

## Production of Synthetic Elastomers

3 days

PCH/ELAST-E

### Overview

#### LEVEL

Skilled

#### PURPOSE

This course provides technical information of the polymerization and main processes used to produce synthetic elastomers: SBR, BR, IR, NR, IIR, CR...

#### LEARNING OBJECTIVES

Upon completion of the course, participants will be able to:  
grasp the main principles of polymerization techniques and the key characteristics of manufactured elastomers,  
review the manufacturing processes in the elastomers industry,  
identify the various techniques of elastomers processing, their main end uses and related market share.

#### WAYS AND MEANS

Detailed course material.  
Pictures/videos of main equipment and samples.

#### LEARNING ASSESSMENT

Quiz.

#### PREREQUISITES

No prerequisites for this course.

### Agenda

#### POLYMER TYPES & NATURE - MAIN ELASTOMERS

0.5 d

Polymer constitution: monomers, macromolecules, building blocks.  
Various kinds of polymer: fibers, elastomers, plastics.  
Main elastomers: styrene-butadiene-styrene, polybutadiene, polyisoprene, nitrile rubber, butyl rubber, chloroprene rubber...  
Relative economic status of different categories of elastomers.

#### POLYMERIZATION OF ELASTOMERS - RELATED PROPERTIES

1 d

Type of reaction and basic characteristics of polymer reactions: polyaddition, polycondensation, heat of reaction, activation mode, catalytic systems, etc.  
Different arrangements of monomer building blocks in polyaddition: atactic, syndiotactic or isotactic polymers; random, alternated, block, grafted polymers and others.  
Influence of monomer arrangements on the properties of elastomers.  
Relationship between end uses and main elastomer properties. Impact of glass transition temperature.  
Main tests used to get elastomer characterization: solution viscosity, Mooney viscosity, gel permeation chromatography, tensile test.  
Shore hardness, relaxation test, etc.  
Test signification, relationship with polymer structure.

Consequences regarding the elastomer processing techniques (formulation, vulcanization, extrusion, injection, etc.).

## INDUSTRIAL IMPLEMENTATION OF POLYMERIZATION - MAIN ELASTOMERS PROCESSES

1.5 d

Techniques implemented to produce polymers: solution, bulk, emulsion, suspension, gas phase techniques.

Advantages and drawbacks of those different techniques, consequences on industrial implementation of the processes.

Examples applied to main processes used to manufacture major synthetic elastomers, continuous and batch processes.

Flow charts and principles of processes. Typical operating conditions.

Influence of operating parameters (temperatures, pressures, monomers ratio and proportion of any chemicals involved in the reaction) regarding the quality control of the elastomer.