

DEPARTMENT OF CHEMICAL ENGINEERING  
University of Engineering & Technology, Lahore

# Chemical Reaction Engineering Lab

# Introduction

Chemical reaction engineering laboratory course provides a “hands on” environment that is crucial for developing students understanding of theoretical concepts and reactions.

Chemical reaction laboratory is intended to introduce undergraduate students to the areas of chemical reaction and reactor operation. Some of the experiments conducted in the laboratory are related to chemical kinetics, operation of reactors such as batch reactor, Continuous Stirred Tank Reactor (CSTR), tubular reactor and continuous stirred tank reactor in series. Experiments related with dynamics of reactor also conducted. Reactors may operate in either manual or with computer. The laboratory is also equipped with differential thermal analyzer (DTA).

# List of Equipment

1. Batch Reactor
2. Continuous Stirred Tank Reactor
3. Tubular Reactor
4. Continuous Stirred Tank Reactors in Series
5. Differential; Thermal Analyzer (for research)

## Details of Equipment

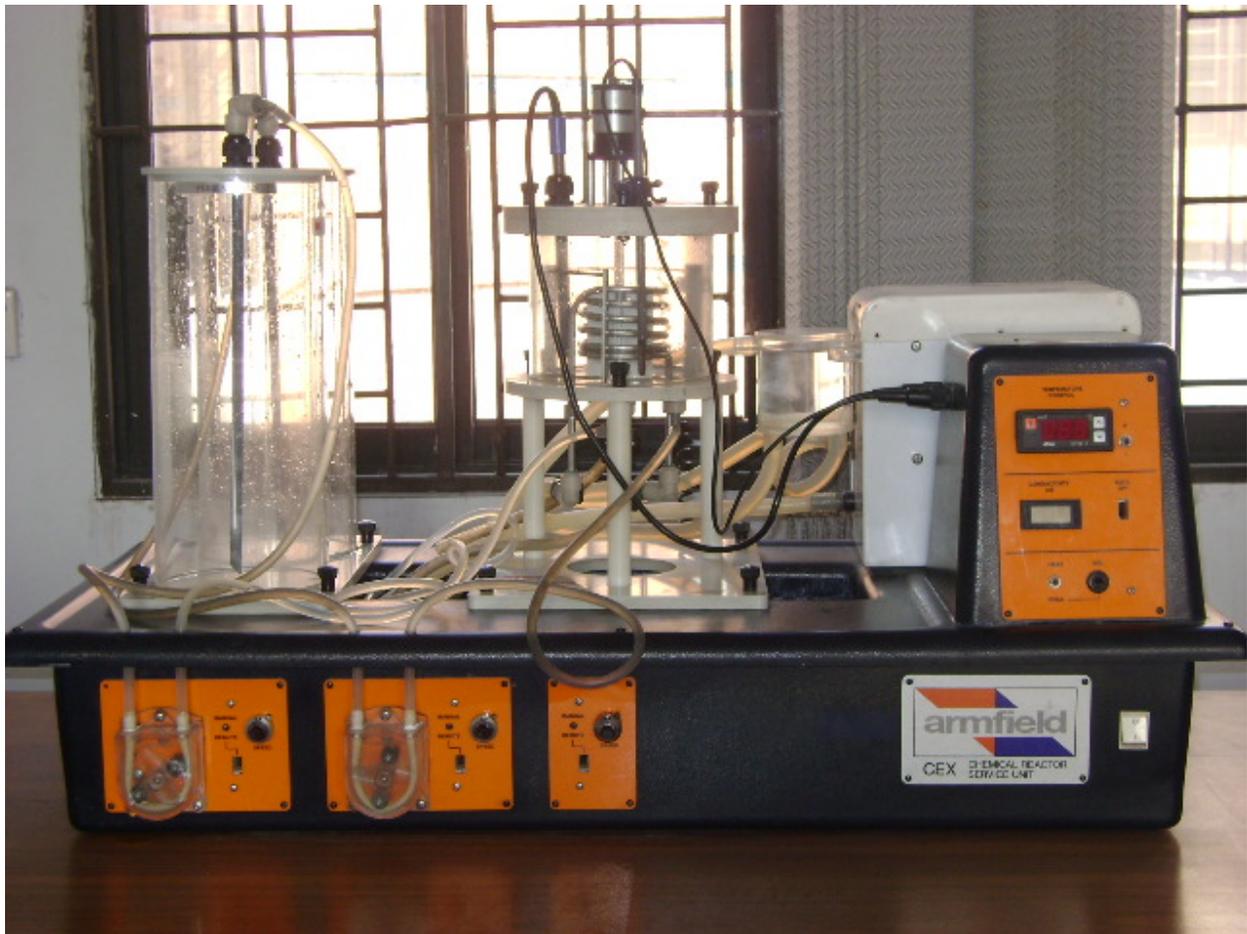
### Batch Reactor

Batch reactor is the generic term for a type of vessel widely used in the process industries. Batch reactor consists of a tank with an agitator and integral heating/cooling system. The advantages of the batch reactor lie with its versatility. A single vessel can carry out a sequence of different operations without the need to break containment. This is particularly useful when processing, toxic or highly potent compounds.



## Continuous Stirred Tank Reactor

The continuous stirred tank reactor is designed to demonstrate the mechanism of chemical reaction in the stirred reactor as well as the effects of varying process conditions such as reaction temperature, reactor volume, stirring rate, feed rate etc.



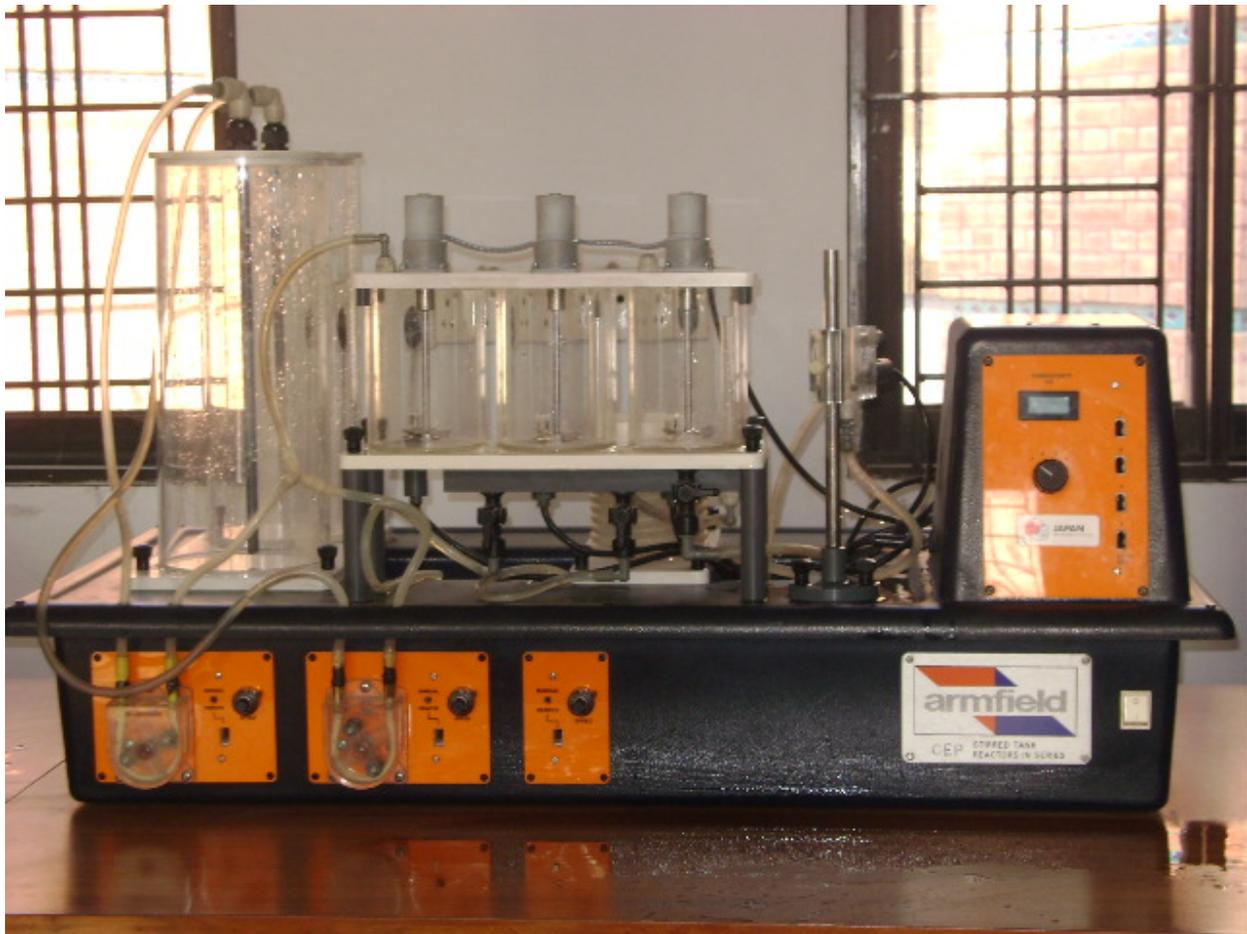
## Tubular Reactor

This equipment is used to design to demonstrate the mechanism of a chemical reaction in such reactor as well as the effects of process conditions.



## Continuous Stirred Tank Reactors in Series

CSTR in series is designed to study the reaction mechanism as well as the dynamics of reactor with various types of inputs.





# List of Experiments

1. To find the reaction rate constant in a stirred batch reactor.
2. To find the effect of reactant concentration on the reaction rate by using batch reactor.
3. To find the reaction rate constant in a continuous stirred tank reactor.
4. To determine the effect of inadequate mixing on the reaction rate using stirred tank reactor.
5. Dynamic behavior of continuous stirred tank reaction.
6. Dynamics of stirred tank reactor in series
  - a. Effect of step input change.
  - b. Response of tank concentration to an impulse change.
  - c. Determination of the influence of flow rate on three tank system following a step change in input concentration.
  - d. Determination of the response to a step change in the input concentration of a system comprising one stirred vessel and a “dead time” module.
7. To determine the rate constant using tubular reactor.
8. To investigate the effect of throughput on the conversion using tubular reactor.
9. To demonstrate the temperature dependence of the reaction and the rate constant using tubular reactor.