Morehouse Cowles

Disperser Basics

Proudly Represented by:
Divtech Equipment Co
PO Box 58468
Cincinnati, OH 45258
513-941-0483
info@divtechequipment.com

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Primary Forces

- **Shear:** The deformation of fluids caused by inducing a differential velocity.
- **Impact:** The force of the collision.

Non-Newtonian

Any liquid that exhibits a viscosity which varies with shear.

Dilatant……Viscosity increases with shear.

"shear thickening"

Pseudoplastic……Viscosity decreases with shear.

"shear thinning"

Rheopetic……Viscosity increases with time at constant shear.

Thixotropic……..Viscosity decreases with time at constant shear.

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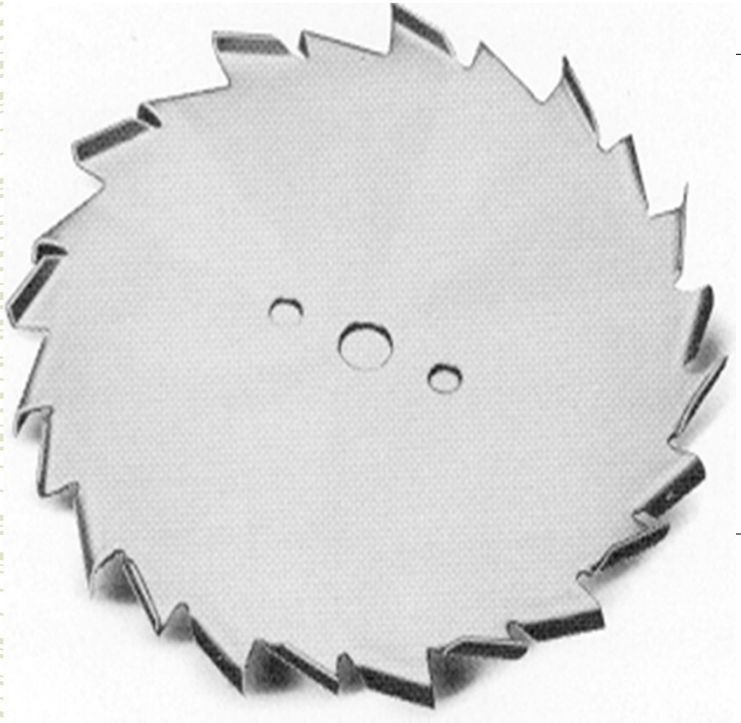
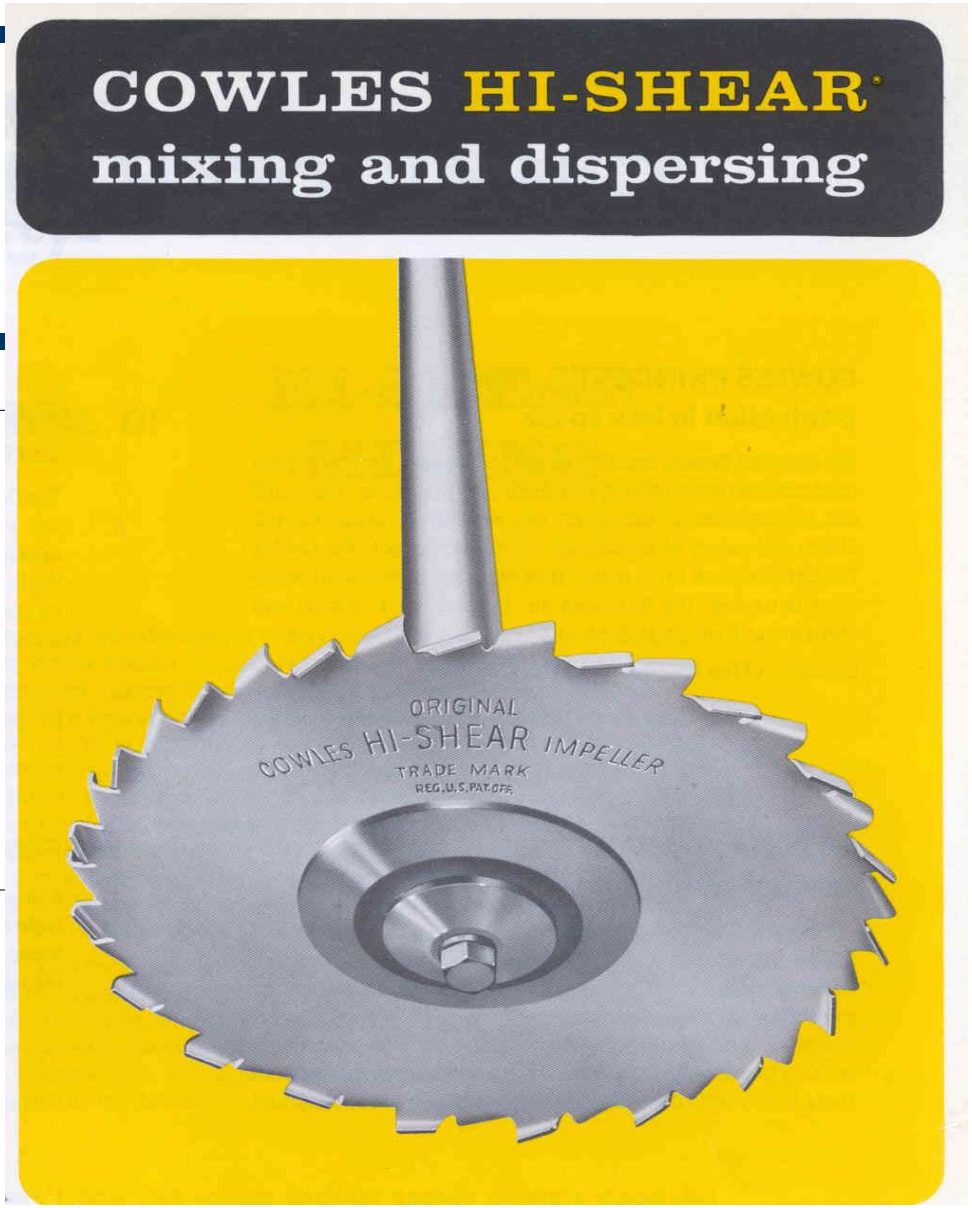
The Original





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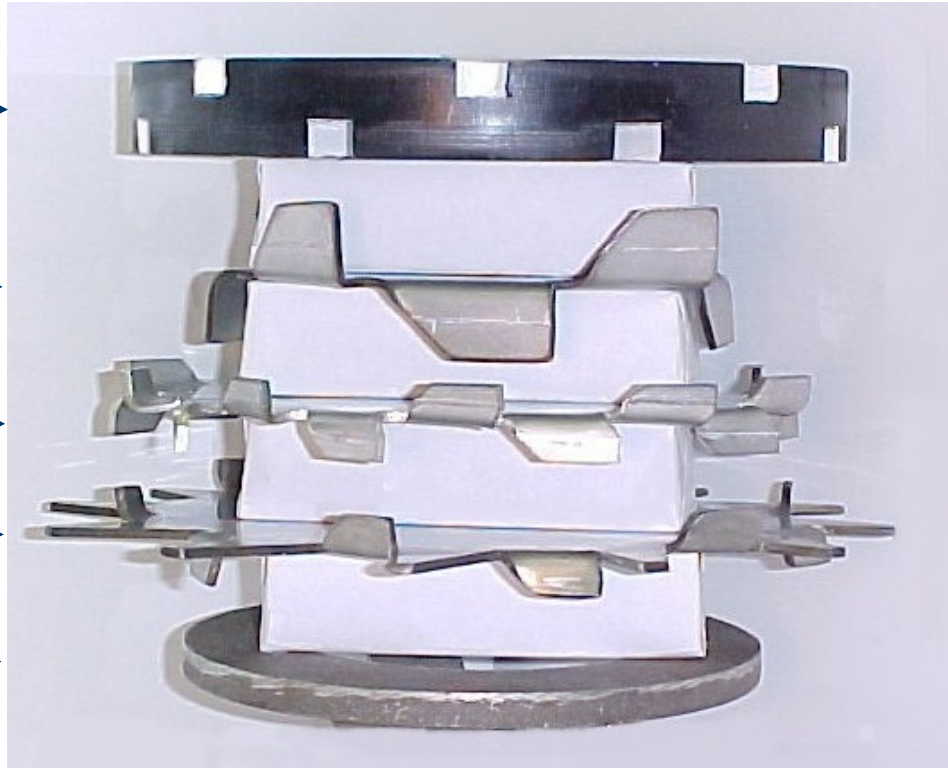
Various blade tooth configurations

- Poly-peller™
- High Vane
- High Shear
- Pick
- Flat Disc



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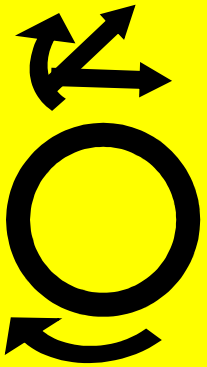
How does the Impeller Work

At dispersion speeds (4000-6000 FPM) the impeller imparts high velocity to the material. {RPM x .262 x Blade Diameter} = FPM

1. Imparts high velocity to material.



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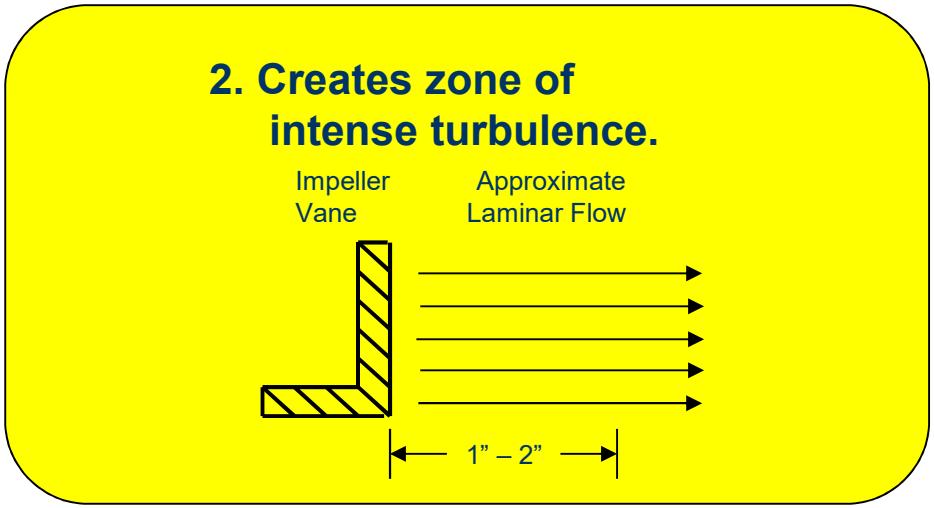
How does the Impeller Work

At dispersion speeds (4000-6000 FPM) the impeller imparts high velocity to the material. {RPM x .262 x Blade Diameter} = FPM

This high velocity creates a Turbulent zone of intense flow. Rapid hydraulic attrition is accomplished in this zone, utilizing Shear and Impact energy. This Turbulent zone is normally within 1-2" of the blade diameter, 75% of the kinetic energy is applied within this zone.



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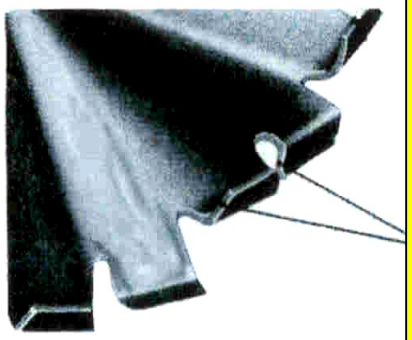
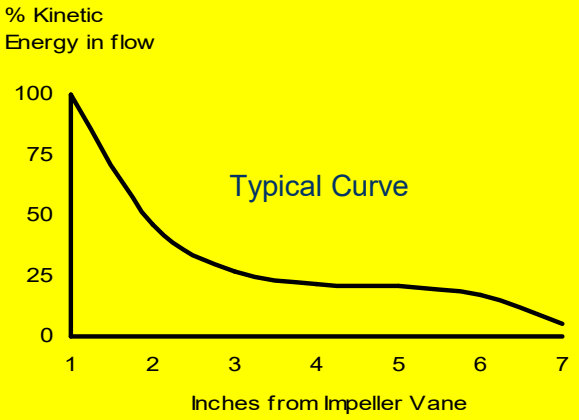
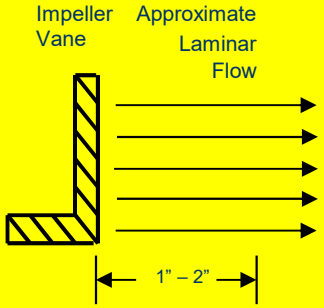


3. Concentrates energy close to impeller.



2. Creates zone of intense turbulence.



The turbulent zone is a zone of intense energy dissipation. Nearly 75% of the kinetic energy is used for hydraulic attrition in a distance of 1"-2" from the impeller vanes.

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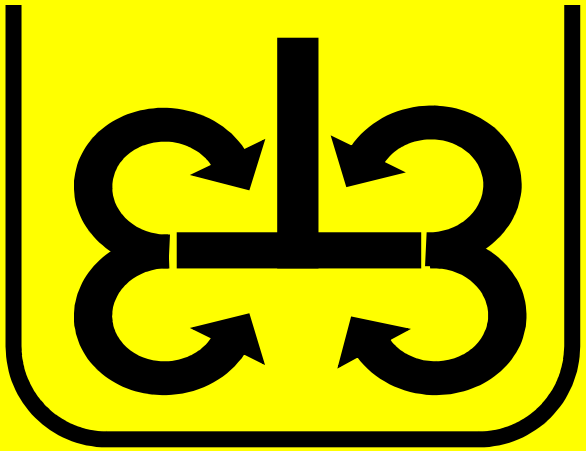
4. Causes laminar flow for "Total Motion"



Beyond the turbulent zone, the movement becomes laminar. This flow divides at the vessel wall assuring complete circulation of the entire batch. Turbulence does not interrupt flow pattern.

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High Shear Impeller

- For most mixing and dispersion applications.
- Most efficient impeller you can buy.

- Most popular and copied design.
- 304 Stainless Steel is standard
- 316 SS, Chrome plated and Tungsten Carbide coated are available.
- Easily removed from shafts.
- Self Cleaning, non-clogging operations
- Sizes from 2” to 36” diameter
- Standard and Custom drill patterns to fit all equipment.

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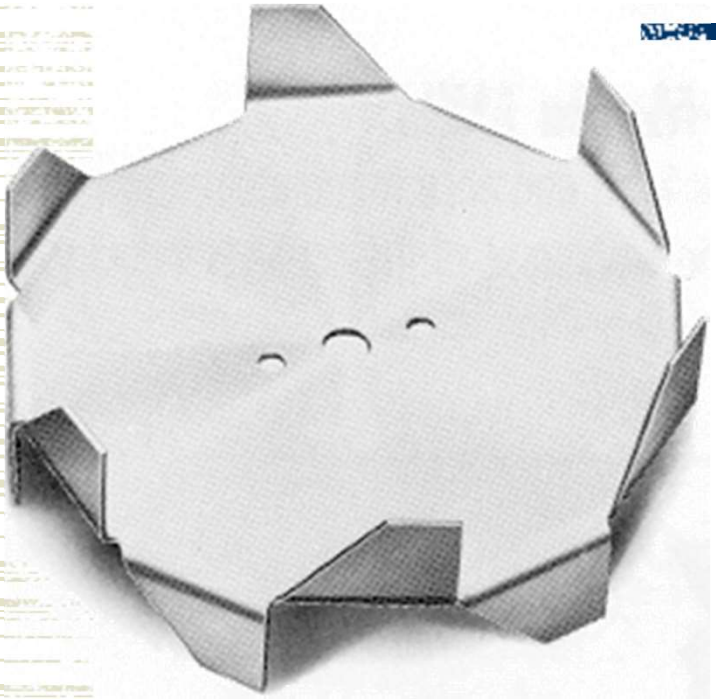
High Vane Impeller

•For mixing and dispersion applications requiring less shear and more mixing. A good blade to fill the intermediate range between low-speed mixing and High Speed Dispersion.



•High pumping action and radial flow promote better blending and low shear keeps the heat down

•304 Stainless Steel is standard, 316 SS, Chrome plated and Tungsten Carbide coated are available.

•Easily removed from shafts.

•Self Cleaning, non-clogging operations

•Sizes from 4” to 36” diameter

•Standard and Custom drill patterns to fit all equipment.

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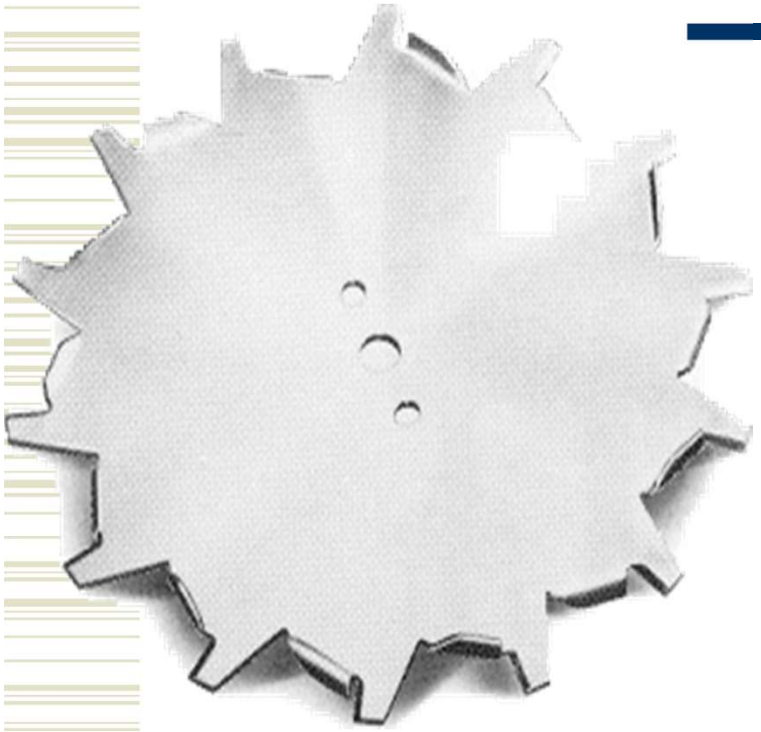
Pick Design Impeller

•For Rapid dispersion of fibrous or solid materials such as rubber.



•Sharp blades are incorporated between regular vanes and extend ¾” beyond the edge of the regular vanes.

•304 SS, 316 SS, Chrome plated and Tungsten Carbide coated are available.

•Easily removed from shafts.

•Self Cleaning, non-clogging operations

•Sizes from 2” to 32” diameter

•Standard and Custom drill patterns to fit all equipment.

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Poly-peller™

•For mixing and dispersion applications where abrasion resistance is required.

•Expected longer life than other blade materials, up to 10 times longer that standard Stainless. This blade can be turned over to increase life.

•Rated for continuous operation at 145 deg. F

•Easily removed from shafts.

•Self Cleaning, non-clogging operations and non sparking operation.

•Sizes from 2” to 36” diameter

•Standard and Custom drill patterns to fit all equipment.

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Standard Rules of Thumb for Sizing

A. 10 H.P. to every 100 gallons of product.

B. Blade diameter 1/3 tank diameter.

C. Blade position in tank ½ - 1 ½ of blade diameter off bottom of tank.

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Allow 10-hp for every 100 gallons of product.

Single shaft dispersers are not recommended for products over 50,000 cps

Tank Configuration

Diameter = Product Level

Straight Side = Product Level+ 15-20% Freeboard

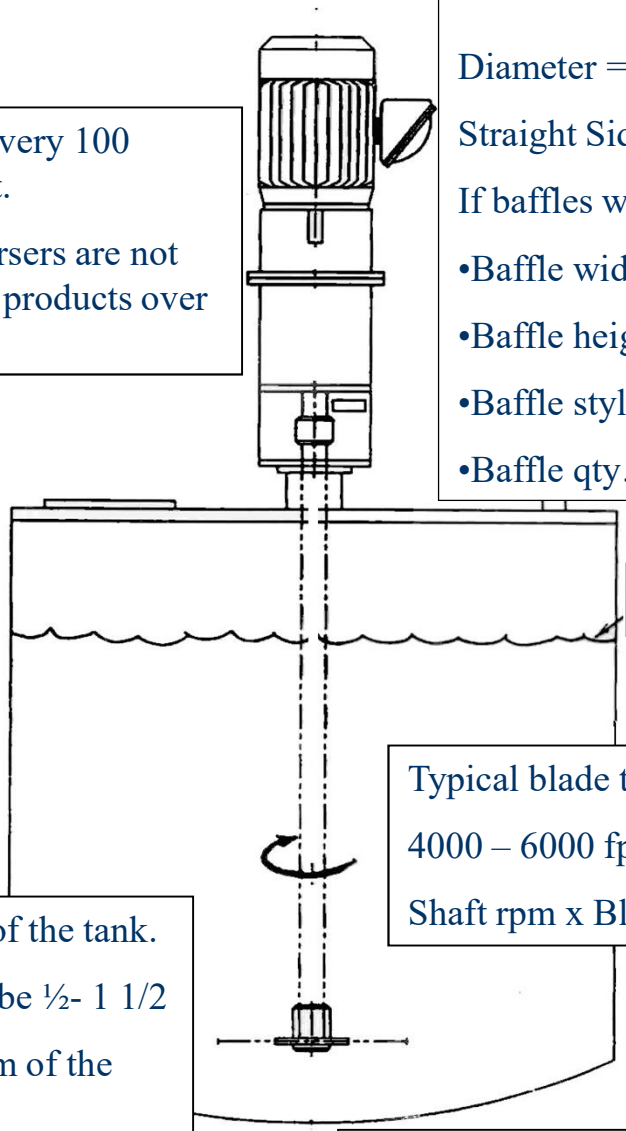
If baffles were needed (<1000 cps) they should be:

•Baffle width …….05-.1 of tank diameter

•Baffle height …….2/3's of the straight wall

•Baffle style……Off the wall, to not allow ebbing

•Baffle qty……..Product specific normally 3-4



Product Level

Typical blade tip speed:

4000 – 6000 fpm

Shaft rpm x Blade Dia inched x .262 = fpm

Blade should be 1/3 the dia of the tank.

Position of the blade should be ½- 1 1/2 blade diameters of the bottom of the tank.

Flat bottom tanks are appropriate for 500 gallons or less. Dish Bottom is the better choice for larger tanks.

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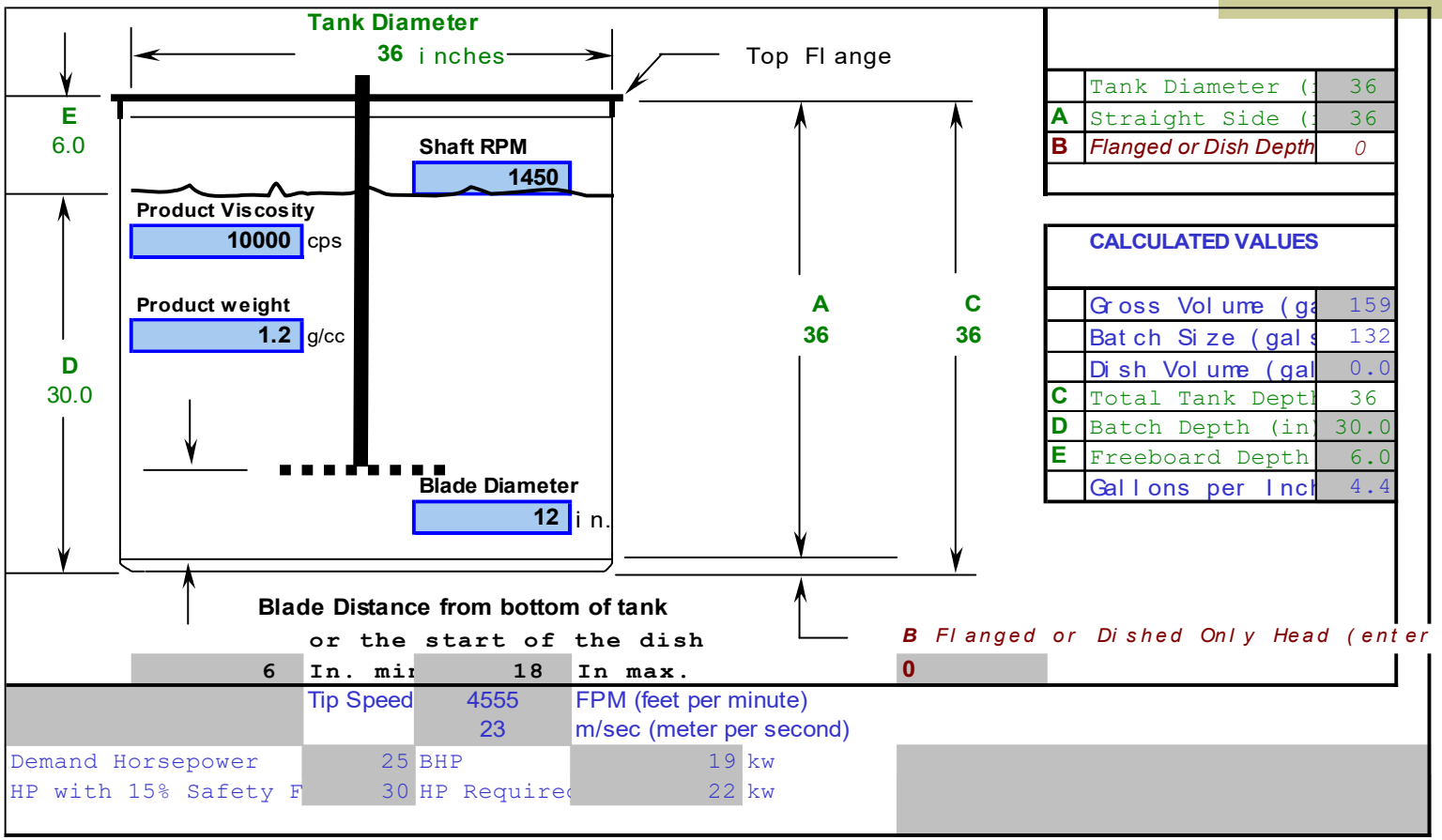
Horsepower Requirement Example



	Tank Diameter (i	36
A	Straight Side (i	36
B	Flanged or Dish Depth	0

CALCULATED VALUES

	Gross Volume (ga	159
	Batch Size (gal s	132
	Dish Volume (gal	0.0
C	Total Tank Depth	36
D	Batch Depth (in)	30.0
E	Freeboard Depth	6.0
	Gallons per Inch	4.4

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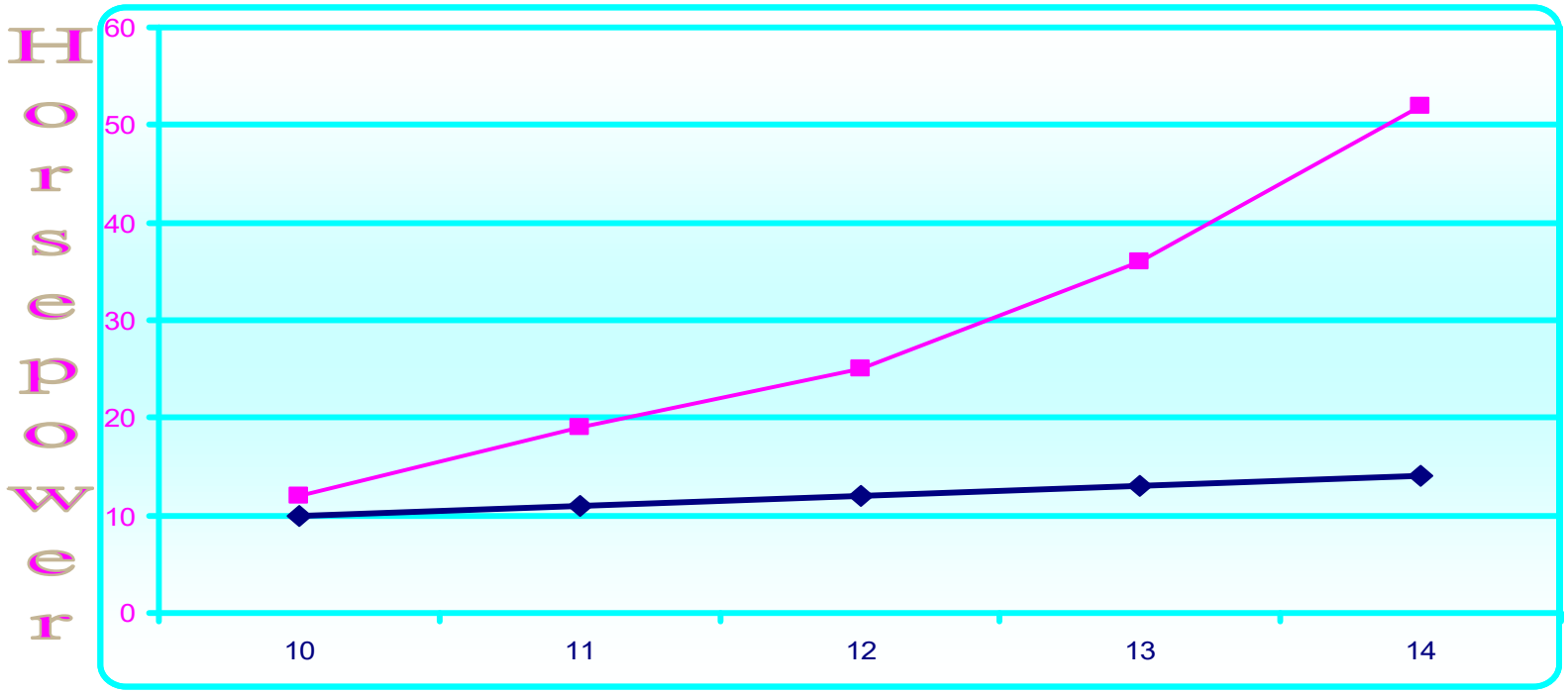
36” Diameter tank, shaft speed 1450 rpm, 1.2 g/cc^2, 10k cps.
Cowles High Shear Blade
Blade Diameter and Horsepower



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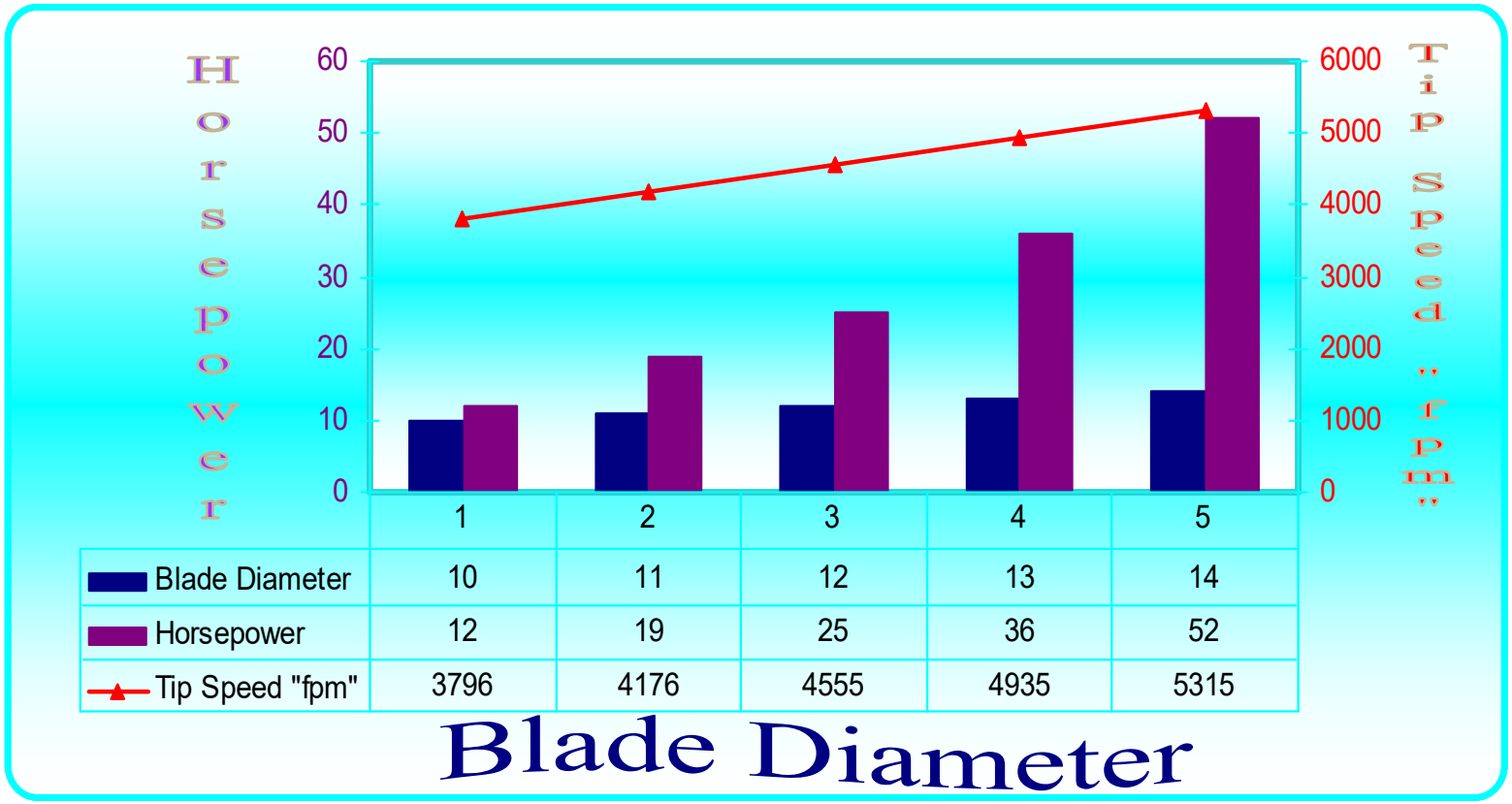
36” Diameter tank, shaft speed 1450 rpm, 1.2 g/cc^2, 10k cps.
Cowles High Shear Blade
Blade Diameter, Horsepower and Tip Speed



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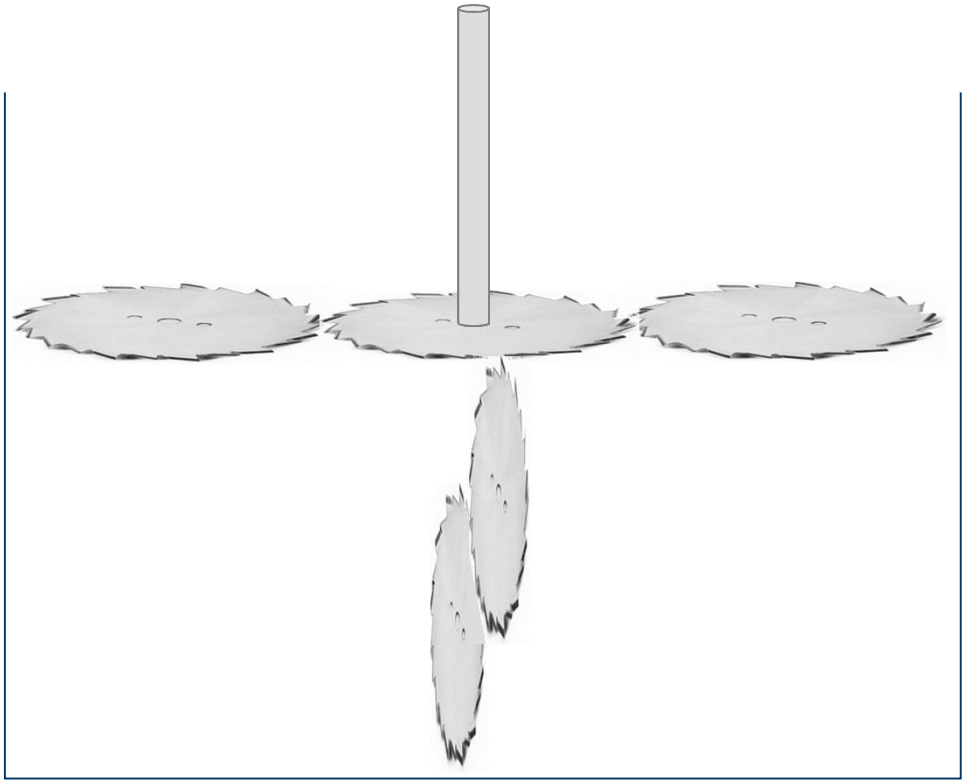
Blade Diameter should be 1/3 the tank diameter and should be 1 to 1-1/2 blade diameters off the bottom of the tank.



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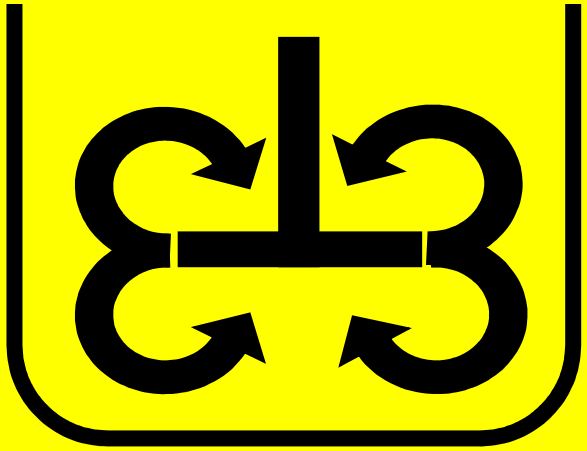
Good laminar flow will result in a good vortex

4. Causes laminar flow for "Total Motion"



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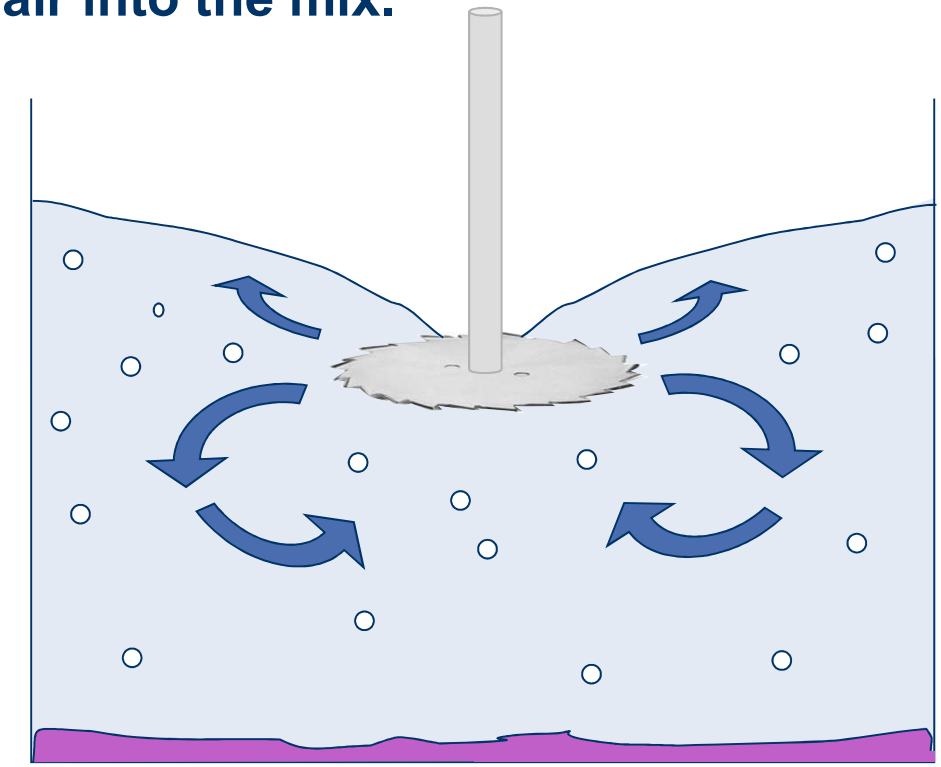
With the blade position to high in the tank, flow to the bottom of the tank is decreased and will allow some solids to settle and not get dispersed, and you will get some air into the mix.



Too High

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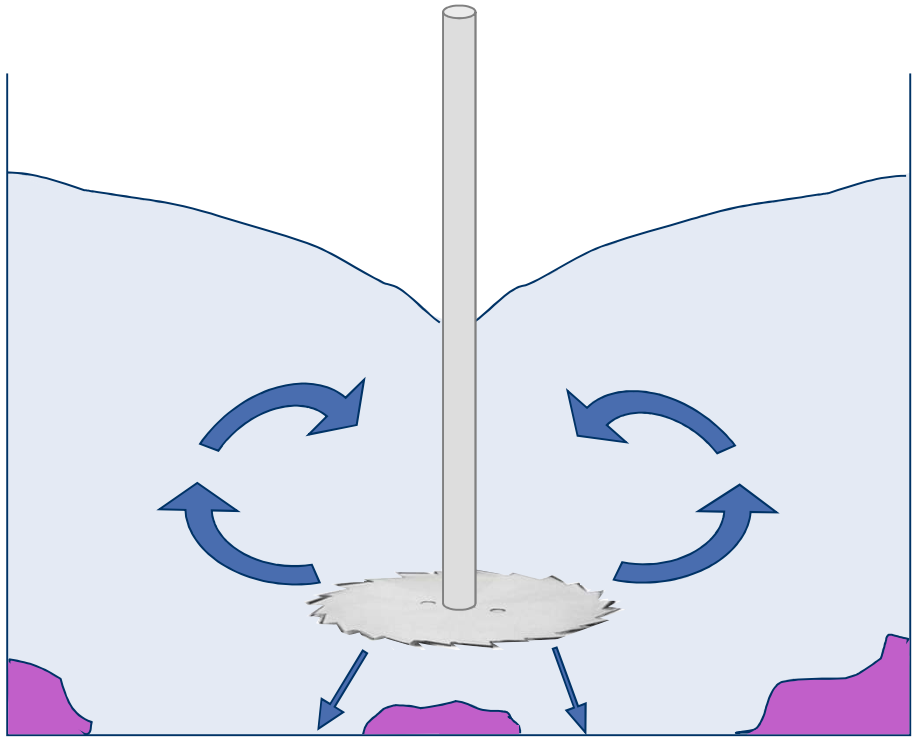
Having the Blade too low in the tank will decrease product flow and create dead spots that will not be dispersed.



Too Low

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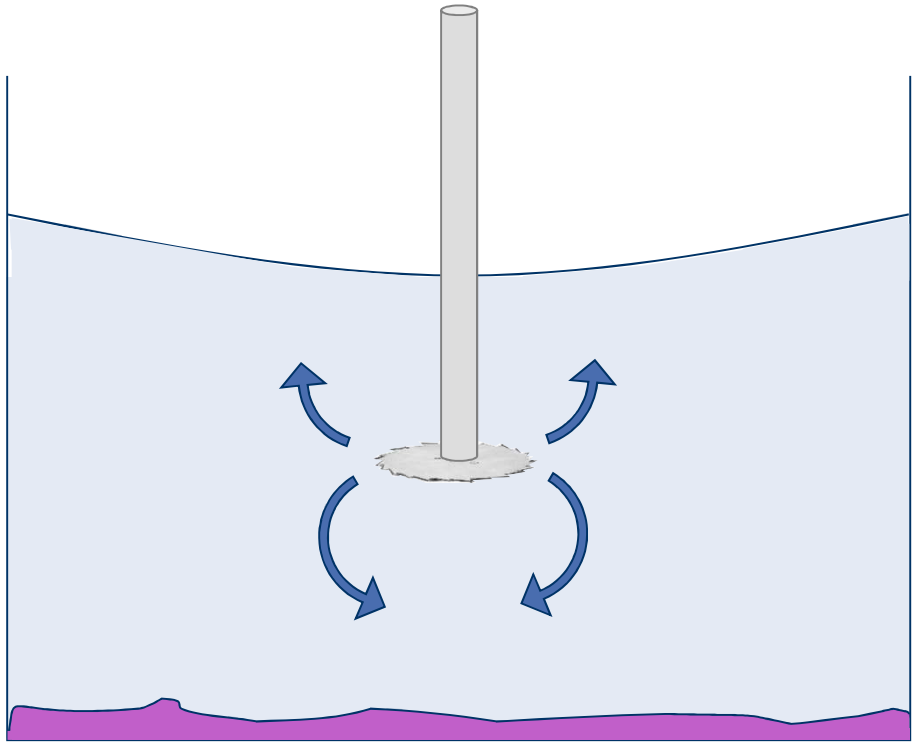
When you have a blade too small for the tank you will not get good product movement and some settling of solids will take place along with long dispersion times.



Too Small

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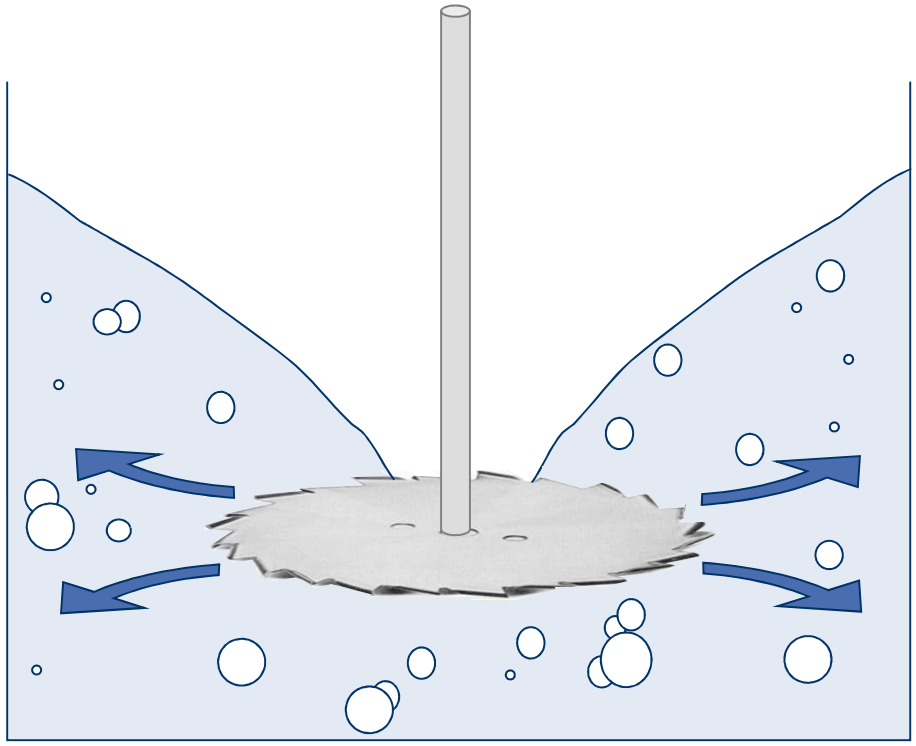
A blade too big for the tank will not get good product movement and will put air into the product.



Too Big

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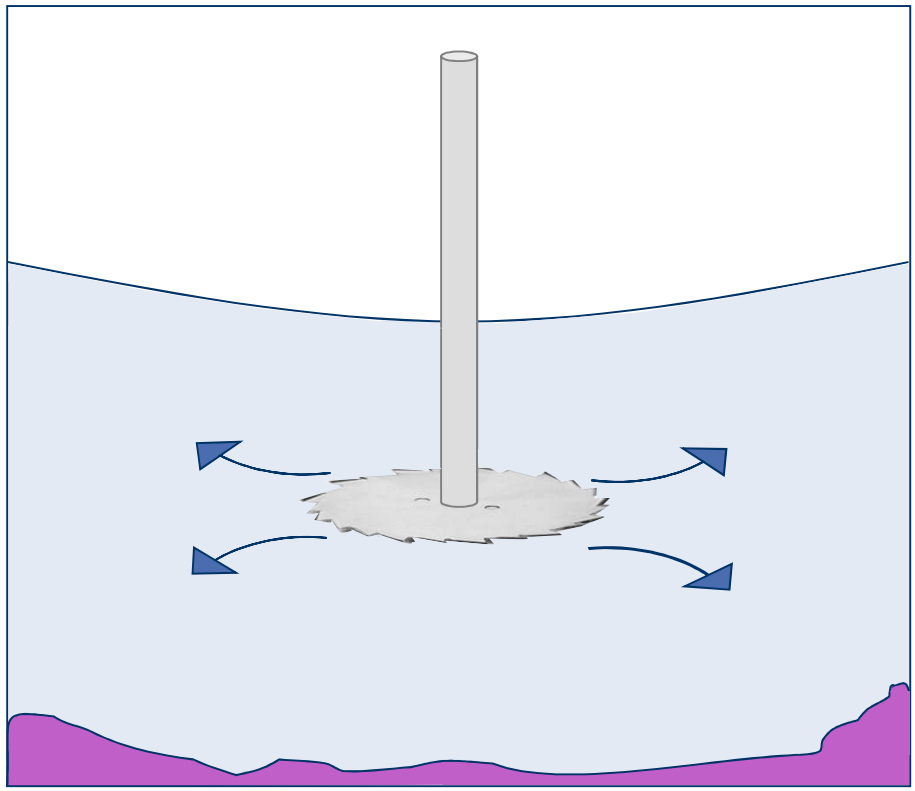
Good dispersion is between 4000-6000 feet per minute, too slow will result in long dispersion times and possibly material settling.



Too Slow

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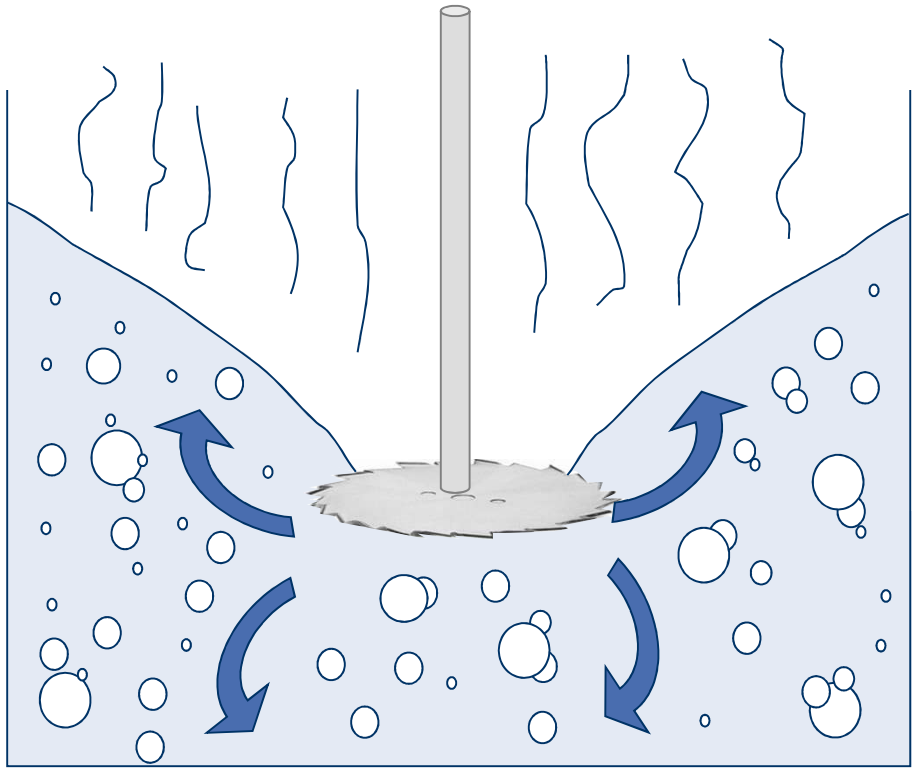
Faster is not better, going faster than 6000 fpm will result in air in the product, excess heat build-up, and a low quality dispersion.



Too Fast

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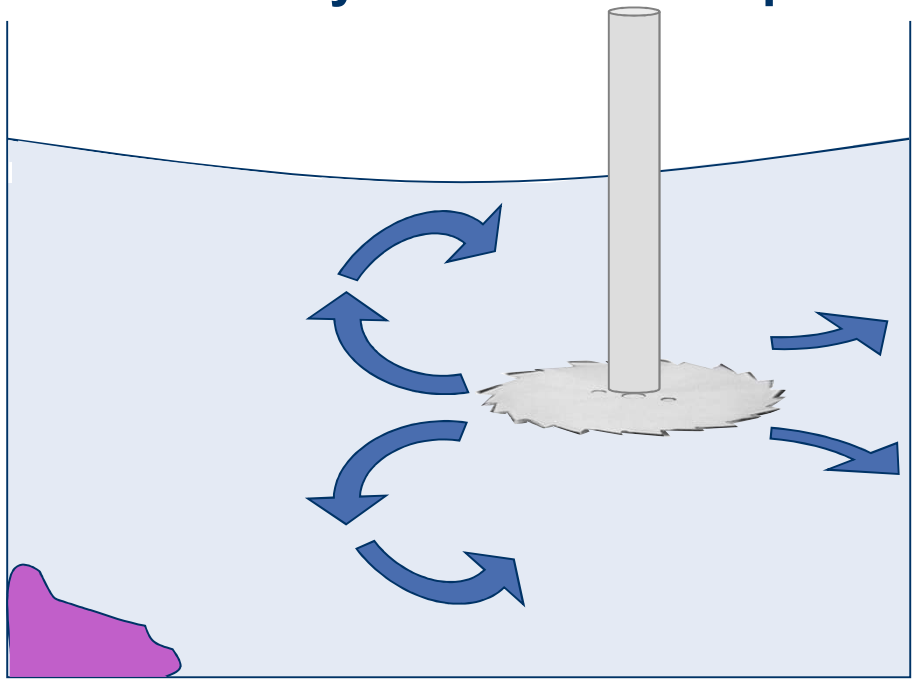
If your tank is too big for the disperser and the blade is off center, you may have some difficulty getting a good dispersion. Although, there are times in a properly sized tank when it is advantageous to have the blade slightly off center, when viscosity is below 1000 cps.



Off Center

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