Mixing: How to choose a mixing element ?

• Some guidlines
• Solve a mixing problem

Some guidelines for choosing a mixing element

• VRT & VRG type agitators:

Propellers with "SABRE®" profile blades - Blending with a minimum of energy consumption.

The flow created is predominately axial, assuring a very efficient pumping effect. These profiles are ideal for a large number of applications, in particular for those needing high speeds and low energy consumption (VRT types) , liquid-solid suspensions for example. They operate at low speed with a very weak or moderate level of turbulence. The VRG mixer is dedicated to viscous products and high flow rate.

Flowrate = 3000 m³/h
Diameter of mixing element = 1 m
Energy absorbed = 0.9 kw
Speed of rotation = 58 rpm
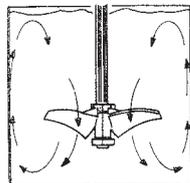
• VRP type agitators:

Axial propellers with 45° pitched, plane blades. Economic blending for small and medium volume agitators.

The flow generated by this type of mixing element is predominately axial with a radial element.
It is used for suspending or for heat transfer in a non-viscous medium. The pitched propeller blades operate at a low speed and generate a higher level of turbulence.
These basic mixing elements are often sufficient for simple applications.

Flowrate = 3000 m³/h
Diameterof mixing element = 1 m
Energy absorbed = 1,2 kw
Speed of rotation = 57 rpm
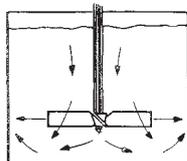
• VLA & VDA type agitators:

Marine type propeller. Economic blending for small volumes.

These traditional mixing elements are used for solids, blends, emulsions. They generate a medium level of turbulence. For reasons of weight, these propellers are only used at small diameters and most often operate at high speeds (direct drive).
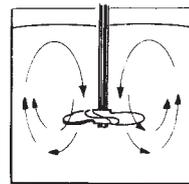
Flowrate = 3000 m³/h
Diameter of mixing element = 1 m
Energy absorbed = 1,25 kw
Speed of rotation = 91 rpm

• "RUSHTON" propeller:

"RUSHTON" flat blade propellers. "Process" mixing.

This mixing element is well adapted for gas-liquid transfer as well as heat transfer in a non-viscous medium. The flow created is radial and with high turbulence and energy consumption levels. It's use is reserved for specific applications.
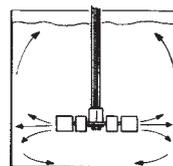
Flowrate = 3000 m³/h
Diameter of mixing element = 1 m
Energy absorbed = 6 kw
Speed of rotation = 63 rpm

The above figures illustrate the different energies absorbed for identical flowrates according to the mixing element used.

MILTON ROY
Mixing

How to tackle and solve a mixing problem ?

• Define the mixing operation decision criteria

The analysis of a mixing problem consists firstly of collating and evaluating all the decision criteria of the quality of mixing.

These criteria can be very varied, for example:

- Full blending of the suspension within the whole volume of the tank,
- Blending at the bottom to allow draw off by a pump,
- Fluid circulation at high wall speeds to avoid scaling,
- Degree of homogeneity of mixing,
- Mixing time,
- Mass transfer,
- Yield. ...

• Choose a suitable agitator-tank geometry

Based on the mixing quality decision criteria, knowledge of the different constituents (quality, physical characteristics, properties), the designer must define the best agitator-tank geometry (type of propeller, profile, diameter, number, position, speed of rotation, baffles, entry and exit ports) in order to accomplish the mixing operation.

There are numerous applications for which the agitator-tank geometry choice can be relatively simple.

For other cases the accumulation of experimental results over many years allows MILTON ROY MIXING to extrapolate or interpolate an optimum solution applications.

Additionally, for certain applications, notably "process", the complexity of the phenomena playing a part leads to a simulation being carried out on a "pilot" plant of reduced size.

Most of the time these tests are designed to confirm the following choice of parameters :

- suitable type and profile of the mixing element for the planned operation,
- ratio propeller ø / tank ø,
- rotation speed.