

## AXENS FCC PROCESS

### OPERATIONS TRAINING

**Objective:** To provide in-depth knowledge of the **FCC** process and particularly the client's unit. By the end of the course, the participants will have:

- A general understanding of the significance of the unit within the refinery scheme
- A broad technical understanding of the catalyst and the chemical reactions involved in the process
- A solid knowledge of the Process Flow Diagram and equipment
- A thorough knowledge of operating conditions and their impact on performance
- A good overview of the start-up and shutdown activities  
(NB: a detailed review of procedures is not included in the course).
- A sound knowledge of the main troubleshooting actions

**Duration:** The training course lasts 10 days. The duration can be tailored to the participants' level of understanding.

**Attendance:** This course is targeted to unit process engineers, unit technical managers, shift leaders, and board men. Suitably qualified or experienced outside operators may attend to enhance their process knowledge.

**Program:** The program below may be modified due to specific customer requirements, subject to an agreement between the customer and AXENS.

## FCC process

### Day 1

1. **Introduction s (0.25 days)**
  - Purpose of FCC
  - The FCC evolution
2. **Process Objectives (0.25 days)**
  - General features of cracking
  - Unit objectives and capacity
  - Unit block flow diagram
  - Feed specifications
  - Unit duty
  - Products specifications
3. **Chemistry and catalyst (0.5 days)**
  - Main chemical reactions
  - Catalyst

### Day 2

4. **Heat & Carbon balance (0.5 days)**
  - Rules of thumb
  - Coke yield
  - Heat balance
5. **Catalyst circulation (0.5 days)**
  - Catalyst circulation factors
  - Principle of fluidization
  - Pressure balance
  - Unit pressure control

### Day 3

6. **FCC: process description s (0.25 days)**
  - Process Flow Diagrams (PFDs)
  - Mechanical drawing: general arrangement
  - FCC & Flue Gas Pictures
7. **FCC: equipment 1 (0.75 days)**
  - Riser & Disengager
  - Regenerators
  - Cyclones
  - Catalyst stripper
  - Catalyst slide valves
  - Gas distribution rings
  - Coking in FCC units

### Day 4

- FCC operating parameters and effects (0.75 days)**
- Summary of variables
  - Feed rate
  - Feed temperature
  - Riser Outlet Temperature (ROT)
  - Catalyst quality
  - Feed quality
  - Recycles (in feed, MTC...)
  - Air balance
  - Regenerators pressure
  - Reactor pressure
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- 9- **Main Frac : process description (0.25 days)**
    - Purpose of the units
    - Process Flow Diagrams (PFDs)
    - Piping & Instrumentation Diagrams (PIDs)

### Day 5

- 10- **Main Frac: equipment, operating parameters and effects**
  - Columns
  - Wet Gas Compressor
  - Slurry Filter System

### Day 6

- 11- **Analysis of operating conditions (0.5 days)**
  - Data for monitoring FCC operation
  - Heat and mass balance
  - Catalyst bed levels
  - Pressure balance and fluidization
  - Cyclone inlet velocity
  - Yields
  - Catalyst collection efficiency

- 12- **FCC technology features (0.5 days)**
  - Refractory
  - Main air blower
  - Assisted check valve
  - Torch oil sprayer
  - Air heater

### Day 7

- 13- **Catalyst handling**
  - Description
  - Operation
  - Draw off
- 14- **Flue Gas treatment**
  - Review
  - CO boiler & Waste Heat Boiler
  - Electrostatic Precipitator
  - Economizer

### Day 8/9

- 15- **Initial start-up (2 days)**
  - Summary of operations for the complete Unit
  - Initial start-up
  - Normal start-up
  - Shutdown operations
  - Restart after a shutdown

### Day 10

- 16- **Normal start-up, shutdown and emergencies operation (0.5 days)**
  - Start-up
  - Shutdown
  - Emergencies
- 17- **Troubleshooting (0.5 days)**
  - Catalyst circulation problems
  - High catalyst losses
  - High regenerator temperatures
  - Afterburning
  - Low regenerator temperatures
  - Poor quality of regeneration
  - Coking of transfer line to Main Fractionators
  - Air blower limitations
  - Refractory ageing

### 8. Health, Safety and Environment

### 9. Quiz