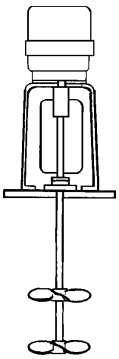
Chapter 2

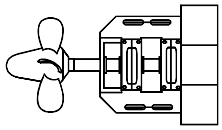
Agitators

Agitators *(AG)*

Description	*Type*
Fixed propeller mixer with motor and gear drive to 100 HP [75 KW]. Includes motor, gear drive, shaft and impeller. *Speed:* **60 HZ [50 HZ]; 1,800 RPM [1,500 RPM]** *Material Selection:* ***CS*, SS** *Driver Power:* 2 **- 100 HP [1.5 - 75 KW]**	▫▫▫▫▫▫▫▫▫▫
Portable propeller mixer with motor to 7.5 HP [5.5 KW]. *Speed:* **60 HZ [50 HZ]; 1,800 RPM [1,500 RPM]** *Material Selection:* ***CS*, SS** *Driver Power:* **0**.33 **- 7.5 HP [0.75 - 5.5 KW]**	▫▫▫▫▫▫▫▫▫
Portable, clamp-on, direct drive with explosion-proof motor. Typically used for rapid disperation or fast reactions. *Speed:* **60 HZ [50 HZ]; 1,800 RPM [1,500 RPM]** *Material Selection:* ***CS*, SS304, SS316, MONEL, RUBCV** *Driver Power:* **0.75 -** 3 **HP [0.75 -** 2.22 **KW]**	▫▫▫▫▫▫
Portable, clamp-on, gear drive with explosion-proof motor. Typically used to keep solids in suspension, medium viscosity blending and dissolving. *Speed:* **60 HZ [50 HZ]; 400 RPM [**330 **RPM]** *Material Selection:* ***CS*, SS304, SS316, MONEL, RUBCV** *Driver Power:* **0.25 - 5 HP; [0.75 -** 3 **KW]**	▫▫▫▫▫▫▫▫▫▫
Fixed mount, top-entering, gear drive, mechanical seal, explosion-proof motor. Typically used for low speed mixing on closed tanks. Shaft enters tank through a mechanical seal. *Speed:* 20 **x HZ -** 30 **x HZ** *Material Selection:* ***CS*, SS304, SS316, MONEL, RUBCV** *Driver Power:* **0.75 - 5 HP; [0.75 -** 3 **KW]**	▫▫▫▫▫▫▫▫▫
Fixed mount, top-entering, gear drive, anchor, stuffing box, explosion-proof motor. Typically used for low speed mixing on closed tanks. *Speed:* **60 HZ [50 HZ]; 400 RPM [**330 **RPM]** *Material Selection:* ***CS*, SS304, SS316, MONEL, RUBCV** *Driver Power:* **0.75 - 5 HP [0.75 -** 3 **KW]**	▫▫▫▫▫▫



Agitators (AG) - continued

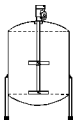
Description	Type
Top entry (for Open or Closed tanks) and Side entry type. Includes motor driver, baseplate, bearings, speed reducer, seals and a variety of shaft and impeller configurations. **Material: *CS*, SS403, SS316, SS321, SS347, 304L, 316L, NI, INCNL, MONEL, HAST, TI** **Configuration: Default: *BELT*** **DRCT - Direct drive, no speed reduction** **BELT - Belt driven speed reduction** **VFD - Variable frequency drive** **GEAR - Gear drive speed reduction** **Capacity: Enter Capacity or Impeller Diameter** **Impeller Diameter: Enter Capacity or Impeller Diameter** **Agitator Orientation: Default: *VTOP*** **VTOP - Top entry agitator for open tanks** **VTCL - Top entry agitator for closed tanks** **SIDE - Side entry agitator** **Driver Speed: Max: 3,000 RPM [3,600 RPM]; Default: *1,500* RPM: [*1,800* RPM]** **Consistency-AD%: Max: 10.0; Default: *4.0*** **Product Density: *62.4* PCF [*1000* KG/M3]** **Seal Type: Default: *PACK*** **PACK - Packing** **MECH - Mechanical seal**	▫▫▫▫▫▫▫▫▫▫▫ 

Agitate*d Tanks* (A*T*)

Small to large, pressure/vacuum, jacket, driver, motor-reducer, agitator and supports.

For □□□□□, □□□□□□□ and □□□□□□□□:

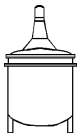
***Vessel Capacity*: To secure desired vessel size, specify the diameter and height directly. A value must be specified if diameter and height are not both specified. Otherwise, calculated from diameter and height. If both vessel dimensions and capacity are specified, the system-calculated capacity must agree with the specified capacity to within +/- 10%.**
***Skirt or Leg Height*: If the capacity is 1000 GAL. [37 M3] or less, the vessel is designed with 4 FEET [1.25 M] pipe legs. For a capacity greater than 1000 GAL. [37 M3], the vessel is designed with a skirt. The skirt height is calculated as 1.5 x (vessel diameter) with minimum and maximum heights of 4 and 32 FEET [1.25 and 9.5 M] respectively. Enter "0.0" if hung in open structure.**
***Manhole Diameter*: If no value is specified, a value is calculated as a function of vessel diameter and height with a maximum manhole diameter of 48 INCHES [1200 MM].**
Corrosion Allowance: For CS alloys, the default is 0.125 INCHES [3 MM]; 0.0 for all other materials.
***Weld Efficiency %*: 5- - 100 (For ASME and JIS codes only).**
***Product Density*: *62.4* PCF [*1,000*KG/M3]**
***Viscosity*: *1.0* CPOISE [*1.0* MPA-S]**

Description	*Type*
Pressure/vacuum vessel, optional jacket. **Includes top entering impeller and geared motor-reducer, tank designed for 15 PSIG [100 KPA].**	□□□□□ 

Application Symbol: Defines vessel function and related pipe/instrum. model.
<blank> - Standard continuous process
BATCH - Batch process
***Shell Material*: For clad plate, specify the backing plate material. (Cladding is defined below.) Default: *A285C*.**
Capacity: Enter either Capacity or Diameter and Height.
***Diameter*: Enter either Capacity or Diameter and Height.**
***Vessel T-T Height*: Enter either Capacity or Diameter and Height.**
***Design Press. - Gauge*: Default: *15* PSIG [*100* KPA]**
If pressure and vacuum entered, design is for worst case. Default: Pressure.
***Design Vacuum - Gauge*: If pressure and vacuum entered, design is for worst case. Default: Pressure.**
***Design Temperature*: *250* DEG F [*120* DEG C]**
***Operating Temperature*: Default: Design temperature.**
***Jacket Press. - Gauge*: Pressure must be specified to obtain a jacket. Default: No jacket.**
Jacket Type*: Default: *FULL
FULL - Full jacket
PIPE - Half-pipe jacket
***Jacket Thickness*: Jacket pressure or thickness required to obtain jacket. Default: No jacket.**
Driver Type*: Default: *STD
STD - Standard motor
VFD - Variable frequency drive
Cladding Material: Default: None.

- Continued -

Agitated Tanks (AT) - continued

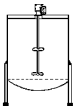
Description	Type
▫▫▫▫▫ - continued	
Skirt or Leg Height: Enter 0.0 if hung in OPEN structure, legs provided if capaicty < 10,000 GAL [37 M3].	
Manhole Diameter: If no value is specified, a value is calculated as a function of vessel diameter and height with a maximum manhole diameter of 48 INCHES [1200 MM].	
Base Mat'l Thickness: Base material thickness including corrosion allowance.	
Corrosion Allowance: For CS alloys, the default is 0.125 INCHES [3 MM]; 0.0 for all other materials.	
Weld Efficiency %: 5 - 100 (For ASME and JIS codes only).	
Stress Relief:	
CODE - Provide stress relief if code requires	
YES - Provide stress relief	
NO - No stress relief required	
Cladding Thickness: Deault: 0.125 INCHES [3 MM] if cladding material is specified; otherwise 0.0.	
Fluid Depth: Maximum fluid depth: vessel height less 12 INCHES [300 MM]	
Product Density: *62.4* PCF [*1,000* KG/M3]	
Viscosity: *1.0* CPOISE [*1.0* MPA-S]	
Impeller Type: See Impeller Types table later in this chapter.	
Stiff'g Ring Spacing: Default stiffeners designed for vacuum only, enter 0.0 if not required.	
No. Body Flange Sets: Number of sets (pairs) of body flanges of same diameter as vessel.	
Diameter Option: Defines desired diameter as ID or OD. Default: See Area Design Basis.	
OD - Outside Diameter	
ID - Inside Diameter	
Pressure/vacuum vessel, jacketed. Includes jacket motor gear drive and shaft seal, agitator, shaft, thermometer well, blow-pipe, insulation and safety valves. Rating of full vacuum and design pressure.	▫▫▫▫▫▫▫ 
Application Symbol: Defines vessel function and related pipe/instrum. model.	
<blank> - Standard continuous process	
BATCH - Batch process	
Shell Material: For clad plate, specify the backing plate material. (Cladding is defined below.) Default: *A285C*.	
Capacity: Enter either Capacity or Diameter and Height.	
Diameter: Enter either Capacity or Diameter and Height.	
Vessel T-T Height: Enter either Capacity or Diameter and Height.	
Design Press. - Gauge: Default: *15* PSIG [*100* KPA] If pressure and vacuum entered, design is for worst case. Default: Pressure.	
Design Vacuum - Gauge: If pressure and vacuum entered, design is for worst case. Default: Pressure.	

- Continued -

Agitated Tanks (AT) - continued

Description	Type
□□□□□□□ - continued	
Design Temperature: **Ferrous mat'l: 650 DEG F [340 DEG C]; Other mat'l: 250 DEG F [120 DEG C].**	
Operating Temperature: **Default: Design temperature.**	
Jacket Press. - Gauge: ***90* PSIG [*620* KPA]**	
Jacket Type: **Default: *FULL***	
FULL - Full jacket	
PIPE - Half-pipe jacket	
Jacket Material: **Default: *CS***	
Driver Type: **Default: *STD***	
STD - Standard motor	
VFD - Variable frequency drive	
Cladding Material: **Default: None.**	
Skirt or Leg Height: **Enter 0.0 if hung in OPEN structure, legs provided if capaicty < 10,000 GAL [37 M3].**	
Manhole Diameter: **If no value is specified, a value is calculated as a function of vessel diameter and height with a maximum manhole diameter of 48 INCHES [1200 MM].**	
Base Mat'l Thickness: **Base material thickness including corrosion allowance.**	
Corrosion Allowance: **For CS alloys, the default is 0.125 INCHES [3 MM]; 0.0 for all other materials.**	
Weld Efficiency %: **5 - 100 (For ASME and JIS codes only).**	
Stress Relief:	
CODE - Provide stress relief if code requires	
YES - Provide stress relief	
NO - No stress relief required	
Cladding Thickness: **Deault: 0.125 INCHES [3 MM] if cladding material is specified; otherwise 0.0.**	
Fluid Depth: **Maximum fluid depth: vessel height less 12 INCHES [300 MM]**	
Product Density: ***62.4* PCF [*1,000* KG/M3]**	
Viscosity: ***1.0* CPOISE [*1.0* MPA-S]**	
Impeller Type: **See Impeller Types table later in this chapter.**	
Stiff'g Ring Spacing: **Default stiffeners designed for vacuum only, enter 0.0 if not required.**	
No. Body Flange Sets: **Number of sets (pairs) of body flanges of same diameter as vessel.**	
Diameter Option: **Defines desired diameter as ID or OD.**	
Default: See Area Design Basis.	
OD - Outside Diameter	
ID - Inside Diameter	

Agitated Tanks (AT) - continued

Description	Type
Open with loose-fitting cover, optional jacket. **Includes impeller and geared motor reducer, supported by structural steel spanning tank top, tank without head.**	□□□□□□□□ 

Shell Material: For clad plate, specify the backing plate material. (Cladding is defined below.) Default: *A285C*.
Capacity: Enter either capacity or diameter and height.
Diameter: Enter either capacity or diameter and height.
Vessel T-T Height: Enter either capacity or diameter and height.
Design Temperature: Default: *68* DEG F [*20* DEG C]
Operating Temp: Default: Design Temperature.
Jacket Press. - Gauge: Jacket pressure or thickness required to obtain jacket. Default: no jacket.
Jacket Type: Default: *FULL*
- FULL - Full jacket
- PIPE - Half-pipe jacket

Jacket Thickness: Jacket pressure or thickness required to obtain jacket. Default: no jacket.
Jacket Material: Default: *CS*.
Driver Type: Default: *STD*
- STD - Standard Motor
- VFD - Variable frequency drive

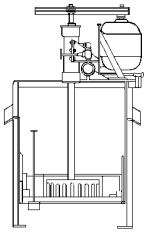
Cladding Material: Default *none*.
Skirt of Leg Height: Enter 0.0 if hung in OPEN structure, legs provides if capacity < 10,000 GAL. [37 M3].
Manhole Diameter: Max: 48 INCHES [1200 MM].
Base Mat'l Thickness: Base material thickness including corrosion allowance.
Corrosion Allowance: Default 0.125 INCHES [3.0 MM] for CS; 0.0 for other material; double if jacketed.
Weld Efficiency %: ASME/JIS codes only, where allowed for thin wall vessels; Default: Area Basis 50 - 100.
Stress Relief: Default: See Area Basis
- CODE - Provide stress relief if code requires
- YES - Provide stress relief
- NO - No stress relief required

Cladding Thickness: Default: 0.125 INCHES [3 MM] if cladding material is specified; otherwise: 0.0.
Fluid Depth: Maximum fluid depth: vessel height less 12 INCHES [300 MM].
Product Density: Default: *62.40* PCF.
Viscosity: Default: *1.00* CPOISE.
Impeller Type: See Impellor Types table.
Stiff'g Ring Spacing: Default stiffeners designed for vacuum only, enter 0.0 if not required.
No. Body Flange Sets: Number of sets (pairs) of body flanges of same diameter as vessel.
Diameter Option: Defines desired diameters as ID or OD; Default: See Area Design Basis.
- OD - Outside diameter
- ID - Inside diameter

Agitate*d Tanks* (A*T*) - continued

Description	*Type*

Floatation machine, minerals separation, multi-cell. ▫▫▫▫▫▫▫▫▫▫



Floatation machine for selectively separating minerals by agitation, air dissemination and chemical adhesion. Includes one row of cells connected in series with one feed box, one discharge box and one connection box for each group of four cells.

Mat'l of Construction: **Default: *CS***
Volume Per Cell: **10 - 1,500 CF [0.3 - 40 M3]**
Number of Cells: **Refers to number per row connected in series.**
No. of Cells/Motor: **1 - 2; Default: *1***

Conditioning cell for floatation machine. ▫▫▫▫▫▫▫▫▫

Mat'l of Construction: **Default: *CS***
Volume: **10.0 - 1,500.0 CF [0.3 - 40 M3]**

Pulpers are used for pulping the waste generated by mill operation or in a paper recycling process. Hence the two types: on-machine and off-machine pulpers. Both include a pulping tank with support legs, nozzles (feed, drain and level control). The pulper itself consists of an extraction plate, extraction chamber with flanged outlet, rotor blade, hub, shaft with gear or V-belt drive, drive motor, motor coupling and an adapter plate. Multiple rotors can be selected. ▫▫▫▫▫▫▫▫▫

▫▫▫▫▫▫▫▫▫

Application Symbol: **Default: *BATCH***
BATCH - Batch pulper
CONT - Continuous pulper
Tank/Vat Material: **CS, SS304, *SS316*, SS321, SS347, 304L, 316L, NI, INCNL, MONEL, HAST, TI**
Configuration: **Default: *RECT***
CYLIN - Cylindrical tank
RECT - Rectangular tank
Hydraulic Capacity: **Enter pulping rate or hydraulic capacity.**
Pulping Rate - AD: **Enter pulping rate or hydraulic capacity.**
Tank Length/Diameter: **Enter length for rectangular tank or diameter for cylindiricl tank.**
Width: **Retangular tanks only.**
No. of Rotors/Drives: **1-2; Default: *1*.**
Consistency - AD %: **Max: 18; Default: *4.00***
Impeller Type: **Default: *STD***
STD - Standard rotor shaft length
EXTD - Extended rotor shaft length
Impeller Material: **CS, SS304, *SS316*, SS321, SS347, 304L, 316L, NI, INCNL, MONEL, HAST, TI**
Driver Type: **Default: *GEAR***
BELT - Belt driven speed reduction
GEAR - Gear drive speed reduction
Design Temperature: ***68.0* DEG F [*20.0* DEG C]**

- Continued -

Agitated Tanks (AT) - continued

Description	Type
▫▫▫▫▫▫▫▫▫ - continued Seal Type: Default: *PACK* PACK - Packing MECH - Mechanical seal Corrosion Allowance: For CS alloys, the default is 0.125 INCHES [3 MM]; 0.0 for all other materials. Driver Speed: Max: 3,000 RPM [2,600 RPM]; Default: *1,500* RPM [*1,800 RPM] Leg Height: *10.0* FEET [*3.00* M] Number of Manholes: Default: *1*. Manhole Diameter: If no value is specified, a value is calculated as a function of vessel diameter and height with a maximum manhole diameter of 48 INCHES [1200 MM]. Default: *18* INCHES [*450* MM]	
▫▫▫▫▫▫▫▫ Application Symbol: Default: *BATCH* BATCH - Batch pulper CONT - Continuous pulper Tank/Vat Material: CS, SS304, *SS316*, SS321, SS347, 304L, S16L, NI, INCNL, MONEL, HAST, TI. Configuration: Default: *CYLIN* CYLIN - Cylindrical tank RECT - Rectangular tank Hydraulic Capacity: Enter tank capacity or tank dimensions. Tank Length/Diameter: Enter tank capacity or dimensions, diameter for cylindrical, length for rectangular. Height: Enter tank capacity or tank dimensions. Width: Enter tank capacity or dimensions, width is for rectangular tanks only. No. of Rotors/Drives: 1-2, Default: *1*. Consistency - AD %: Max: 18; Default: *4.0*. Impeller Type: Default: *EXTD*. <blank> - Standard rotor shaft length EXTD - Extended rotor shaft length Impeller Material: CS, SS304, *SS316*, SS321, SS347, 304L, S16L, NI, INCNL, MONEL, HAST, TI Driver Type: Default: *GEAR* BELT - Belt driven speed reduction GEAR - Gear drive speed reduction Design Temperature: Default: *68.0* DEG F [*20.0* DEG C]. Seal Type: Default: *PACK*. PACK - Packing MECH - Mechanical seal Corrosion Allowance: For CS alloys, the default is 0.125 INCHES [3.0 MM]; 0.0 for all other materials. Driver Speed: Max: 3,000 RPM [2,600 RPM]; Default: *1,500 RPM [*1,800* RPM]. Leg Height: Default *10* FEET [*3.0* M]. Number of Manholes: Default: *1*. Manhole Diameter: If no values is specified, a value is calculated as a function of vessel diameter and height with a maximum diameter of 48 INCHES [1,200 MM]. Default: *18* INCHES [*450* MM].	

Description of Agitated Tanks

1. Reynolds Number (RN), dimensionless: $RN = (D^2N)(FD/FV)$

2. Froude Number (FN), dimensionless: $FN = g/N^2D$

3. Power Number (PN), dimensionless: $PN = (Pg_c/FD)(N^3D^5)$

4. Power Function (PF), dimensionless:

For RN > 300 and for unbaffled tanks,

$$\log PF = \log PN - (a - \log RN)(\log FN)/b$$

For RN < or = 300 for tanks with or without baffles,

$$FP = PN$$

5. Relationships between PF, PN, FN, RN for each impleller listed in the Impeller Types table are contained in the AT agitated tank model. Power is derived from PN.

6. General Nomenclature

Variable	Description	Value
a	impeller contant	See Impeller Types table
b	impeller contant	See Impeller Types table
D	impeller diameter	
FN	Froude Number	
g	local acceleration due to gravity	
g_c	gravitational constant	See Chapter 29: Units of Measure
N	rotational speed of impeller	
P	power to shaft of impeller	
PN	Power number	
RN	Reynolds number	
FD	fluid density	
FV	fluid viscosity	

Impeller Types — General Range of Basic Data**

Impeller No.	Impeller Type Symbol	Impeller Type	D/d	L/d	E/d	Reynolds Number Low - High	Baffles No.	Baffles B/D	Baffles Ref
1	T6FB	Turbine with six flat blades. B=0.25d; Blade Height=0.2d	3	2.7-3.9	0.75-1.3	1 - 10^6	4	0.17	1
2	T6FB2	Same as No. 1	3	2.7-3.9	0.75-1.3	1 - 10^6	4	0.10	1
3	T6FB3	Same as No. 1	3	2.7-3.9	0.75-1.3	1 - 10^6	4	0.04	1
4*	T6FB4	Same as No. 1; a=1, b=40	3	2.7-3.9	0.75-1.3	1 - 10^6	0	—	1
5	T6CB	Turbine with six curved blades. Blade sizes same as No. 1	3	2.7-3.9	0.75-1.3	1.8 - 10^6	4	0.10	1
6	T6AB	Turbine with six arrowhead blades. Blade size same as No. 1	3	2.7-3.9	0.75-1.3	3 - 10^6	4	0.10	1
7	STDR	Shrouded turbine with six blades. 20 blade deflector ring.	2.4	0.74	0.9	20,000 - 90,000	0	—	2
8	STDR2	Similar to No. 7, but not identical.	3	2.7-3.9	0.75-1.3	2.5 - 10^6	0	—	1
9	ST	Same as No. 8, but no deflector ring.	3	2.7-3.9	0.75-1.3	10 - 10^6	4	0.10	1
10	AT8B45	Axial Turbine with eight blades at a 45 degree angle. See No. 11.	3	2.7-3.9	0.75-1.3	1.8 - 10^6	4	0.10	1
11	AT4B60	Axial turbine with four blades at a 60 degree angle. B=0.25d.	3	3	0.50	15 - 60,000	0	—	3

Continued on following page.

*Impeller Types — General Range of Basic Data*** (continued)

Impeller						Reynolds Number	Baffles		
No.	Type Symbol	Type	D/d	L/d	E/d	Low - High	No.	B/D	Ref
12	AT4B45	Axial turbine with four blades at a 45 degree angle. See No. 11.	5.2	5.2	0.87	600 - 40,000	0	—	3
13	P4B	Paddle with four blades.	3	3	0.50	200 - 70,000	0	—	3
14	P2B3	Paddle with two blades. See No. 13.	3	2.7-3.9	0.70-1.3	2 - 10^6	4	0.10	1
15*	MP3B2	Marine propeller with three blades. Pitch=2d; a=1.7; b=18.	3.3	2.7-3.9	0.75-1.3	2.5 - 10^6	0	—	1
16	MP3B5	Same as No. 15, but pitch=1.05d; a=2.3; b=18.	4.5	2.7-3.9	0.75-1.3	2.5 - 10^6	0	—	1
17*	MP3B6	Same as No. 15, but pitch=1.04d; a=0; b=18.	4.5	2.7-3.9	0.75-1.3	2.5 - 10^6	0	—	1
18	MP3B7	Same as No. 15, but pitch=d.	3	2.7-3.9	0.75-1.3	2.3 - 10^6	4	0.10	1
19*	MP3B8	Same as No. 15, but pitch=d; a=2.1; b=18.	3	2.7-3.9	0.75-1.3	2.5 - 10^6	0	—	1
20	MP3B9	Same as No. 15, but pitch=d.	3.8	3.5	1.0	300 - 500,000	0	—	4
21	HRA	Helical ribbon. Ribbon width=d/8.5; helical screw=D/30	1.05	1.5	—	0.7 - 23	0	—	5

*** Surface effects are important. Froude number is included for Reynolds Numbers greater than 300.**

****System will permit extension beyond these ranges. Please check your results.**

Impeller Materials

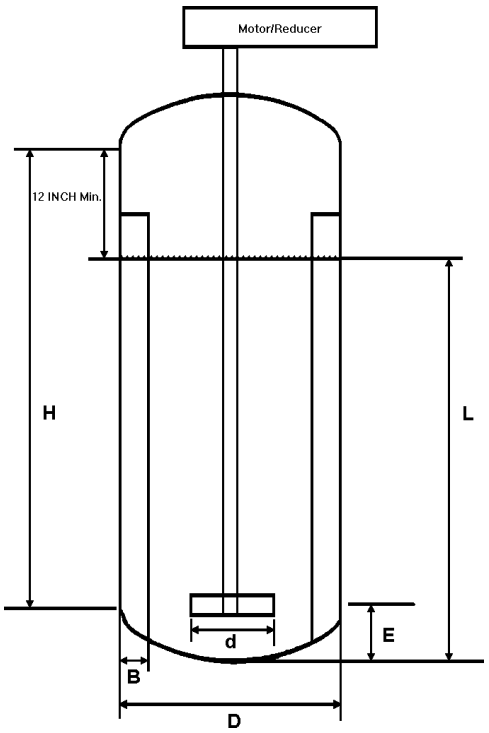
If Component	Impeller Material
CLAD	Match cladding
GLSCS	SS316 blades/shaft
Other	Match steel

Impeller Type References

Ref	Reference for Impeller Type
1	Rushton, J. H., E. Costich, and H. J. Everett, Presented at Annual Meeting of the American Institute of Chemical Engineers, Detroit, 1947.
2	Olney, R. B., and G. J. Carlson, Chemical Engineering Progress, 43, 473, 1947.
3	Hixson, S. Q., and S. J. Baum, Industrial and Engineering Chemistry, 34, 194, 1942.
4	Stoops, C. E., and C. L. Lovell, Industrial and Engineering Chemistry, 35, 845, 1943.
5	Gray, J. B., Chemical Engineering Progress, 59, 55, 1963.

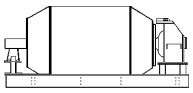
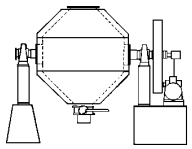
Legend for Impellers

- B - **Baffle width**
- D - **Tank diameter**
- d - **Impeller diameter**
- E - **Impeller elevation above tank bottom**
- H - **Tangent-to-tangent height of tank**
- L - **Liquid level in tank**



Blenders (BL)

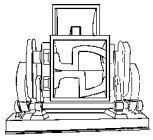
Rotary, batch, dry or semi-dry solids, motor and speed reducer.

Description	*Type*
Rotary drum. **For batch blending of dry or semi-dry solids. Includes motor and drive.** *Material Selection:* ***CS*, SS** **Capacity: 1 - 450 CF [0.03 - 12 M3]** *Product Density:* **Max: 200 PCF [3,200 KG/M3];** **Default: *50* PCF [*800* KG/M3]** *Speed:* **Default: *1,800* RPM**	▫▫▫▫▫▫▫ 
Rotary double-cone. **For batch blending of dry solids. Includes motor and drive.** *Material Selection:* ***CS*, SS316** **Capacity: 5 - 350 CF [0.02 - 9 M3]** *Speed:* **30 x Hz RPM** *Material Selection:* **GSLCS** **Capacity: 2 - 165 CF [0.06 - 2.5 M3]** *Speed:* **30 x Hz RPM**	▫▫▫▫▫▫ 

Kneaders (K)

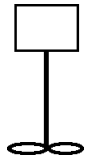
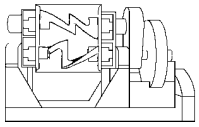
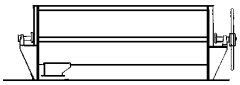
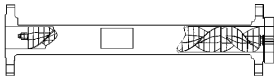
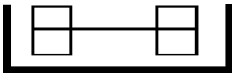
Jacket, motor, motor reducer, cover, nozzles and agitator.

Description	Type
Stationary, upright double-arm. *Material Selection:* ***CS*, SS304, SS316, MONEL** *Volume:* **100 - 750 GALLONS [0.4 to 2.8 M3]**	▫▫▫▫▫▫▫▫▫▫▫
Tilting, double-arm. *Material Selection:* ***CS*, SS304, SS316, MONEL** *Volume:* **10 - 500 GALLONS [0.5 to 1.8 M3]**	▫▫▫▫▫▫▫
Vacuum, tilting, double-arm. *Material Selection:* ***CS*, SS304, SS316, MONEL** *Volume:* **10 - 500 GALLONS [0.5 to 1.8 M3]**	▫▫▫▫▫▫▫▫▫▫▫

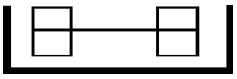
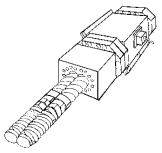


Mixers (MX)

Typically used for keeping solids in suspension, for dissolving solids and for mixing and/or reacting two or more feed streams.

Description	*Type*	
Fixed propeller mixer with motor and gear drive to 100 HP [75 KW]. This item is a top entering mixer including a gear drive, TEFC motor, shaft and impeller. *Speed:* **60 HZ [50 HZ]; 1,800 RPM [1,500 RPM]** *Material Selection:* ***CS*, SS** *Driver Power:* 2 **- 100 HP [1.5 - 75 KW]**	▫▫▫▫▫▫▫▫▫▫	
Portable propeller mixer with motor to 7.5 HP [5.5 KW]. Includes motor driver. *Speed:* **60 HZ [50 HZ]; 1,800 RPM [1,500 RPM]** *Material Selection:* ***CS*, SS** *Driver Power:* **0**.33 **- 7.5 HP [0.75 - 5.5 KW]**	▫▫▫▫▫▫▫▫▫	
Sigma double-arm non-vacuum mixer with motor and drive. *Mat'l of Construction:* ***CS*** *Driver Power:* 2 **- 100 HP [**2.22 **- 6.0 KW]** *Volume:* **1 - 70 CF [0.05 - 1.9 M**3**]** *Speed:* **Max: 60 x HZ; Default: ***30 **x HZ***	▫▫▫▫▫	
Spiral ribbon includes motor and drive. *Mat'l of Construction:* ***CS*** *Driver Power:* **5 - 50 HP [4 -** 37.5 **KW]** *Volume:* **10 -** 395 **CF [**0.3 **- 11 M**3**]** *Speed:* **Max: 60 x HZ; Default: ***30 **x HZ***	▫▫▫▫▫▫▫▫▫▫	
Cylinder type extruder with variable drive. *Mat'l of Construction:* ***CS*** *Driver Power:* **5 - 40 HP [4 -** 30 **KW]** *Speed:* **Max: 60 x HZ; Default: ***30 **x HZ***	▫▫▫▫▫▫▫▫	
Extruder muller type with open motor. *Mat'l of Construction:* ***CS*** *Driver Power:* 3 **- 75 HP [**2.22 **- 55 KW]** *Speed:* **Max: 60 x HZ; Default: ***30 **x HZ***	▫▫▫▫▫▫▫▫▫▫	

Mixers (MX) - continued

Description	Type
Pan includes motor and drive. *Mat'l of Construction:* ***CS*** *Volume:* **4 - 40 CF [0.2 - 1.1 M3]** *Speed:* **Max: 60 x HZ; Default: *30 x HZ***	▫▫▫ 
Two-roll includes motor and drive. *Mat'l of Construction:* ***CS*** *Driver Power:* **50 - 300 HP [37.5 - 224 KW]** *Speed:* **Max: 60 x HZ; Default: *30 x HZ***	▫▫▫▫▫▫▫▫ 
Static mixer used for instantaneous mixing of two fluid streams. The unit includes the main pipe housing, the mixer elements and the flanges at both ends. *Pipe Material:* **A 53, A 106, *304P*, 304LP, 316P, 316LP, 321P, NI, MONEL, INCNL, TI** *Flow Type:* ***TRNS*, TURB, LAMN** *Diameter:* **0.5 - 12.0 IN DIAM [12 - 300 MM DIAM]** *Number of Elements:* **Default: *4*** *Element Material:* **CS, SS, NI, MONEL, TI, HAST, HASTC, PD; Default: *SS304*** *Design Temperature:* ***68.0* DEG F [*20.0* DEG C]** *Fluid Density:* ***62.4* PCF [*300* KG/M3]** *Viscosity:* ***1.0* CPOISE [*1.0* MPA-S]** *Inlet Pressure - Gauge:* **15.0 PSIG [100 KPA]**	▫▫▫▫▫▫