Oscillatory Baffled Mesoreactors for Laboratory-scale Process Development

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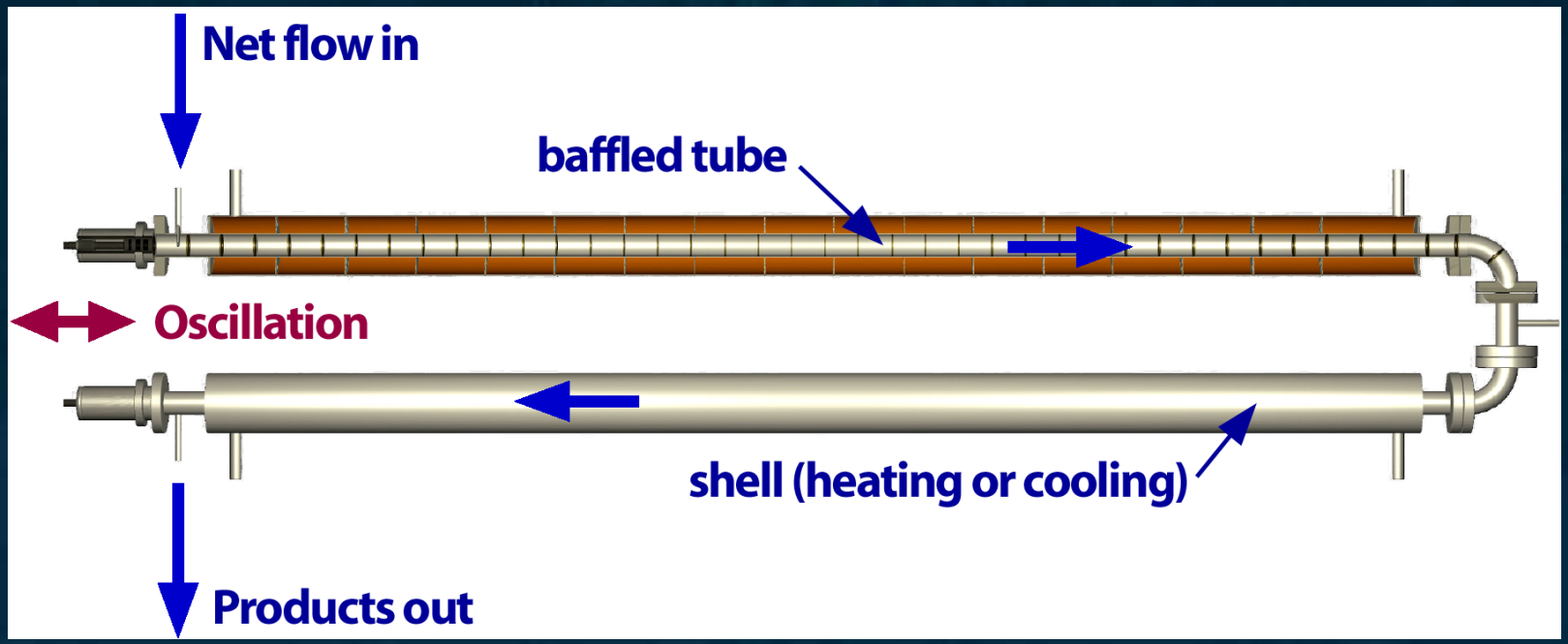
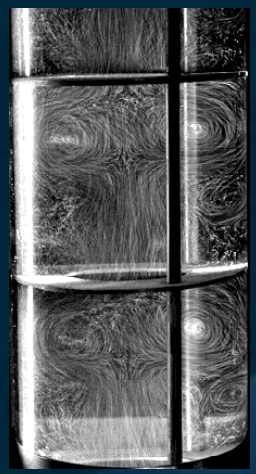
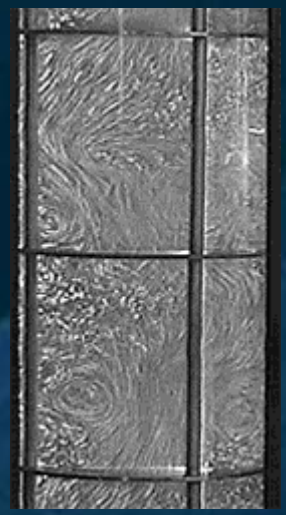
Conventional "Full-scale" Oscillatory Baffled Reactor (OBR)

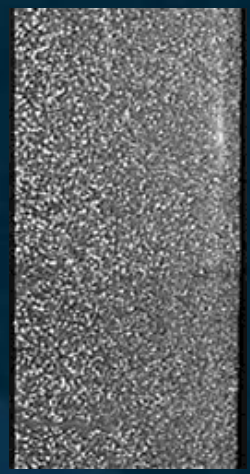


Oscillatory Mixing





Oscillatory Flow in A Baffled Tube



Oscillatory Flow in An Unbaffled Tube

Niche Application

A Plug Flow Reactor for "long" (>10 minutes) reactions

Also:

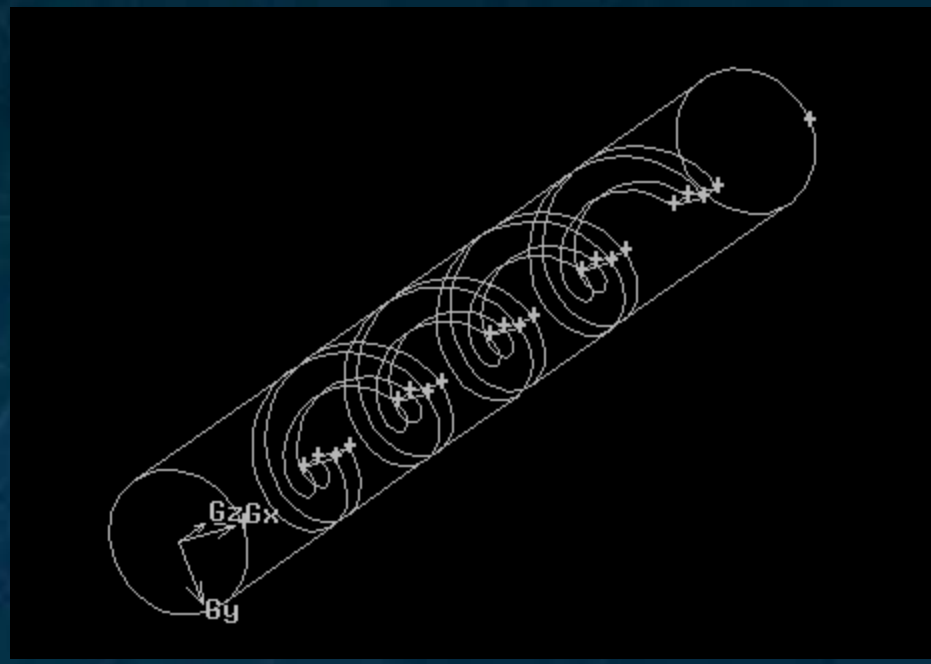
- Enhanced heat & mass transfer
- Controllable mixing: uniform shear
- Scaleable
- Flexible operating conditions

Design of Oscillatory Baffled "Mesoreactors"

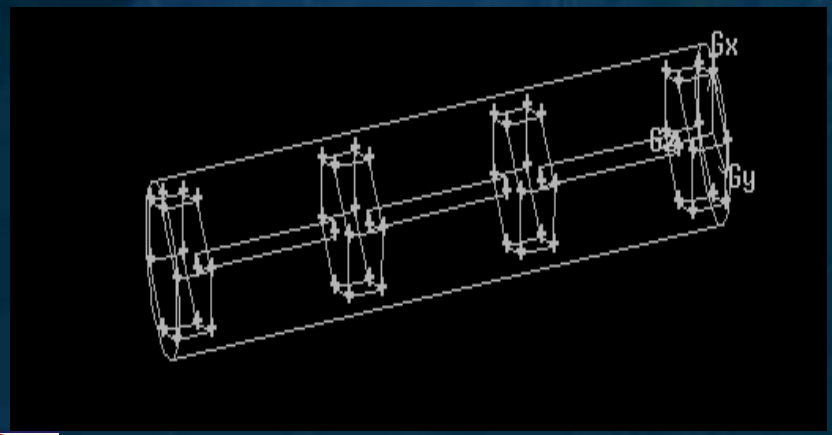
- Flowrates: mL/hr
- Flexible
- Inexpensive baffles, tubes and fittings
- Glass, initially

“Meso-scale” OBRs

(a) Integral baffles

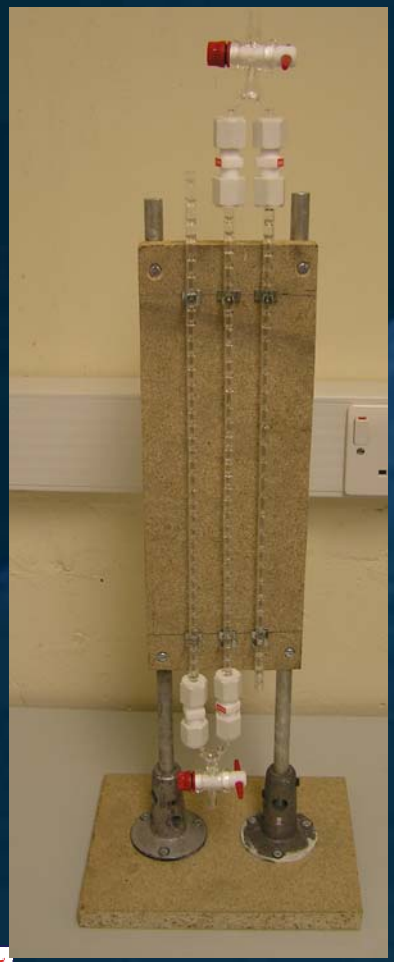


(b) Helical baffles

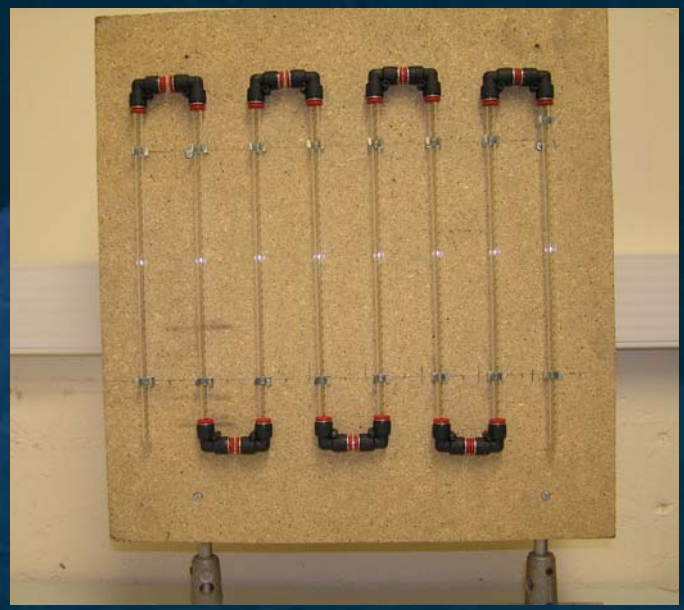


(c) Central baffles/ axial circular baffles

Layout of the meso scale baffled reactors



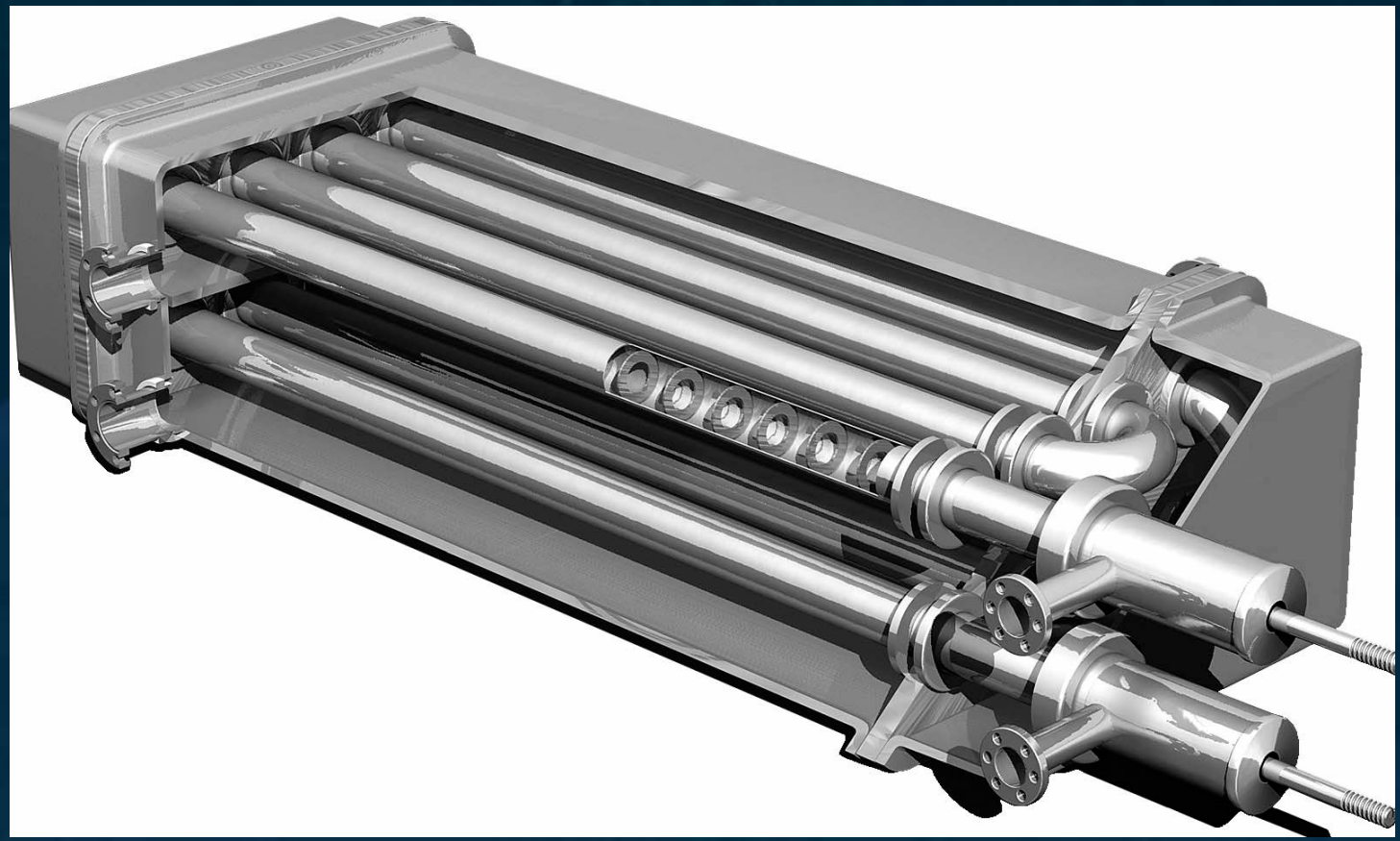
(a) Integral baffled reactor



(b) Helical baffled reactor

(c) Central baffled reactor

Full OBR Design



Conclusions

RTDs evaluated over a range of conditions for the integral, helical and central baffle designs:

- all exhibit narrow, symmetrical RTDs over a wide operating range

Current work

- Reactions (case studies):
  - Biodiesel production
  - Polyoxometallate crystal formation
  - Imine formation
- Illustration of moving between steady states, dynamic process condition screening

Can be seen on the lab tour today