Reactor sizing

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Ametys Code:** N9EM15B
- **Open to exchange students:** No

Presentation

Objectives

Gain an understanding of the methodologies involved in modeling and sizing process engineering equipment, using chemical reactors as an example. In particular, take into account coupled phenomena and put them into equations (mass and heat balances).

Description

Contents

- Types of reactor technologies according to industrial fields and operating constraints: examples, diagrams and photos, operating principle.

- The 2 ideal models for modeling reactors: notion of "ideal" flow, residence time, calculation of progress and productivity; writing of mass and heat balances for these 2 simplified models.

- Taking into account the non-ideality of flow in a device: notion of degree of mixing ("dispersion"), residence time distribution (DTS), specific adimensional number (Péclet); models for estimating the rate of advancement: series tanks or "piston-dispersion".

- Multiphase reactors: example of fixed-bed catalytic reactors, notion of coupled phenomena (at catalyst grain scale), transfer resistances, apparent reaction, related adimensional numbers (Thiele modulus, Biot numbers); phenomenological approach to multi-scale sizing.