

Mixing Impeller Selection

WHICH DESIGN IS BEST?

There are a multitude of mixing impeller designs available for industrial mixing, miscible liquids blending and solids suspension. Good material flow is essential to successful execution of these processes. Hydrofoil impellers, marine style mixing propellers, axial flow turbines and radial flow turbines are all flow-producing impeller designs. Each impeller design has unique characteristics and they are not necessarily interchangeable on a given mixer. First, the horsepower required to drive any impeller type increases dramatically as diameter increases (power is proportional to diameter to the 5th power). Similarly, power required increases with increased speed (proportional to speed to the 3rd power). Therefore, before increasing the diameter and/or speed of a mixer impeller, horsepower requirements should be evaluated to prevent possible motor failure.

Among the previously mentioned designs the hydrofoil provides the gentlest agitation with the least shear. Its blade profile creates nearly uniform flow with the minimum required horsepower. Hydrofoils are fabricated by welding blades formed from flat plate to a cylindrical hub. The marine style propeller performs similarly to the hydrofoil with slightly higher power consumption and resulting shear. At small diameters hydrofoils are more expensive than marine style propellers which are cast and then machined. However, this relationship is reversed when the diameter exceeds about 13" as the cost of large castings becomes higher than the fabrication costs of the hydrofoil. Marine style mixing propellers and hydrofoils are common selections for low viscosity mixing. Steep pitch propellers are available where increased flow from a given impeller size is desired. Large diameter hydrofoils driven at low rpm are often selected for agitation of large batches. Axial flow turbines are fabricated similarly to hydrofoils but with large, flat blade surfaces at 45-degree angles to contact and therefore push more viscous materials. Primarily used for flow-controlled processes with higher viscosities, the blade edges provide higher shear and require greater horsepower to drive them. Unlike the previously discussed impellers, radial flow turbines produce a primary flow pattern 90-degrees from the shaft. In order to achieve this motion flat blades are welded to the hub like the axial flow turbine but with a 0-degree angle to the axis of the shaft. These impellers are often used to assist with gas dispersion or to agitate liquids in vessels of large diameter and minimal depth.

We invite you to contact us with any questions. We can help you select the right impeller for your application and evaluate the necessary horsepower and torque to prevent premature motor failure.