High temperature fixed bed reactor

The Vapourtec high temperature fixed bed reactor complements the existing fixed bed reactor products by extending operation up to 250 °C and 50 bar pressure. The stainless steel or Hastelloy[®] reactor is packed by the user with the desired catalyst or reagent providing excellent versatility. Once packed, the reactor is simply inserted into an insulated housing to be heated rapidly and accurately using an R-Series or E-Series flow chemistry system.



The reactor is heated by either an R-Series or E-Series flow chemistry system.

A temperature sensor accurately controls the outside temperature of the steel column in the range ambient to 250 °C.

In a typical application, the working fluid will be preheated in a tubular reactor before entering the high temperature fixed bed reactor and contacting the catalyst or reagents within the column. A cooling coil is supplied with the high temperature reactor to ensure the reactants exiting the reactor are reduced in temperature sufficiently before depressurising through a back pressure regulator.

Application examples

- Post cracking work-up of high value petroleum products
- Continuous flow hydrogenation
- Continuous flow hydration over a fixed bed
- Direct alkylation of N-heterocycles and amines
- α-Methylation of pyridines
- Click chemistry
- Heterogeneous or homogeneous reactions using Dowtherm solvents
- Gould-Jacobsen reaction
- Oxidations using manganese oxide. However extreme care should be taken to avoid strongly exothermic conditions.



Tubular reactor



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Key features

- Precise temperature control, ambient to 250 °C
- Pressure up to 50 bar
- The reactor volume is 3.8 ml. If a smaller volume is required for the active packed bed then celite can be used to fill the remaining void volume.
- "Post Cooling" tube to return products to a safe temperature before re-entering PFA tubing.
- Ideal for immobilised catalysts at high temperature conditions
- Precise temperature control
- Materials of construction for the fixed bed reactor are stainless steel 316 L, (Hastelloy® C276 also available upon request).



Safety

Vapourtec takes safety extremely seriously. Consideration should be given to the following:

- Reaction products exiting the system at 250 °C can present a hazard. The following actions are recommended to mitigate the risks.
 - i. Either a cooling coil or another metal tubular reactor set at a lower temperature is used after the column reactor as a cooling stage before products are depressurised and leave the system.
 - ii. Or, on line quenching is adopted where a solvent is added immediately after the packed bed reactor to reduce the temperature.
- Highly exothermic reactions should be avoided as the capability of the packed bed reactor to remove heat is limited.



Reaction type α -methylation of substituted pyridines



Typical flow diagram for the high temperature fixed bed reactor

