Agitator Design Principles for Biofuels

Day One: Major Agitator Design Principles and Biofuel Applications

Agitator design basics

- **Nomenclature**
- **Principal dimensionless numbers, correlations**
- **Impeller classifications**
- **Flow patterns**
- **Agitated heat transfer**

Design for liquid motion

- **Calculating pumping capacity**
- **Characteristic velocity**
- **Scale of Agitation**
- **Why power, rpm both important**
- **Sample problem**
- **Use of commercial software**
- **Comparing impeller performance**

Starch-based ethanol application guide

- **Typical flow sheets covered**
- **Slurry tanks**
- **Liquefaction**
- **Saccharification**
- **Fermentation**
- **Beerwell**
- **Stillage**
- **Other miscellaneous applications**

Cellulosic ethanol application guide

- **Pretreated biomass slurry tank**
- **Cellulose hydrolysis reactor basics**
- **Simultaneous saccharification and fermentation**
- **Other miscellaneous applications**

Biodiesel application guide

- **Esterification reactors**
- **Washing**
- **Storage**
- **Other miscellaneous application**

Day Two: Scale-up, Rheology, Cellulose Reactor design, etc.

Agitation Scale-up

- **Goal of scale-up**
- **Process versus physical scale-up**
- **Single versus multiple scaling parameters**
- **Impact of scaling method on equipment size**

Basic rheology for agitator design

- **Discussion of major rheology types**
- **Limitations of conventional viscometers for fibrous materials**
- **How to use an agitator as a viscometer**

Cellulose hydrolysis reactor design

- **Reactor schemes: fed batch, continuous flow**
- **How to do the job with a turbine agitator**
- **How to design experiments to cover scale-up needs**
- **Sample problem**

Use of Computational Fluid Dynamics in agitator design

· Flow around coils
· Velocity profiles
· Bubble size distribution
· Gas holdup distribution
· $k_l a$ distribution
· Blending simulation
· Reaction simulation