ThermoCore™

Tubular reactor internals

"Cooler Reactors. Smarter Chemistry."

Technology

This invention relates to tubular fixed bed reactors (TFBRs), specifically to a reactor internal component designed to improve heat transfer performance during exothermic catalytic processes such as Fischer–Tropsch Synthesis (FTS). The technology includes (i) a reactor internal component for a fixed bed reactor, (ii) a reactor tube incorporating the internal component, and (iii) a method of installing the internal component within the reactor tube.

Traditional TFBRs, while simple and scalable, suffer from poor heat removal, high pressure drops, and uneven temperature distribution during highly exothermic reactions. These challenges can lead to the formation of hot spots, catalyst deactivation, reduced selectivity, and even thermal runaway. The proposed invention overcomes these drawbacks by incorporating a novel internal structure that enhances heat transfer within the reactor tube without significantly reducing catalyst loading or increasing pressure drop.

Market need

There is a strong industrial demand for energy-efficient and thermally stable reactor designs for use in chemical, petrochemical, and fuel synthesis industries. Conventional tubular fixed-bed reactors remain popular due to their simplicity, but they are limited by poor heat management in exothermic reactions such as FTS, methanation, hydrogenation, and oxidation Industrial operators are seeking cost-effective solutions to improve process safety, extend catalyst life, and increase throughput without sacrificing reactor productivity. This invention directly addresses these challenges by providing a scalable retrofit solution that improves heat dissipation and operational stability in existing and new TFBR units.

Features

- High Thermal Conductivity Materials
- Suitable for use in single or multi-tube configurations.
- Simple Installation Method
- Customisable dimensions for different reactor sizes and process conditions.

Benefits

- Improves thermal conductivity and minimises temperature gradients in the catalyst bed.
- Prevents localised overheating.
- Reduces thermal stress and deactivation rates.
- Can be easily integrated into existing TFBR systems without major modification.
- Supports isothermal operation and minimises the risk of thermal runaway.
- Applicable from laboratory to full-scale reactors across chemical and energy sectors.

Industry
Energy

Potential applications
- Fischer–Tropsch synthesis and other exothermic catalytic processes requiring enhanced heat management.
- Petrochemical and chemical manufacturing for improved reactor stability and catalyst longevity.
- Hydrogenation, methanation, and oxidation reactions where heat buildup can affect selectivity and safety.
- Retrofitting of existing tubular fixed-bed reactors (TFBRs) to improve heat transfer efficiency and throughput.
- Design integration in new reactor systems for cleaner, safer, and more energy-efficient industrial operations.

Creators
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Stage of development
Technology is ready for adoption/ no prototype

Intellectual property
Patent Protection

Desired relationship
Co-development, Investors`