USF High Efficiency Reactor (USF-HER)

Researchers at the University of South Florida have developed an innovative high efficiency reactor design for any process that requires multiple discrete reaction steps. The USF High Efficiency Reactor (USF-HER) can provide up to 82% volumetric footprint reduction compared to traditional reactor designs, reducing construction and operational costs associated with the process. USF-HER can be effective under any operational conditions where space is a constraint or high efficiency reactions are desired. These include:

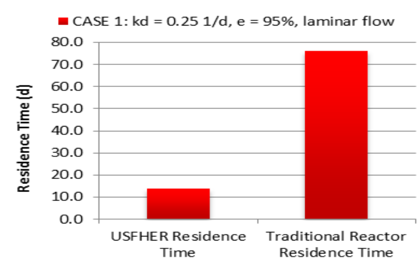
- Environmental engineering: Water and wastewater treatment, urban sanitation, decentralized onsite treatment, anaerobic digestion
- Chemical engineering: Process intensification, catalytic processes, manufacturing of chemicals
- Bioengineering: Biocatalytic processes, enzyme and protein manufacturing, manufacturing of pharmaceuticals

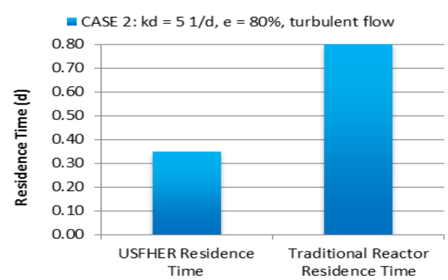
Industrial processes are often conducted in unit operations in a series of separate individual reactors. The reactors may be different in volume, thereby having different hydraulic retention times. This allows different technologies and environmental conditions to be achieved within each reactor. However, commonly encountered drawbacks and difficulties exist, such as high fabrication costs, increased footprint of each reactor, complexity, as well as high energy/monitoring costs incurred while operating the reactor. There is need for the above mentioned challenges to be curbed or greatly reduced to improve on the overall performance of industrial processes.

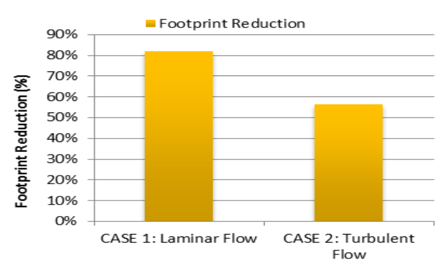
USF inventors have developed a high efficiency reactor designed with a unique geometry that offers low footprint, low residence time (higher throughput), passive operation, a reduction in moving parts, increased process robustness, and the ability to handle shock loadings. Using USF-HER, a gradient of conditions (such as temperature, particle size, solid concentration, pH, redox and other water quality parameters) can all be achieved in one reactor. Different treatment schemes and objectives can be achieved by changing different points of origin and destination of the internal recirculation.

ADVANTAGES:

- **High treatment efficiency (lower residence time = higher throughput)**
- **High process robustness**
- **Ability to handle shock loadings**
- **Reduced system footprint**
- **Reduced construction and operation costs of the plant**
- **Passive system (more energy efficient)**







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