

CHEMICAL REACTION ENGINEERING

SUBJECT OBJECTIVE:

Chemical Reaction Engineering (CRE) is the field that studies the rates and mechanisms of chemical reactions and the design of the reactors in which they take place. A chemical species is said to have reacted when it has lost its chemical identity. This lab is developed to study the kinetic data of reaction and to study the design parameter of different chemical reactor.



ISOTHERMAL BATCH REACTOR:

A batch reactor is a system with no input and output streams. A batch reactor can operate under conditions like isothermal (Temperature of reaction Mass remains constant) perfectly mixed (composition of reaction Mass throughout), and constant volume. This set up is used to study a non-catalytic homogeneous reaction under isothermal condition. The set up consists of a Reactor fitted in a constant temperature water bath. One stirrer is fitted for mixing the reactor and other is fitted in water bath to keep the uniform temperature throughout in the bath. The

temperature of bath can be maintained from ambient to 90° C with the help of digital Temperature indicator cum controller. Sample can be taken out with the help of a sampling pipette.





PLUG FLOW REACTOR (Coil Type):

The set up consists of two feed tanks through which two reactants are fed to reactor system. The rotameters are provided to measure the individual flow of chemicals. The flow rate can be adjusted by operating the needle valves provided on respective rotameters. The compressed air is used for circulation of feed. The plug flow reactor made of S.S. 304 is provided for understanding the saponification reaction.

ISOTHERMAL C.S.T.R :

The set up consists of two feed tanks through which two reactants are fed to the reactor system. The rotameters are provided to measure the individual flow of chemicals. The flow rate can be adjusted by operating the needle valves provided on respective rotameters. The compressed air is used for circulation of feed. CSTR is made of S.S. 304. Constant temperature water bath arrangement is provided to conduct the experiment at various temperatures.



RTD STUDY IN PLUG FLOW REACTOR (COIL TYPE):



Real reactors do not satisfy the idealized patterns back mix flow or plug flow deviation from ideality can be due to channeling of fluid the vessel, recycling of fluid within the vessel or due to presence of stagnant region or pockets of fluid in the vessel. To predict the exact behavior of a vessel as Chemicals reactors, RTD or stimulus techniques are used. The setup consists of one feed tank through which water is feed to the reactor. Their flow rate can be adjusted by operating the needle valve and measured by the rotameter. The compressed air is used for circulation of feed. It is helical coil tube type

plug flow reactor made up of stainless steel pipe. Reactions enter at lower end coming out of the top of coil from where samples are collected for analysis. For understanding the RTD characteristics, a special arrangement to inject tracer into the lower end of reactor, using a syringe is provided Pressure Regulator & Pressure Gauge are fitted in the compressed air line.

RTD STUDIES IN CONTINUOUSLY STIRRED TANK REACTOR (CSTR):

The setup consists of one tank through which water is fed to rotameter and then to the reactor. The flow rate can be adjusted by operating the needle/ball valve. The compressed air is used for circulation of feed. The continuously stirred tank reactor made of S.S. 304 is provided for understanding the R.T.D. characteristics. An special arrangement is done for dozing the tracer in the C.S.T.R. Pressure Regulator & Pressure Regulator & pressure Gauge are fitted in the compressed air line.





PACKED BED REACTOR FOR RTD STUDY:

The setup consists of a glass column packed with Rasching Rings. Liquid Distributor is fitted at the bottom of the column. Tracer is fed in the feed line entering the column at bottom. Samples can be taken periodically. Pressure Regulator & Pressure Gauge are fitted in the compressed air line.