HEX Reactors for Fast Exothermic Reactions

HEX chemical reactor – heat exchangers provide safer processing, better economics, and are more energy-efficient than conventional

Applications

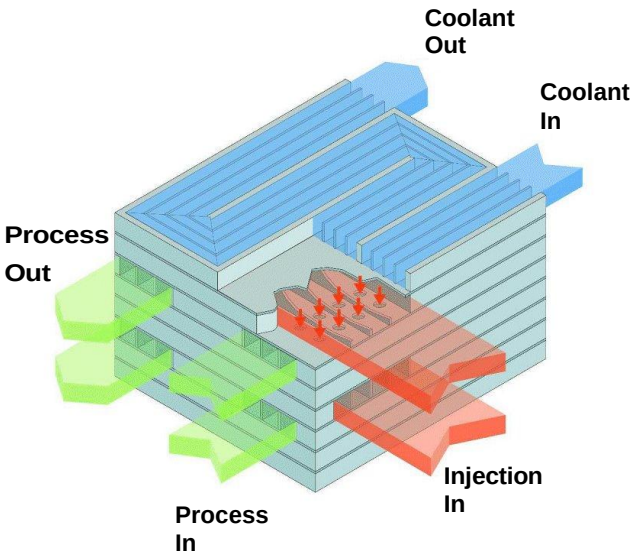
- Nitration
- Azo coupling
- Halogenation
- Hydrogenation
- Oxidation
- Sulfonation
- Amination
- Alkylation

Benefits

- Higher yields & productivity
- Improved product purity
- Less energy, pollution and reprocessing
- Lower running costs
- Thermal runaway eliminated
- Continuous production
- Reaction heat recovery
- High pressure capability
- Lower capital costs
- Smaller plant
- Inherently safer

HEX Reactors, compact integrated chemical reactor-heat exchangers, give marked improvements in productivity, and substantially reduce by-product formation when flow patterns, mixing and heat transfer rates are tailored to the chemical process requirements.

HEX Reactor technology is proven for single liquid-phase processes, and is being extended to two-phase reactions and ultimately to multi-phase processes.



Courtesy Chart Heat Exchangers

Appropriate designs of HEX Reactor can be selected depending on the duty and operational requirements.

Commercial designs of compact heat exchangers being characterised as reactors include: Plate & frame, Inserts for shell & tube, Printed circuit, Plate-fin – featured above. HEX Reactors can also be tailored to the specific reaction kinetics and exothermicity

Process Intensification

Process Intensification (PI) is a design philosophy of matching reactor fluid dynamics to the physico-chemical requirements of the reaction to achieve high productivity and selectivity.

Match

- Reaction rate to Mixing rate
- Mechanism to Flow pattern
- Reaction time to Residence time
- Exotherm To Heat transfer

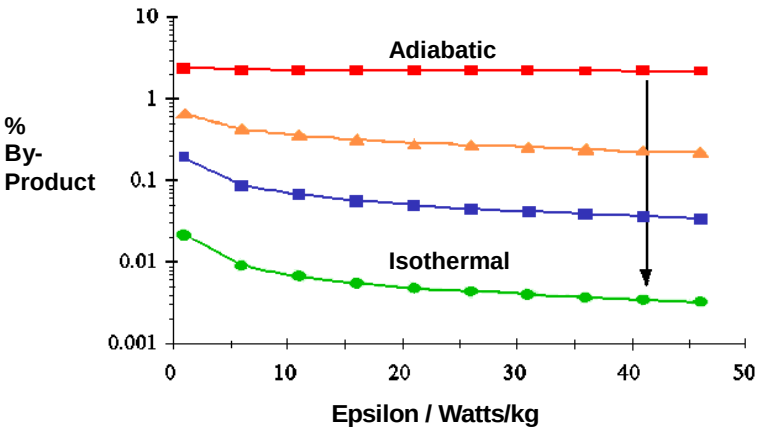
Tools

- Models of exothermic reacting flows
- Chemical probes for HEX reactor characterisation
- Flow loops for characterising HEX reactor performance
- Linking kinetics to fluid dynamics
- Reactor design guidelines
- Laboratory & pilot plant equipment

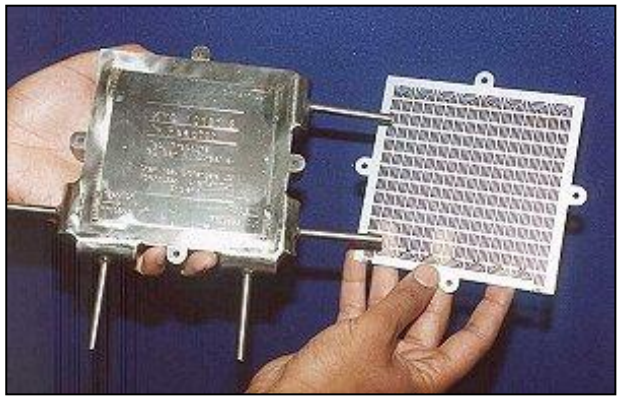
Services

- Audit total systems
- Identify key reaction stages
- Evaluate process sensitivity to mixing and heat transfer
- Assist with implementation

Heat Removal decreases Byproduct Formation



By-product formation decreases as mixing intensity and rate of heat transfer increase. As more reaction heat is removed, mixing benefits become even more pronounced. Trends can be predicted for industrial reactions by our experimentally validated model.



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