equipment.



## Mass Transfer School – About Us

**Dr. Izak Nieuwoudt**

Izak has more than 30 years experience in the field of separation technology. He has authored more than 70 journal papers, conference papers and book chapters. He is listed as an inventor on 34 patents in this field. His areas of focus are in mass transfer fundamentals, packing and tray development, and modeling. He is the Chief Technology Officer and R&D Director at Koch-Glitsch and serves as Koch-Glitsch's representative on the technical committee and technical advisory committee of FRI.

**Patrick Quotson**

Pat has more than 30 years experience in the field of mass transfer. His area of focus is packing applications, and he is the packing product manager at Koch-Glitsch.

**Neil Sandford**

Neil has more than 30 years experience in the field of mass transfer. His field of expertise is tray applications, and he is the tray product manager at Koch-Glitsch. Neil is also experienced in liquid-liquid extraction and applications and equipment design.

**Hubert (Hugh) Zey**

Hugh has over 20 years of experience in the field of mist elimination and liquid-liquid separations. He is the mist elimination and liquid-liquid separations product manager at Koch-Glitsch.

**Darren Headley**

Darran has more than 30 years experience in the field of mass transfer. His areas of focus are liquid distributors, tower internals, and mechanical design. He is the Innovation & Process Transformation Leader at Koch-Glitsch.

**Jeff DeGarmo**

Jeff has more than 35 years experience in the field of mass transfer and is an authority in the fields of catalytic distillation and rate-based simulation. He has authored 18 papers and conference publications in the field of mass transfer. He is the pilot plant manager at Koch-Glitsch.

**Koch-Glitsch**

and its affiliates are global leaders in the supply of mass transfer and mist elimination equipment, as well as other process technologies and related services. The company's products are found in refineries and chemical plants worldwide.

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