

▲ Who should attend?

Shift leaders, graduated engineers and technical staff involved in the operation of an alkylation unit. The technical content of this training course also makes it suitable for the staff of the refineries, research centers, oil companies and engineering firms concerned by the different aspects of the operation of alkylation.

▲ Duration

4 days

▲ Dates & Location

*Non-scheduled*

*May only be organized for a single company*

▲ Tuition Fees

*To be agreed upon*

▲ Course Coordinator

*Jean-Pierre Baumann*

Ref. **PTF / ALKY-E**

# ALKYLATION

## OBJECTIVES

To give participants a good technical understanding of the alkylation processes.

On completion of the course, the participants should know:

- the role of the unit in the refinery scheme and in the surrounding of the FCC process
- the importance and impact of the main operating parameters on the operation and optimization of the process
- some of the main potential incidents, their origin, consequences and preventive measures

## COURSE CONTENT

### ALKYLATION PRINCIPALS

0.5 day

Octane manufacturing in the refining scheme and C<sub>7</sub>/C<sub>8</sub> alkylate cuts  
Alkylate characteristics and constraints imposed to the production of gasoline  
Various types of alkylation processes and related simplified process scheme  
Basic features of processes with solid catalyst

### FEED AND PRODUCTS

0.5 day

Origins of the feed: C<sub>3</sub> and C<sub>4</sub> olefinic cuts from FCC  
Imposed proportion of olefins and isobutane: alternate sources of isobutane  
Impact of the inert components and of the pollutants in the feeds; feed pretreatments  
Characteristics of the alkylate: RON, MON, RVP, final point, ...

### CHEMICAL REACTIONS AND CATALYST

0.5 day

Characteristics of the main reactions, side and undesired reactions; influence of the operating parameters  
I/O ratio: definition, role, implementation, influence on performances and on energy consumption  
Catalysts: hydrofluoric acid (HF) or sulfuric acid (H<sub>2</sub>SO<sub>4</sub>); respective properties and safety  
Impact, performances and **consumption** of the liquid acid implemented

### OPERATING PARAMETERS OF THE REACTION SECTION

1 day

Alkylation reactor (depending on the catalyst): technology, stirring method and tightness  
Reactors arrangement and circulation of the fluids inside and outside of the reactors  
Importance of mixing the two contacting phases, decantation step and separation  
Cooling of the reactors: heat exchange and heat integration  
Cryogenic section and pressure control, heat integration  
**Control of the operating parameters:** temperature, I/O ratio, acid composition, acid/H<sub>2</sub>C ratio  
Impact of these parameters on **operation and optimization** facing bottlenecks

### OPERATING PARAMETERS OF SEPARATION SECTION

0.5 day

Separation of the Isobutane recycle, influence of the nC<sub>4</sub> and C<sub>3</sub> content  
Joint separation of the entering nC<sub>4</sub>  
Role and benefit of a depropanizer for the mass balance

### OPERATION OF THE NEUTRALIZING SECTION

0.5 day

Neutralization with caustic solid or liquid (HF)  
Neutralization with acid then caustic: principles, operation and monitoring (H<sub>2</sub>SO<sub>4</sub>)

### OPERATION AND TROUBLESHOOTING

0.5 day

Feed composition, lack of olefins or of isobutane  
Optimization: maxi RON, maxi production, mini acid consumption, ...  
Acid consumption: acid composition, acid regeneration (HF) or acid run away (H<sub>2</sub>SO<sub>4</sub>)  
Upsets: compressor failure, mechanical failure

*Der Vortrag über dieses Thema kann auch auf Deutsch gehalten werden.*