KaeMix

KaeMix Student 2024 User Guide

KaeMix Documentation

August 20, 2024

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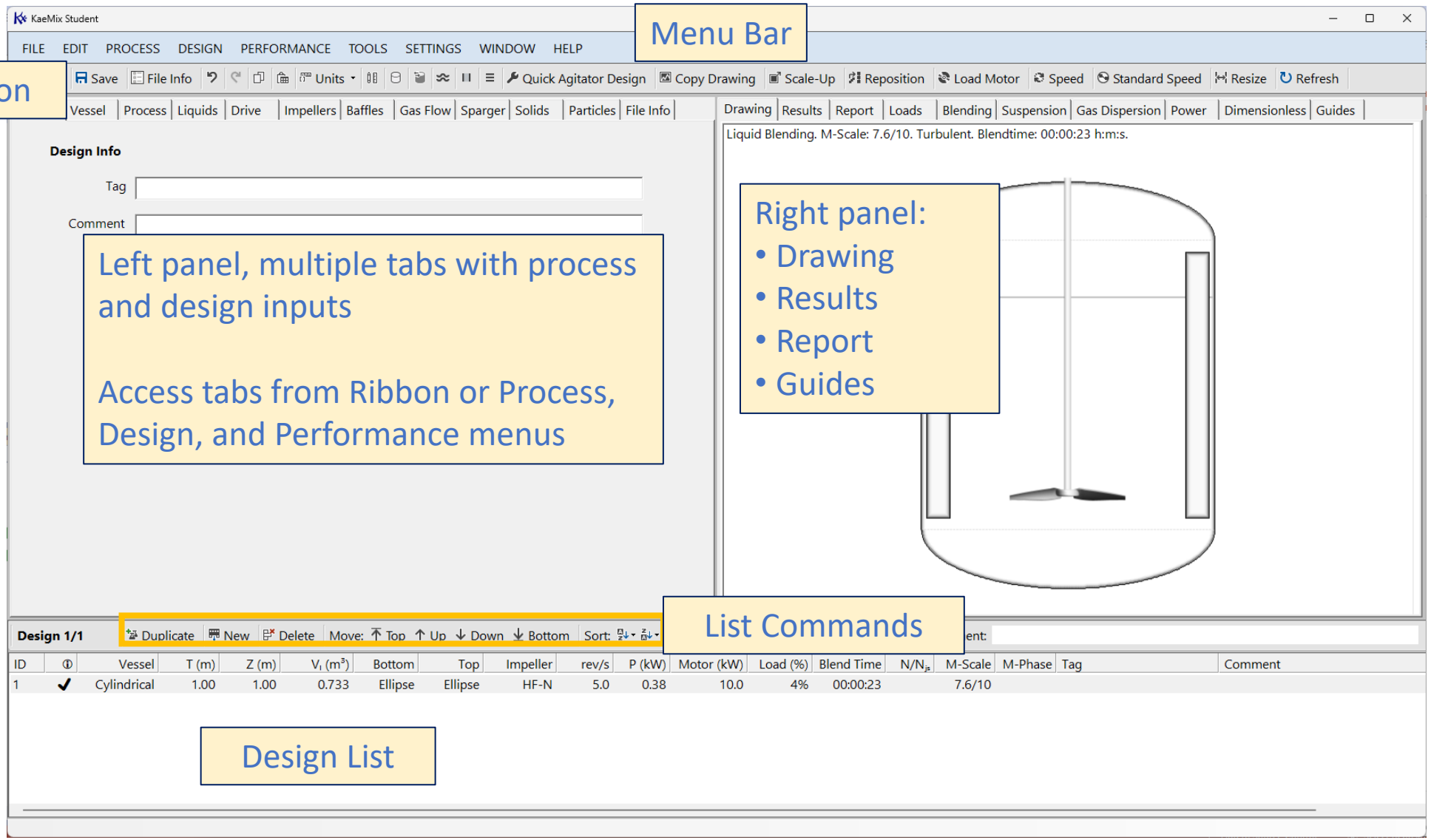
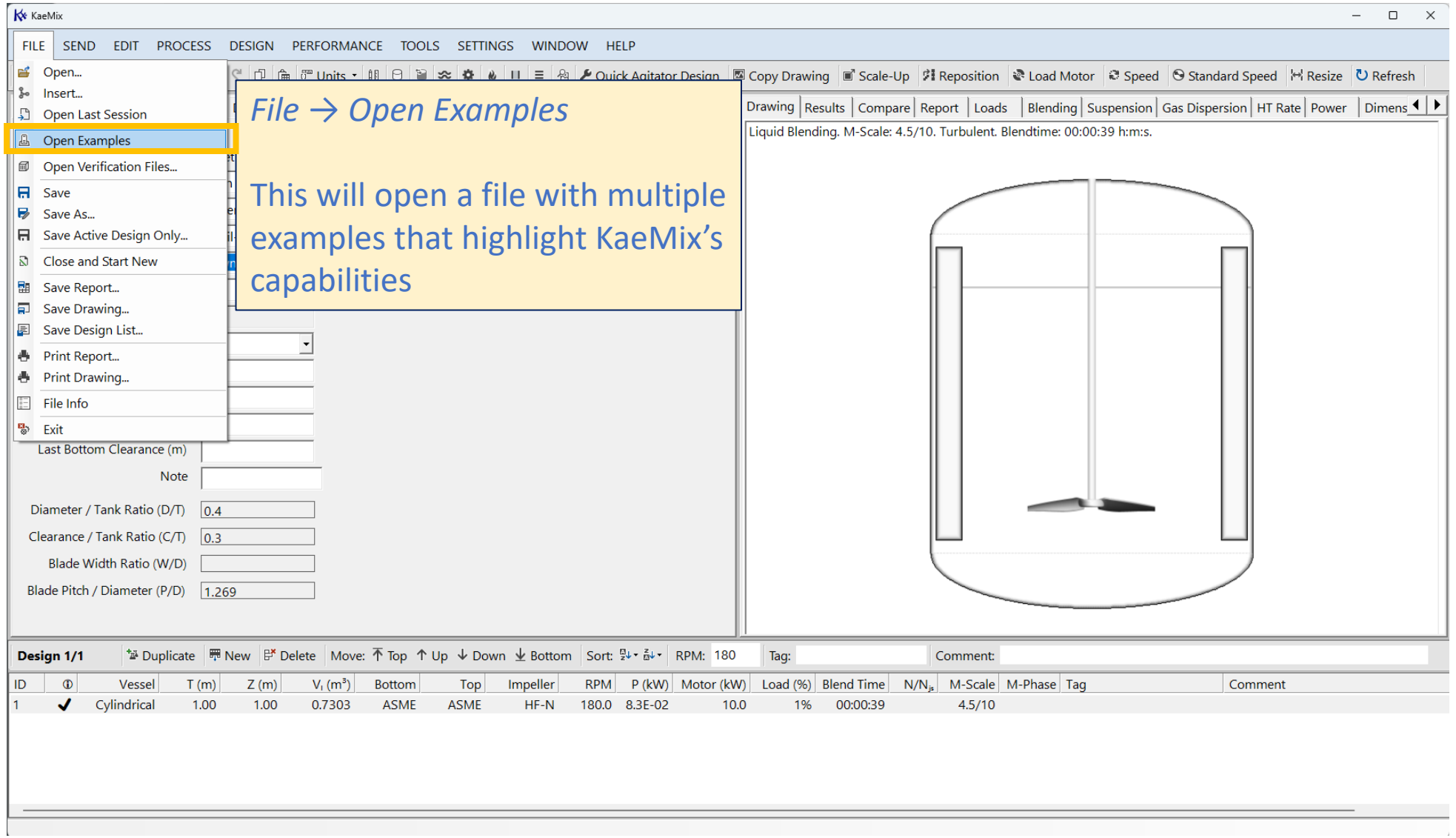
Summary

- This document describes KaeMix Student's features, user interface, and how to use the program
- For instructions on how to install KaeMix Student, see the installation guide

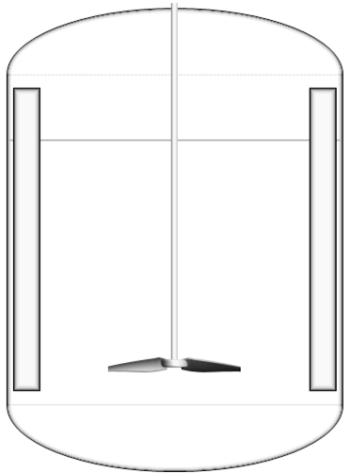
Screen Layout



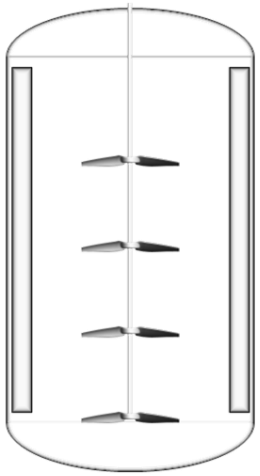
Built In Examples



Design Examples

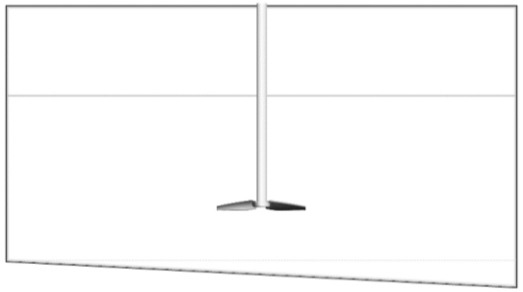


Default design: single hydrofoil

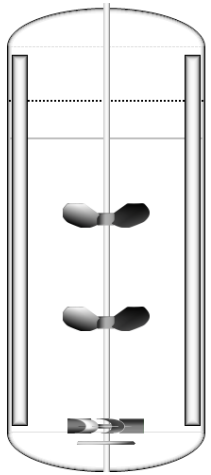


Multiple hydrofoils

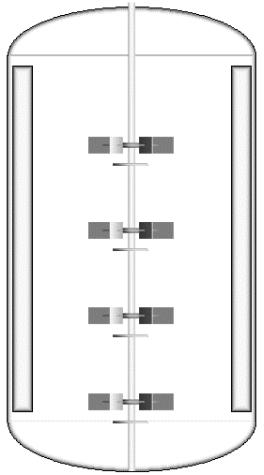
Hydrofoils, a sweeper, and helical coils



Rectangular vessel with sloped bottom

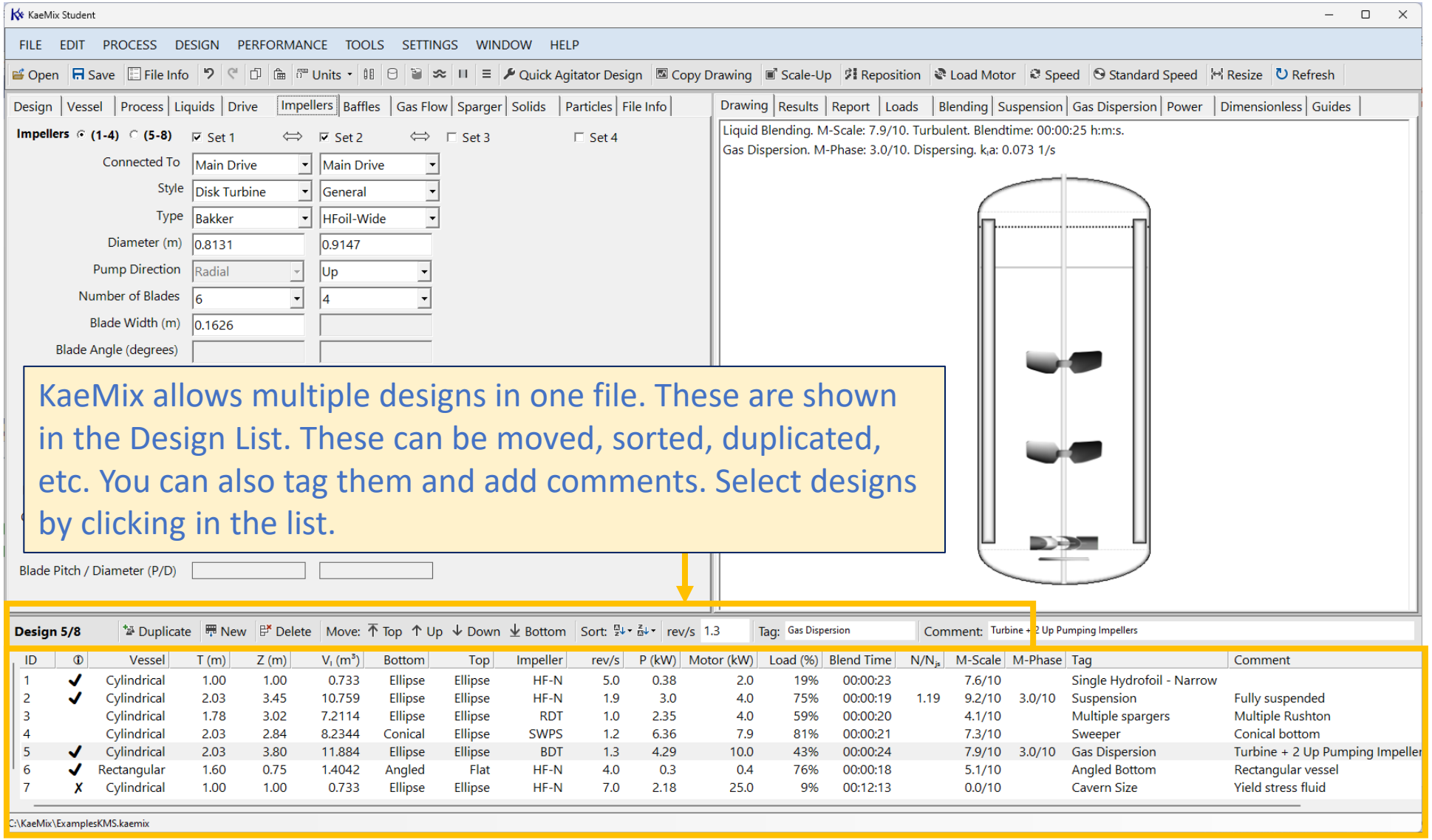


Hydrofoils, a disk turbine, and gas sparger

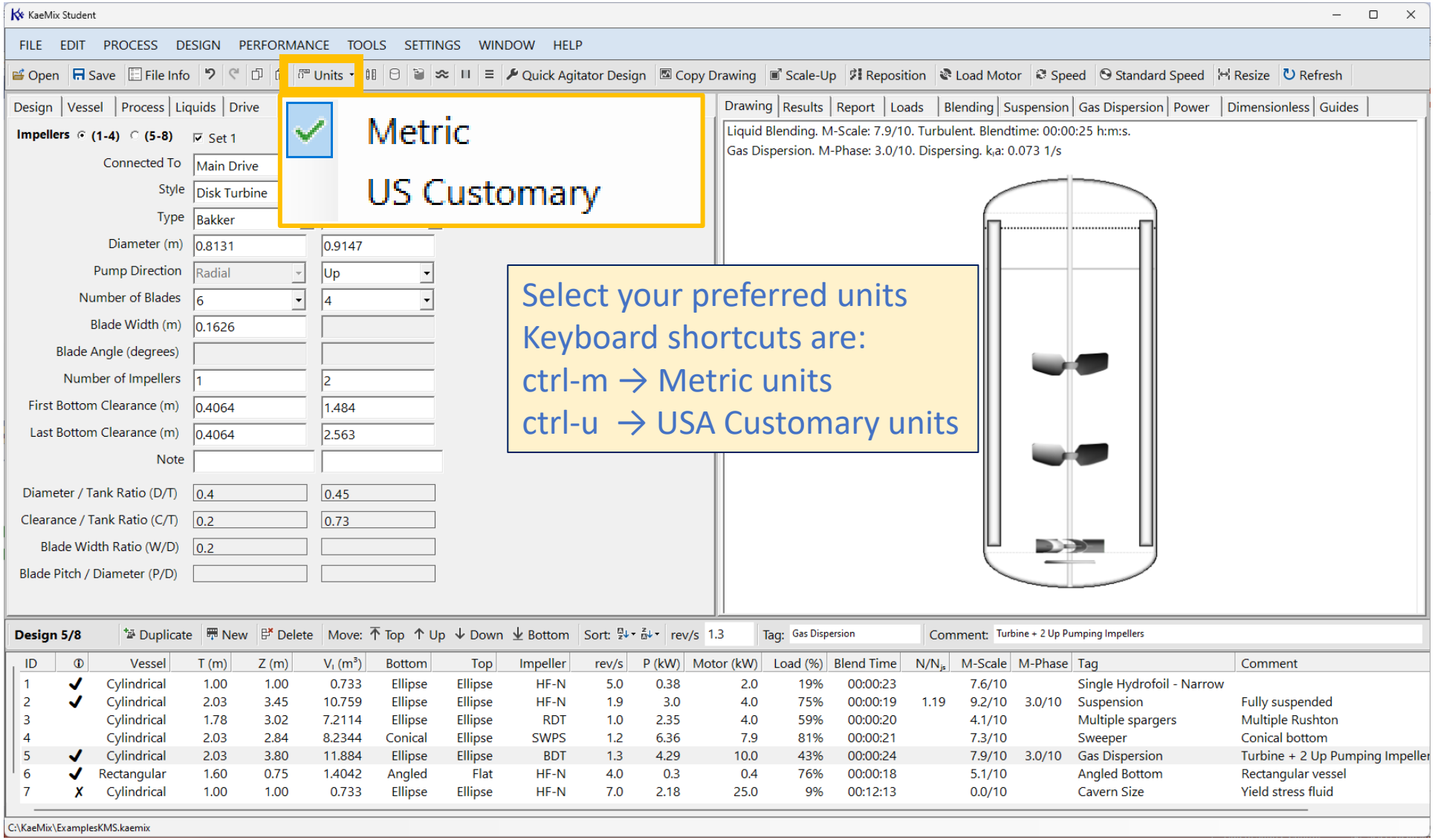


Multiple impellers and spargers

Multiple Design Capability

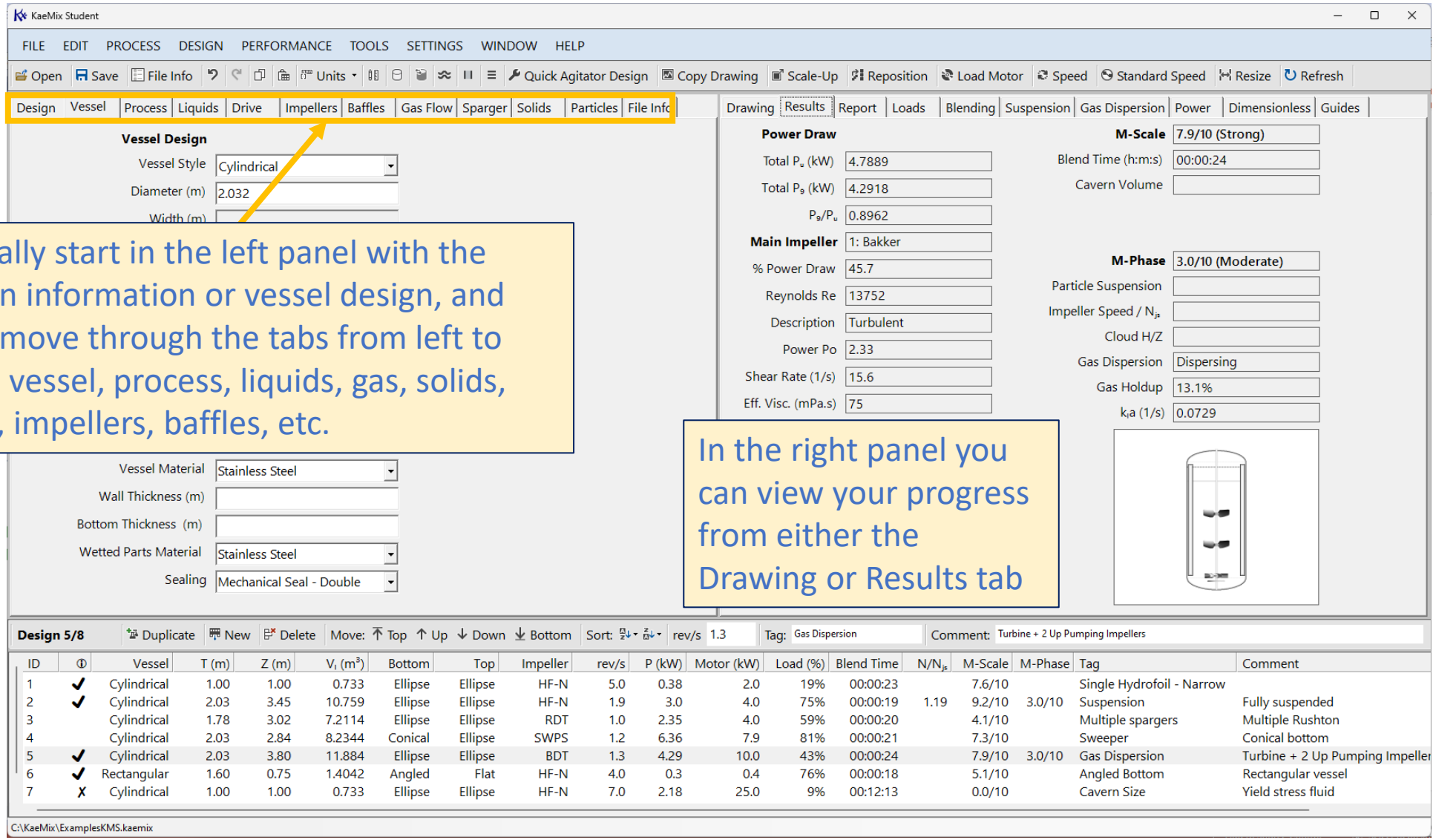


Unit Systems: Metric and USA

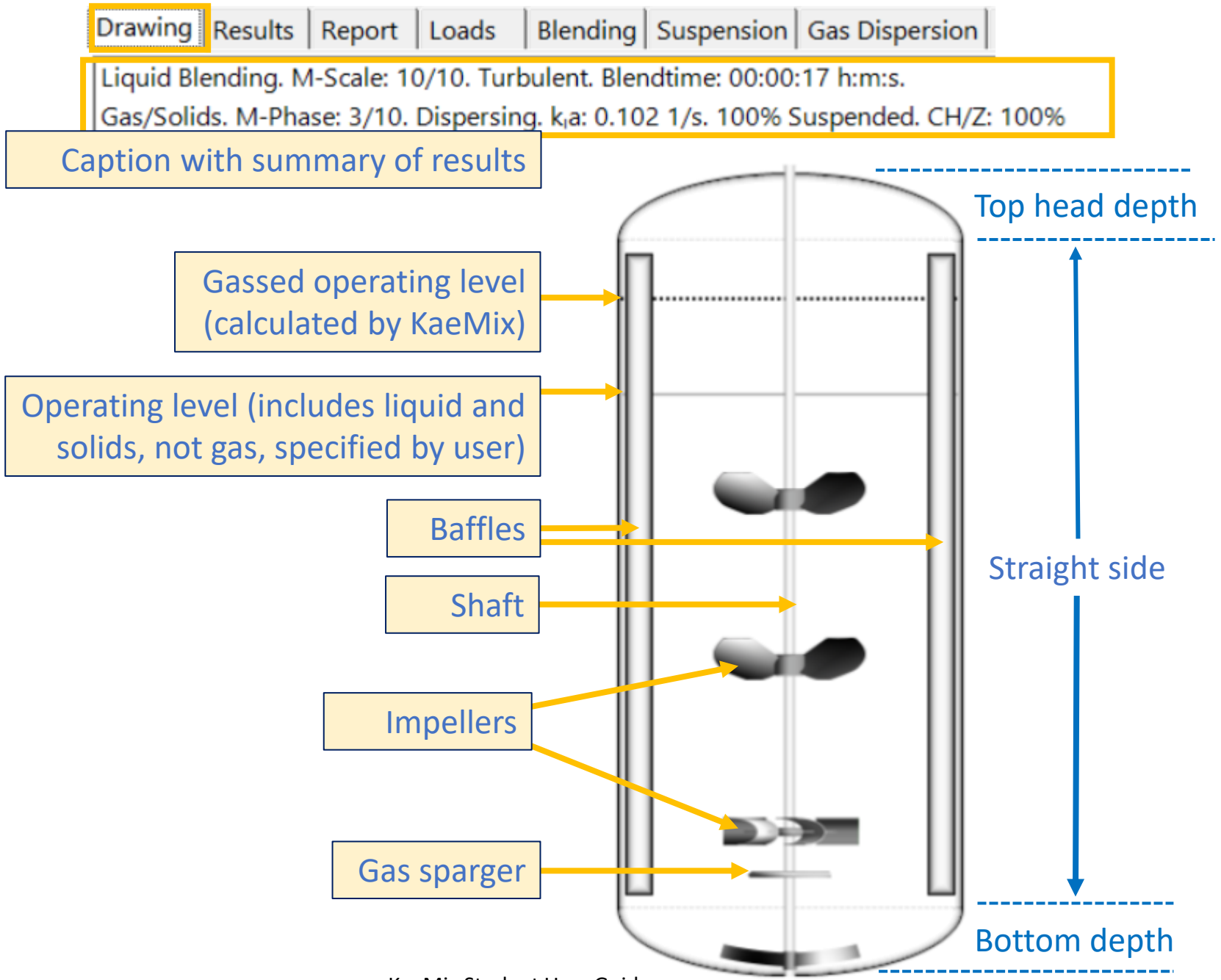


Workflow

Workflow

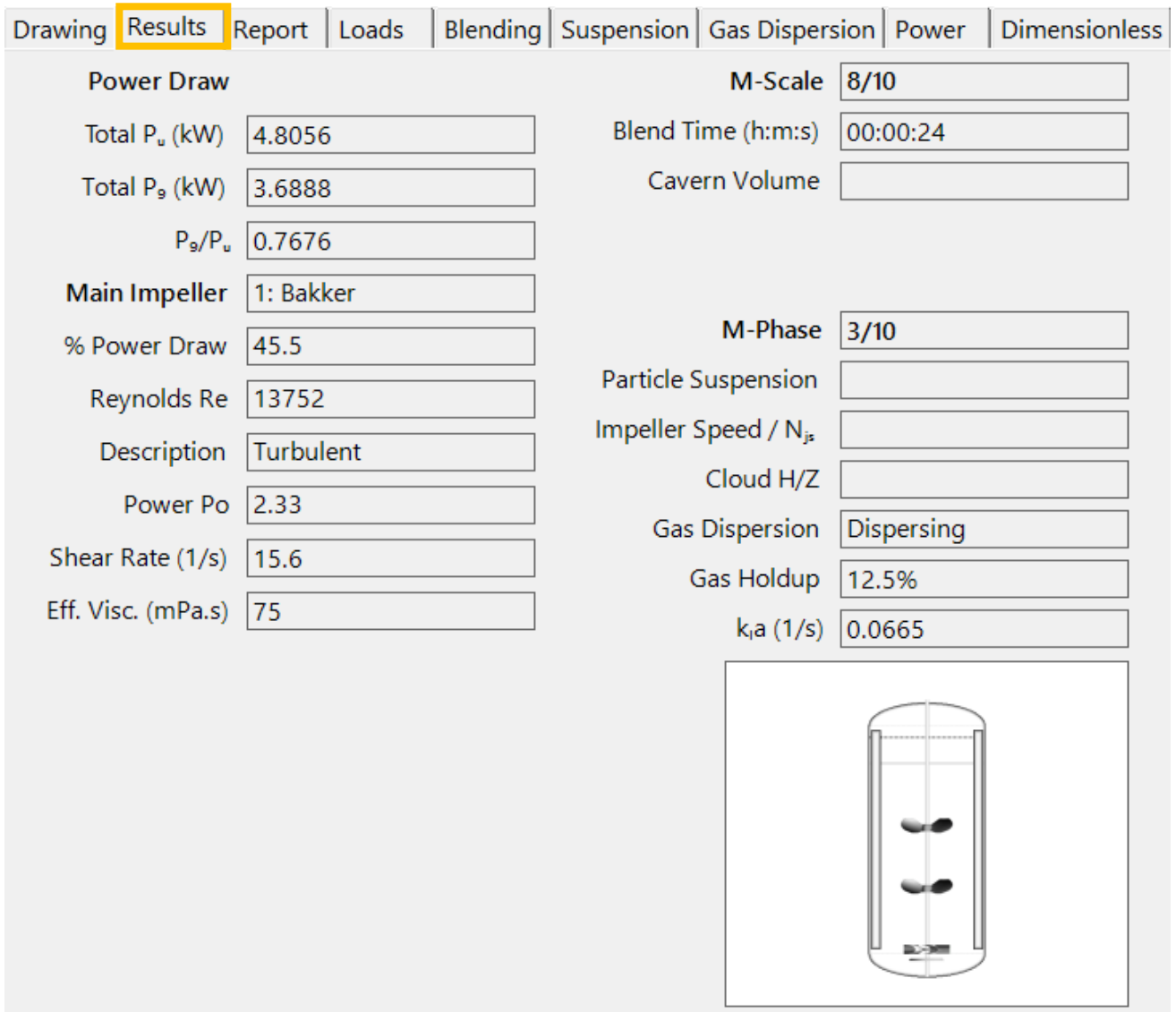

KaeMix Student
FILE EDIT PROCESS DESIGN PERFORMANCE TOOLS SETTINGS WINDOW HELP
Open Save File Info Units Quick Agitator Design Copy Drawing Scale-Up Reposition Load Motor Speed Standard Speed Resize Refresh
Design Vessel Process Liquids Drive Impellers Baffles Gas Flow Sparger Solids Particles File Info
Vessel Design
Vessel Style Cylindrical
Diameter (m) 2.032
Vessel Material Stainless Steel
Wall Thickness (m)
Bottom Thickness (m)
Wetted Parts Material Stainless Steel
Sealing Mechanical Seal - Double
Drawing Results Report Loads Blending Suspension Gas Dispersion Power Dimensionless Guides
Power Draw
Total Pu (kW) 4.7889
Total Pg (kW) 4.2918
Pg/Pu 0.8962
Main Impeller 1: Bakker
% Power Draw 45.7
Reynolds Re 13752
Description Turbulent
Power Po 2.33
Shear Rate (1/s) 15.6
Eff. Visc. (mPa.s) 75
M-Scale 7.9/10 (Strong)
Blend Time (h:m:s) 00:00:24
Cavern Volume
M-Phase 3.0/10 (Moderate)
Particle Suspension
Impeller Speed / Njs
Cloud H/Z
Gas Dispersion Dispersing
Gas Holdup 13.1%
kLa (1/s) 0.0729
Typically start in the left panel with the design information or vessel design, and then move through the tabs from left to right: vessel, process, liquids, gas, solids, drive, impellers, baffles, etc.
In the right panel you can view your progress from either the Drawing or Results tab
Design 5/8 Duplicate New Delete Move: Top Up Down Bottom Sort: rev/s 1.3 Tag: Gas Dispersion Comment: Turbine + 2 Up Pumping Impellers
ID Vessel T (m) Z (m) V (m³) Bottom Top Impeller rev/s P (kW) Motor (kW) Load (%) Blend Time N/Njs M-Scale M-Phase Tag Comment
1 Cylindrical 1.00 1.00 0.733 Ellipse Ellipse HF-N 5.0 0.38 2.0 19% 00:00:23 7.6/10 Single Hydrofoil - Narrow
2 Cylindrical 2.03 3.45 10.759 Ellipse Ellipse HF-N 1.9 3.0 4.0 75% 00:00:19 1.19 9.2/10 3.0/10 Suspension Fully suspended
3 Cylindrical 1.78 3.02 7.2114 Ellipse Ellipse RDT 1.0 2.35 4.0 59% 00:00:20 4.1/10 Multiple spargers Multiple Rushton
4 Cylindrical 2.03 2.84 8.2344 Conical Ellipse SWPS 1.2 6.36 7.9 81% 00:00:21 7.3/10 Sweeper Conical bottom
5 Cylindrical 2.03 3.80 11.884 Ellipse Ellipse BDT 1.3 4.29 10.0 43% 00:00:24 7.9/10 3.0/10 Gas Dispersion Turbine + 2 Up Pumping Impeller
6 Rectangular 1.60 0.75 1.4042 Angled Flat HF-N 4.0 0.3 0.4 76% 00:00:18 5.1/10 Angled Bottom Rectangular vessel
7 Cylindrical 1.00 1.00 0.733 Ellipse Ellipse HF-N 7.0 2.18 25.0 9% 00:12:13 0.0/10 Cavern Size Yield stress fluid
C:\KaeMix\ExamplesKMS.kaemix

Drawing



Results

- P_u: total power draw of all submerged impellers, ungassed
- P_g: total power draw of all submerged impellers, gassed
- P_g/P_u: ratio between gassed and ungassed power draw
- Main Impeller: name of the impeller with the highest power draw
- % Power Draw: main impeller power draw as percentage of total
- Reynolds Re: Reynolds number of main impeller
- Description: if flow is turbulent or laminar
- Power Po: main impeller power number
- Shear Rate: shear rate in region of main impeller
- Eff. Visc.: effective viscosity based on main impeller shear rate
- M-Scale: a 1 to 10 scale of agitation for liquid mixing
- Blend time: time to reach 100% uniformity in liquid
- Cavern volume: volume of caverns around impellers for yield stress fluids
- M-Phase: a 1 to 10 scale of agitation for the gas and/or solids phases
- Particle Suspension: percentage of the solids suspended into the liquid
- Impeller Speed / Njs: ratio between impeller speed and the just-suspended speed for the impeller that contributes the most to the off-bottom suspension
- Cloud H/Z: ratio between the height of the solids cloud and the operating level
- Gas Dispersion: if the gas is being dispersed or the impeller is flooded
- Gas Holdup: volume of gas divided by total volume (liquid + solid + gas)
- $K_l a$: gas-liquid mass transfer coefficient



M-Scale

- Originally, a 1 to 10 Scale of Agitation* for blending applications, described in:

  "How to design agitators for desired process response"

  Hicks et al., Chemical Engineering, April 1976

- Scale of 1 to 10:
  - M-Scale 1-2 are for applications requiring minimum fluid velocities to achieve the process result.
  - M-Scale 2 will blend miscible liquids to uniformity if specific gravity differences are less than 0.1; blend miscible fluids to uniformity if the viscosity of the most viscous is less than 100 times that of the other; establish complete fluid-batch control; and produce a flat, but moving, fluid-batch surface.
  - M-Scale 3-6 are characteristic of fluid velocities in most chemical process industries agitated batches.
  - M-Scale 6 will blend miscible liquids to uniformity if specific gravity differences are less than 0.6; blend miscible fluids to uniformity if the viscosity of the most viscous is less than 10000 times that of the other; and produce surface rippling at lower viscosities.
  - M-Scale 7-10 are characteristic of applications requiring high fluid velocity for the process result, such as in critical reactors.
  - M-Scale 10 will blend miscible liquids to uniformity if specific gravity differences are less than 1.0; blend miscible fluids to uniformity if the viscosity of the most viscous is less than 100,000 times that of the other; and produce surging surfaces at low viscosities.

M-Scale Descriptions
1: Slow
2: Mild
3: Moderate
4: Intermediate
5: Medium
6: Medium-Strong
7: Strong
8: Very Strong
9: Powerful
10: Very Powerful*

** In KaeMix the scale has been extended to a maximum of 14*

M-Phase

- Originally, a 1 to 10 Scale of Agitation* for multiphase applications, described in:

  For solids: "*Selecting agitator systems to suspend solids in liquids*"
  Gates et al., Chemical Engineering, May 1976

  For gas: "*How to select turbine agitators for dispersing gas into liquids*"
  Hicks and Gates, Chemical Engineering, July 1976

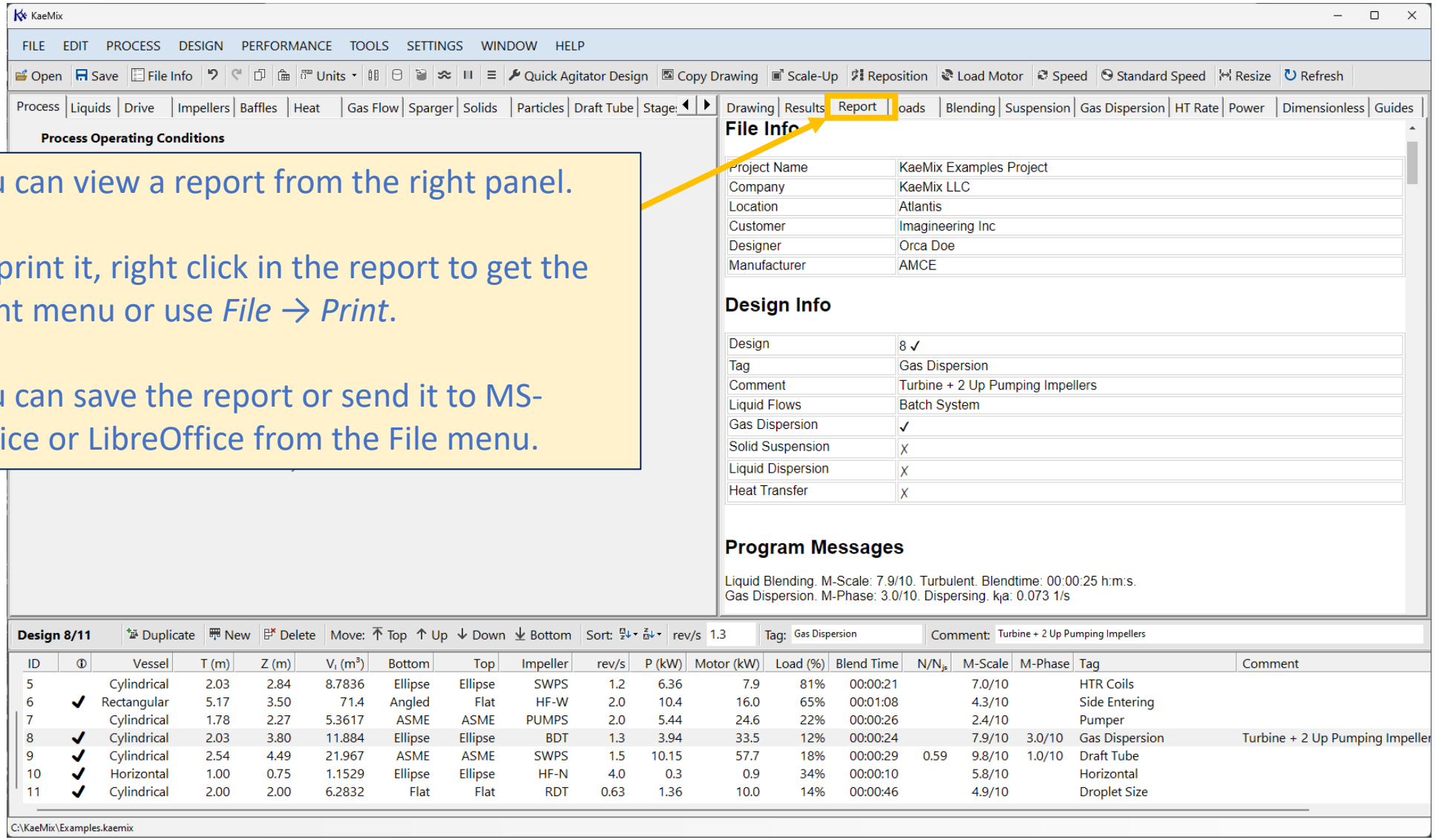
  For gas and solids: KaeMix reports the lower value of the gas and solids scales

- Solids suspension:
  - M-Phase 1-2 produces motion of all solids. Moving fillets of solids on the bottom are periodically suspended.
  - M-Phase 3-5 is sufficient for most suspension applications including dissolving solids. All solids are completely suspended off the vessel bottom. Typically, suitable for slurry drawoff at low exit-nozzle elevations.
  - M-Phase 6-8 is for when the solids-suspension level needs to approach uniformity. Typically, suitable for slurry drawoff up to 80% of fluid-batch height.
  - M-Phase 9-10 is for applications where the solids-suspension uniformity is the maximum practical. Typically, suitable for slurry drawoff by means of overflow.

- Gas dispersion:
  - M-Phase 0 indicates the impeller system is flooded by the gas.
  - M-Phase 1-2 is for when the degree of gas dispersion is not critical.
  - M-Scale 2 provides a coarse level of gas dispersion and is typical of applications that are not mass-transfer limited.
  - M-Phase 3-5 provides complete gas dispersion. Fine bubbles are driven to the vessel wall and recirculated back into the impeller.
  - M-Phase 6-10 is for critical gas-liquid reactors where rapid mass transfer is required. Fine dispersions are accomplished, and gas-liquid interfacial area is maximized.

** In KaeMix the scale has been extended to a maximum of 14*

Report



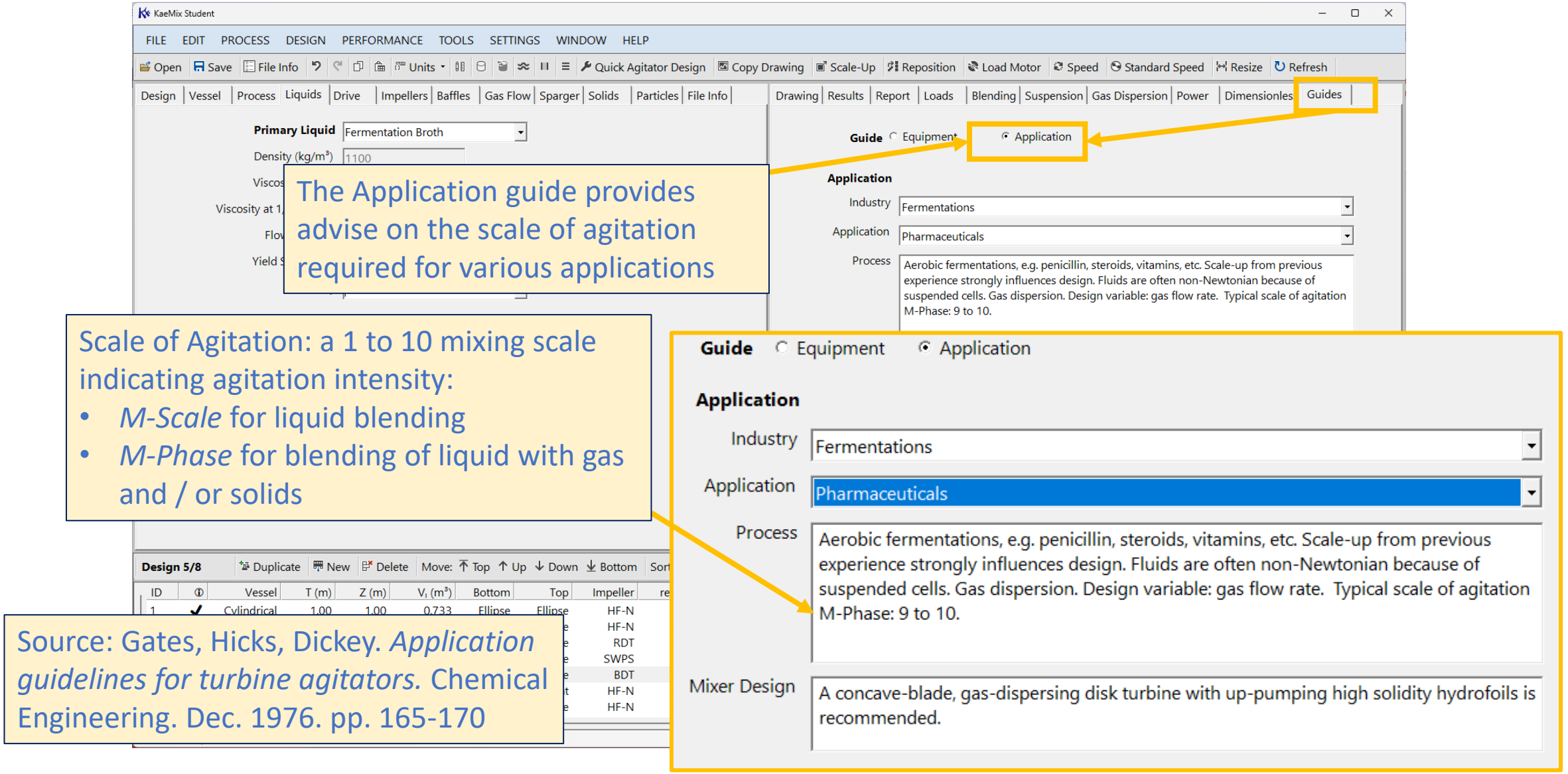
You can view a report from the right panel.

To print it, right click in the report to get the print menu or use *File → Print*.

You can save the report or send it to MS-Office or LibreOffice from the File menu.

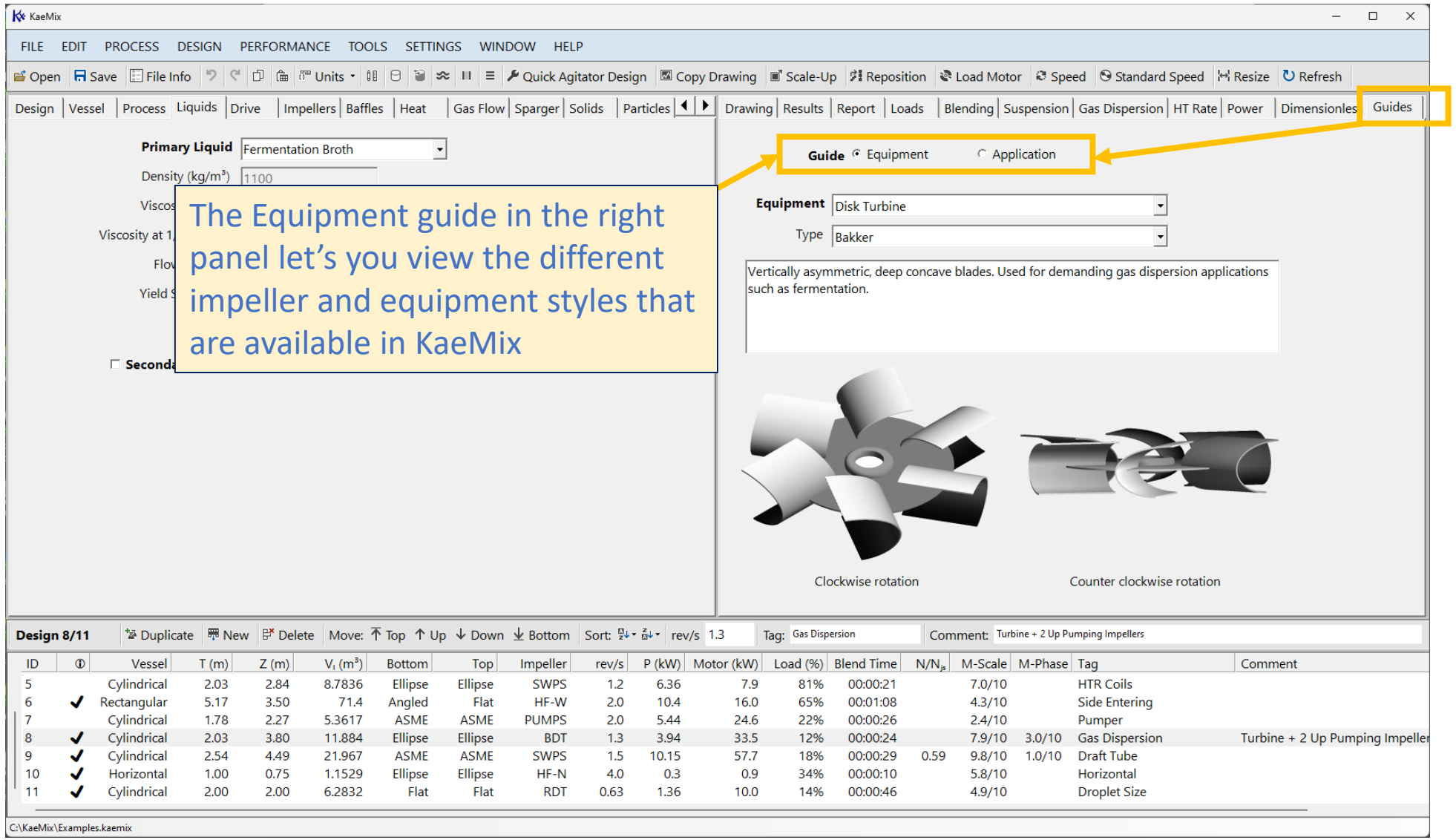
Guides

Guides: Applications



Source: Gates, Hicks, Dickey. *Application guidelines for turbine agitators.* Chemical Engineering. Dec. 1976. pp. 165-170

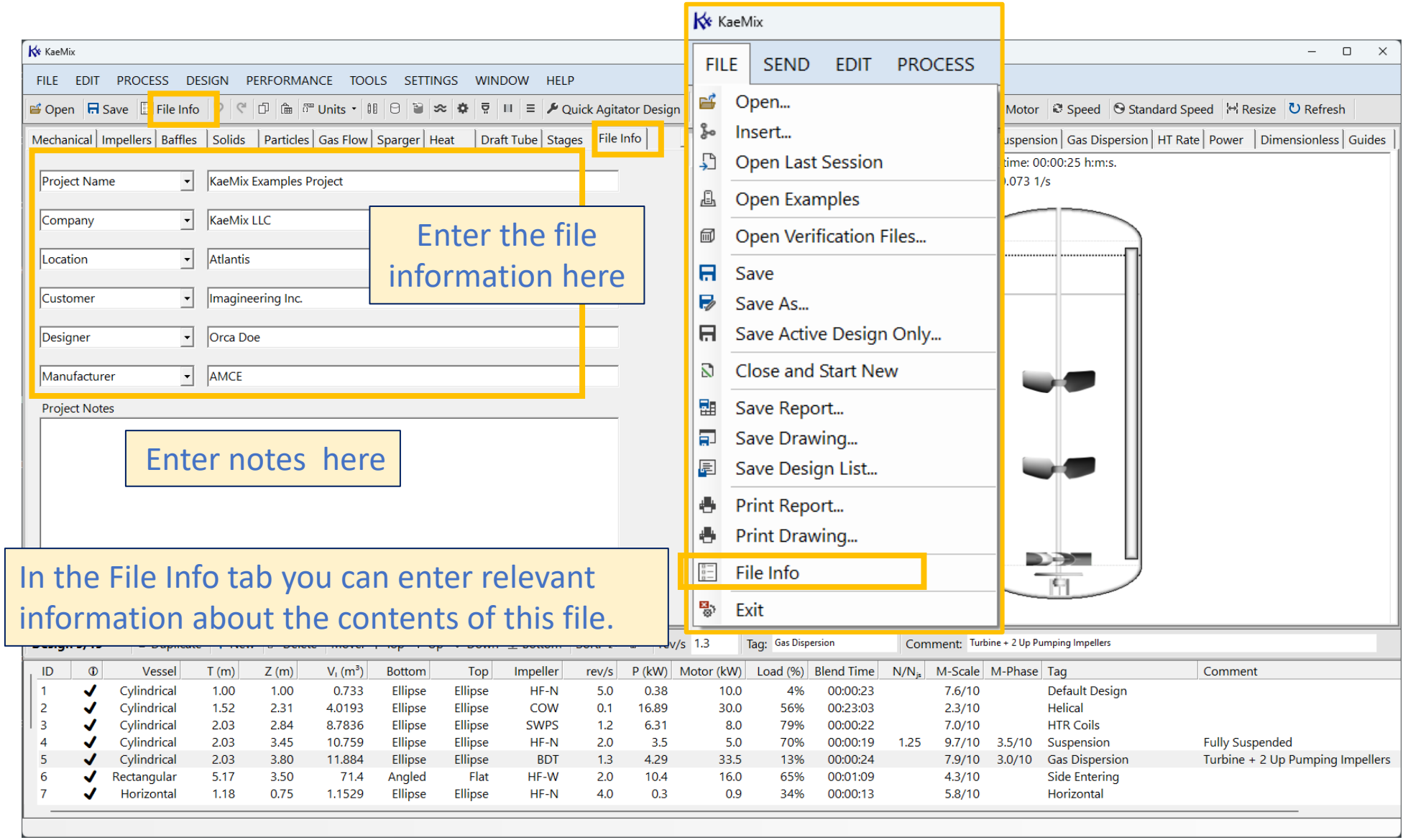
Guides: Equipment



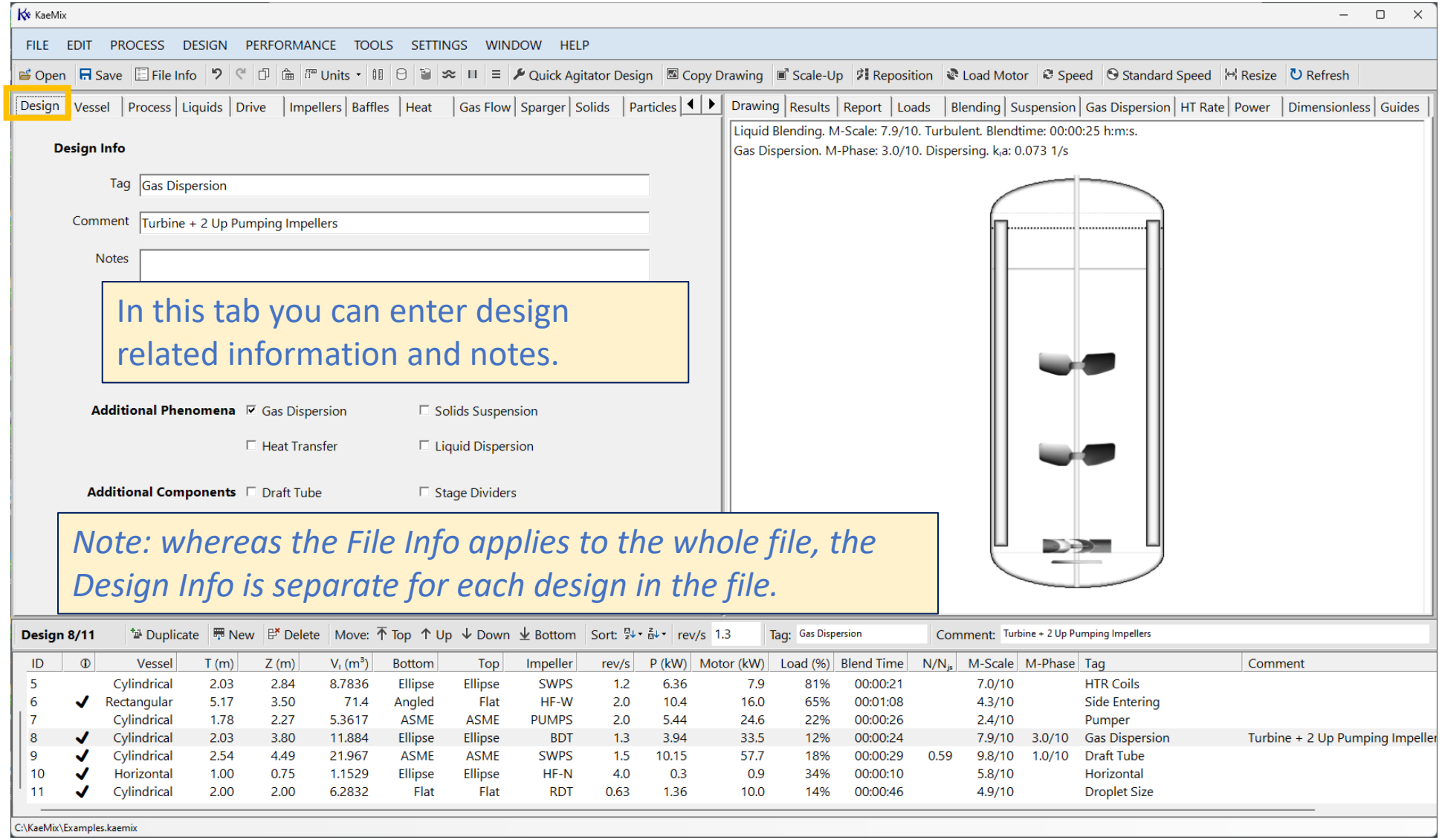
KaeMix

File and Design Info

File Info



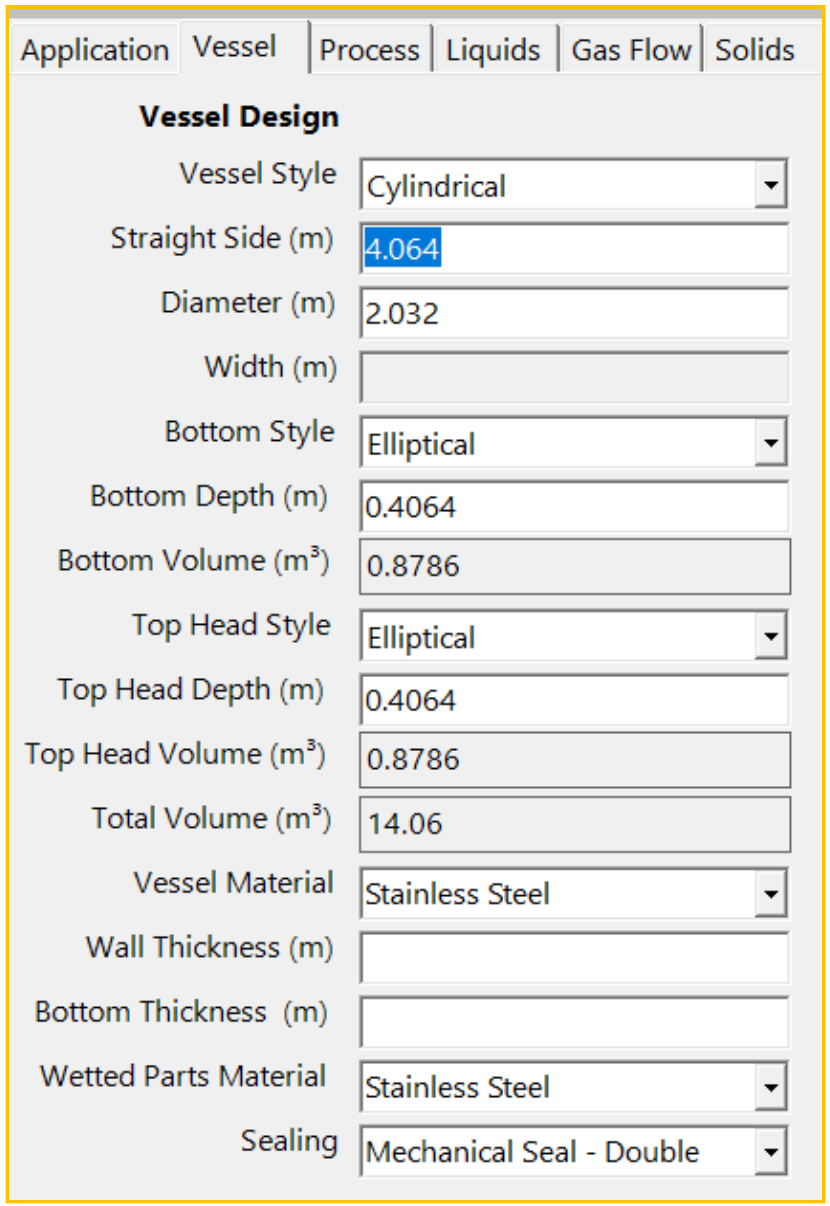
Design Info



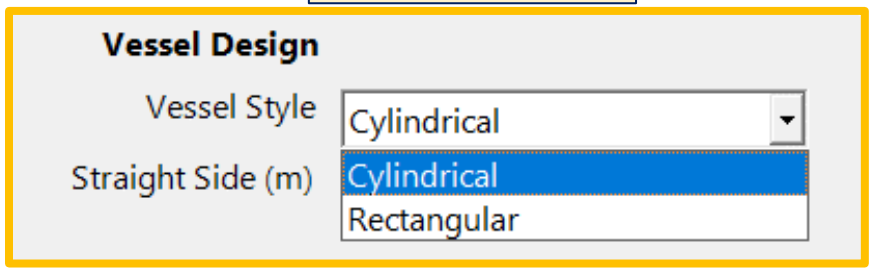
KaeMix

Vessel Design

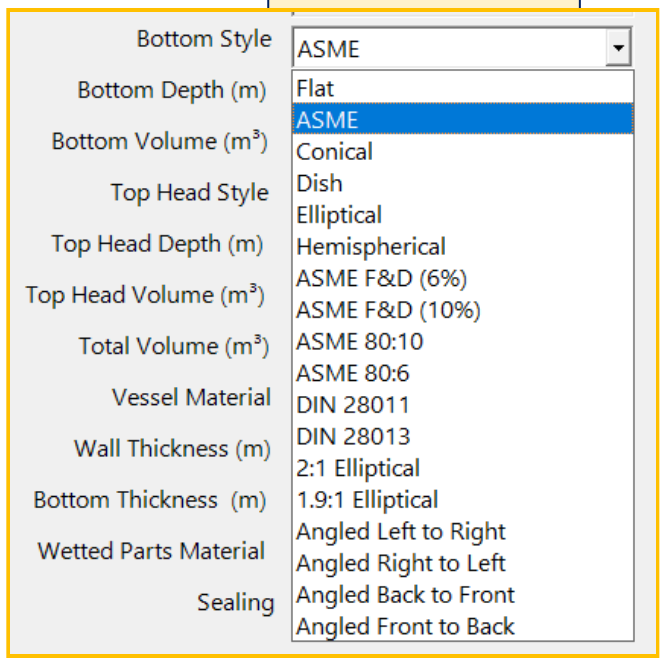
Vessel Design (1/3)



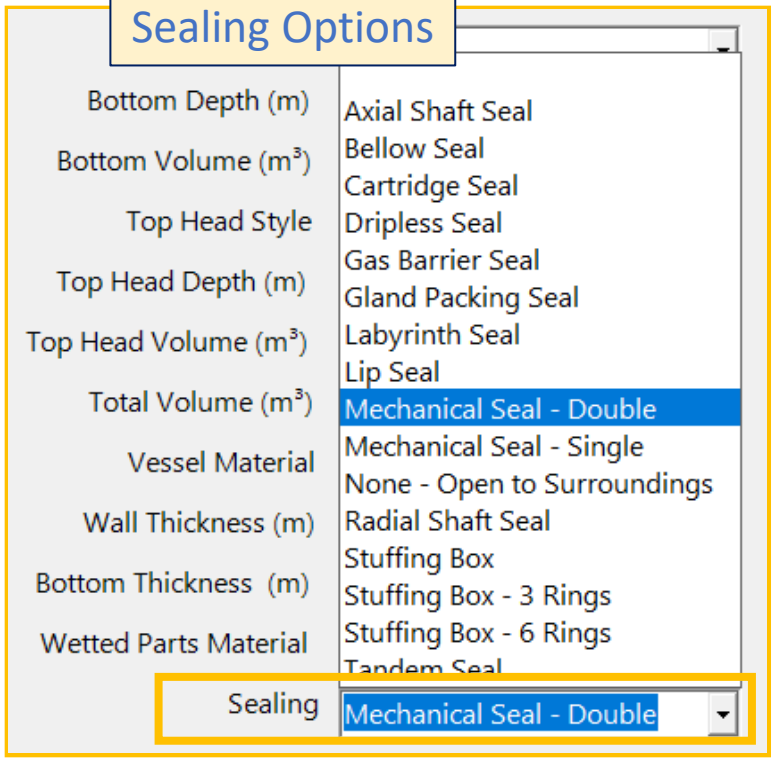
Vessel Styles



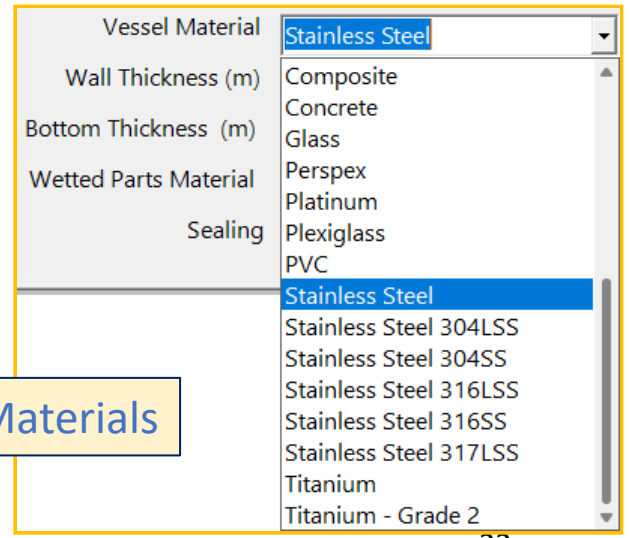
Bottom Styles



Sealing Options

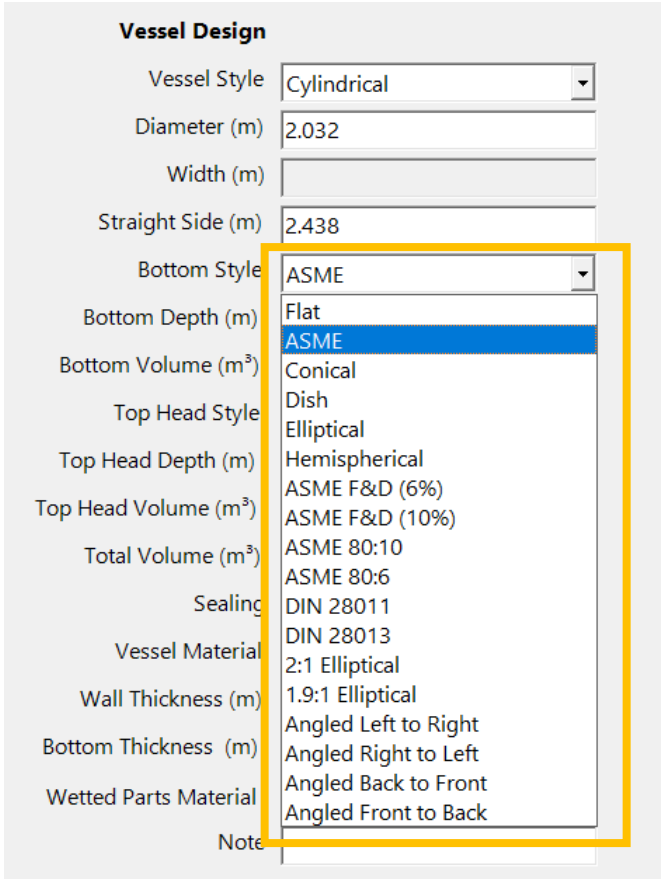


Materials

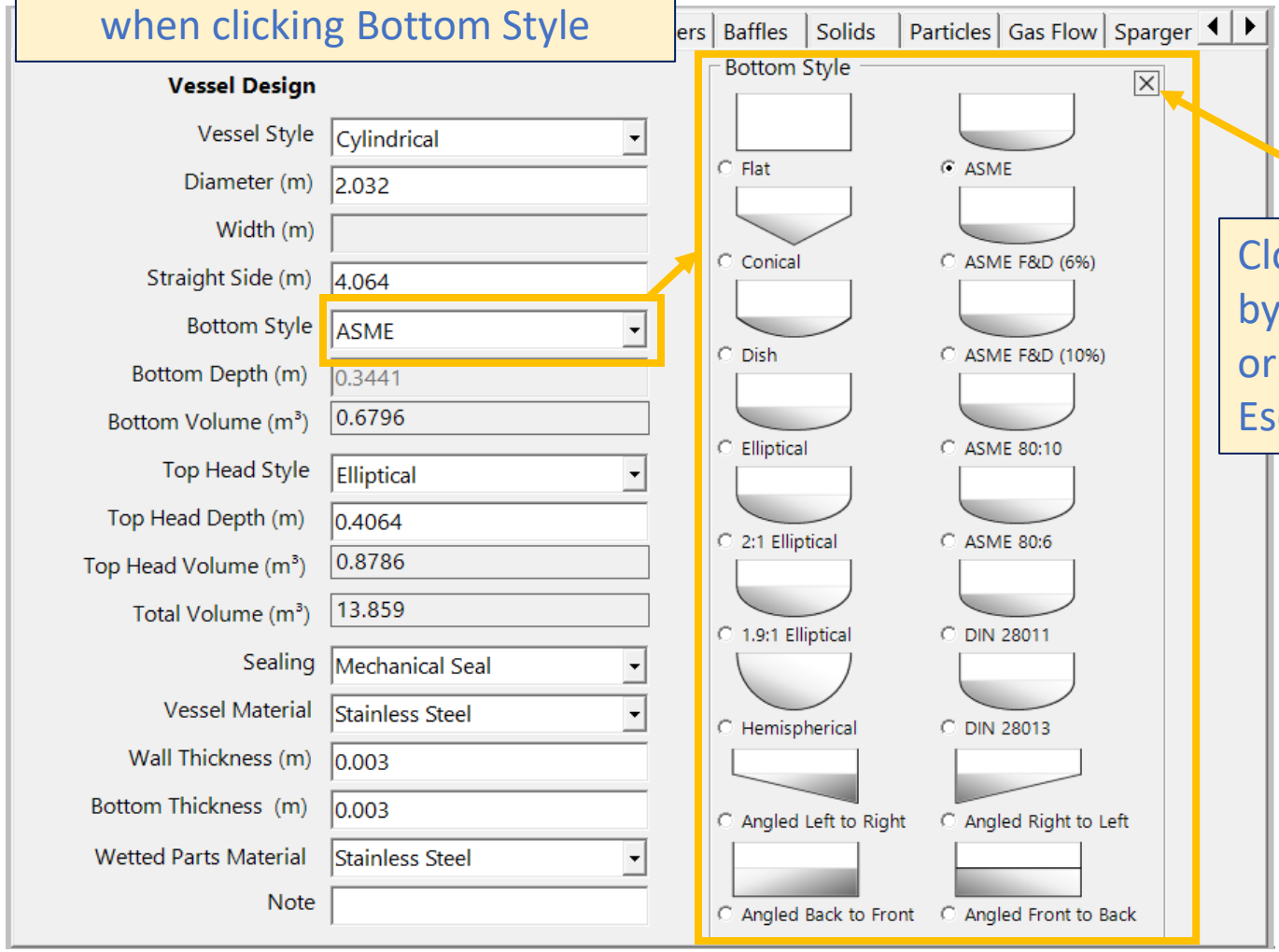


Vessel Design (2/3)

Settings | Equipment Preview **OFF**
Standard dropdown when clicking Bottom Style



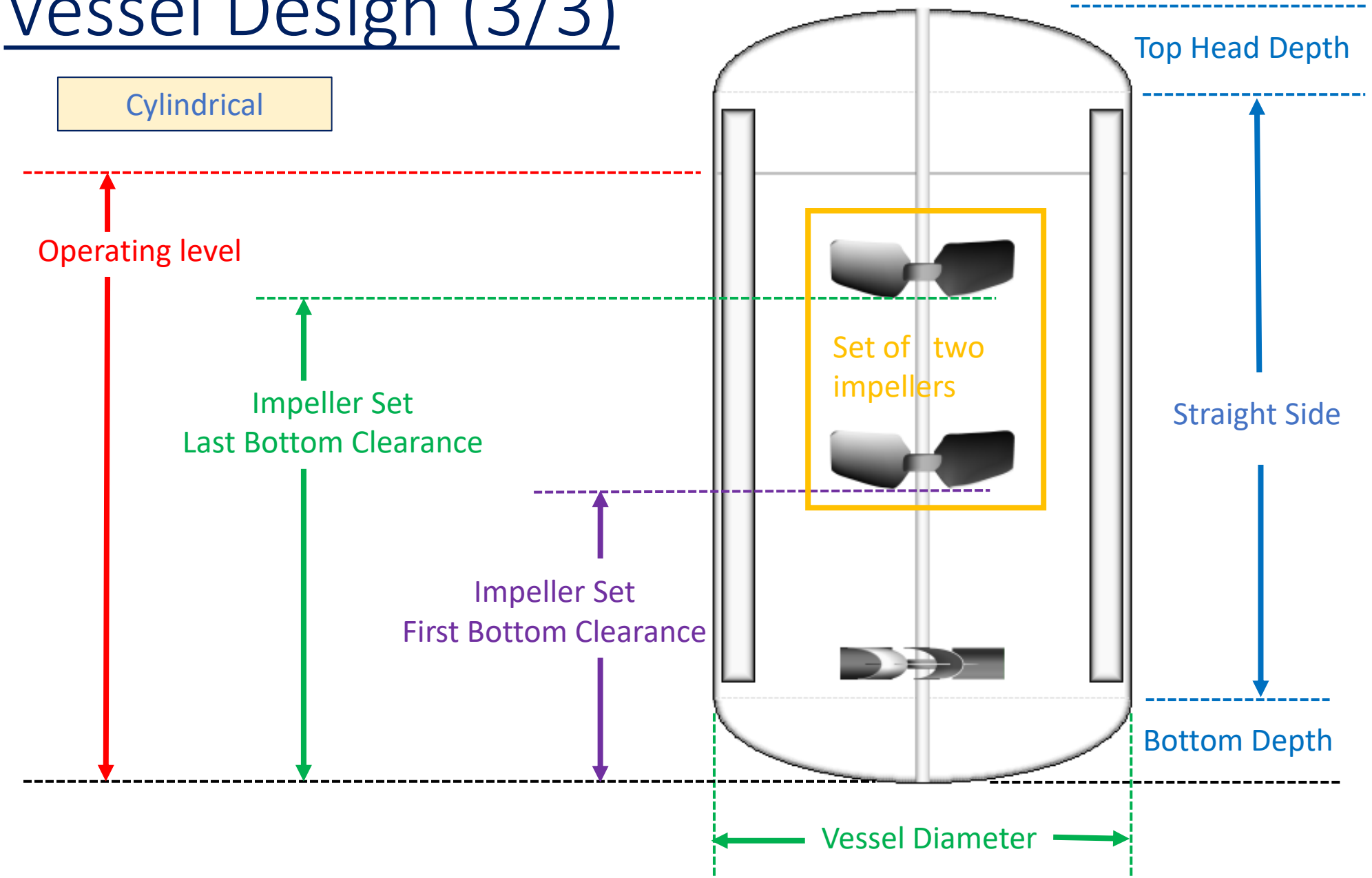
Settings | Equipment Preview **ON** opens graphical selection panel when clicking Bottom Style



Close the panel by clicking x-box or press Enter or Esc on keyboard

Vessel Design (3/3)

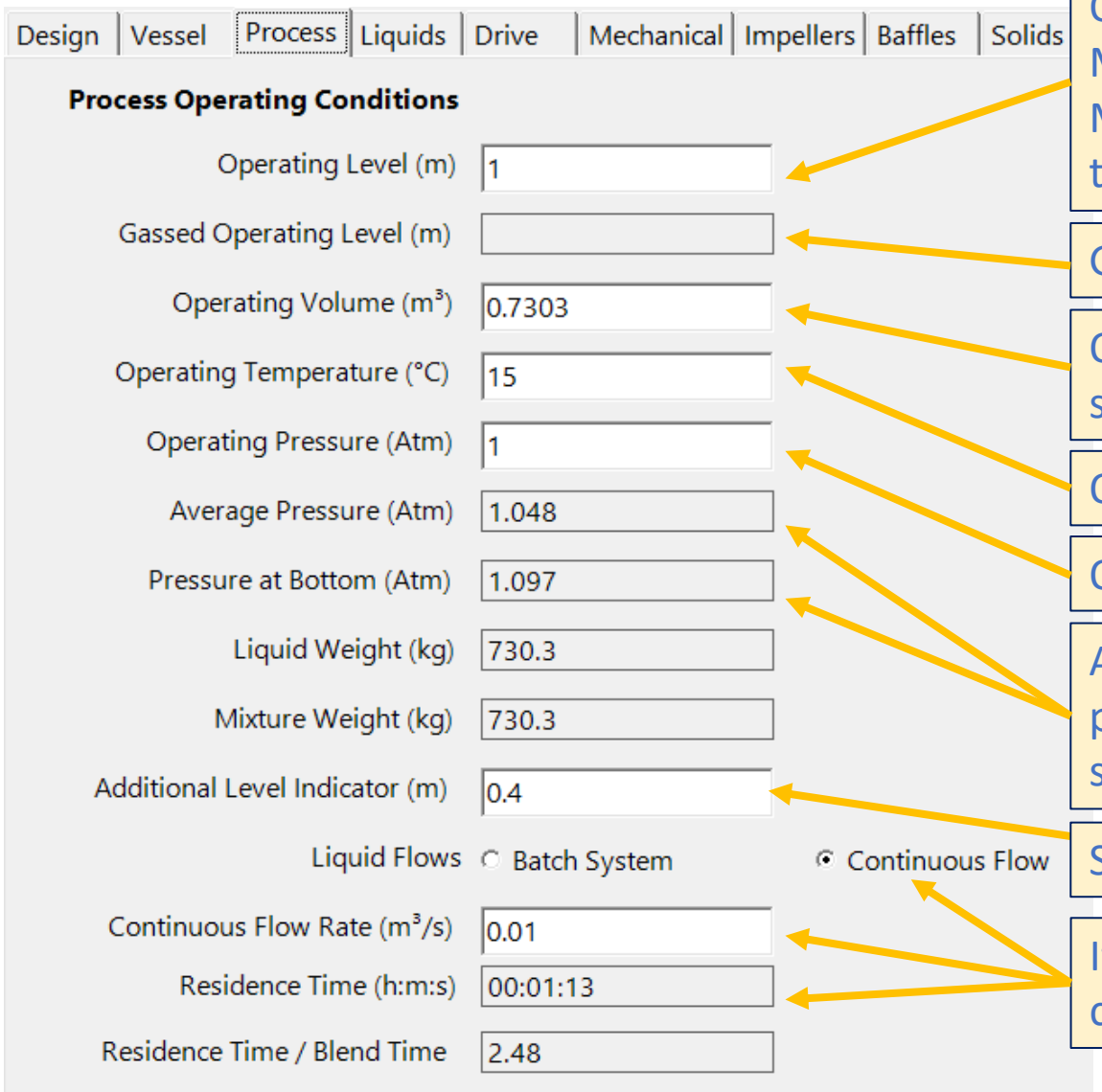
Cylindrical



KaeMix

Process

Process Operating Conditions



Operating level includes liquid and solids but excludes gas. Measured vertically from the deepest point in the bottom. Minimum level is the bottom depth. Maximum level is to the top of the straight side

Gassed operating level includes gas and is calculated by KaeMix

Operating volume corresponding to operating level. You can specify either volume or level and the other is calculated

Operating temperature

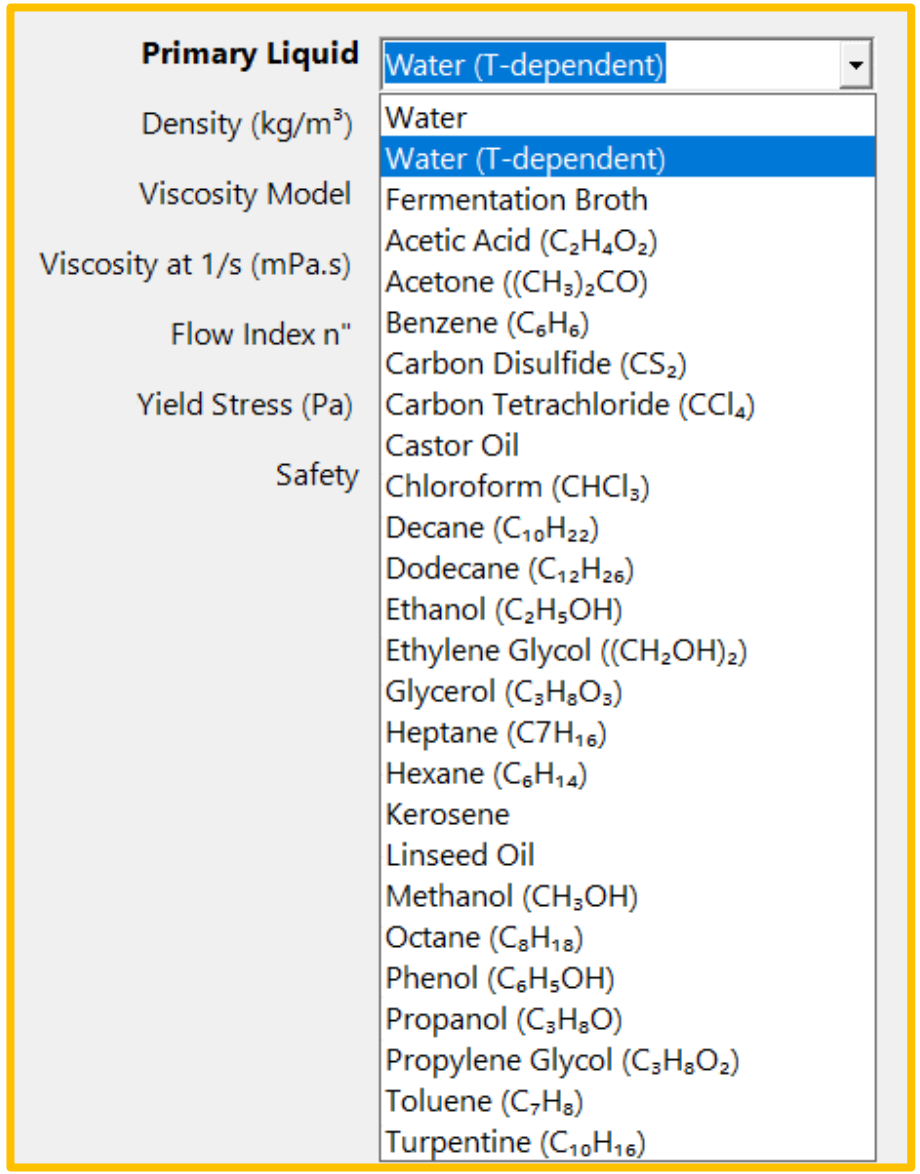
Operating pressure (in the head space)

Average pressure in the liquid, and pressure at the deepest point at the bottom, in Atmosphere (or Bar depending on settings), calculated by KaeMix

Specify an additional level for in the drawing

If you specify continuous flow and a flow rate, KaeMix will calculate the residence time

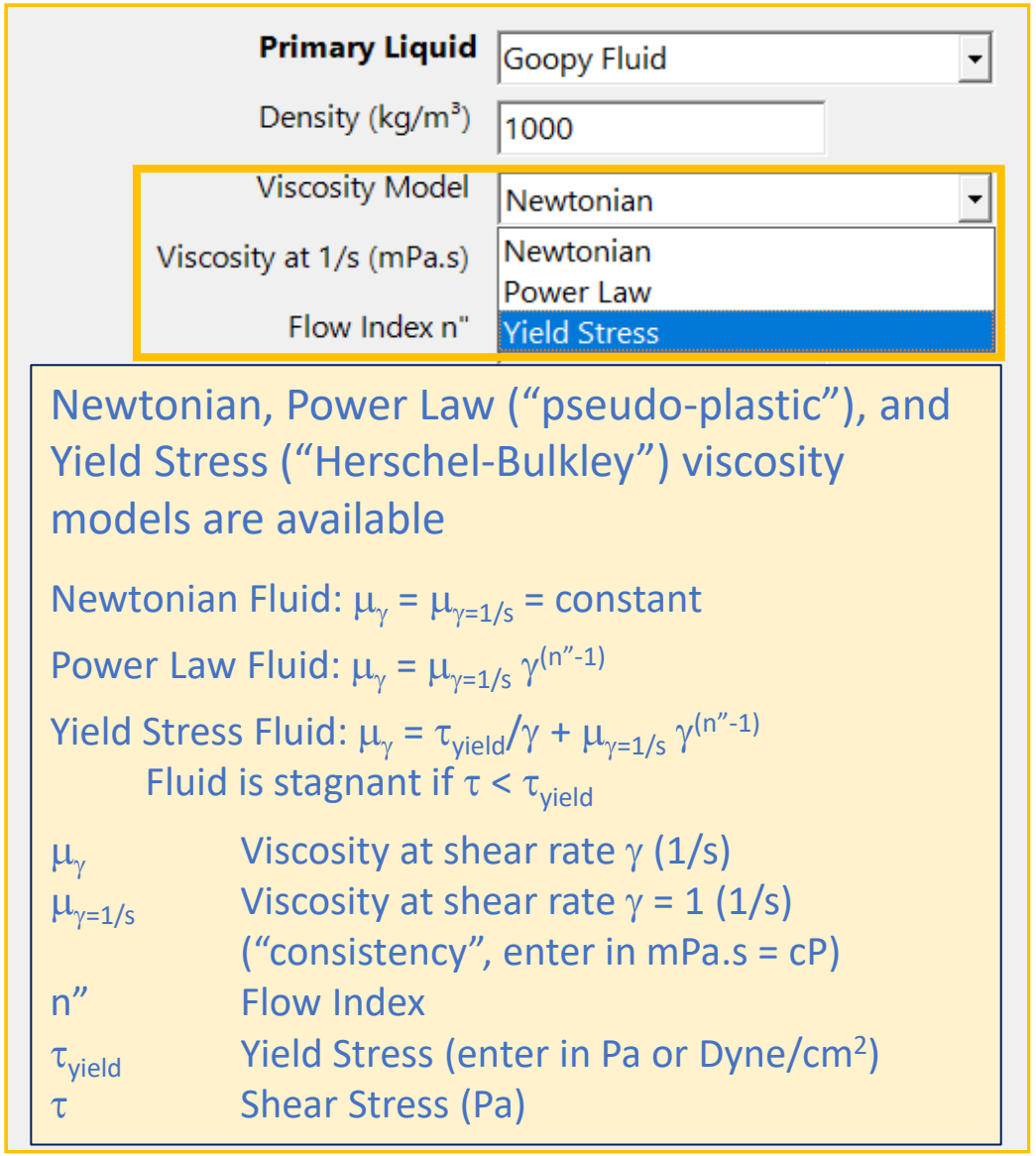
Liquids (1/3)



If you select a liquid from the dropdown list the physical properties will be set automatically. The properties are constant, except for *Water (T-dependent)* in which case density and viscosity vary with temperature.

Important: To specify your own liquid with your own physical properties, first enter a name that does not appear in the dropdown list!

Liquids (2/3)



Newtonian, Power Law ("pseudo-plastic"), and Yield Stress ("Herschel-Bulkley") viscosity models are available

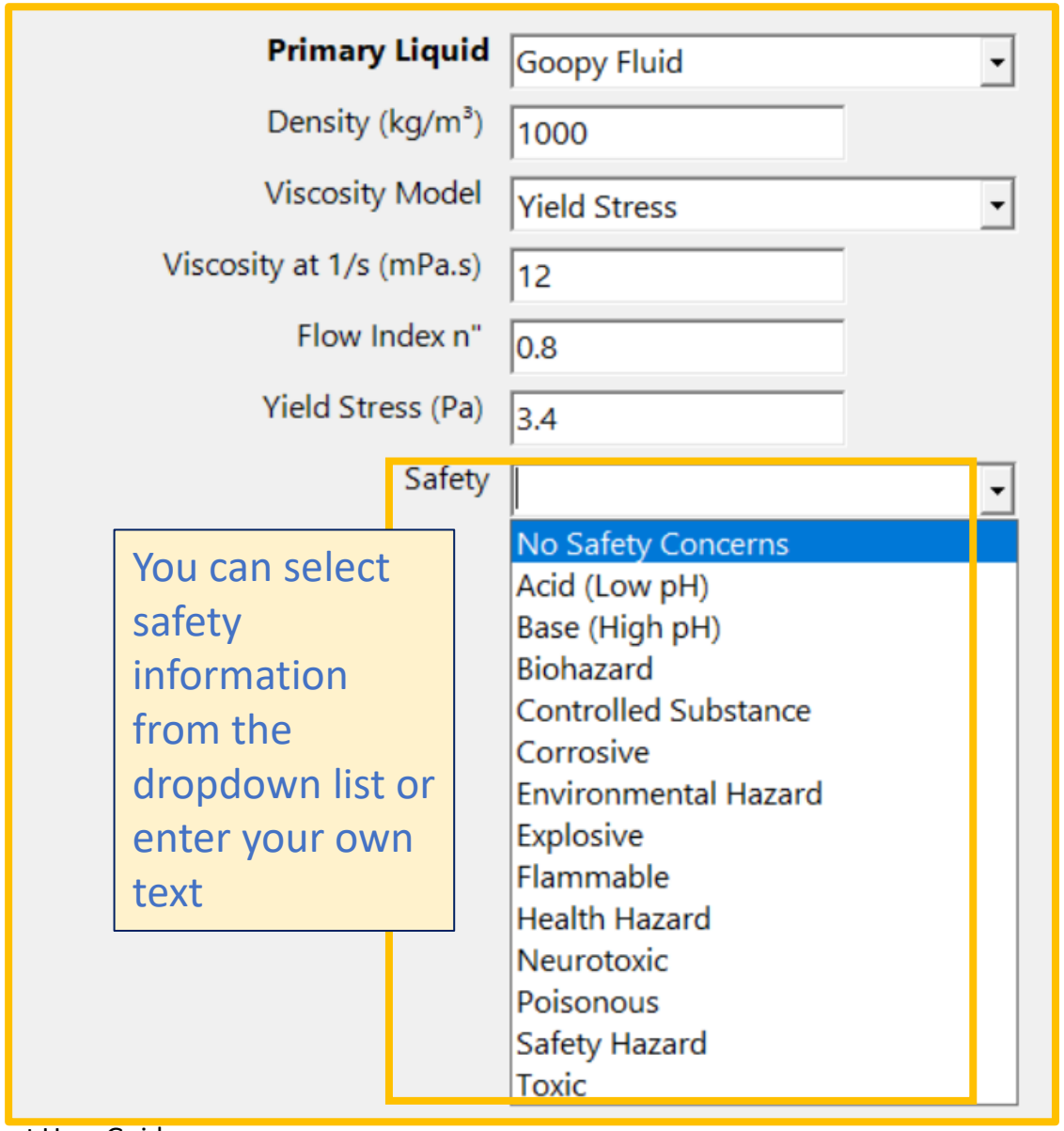
Newtonian Fluid: $\mu_\gamma = \mu_{\gamma=1/s}$ = constant

Power Law Fluid: $\mu_\gamma = \mu_{\gamma=1/s}\ \gamma^{(n"-1)}$

Yield Stress Fluid: $\mu_\gamma = \tau_{yield}/\gamma + \mu_{\gamma=1/s}\ \gamma^{(n"-1)}$

Fluid is stagnant if $\tau < \tau_{yield}$

μ_γ	Viscosity at shear rate γ (1/s)
$\mu_{\gamma=1/s}$	Viscosity at shear rate γ = 1 (1/s) ("consistency", enter in mPa.s = cP)
n"	Flow Index
τ_{yield}	Yield Stress (enter in Pa or Dyne/cm^2)
τ	Shear Stress (Pa)



You can select safety information from the dropdown list or enter your own text

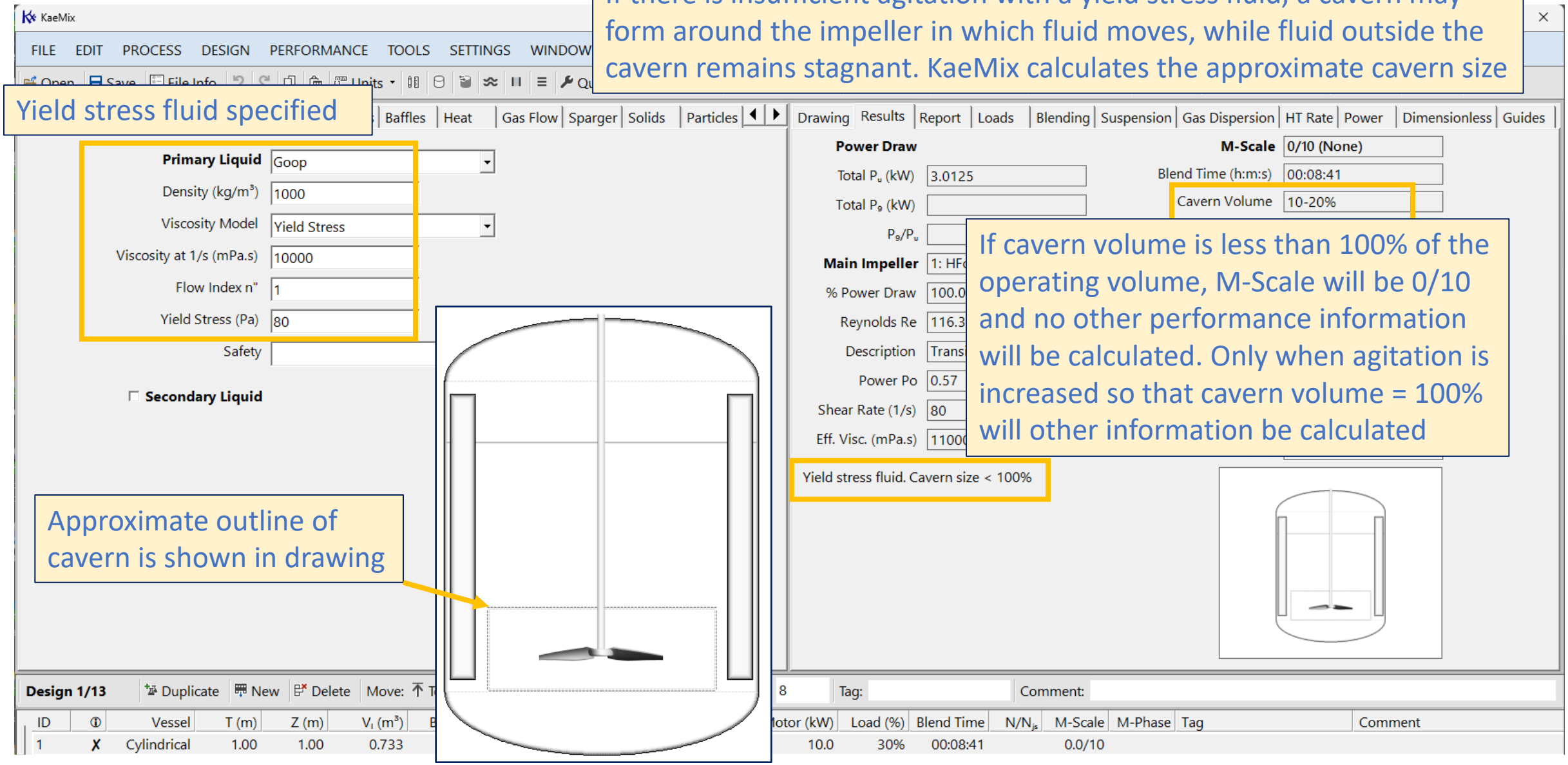
Liquids (3/3)

If there is insufficient agitation with a yield stress fluid, a cavern may form around the impeller in which fluid moves, while fluid outside the cavern remains stagnant. KaeMix calculates the approximate cavern size

Yield stress fluid specified

If cavern volume is less than 100% of the operating volume, M-Scale will be 0/10 and no other performance information will be calculated. Only when agitation is increased so that cavern volume = 100% will other information be calculated

Approximate outline of cavern is shown in drawing

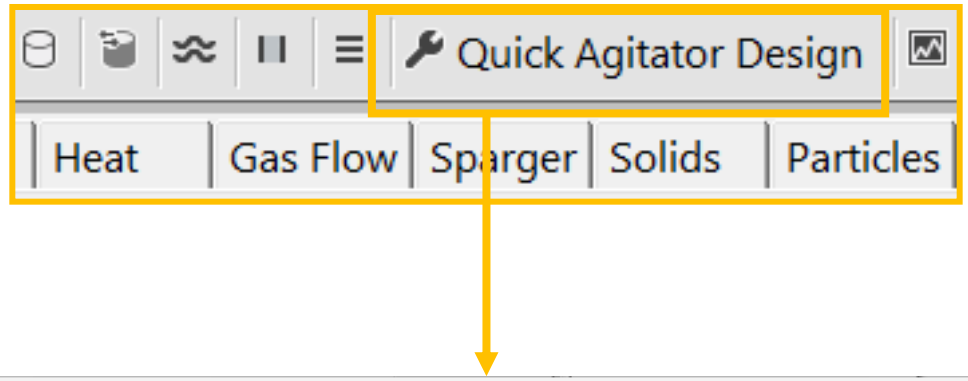


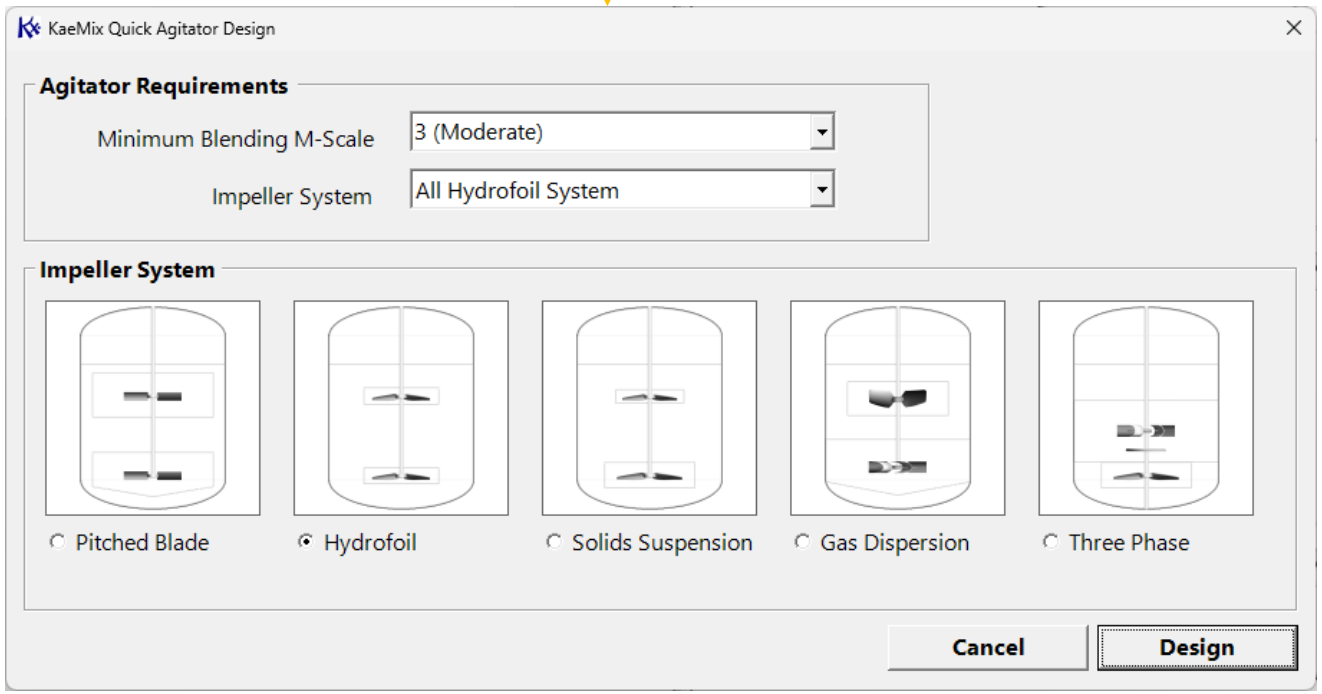
KaeMix

Design Tools

Quick Agitator Design

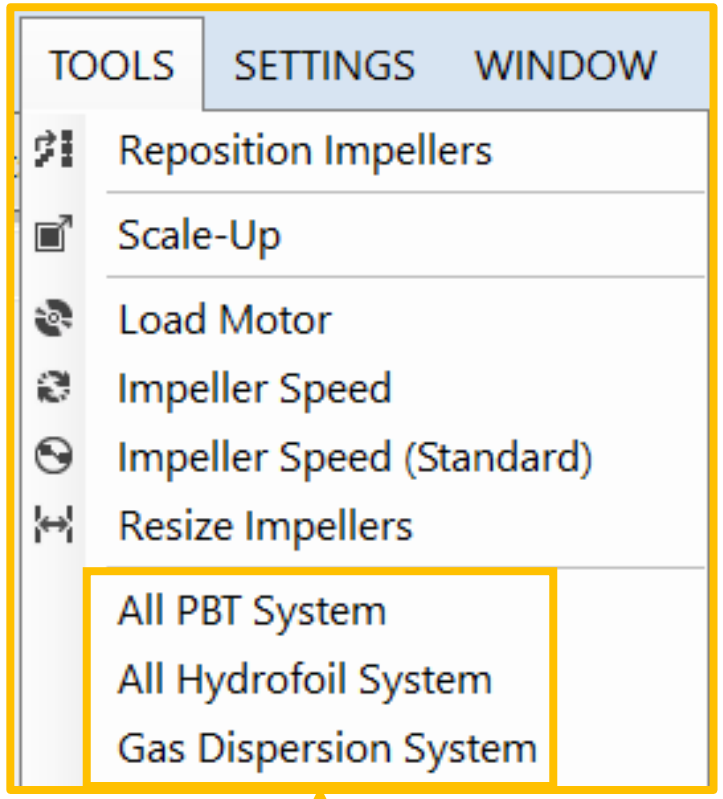
- After specifying the vessel, process, and liquids, the fastest way to create an initial agitator design is using the Quick Agitator Design panel
- Specify the impeller system and required M-Scale, click Design, and KaeMix will design the agitator





Tools Menu

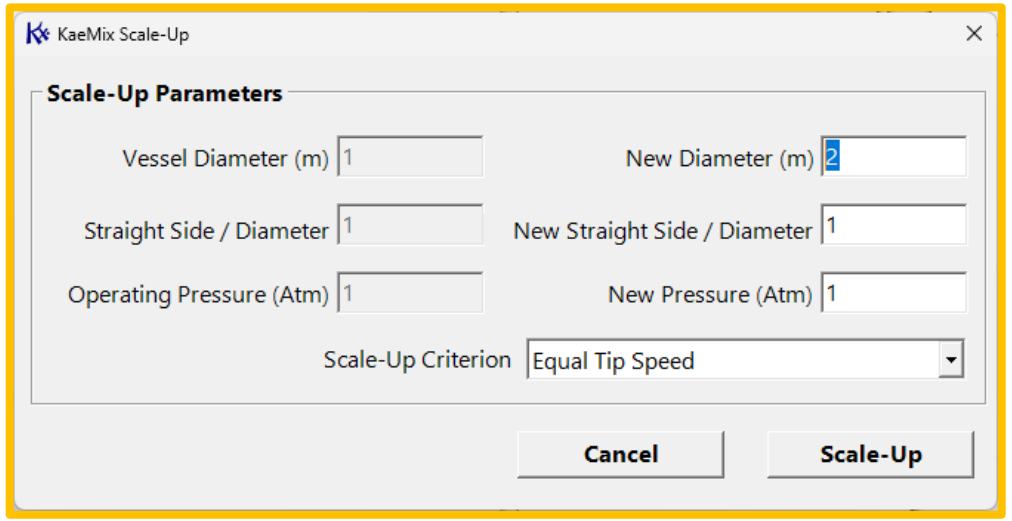
- *Reposition Impellers*: spaces the impellers evenly over the height of the vessel
- *Scale Up*: opens the Scale Up panel
- *Load Motor*: adjust speed and diameter to load the motor
- *Impeller Speed*: adjusts speed only to load the motor
- *Impeller Speed (Standard):* sets the highest standard RPM that does not overload the motor
- *Resize Impellers*: adjusts impeller diameters to load motor
- *All PBT System*: designs system with Pitched Blade Turbines
- *All Hydrofoil System*: designs system with Hydrofoils
- *Gas Dispersion System*: designs system with lower disk turbine, upper hydrofoils

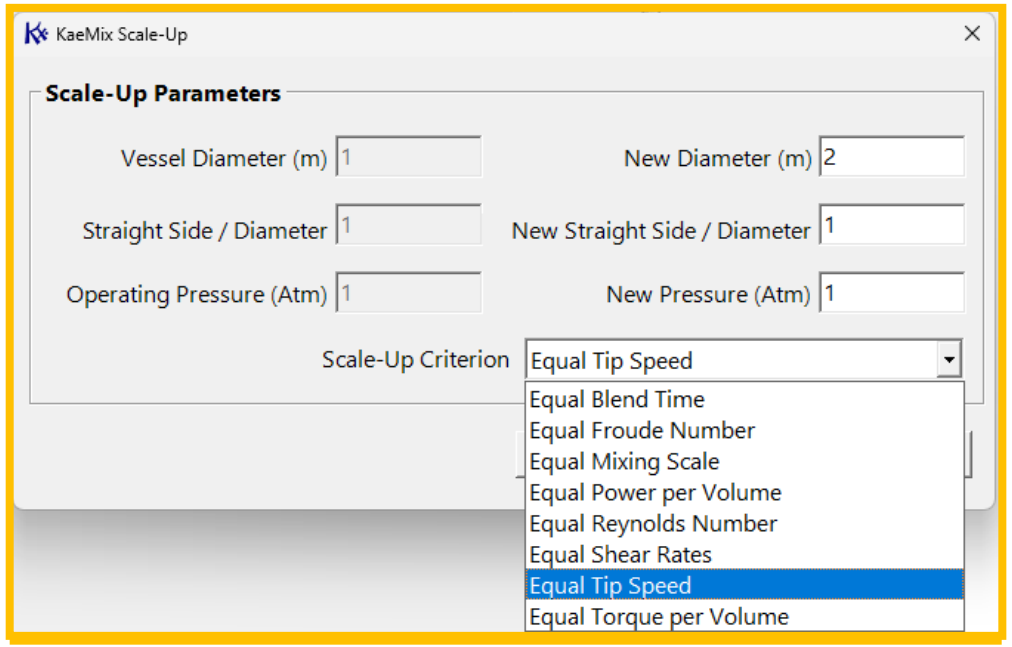


Tip: use these impeller system options to initialize your impeller design before refining it on the Impellers page

Scale-Up

- *Tools → Scale-Up*
- You can scale up or down
- You can change the aspect ratio of the vessel by modifying the ratio between Straight Side and Vessel Diameter
- Available Scale Up criteria:
  - Equal Blend Time
  - Equal Froude Number
  - Equal Mixing Scale (M-Scale)
  - Equal Power per Volume
  - Equal Reynolds Number
  - Equal Shear Rates
  - Equal Tip Speed
  - Equal Torque per Volume
- Clicking Scale-Up adds a new design

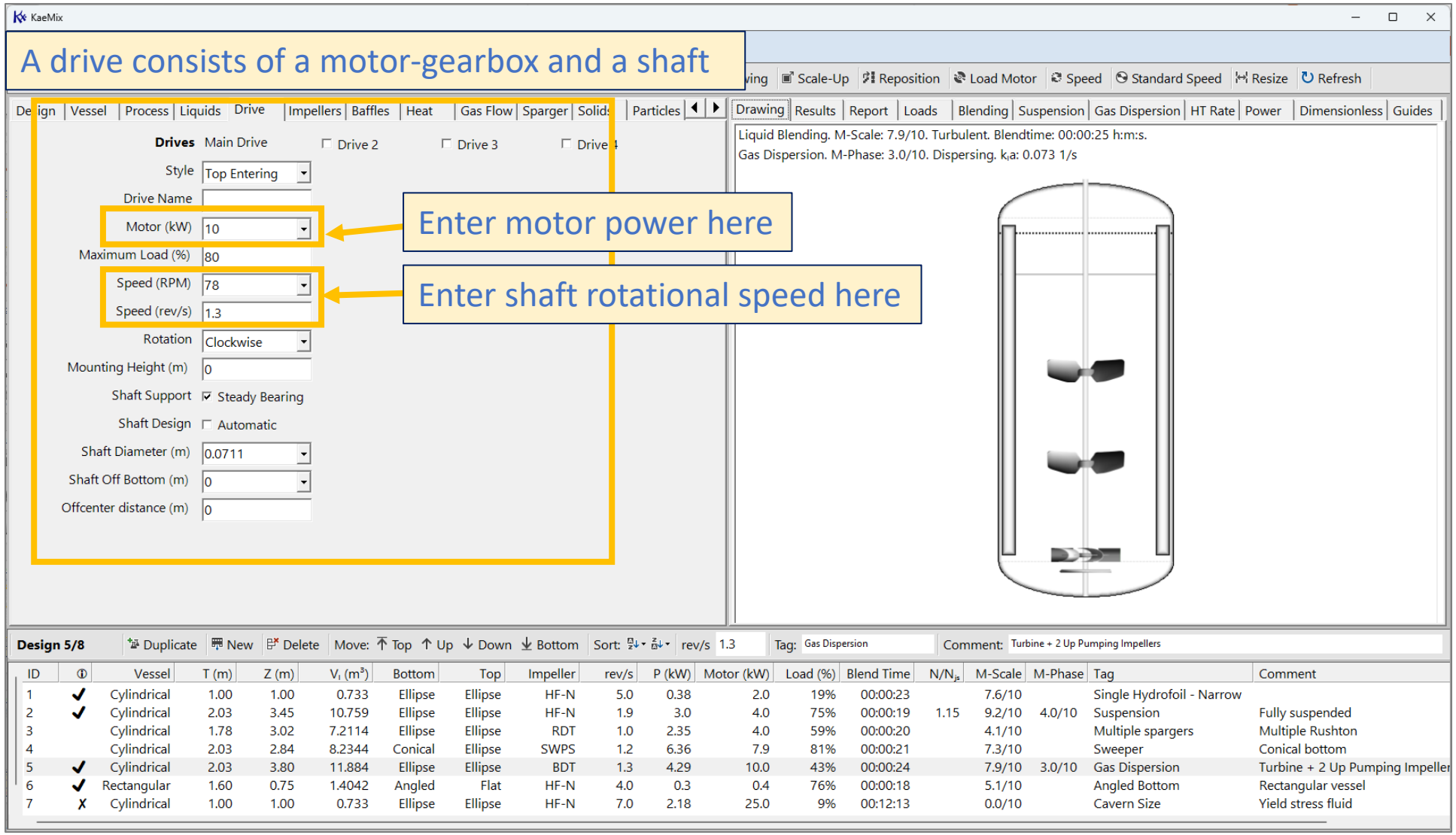




KaeMix

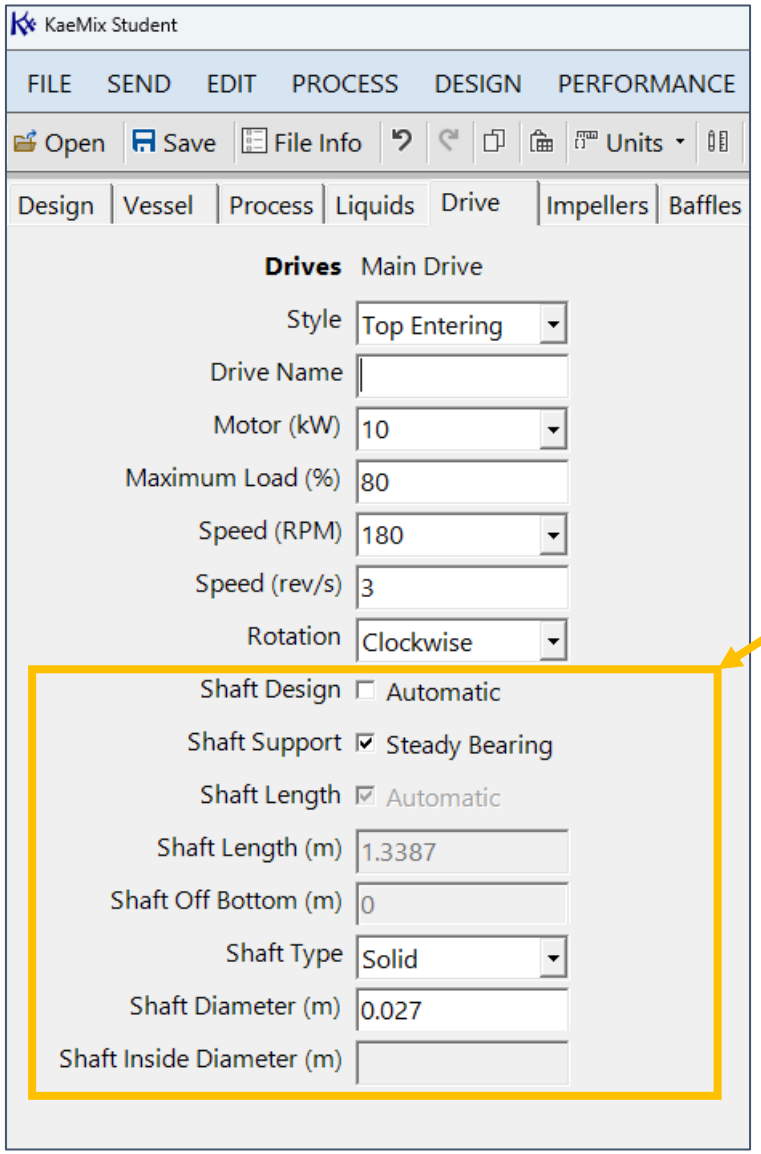
Drives and Shafts

Drives



ID	✓	Vessel	T (m)	Z (m)	V_l (m^3)	Bottom	Top	Impeller	rev/s	P (kW)	Motor (kW)	Load (%)	Blend Time	N/N_{js}	M-Scale	M-Phase	Tag	Comment
1	✓	Cylindrical	1.00	1.00	0.733	Ellipse	Ellipse	HF-N	5.0	0.38	2.0	19%	00:00:23		7.6/10		Single Hydrofoil - Narrow	
2	✓	Cylindrical	2.03	3.45	10.759	Ellipse	Ellipse	HF-N	1.9	3.0	4.0	75%	00:00:19	1.15	9.2/10	4.0/10	Suspension	Fully suspended
3		Cylindrical	1.78	3.02	7.2114	Ellipse	Ellipse	RDT	1.0	2.35	4.0	59%	00:00:20		4.1/10		Multiple spargers	Multiple Rushton
4		Cylindrical	2.03	2.84	8.2344	Conical	Ellipse	SWPS	1.2	6.36	7.9	81%	00:00:21		7.3/10		Sweeper	Conical bottom
5	✓	Cylindrical	2.03	3.80	11.884	Ellipse	Ellipse	BDT	1.3	4.29	10.0	43%	00:00:24		7.9/10	3.0/10	Gas Dispersion	Turbine + 2 Up Pumping Impeller
6	✓	Rectangular	1.60	0.75	1.4042	Angled	Flat	HF-N	4.0	0.3	0.4	76%	00:00:18		5.1/10		Angled Bottom	Rectangular vessel
7	✗	Cylindrical	1.00	1.00	0.733	Ellipse	Ellipse	HF-N	7.0	2.18	25.0	9%	00:12:13		0.0/10		Cavern Size	Yield stress fluid

Drives – Shaft Design



Shaft Design can be set to Automatic or the shaft can be specified by the user.

Shafts can be solid or hollow.

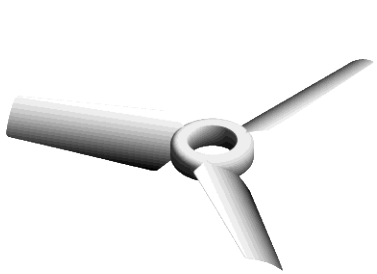
Shaft Length is calculated as follows:

Length = Top Head Depth
+ Vessel Straight Side
+ Bottom Depth
- Shaft Off Bottom

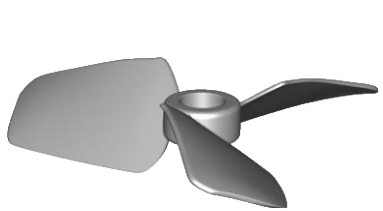
KaeMix

Impellers

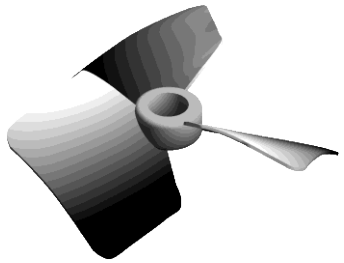
Available Impellers



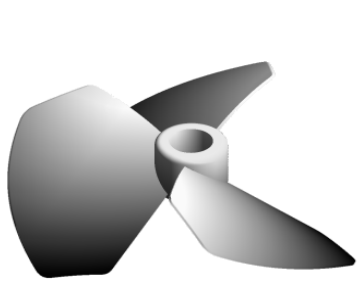
Hydrofoil Narrow



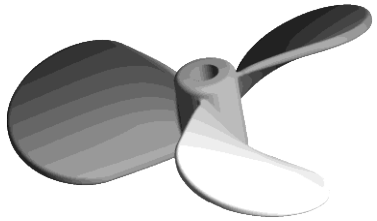
Hydrofoil Medium



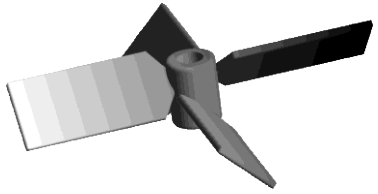
Hydrofoil Wide



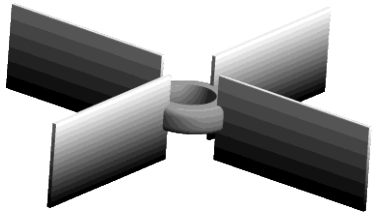
HF Extra Wide



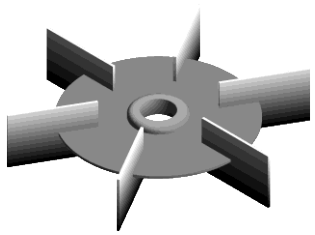
Propeller



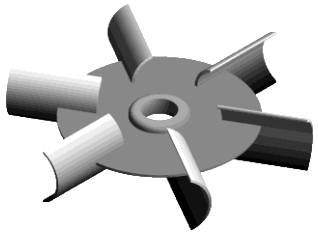
Pitched Blade



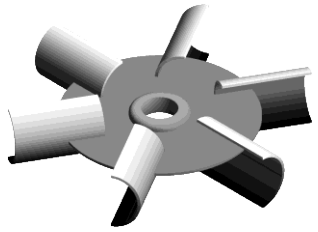
Straight Blade



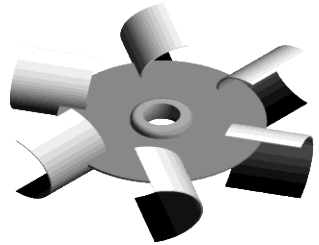
Rushton Turbine



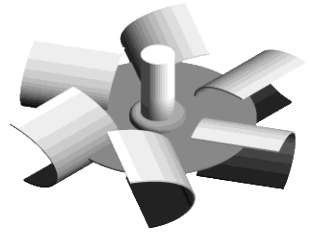
Van‘t Riet Turbine



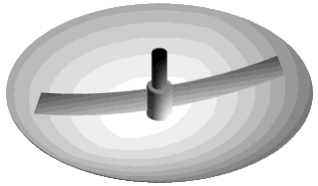
Smith Turbine



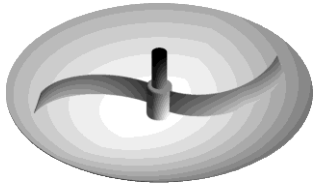
Middleton Turbine



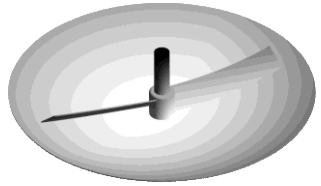
Bakker Turbine



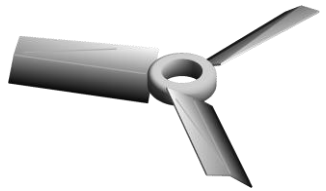
Sweeper Straight



Sweeper Curved



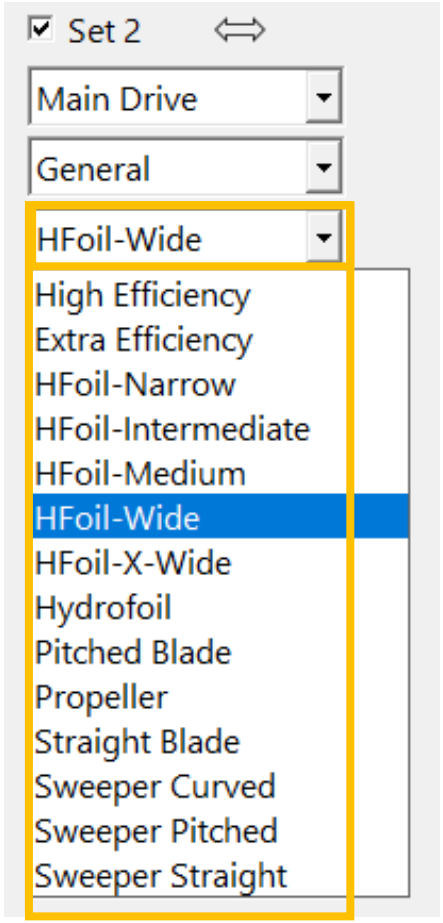
Sweeper Angled



High-Efficiency

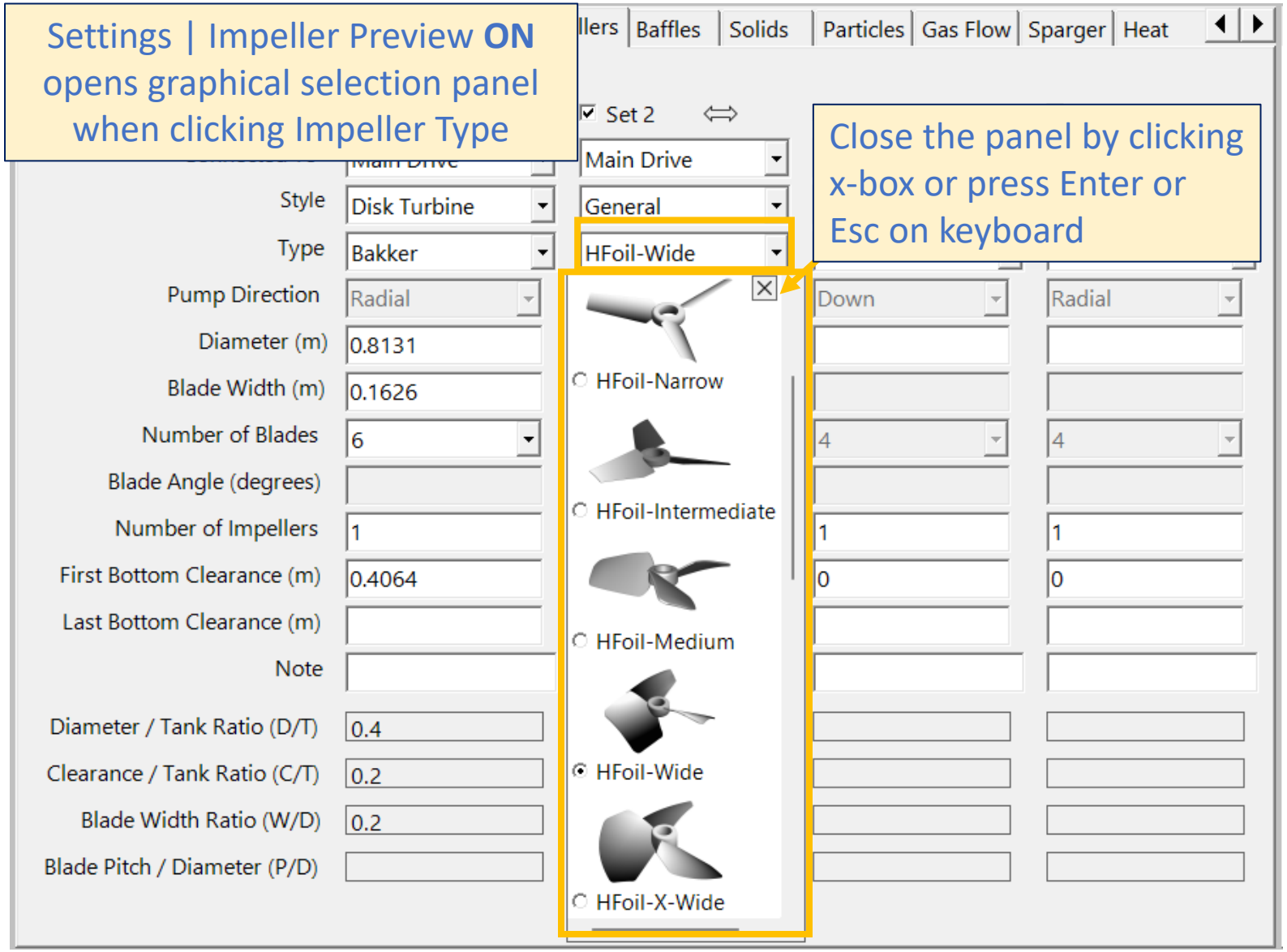
Select Impeller Type

Settings | Impeller Preview **OFF**
Standard dropdown when clicking Impeller Type

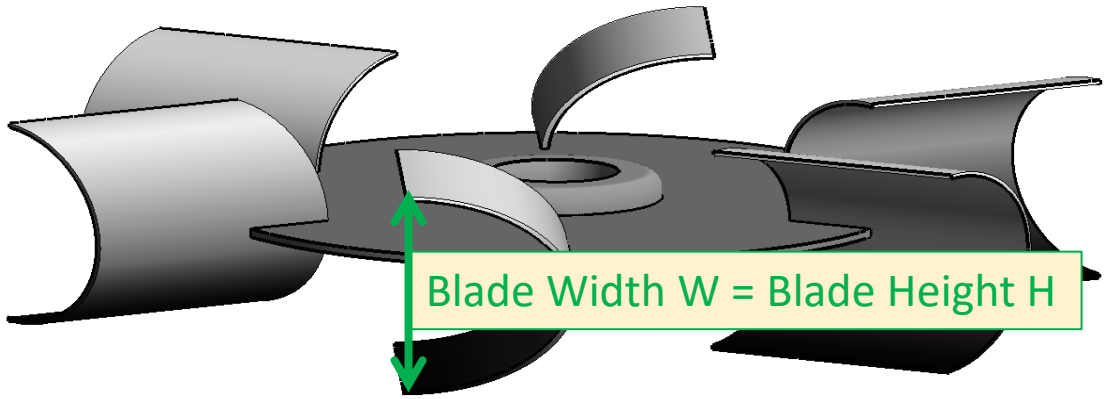


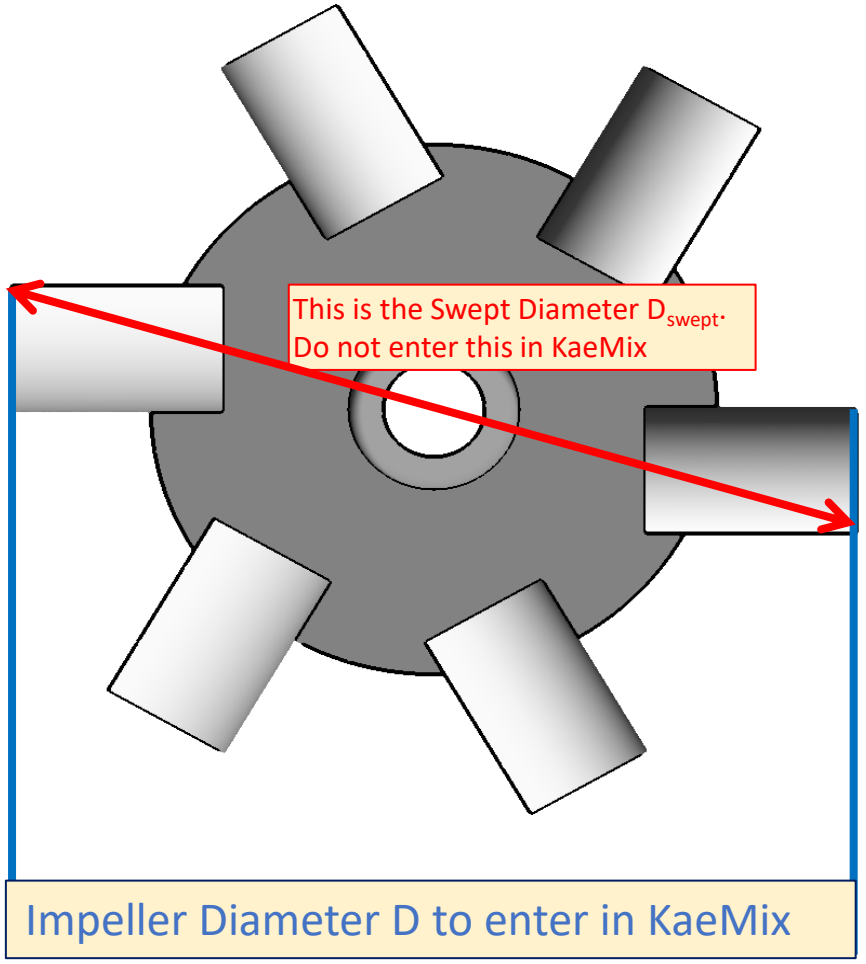
Settings | Impeller Preview **ON**
opens graphical selection panel when clicking Impeller Type

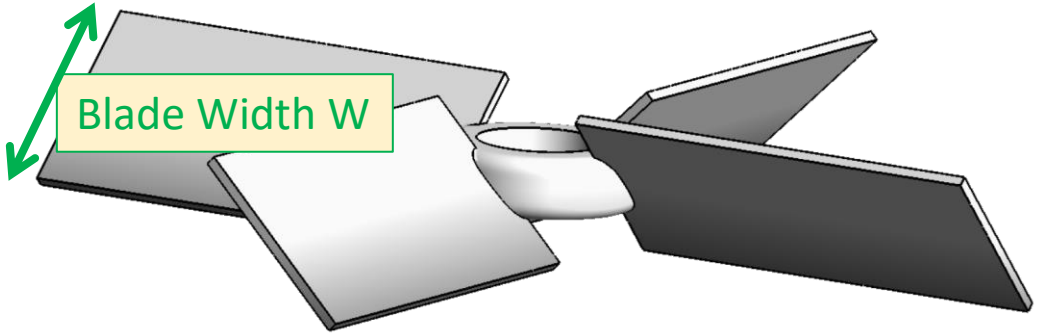
Close the panel by clicking x-box or press Enter or Esc on keyboard

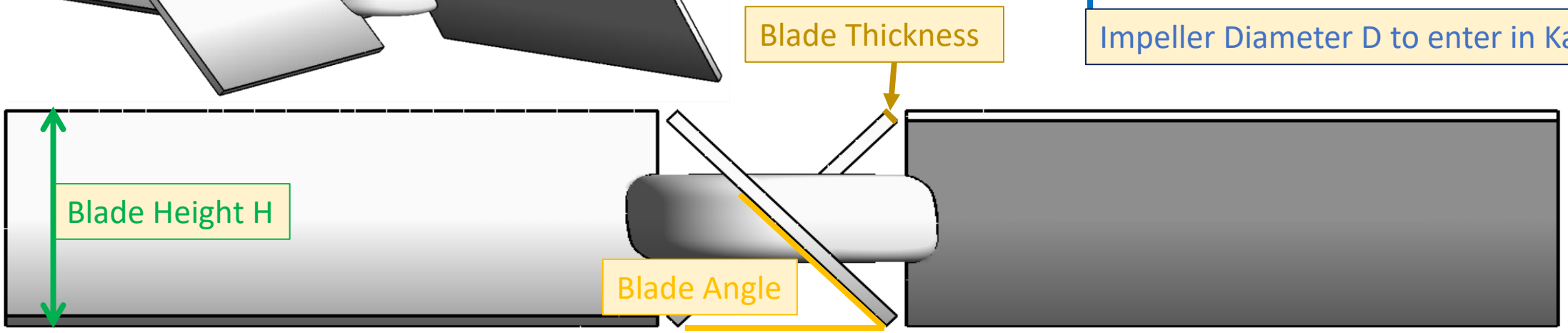


Impeller Dimensions

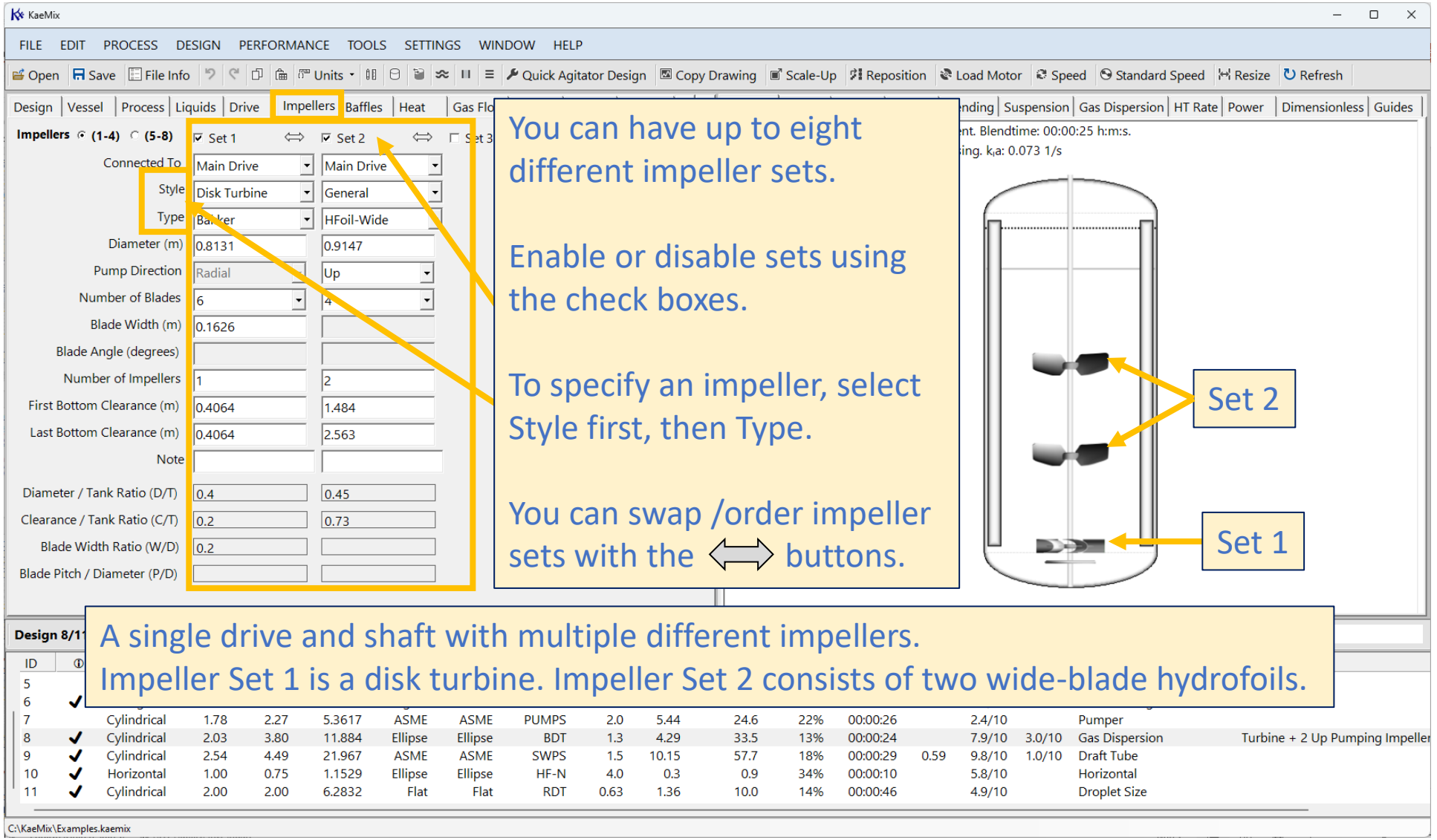




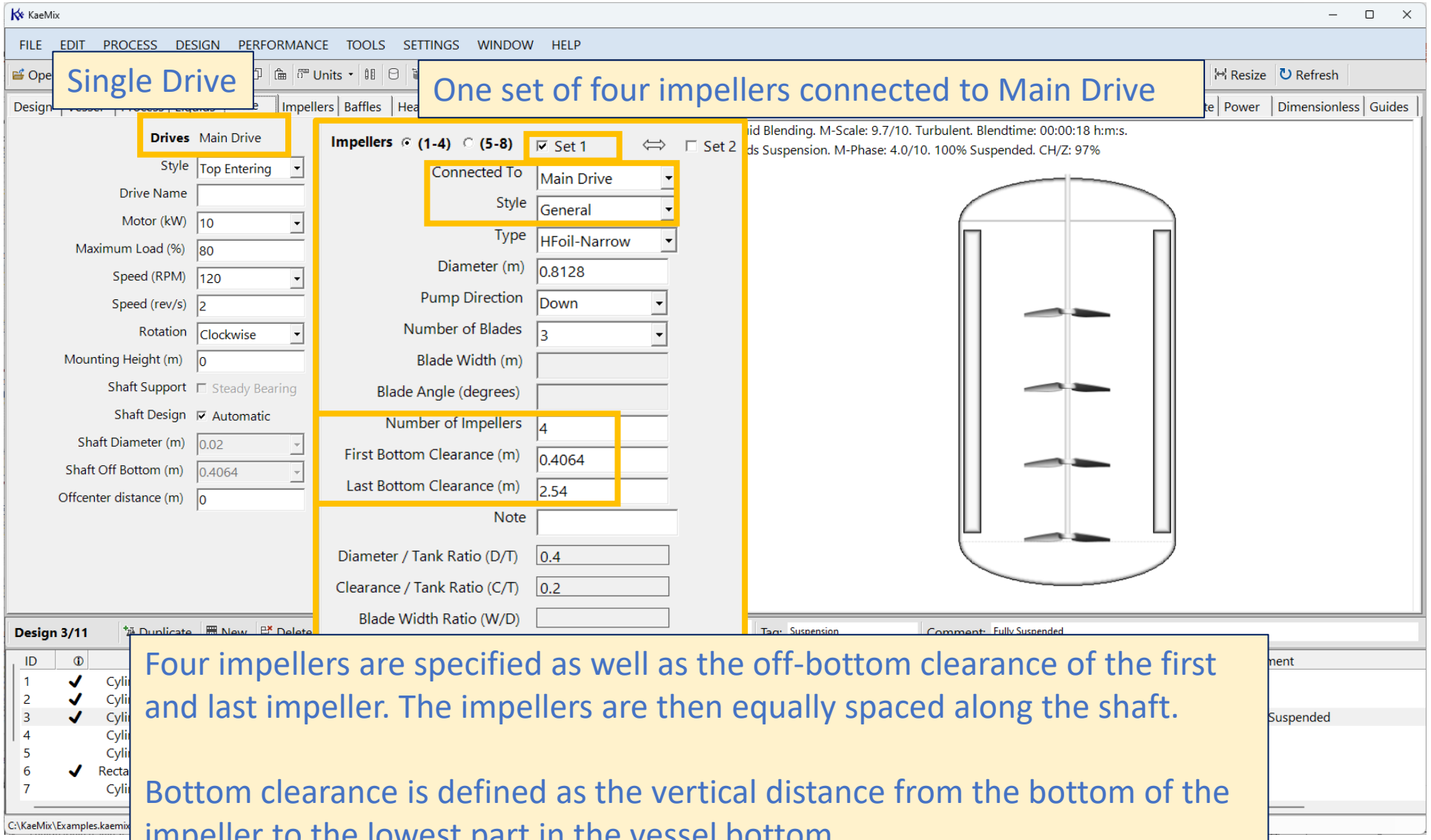




Multiple Impellers of Different Type



Multiple Impellers of Same Type



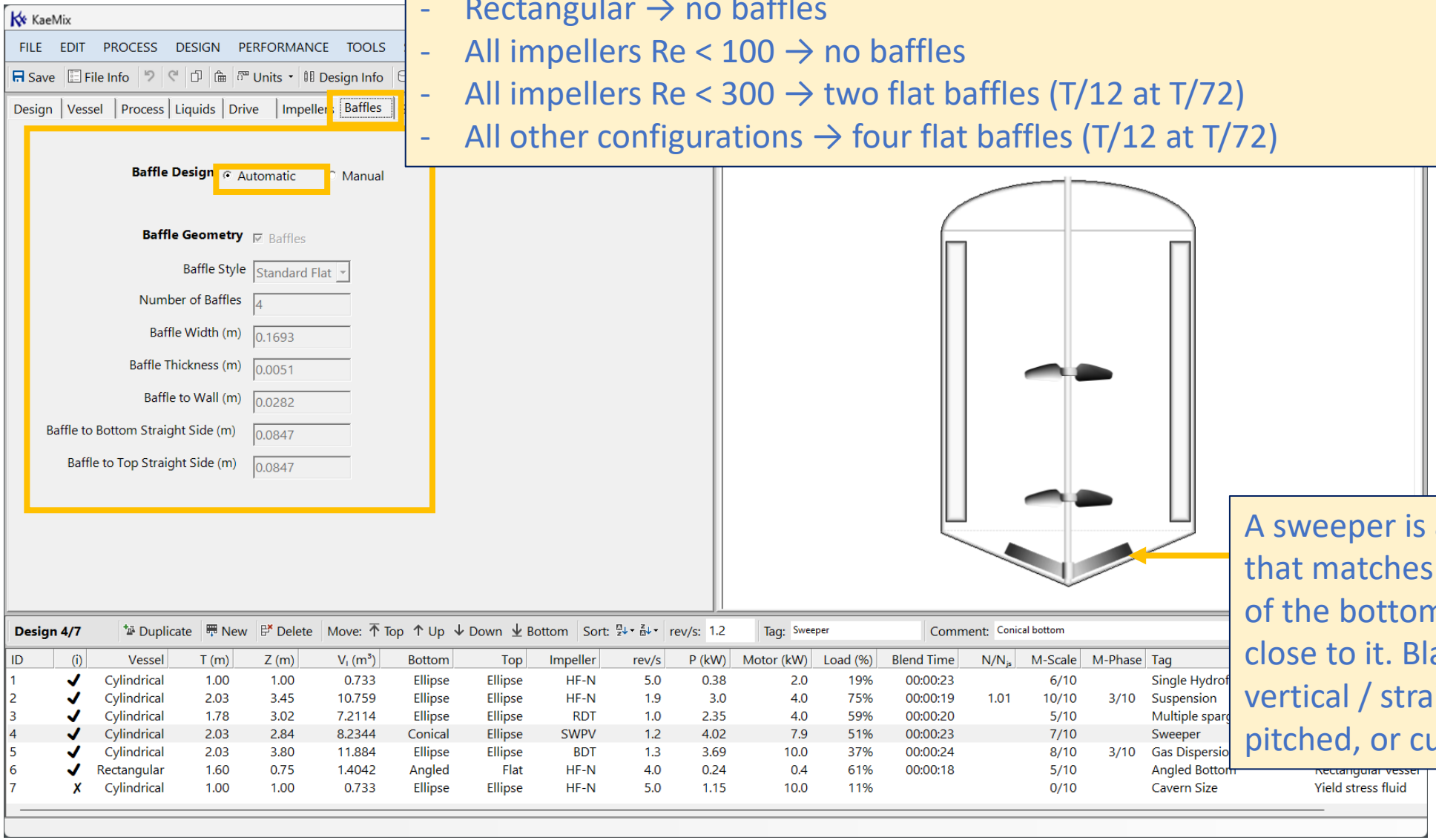
KaeMix

Baffles

Baffle Design

In the Baffles tab you can choose Automatic design or Manual design. Here Automatic is selected, and this follows these rules in this order:

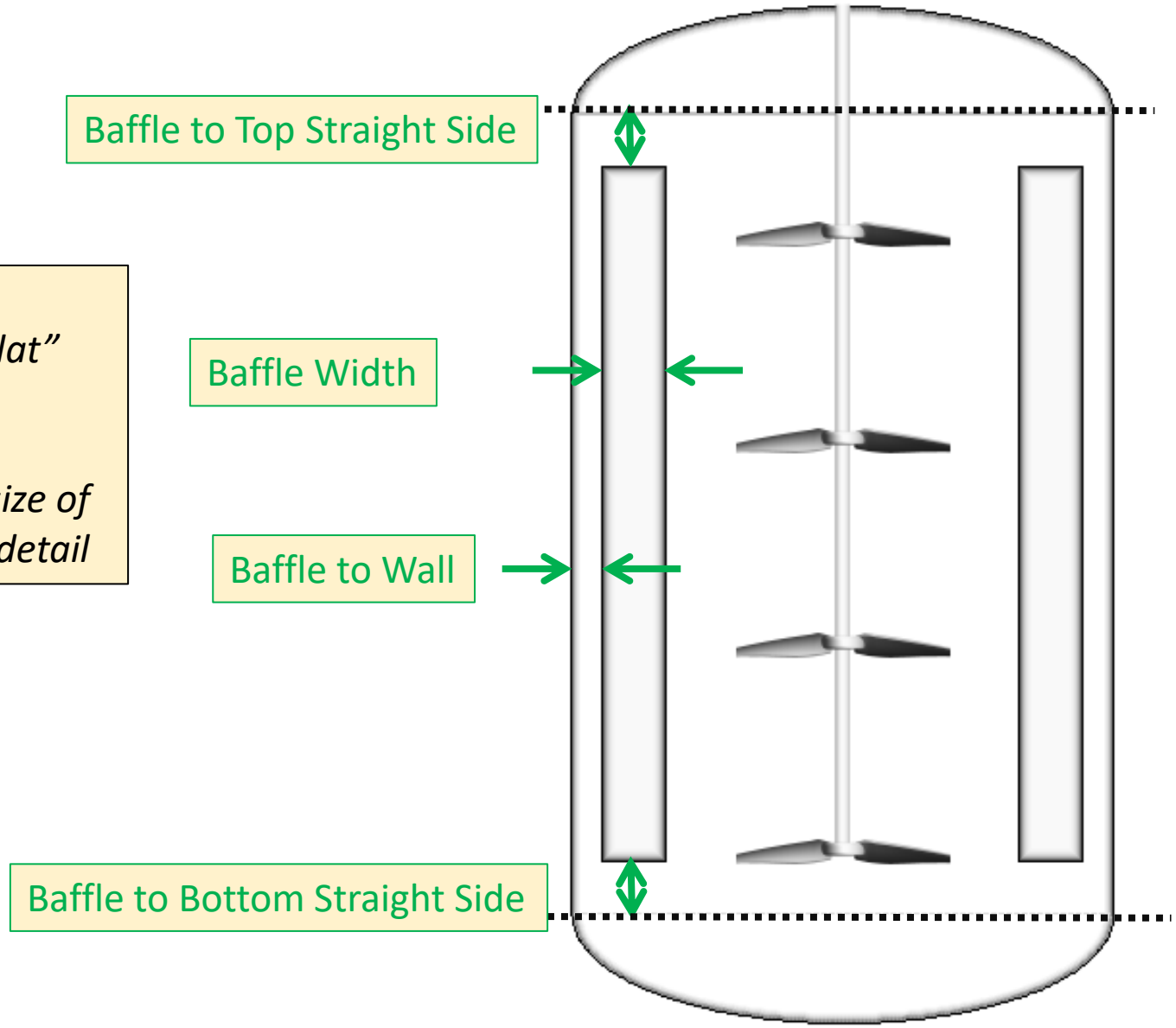
- Rectangular → no baffles
- All impellers Re < 100 → no baffles
- All impellers Re < 300 → two flat baffles (T/12 at T/72)
- All other configurations → four flat baffles (T/12 at T/72)



A sweeper is an impeller that matches the shape of the bottom and is close to it. Blades can be vertical / straight, pitched, or curved.

Baffle Design – Manual

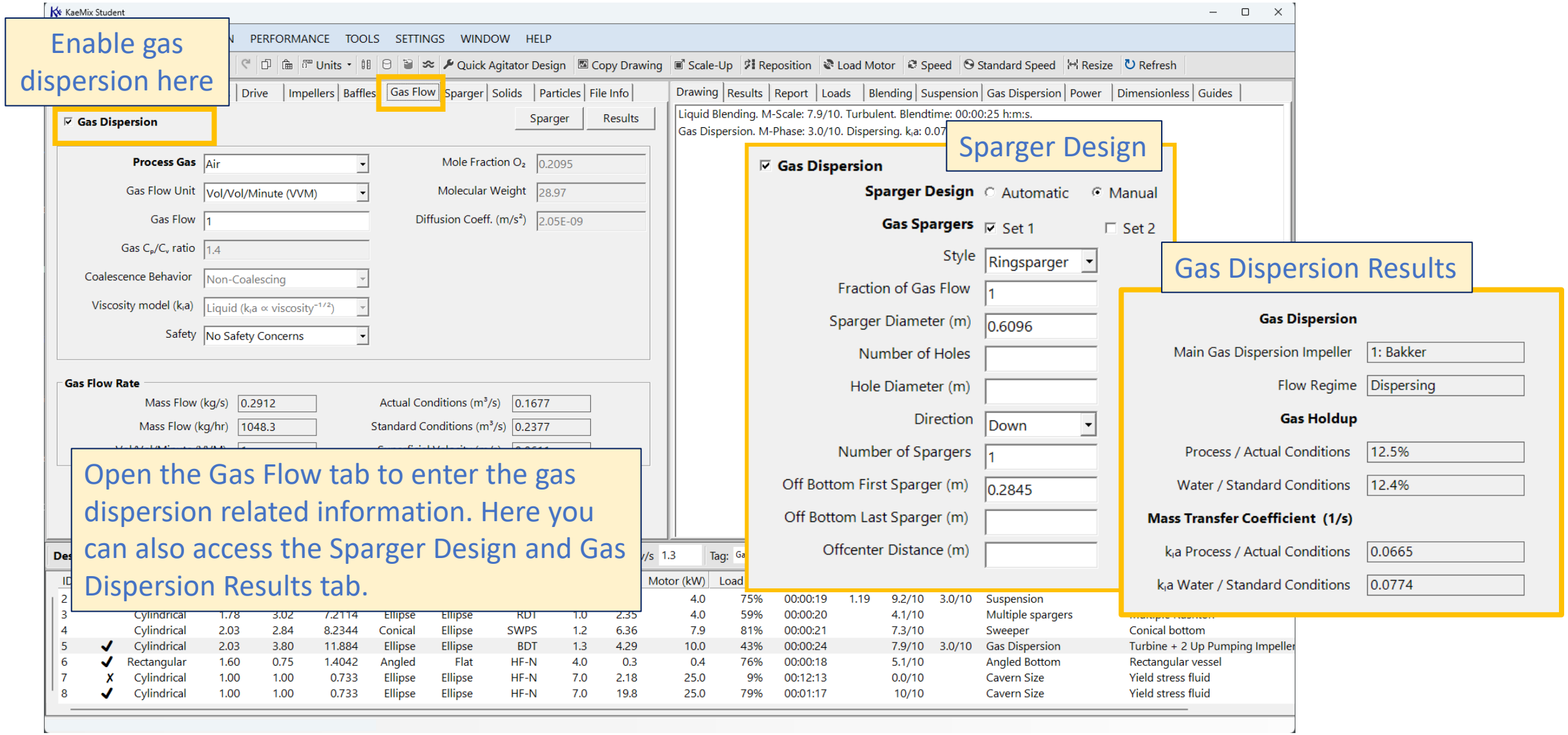
Baffle type "Standard – Flat" allows you to prescribe the location and size of the baffles in detail



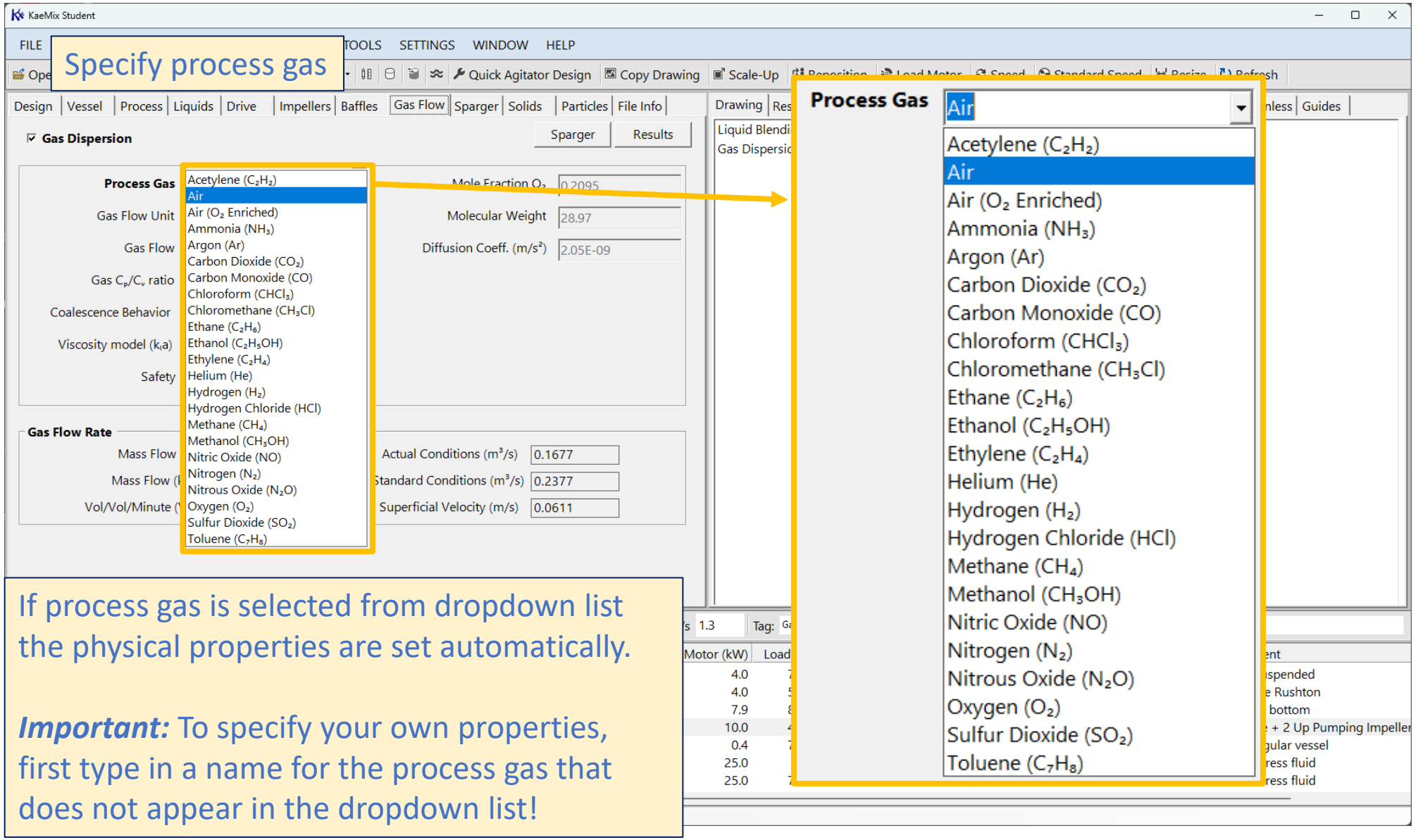
KaeMix

Gas Dispersion

Gas Dispersion



Gas Dispersion – Process Gas



If process gas is selected from dropdown list the physical properties are set automatically.

Important: To specify your own properties, first type in a name for the process gas that does not appear in the dropdown list!

Gas Dispersion – Flow Rate (1/2)

Specify gas flow

To enter the gas flow rate, first select the Gas Flow Unit, then enter the Gas Flow in that unit

Specify bubble coalescence behavior. If unsure, select *coalescing*.

For viscosity model select *Liquid*, *Fermentation Broth*, or *Fine Suspension* as appropriate.

None is for situations where you specified the value of the diffusion coefficient that you want to be used without additional corrections.

Note: if both the process liquid and the process gas are selected from the dropdown lists then the viscosity model setting is disabled and KaeMix automatically selects the best model

Gas Dispersion - Flow Rate (2/2)

Gas Flow Rate

Mass Flow (kg/s)	0.2824	Actual Conditions (m^3/s)	0.1714
Mass Flow (kg/hr)	1016.7	Standard Conditions (m^3/s)	0.2305
Vol/Vol/Minute (VVM)	1	Superficial Velocity (m/s)	0.0611

VVM and superficial gas velocities are calculated based on average gas temperature and average pressure

Actual Conditions are defined as the temperature and the pressure at the bottom

VVM is gas volumetric flow rate / operating volume per minute

Standard Conditions mean the *International Standard Metric Conditions*: 15°C / 59°F at 1 Atm

Gas flow rates in USA units are shown if KaeMix is set to USA units

Here, CFM is Cubic Feet per Minute. Standard is 59°F at 1 Atm

Tip: it is best to enter gas flow as a *mass flow* rate because not everyone uses the same definitions for standard or actual conditions used in volumetric flow rate calculations

Gas Flow Rate

Mass Flow (lb/s)	0.6226	Actual CFM	363.25
Mass Flow (lb/hr)	2241.4	Standard CFM	488.41
Vol/Vol/Minute (VVM)	1	Superficial Velocity (ft/s)	0.2004

Gas Dispersion - Results

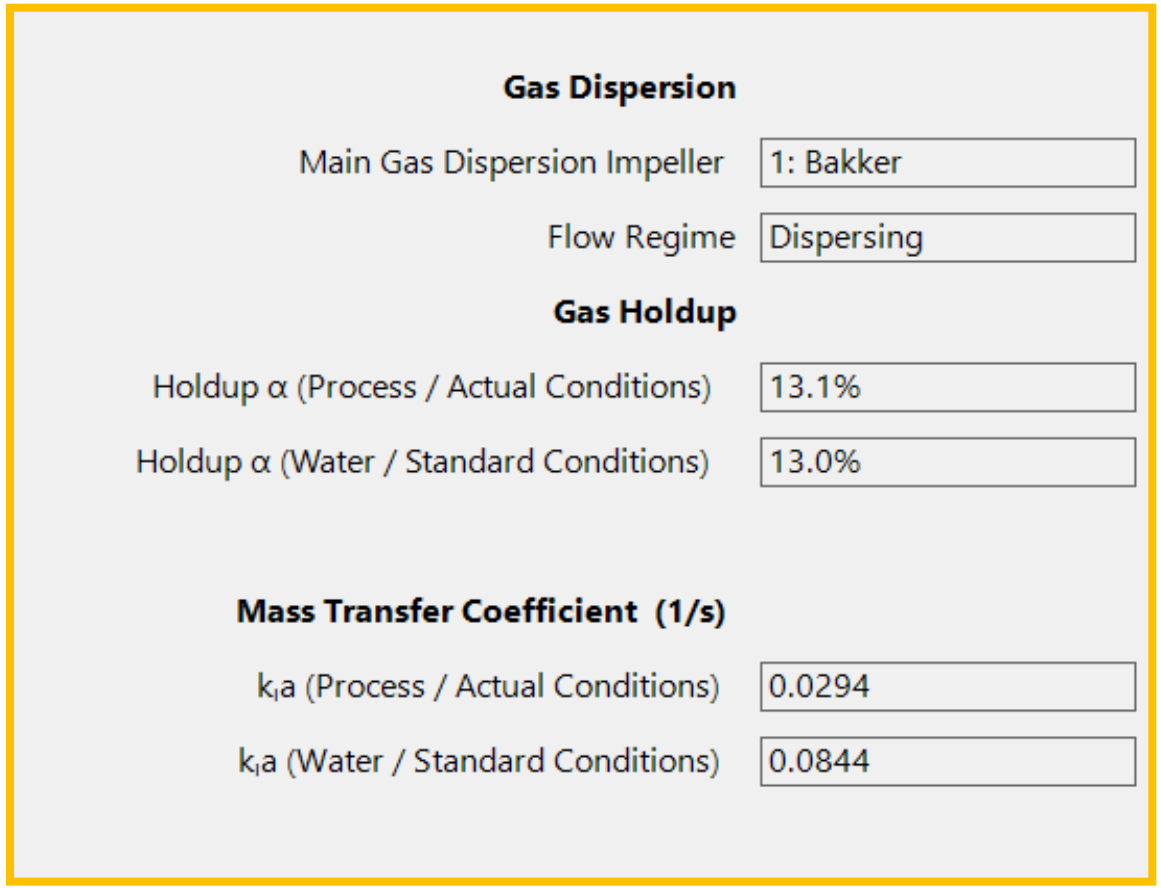
Main impeller: the lowest impeller that is directly gassed

Flow Regime: *Flooded* means the gas rises through the impeller system without being driven to the wall. *Coarse Dispersion* means gas is driven direction vessel wall but may not completely reach it and there is no recirculation. *Dispersing* means that gas is driven to the vessel wall and some smaller bubbles may recirculate. *Complete dispersion* means that gas is also driven down at the vessel wall and part of the gas recirculates through the impeller system

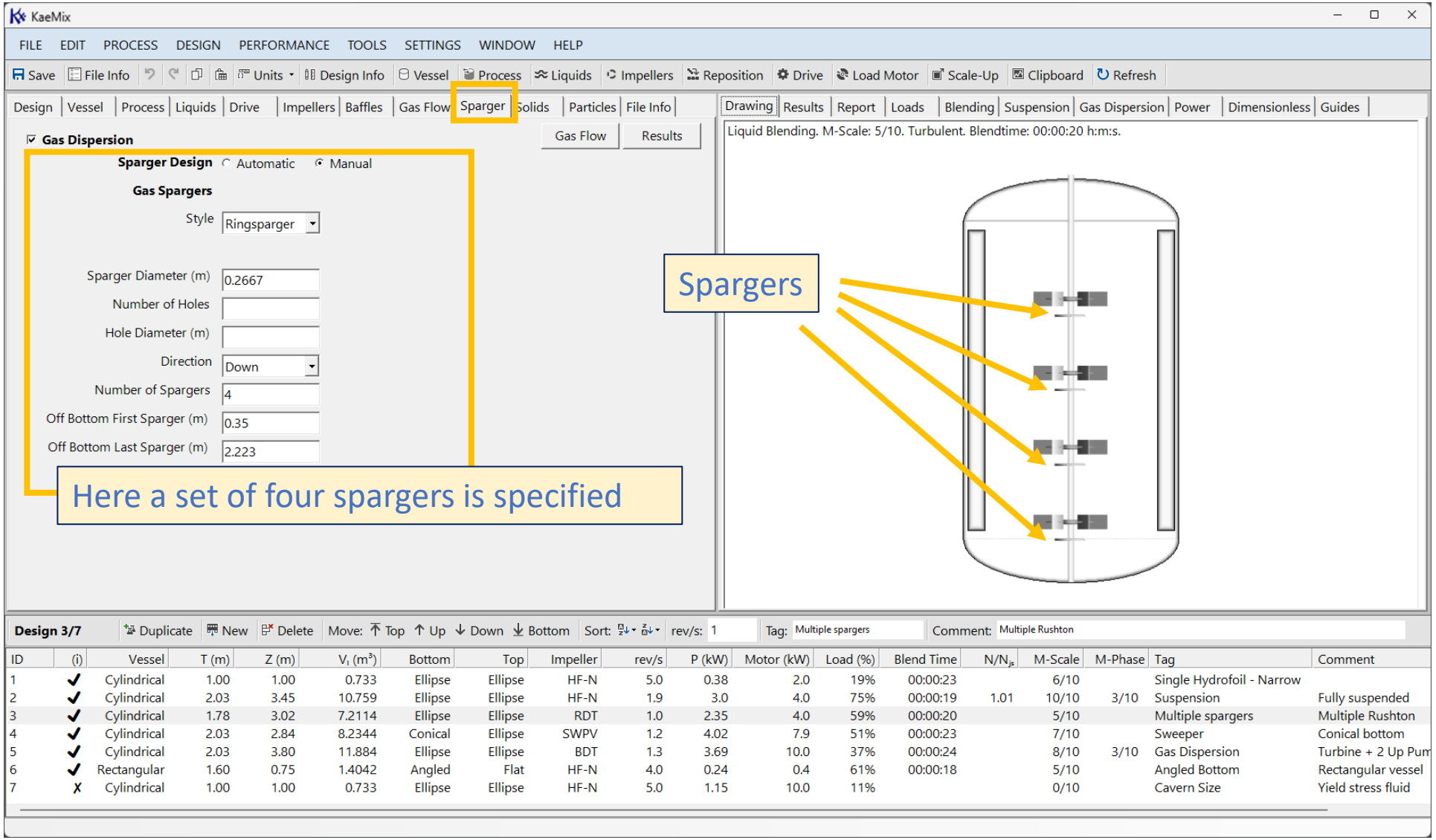
Gas holdup and mass transfer coefficient $k_l a$ are shown for the process / actual conditions; for water / standard conditions (15°C/ 59°F and atmospheric pressure); and for the custom correlations

The following is not included in holdup and $k_l a$ calculations:
- Power input by impellers below the lowest sparger
- Gas input from spargers above the highest impeller
- Impellers and spargers located above the user specified operating level (which is ungassed)

Dip tube spargers work less well than other spargers and a reduced efficiency is assigned to them



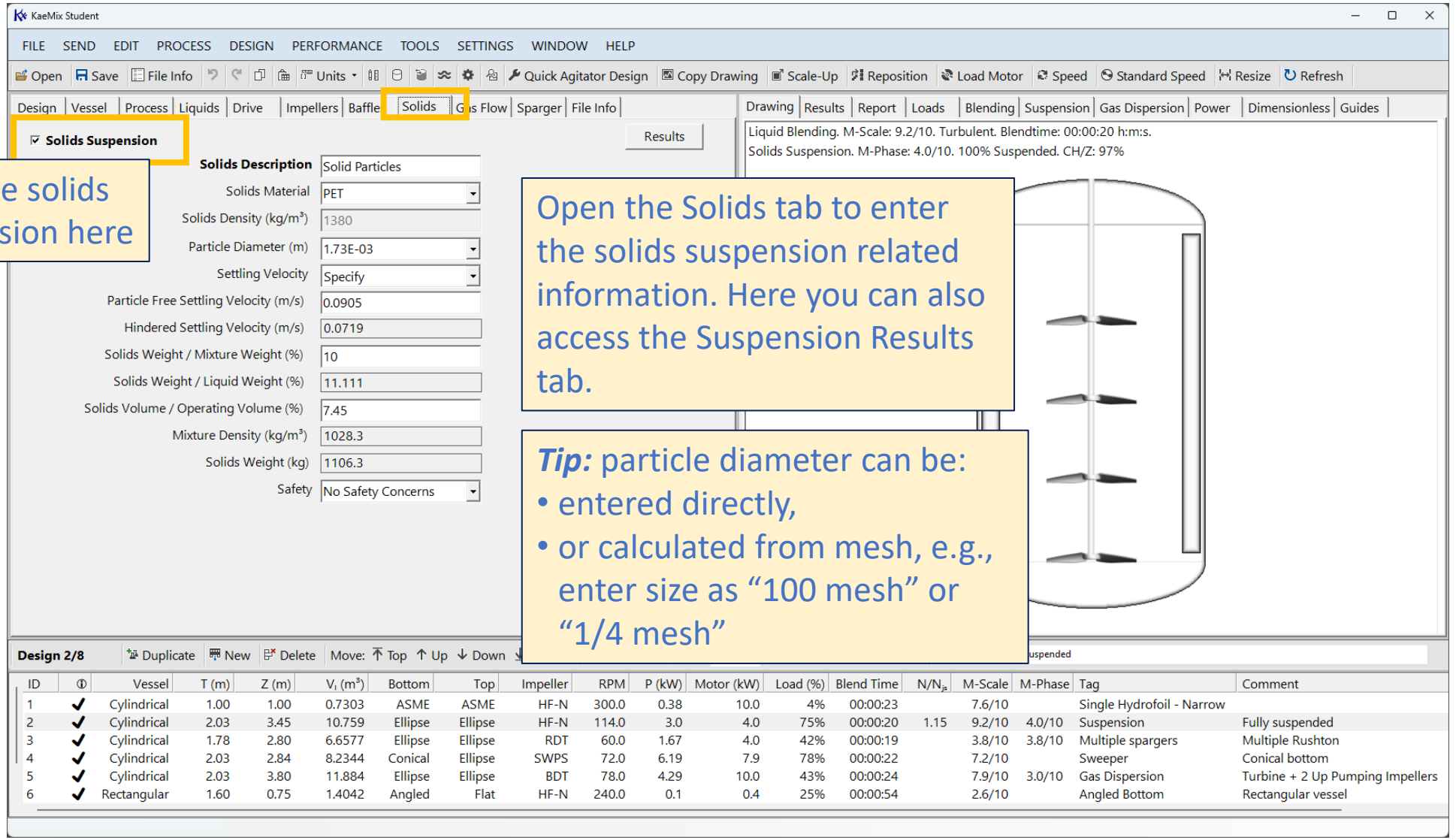
Sparger Design



KaeMix

Solids Suspension

Solids Suspension



Enable solids suspension here

Open the Solids tab to enter the solids suspension related information. Here you can also access the Suspension Results tab.

Tip: particle diameter can be:

- entered directly,
- or calculated from mesh, e.g., enter size as “100 mesh” or “1/4 mesh”

Solids Suspension Results (1/3)

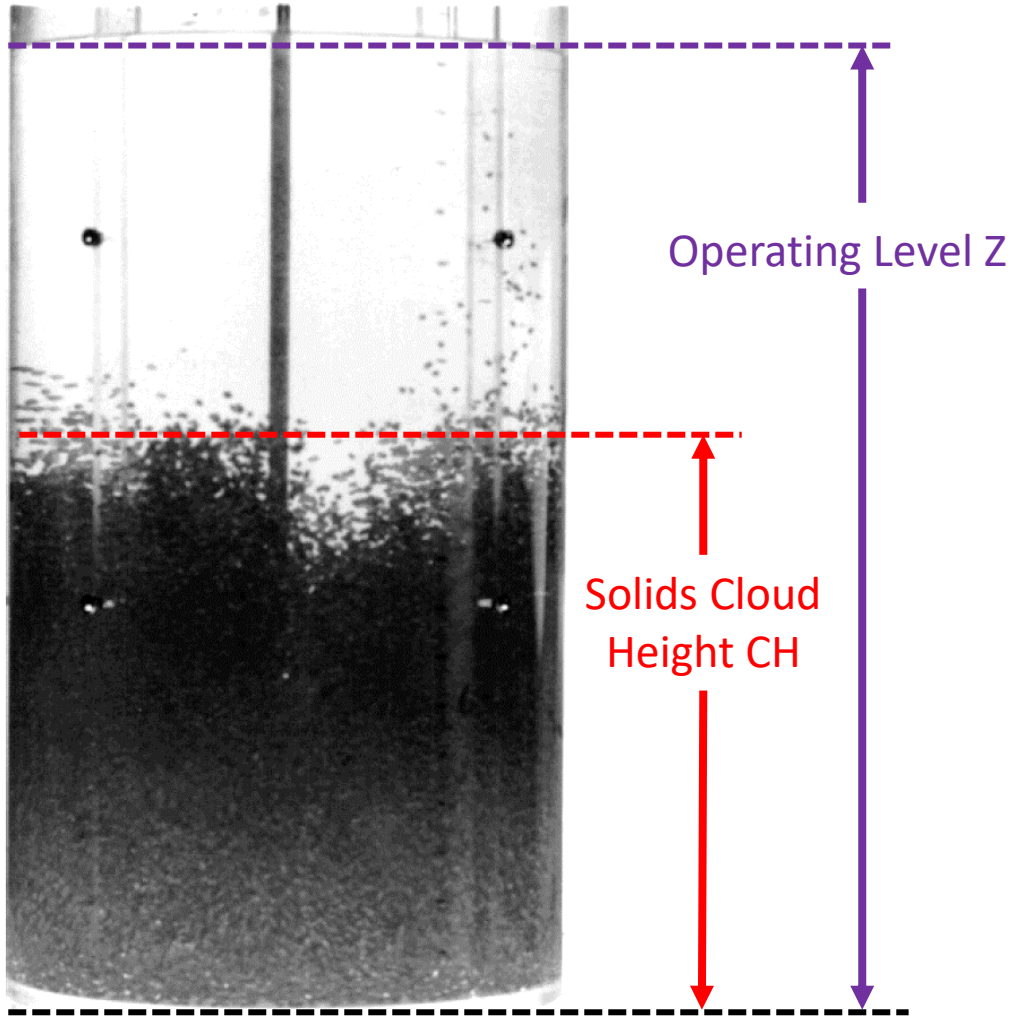
- N_{js} is the just-suspended speed
- Main impeller is name of impeller that contributes most to the off-bottom suspension process
- Three methods are used to calculate this:
  1. N_{js} GMB: Grenville-Mak-Brown (2015). Down pumping axial flow impellers. Scaleup exponent is -0.67
  2. N_{js} CFM: Corpstein-Fasano-Myers (1994). Both down and up pumping axial flow impellers. Scaleup exponent depends on particle properties.
  3. N_{js} Zwietering: Zwietering (1958). Radial and axial flow impellers. Scaleup exponent is -0.85.
- N_{js} is reported as the average of these calculations
- The percentage of unsuspended (settled on the bottom) solids, the percentage of suspended solids, and the Cloud Height / Z (operating level) ratio are reported also for conditions where these can be calculated

Solids Suspension Results

	Ungassed
Main Suspension Impeller	1: HFoil-Narrow
N_{js} (RPM)	**99.1**
N_{js} (rev/s)	1.65
N/N_{js}	1.21
N (RPM)	120
N (rev/s)	2.00
P_{js} (kW)	1.9708
Unsuspended	0%
Suspended	100%
Cloud Height / Z	97%

Solids Suspension Results (2/3)

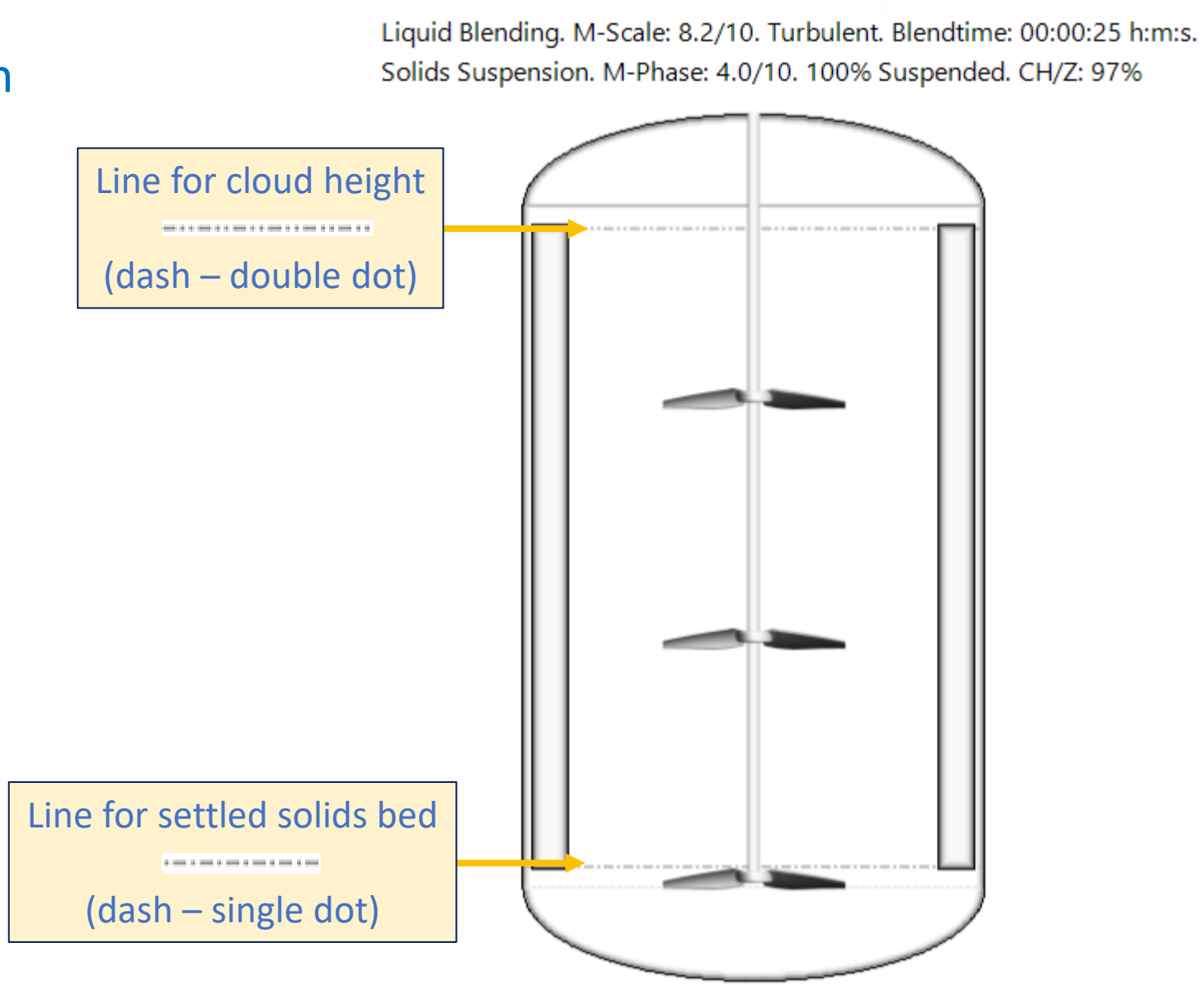
- The Cloud Height / Z (operating level) ratio is reported also for conditions where this can be calculated
- A cloud height CH/Z of 100% means that the solids cloud reaches the liquid surface
  - Note that this does not mean that the solids are 100% uniformly distributed throughout the liquid: there may still be concentration gradients
- Cloud height calculations are based on Hicks M.T., Myers K.J., Bakker A. (1997) *Cloud Height in Solids Suspension Agitation*, Chem. Eng. Comm., Vol. 160, pp 137-155.



In this experiment, cloud height CH / Z ≈ 60%

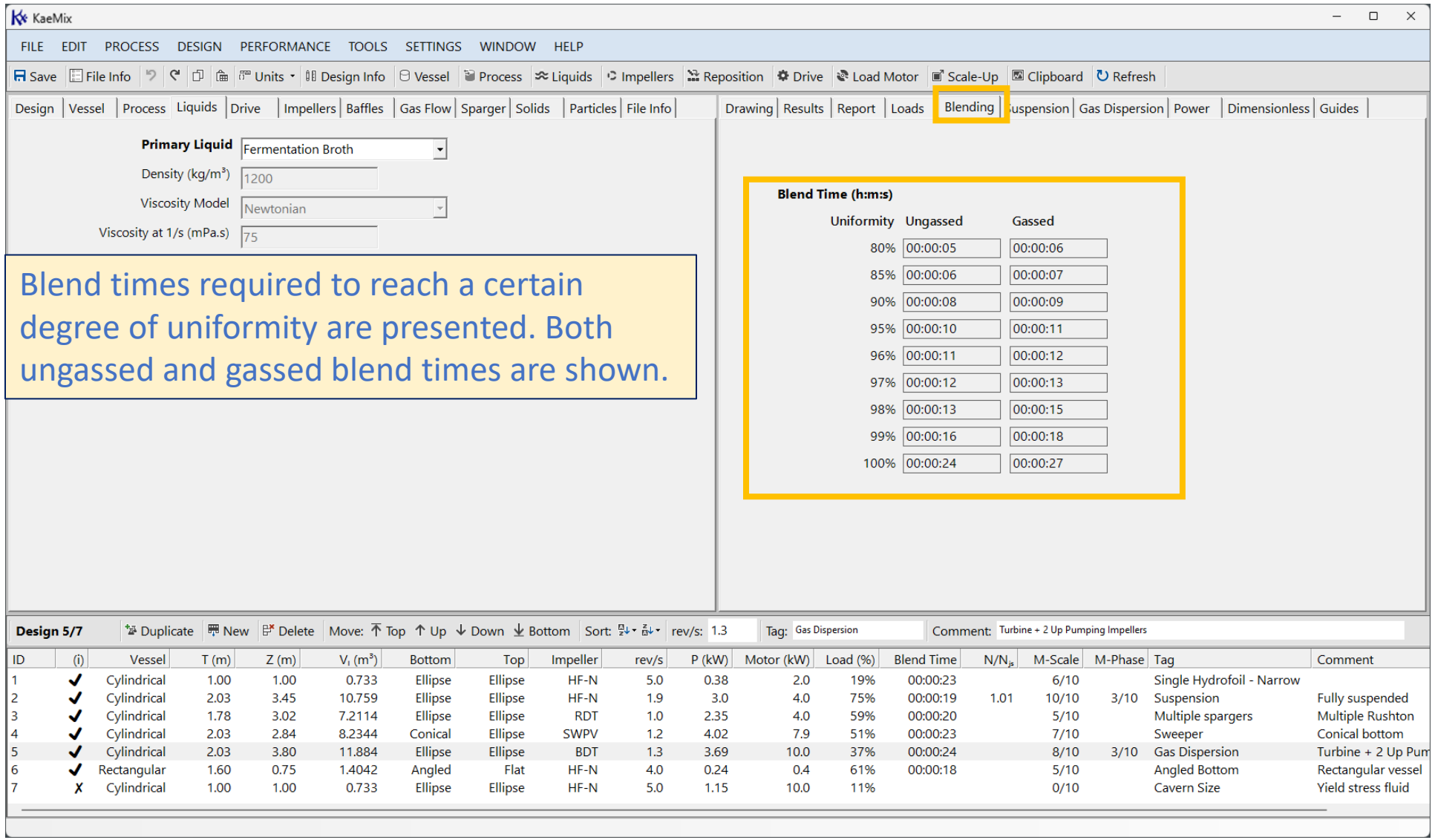
Solids Suspension Results (3/3)

- If Settings | Draw Solids Levels is On then KaeMix will draw lines at the predicted cloud height and at the height of the solids bed if all solids were settled
- Limitations: only for cylindrical and rectangular vessels for which solids suspension calculations can be performed. Solids bed level only drawn if it is greater than the bottom depth. Cloud height only drawn if able to be calculated. If CH/Z = 100% then operating level and cloud height are the same and the line for cloud height is not visible

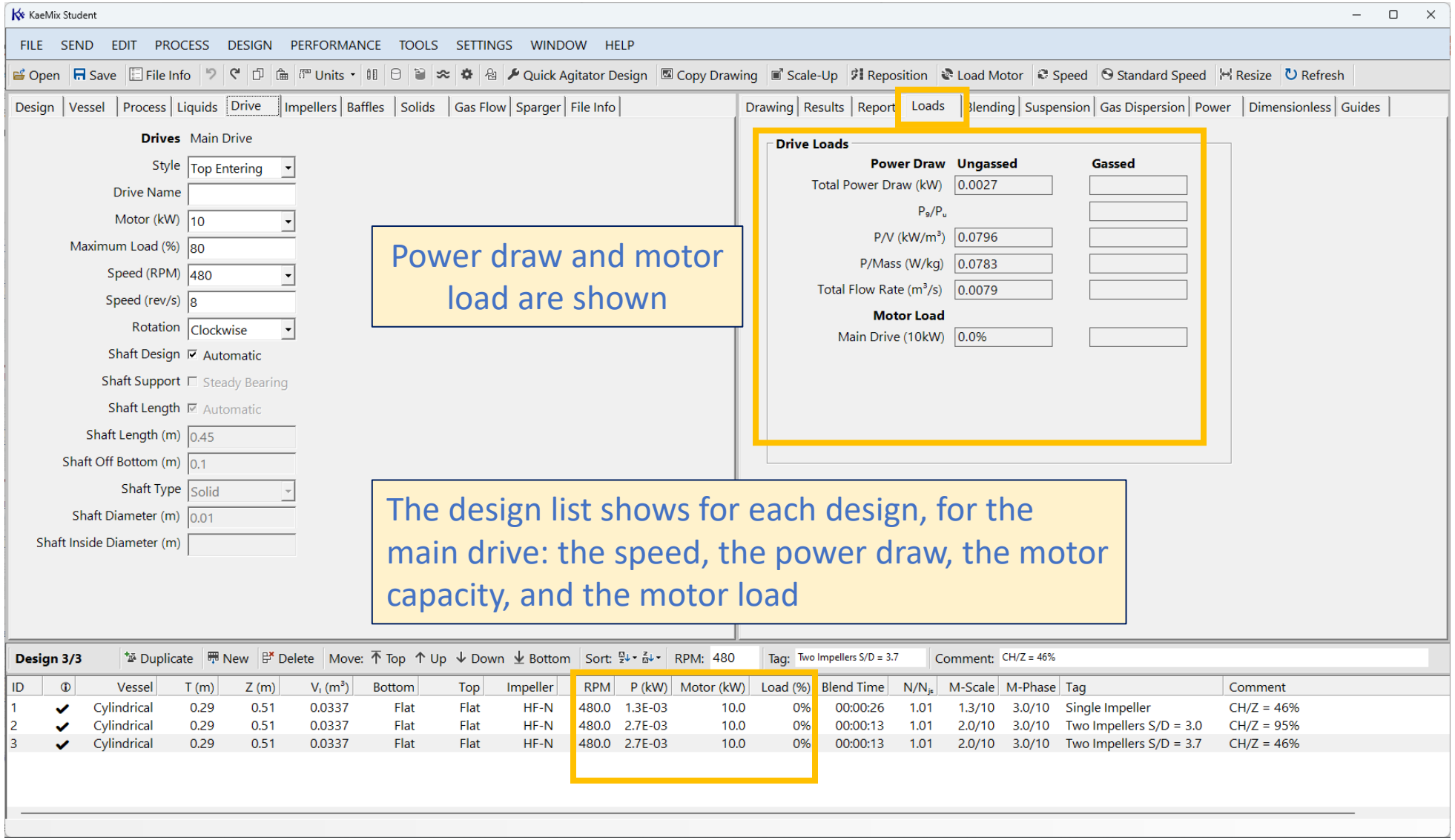


Results

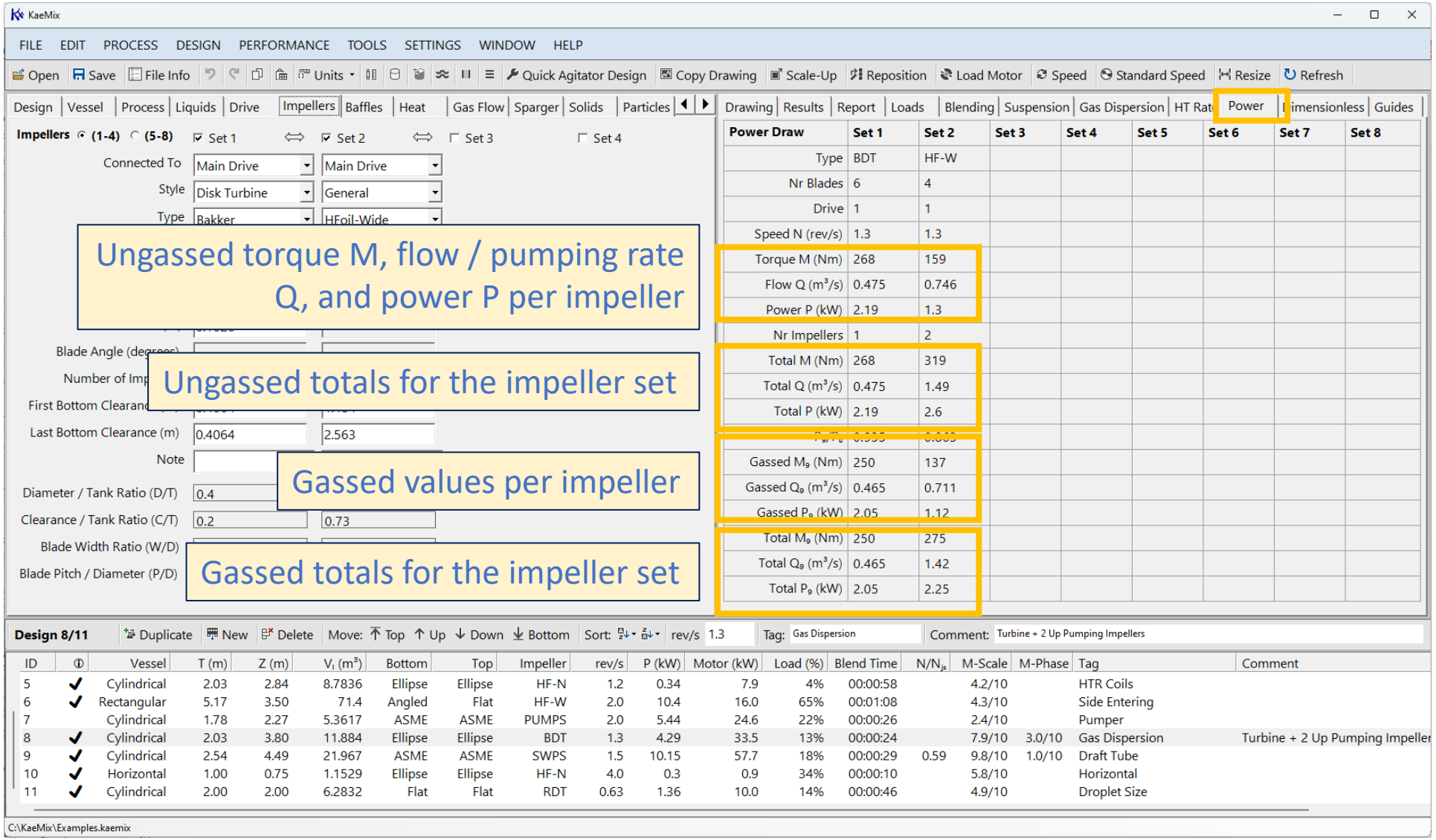
Blend Time



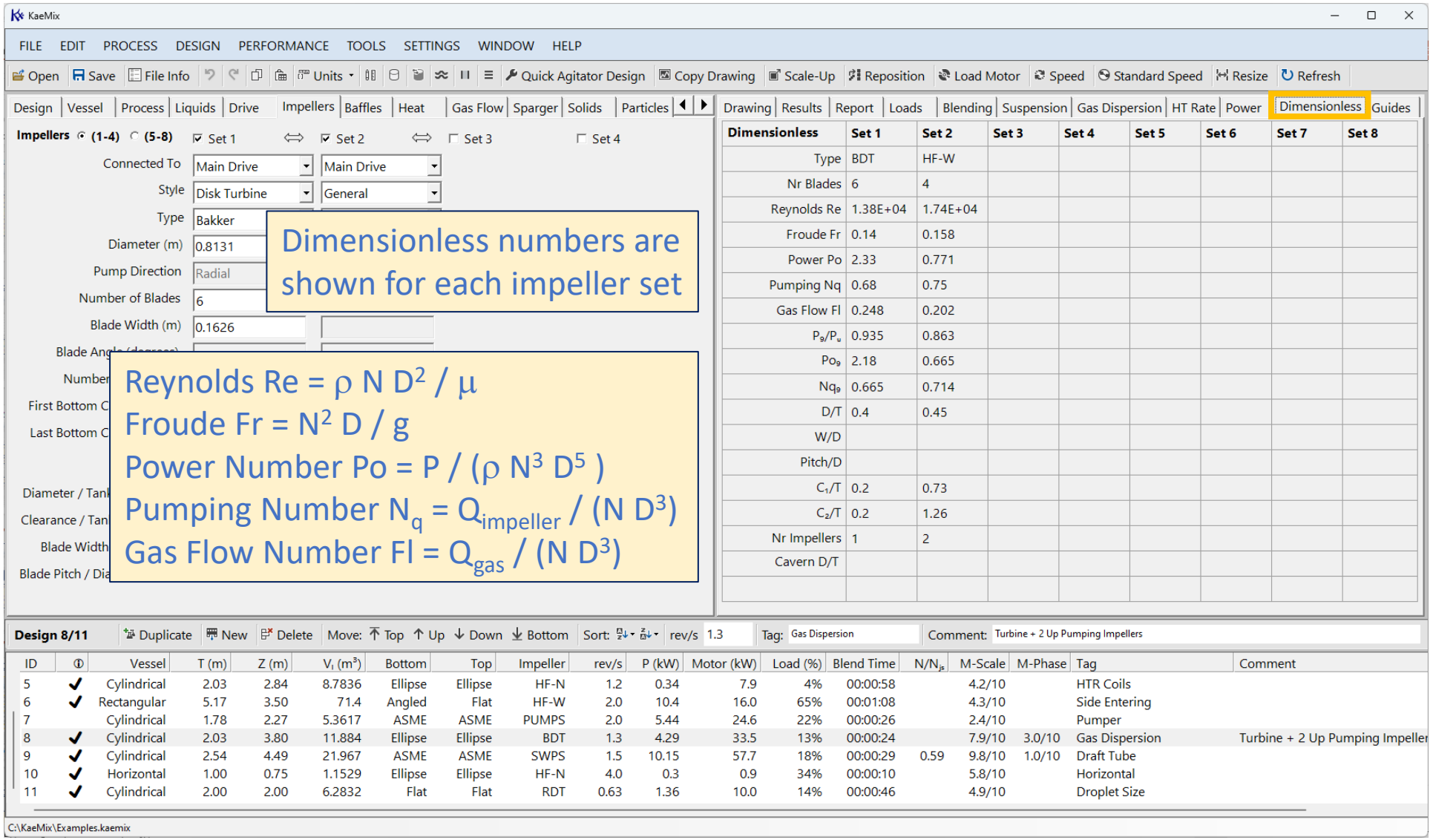
Drive Loads



Power Draw Details



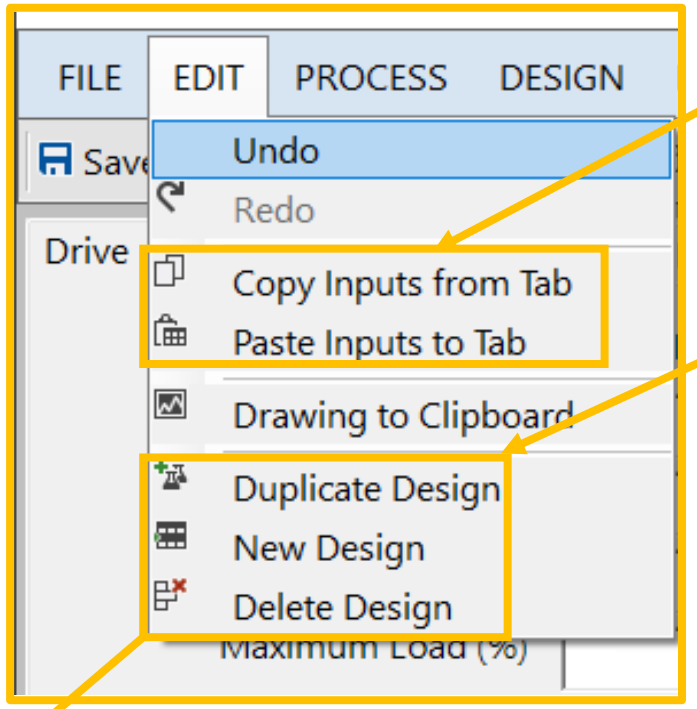
Dimensionless Numbers



KaeMix

Managing Designs

Managing Designs – Design List



Use Copy and Paste to Tab if you want to copy inputs from one design to another. In the first design, click on Copy Inputs from Tab and the inputs from the active tab will be stored. Go to the second design, and click Paste Inputs to Tab and the inputs will be pasted in this design

To add another design, click New or Duplicate. New will add a default design. Duplicate creates a copy of the active design. You can also delete designs you no longer need

The ✓and ✗ indicate if a design passed or failed basic design checks

You can edit the speed for the Main Drive here

You can add a Tag (e.g., a name, label, or keyword) and a Comment to each design

Design 8/11 | Duplicate | New | Delete | Move: Top Up Down Bottom | Sort: | rev/s: 1.3 | Tag: Gas Dispersion | Comment: Turbine + 2 Up Pumping Impellers

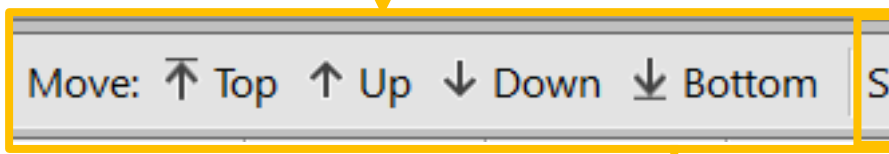
ID	(i)	Vessel	T (m)	Z (m)	V_l (m^3)	Bottom	Top	Impeller	rev/s	P (kW)	Motor (kW)	Load (%)	Blend Time	N/N_{js}	M-Scale	M-Phase	Tag	Comment
4		Cylindrical	1.78	3.02	7.211	Ellipse	Ellipse	RDT	1.0	2.35	2.4	97%	00:00:20		5/10		Stages	
5	✓	Cylindrical	2.03	2.84	8.784	Ellipse	Ellipse	SWPV	1.2	3.97	7.9	50%	00:00:23		7/10		HTR Coils	
6		Rectangular	5.17	3.50	71.4	Angled	Flat	HF-W	2.0	6.4	3.0	213%	00:01:12		3/10		Side Entering	
7	✓	Cylindrical	1.78	2.27	5.362	ASME	ASME	PUMPS	1.4	7.65	24.6	31%	00:00:21		7/10		Pumper	
8	✓	Cylindrical	2.03	3.80	11.88	Ellipse	Ellipse	BDT	1.3	3.76	33.5	9%	00:00:25		8/10	3/10	Gas Dispersion	Turbine + 2 Up P
9	✓	Cylindrical	2.54	4.49	21.97	ASME	ASME	SWPV	1.5	6.35	57.7	11%	00:00:31	0.44	7/10	1/10	Draft Tube	
10	✓	Horizontal	1.00	0.75	1.153	Ellipse	Ellipse	HF-N	4.0	0.3	0.9	34%	00:00:10		7/10		Horizontal	

Managing Designs - Sorting

You can reorder the design list by moving designs up, down, to the top, or the bottom

To sort the whole list, click on the Sort A→Z or Z→A buttons in the list commands. This will bring up the list of variables that you can use to sort

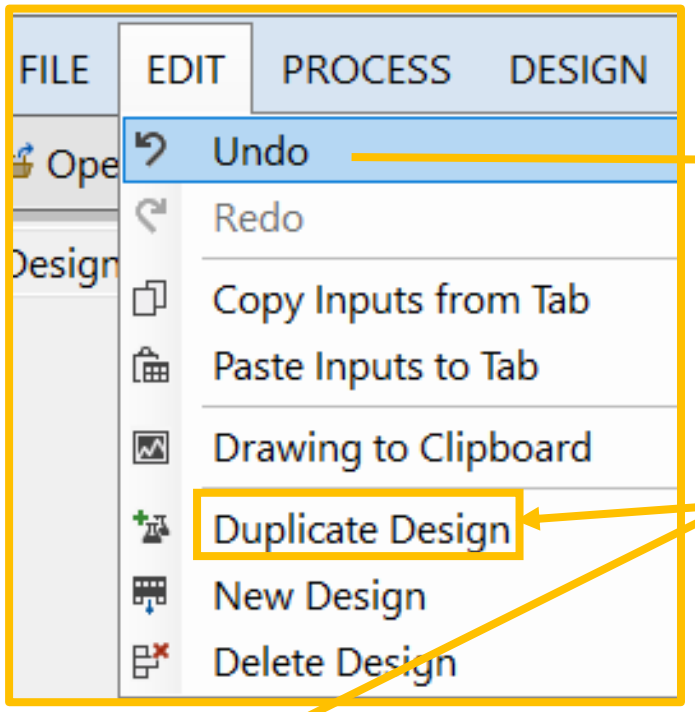
- Tag
- M-Scale
- Blend Time
- Motor Load
- Motor Size
- Power Draw
- Rotation Speed
- Volume
- Liquid Level
- Vessel Diameter
- M-Phase
- N/N_{js}
- Mass Transfer k_la



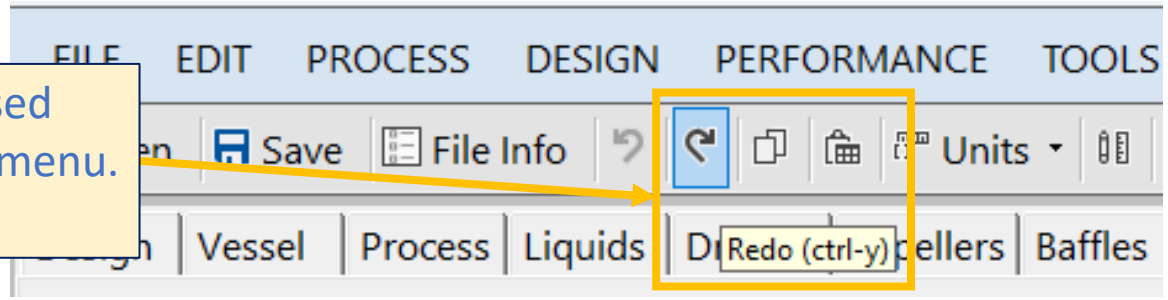
Design 8/11 | Duplicate | New | Delete | Move: Top Up Down Bottom | Sort: | Tag: Gas Dispersion | Comment: Turbine + 2 Up Pumping Impellers

ID	(i)	Vessel	T (m)	Z (m)	V_l (m^3)	Bottom	Top	Impeller	rev/s	P (kW)	Motor (kW)	Load (%)	Blend Time	N/N_{js}	M-Scale	M-Phase	Tag	Comment
1	✓	Cylindrical	1.00	1.00	0.733	Ellipse	Ellipse	HF-N	5.0	0.38	10.0	4%	00:00:23		6/10			
2		Cylindrical	1.52	2.31	4.019	Ellipse	Ellipse	COW	0.1	16.06	2.7	605%	02:07:26		2/10		Helical	
3	✓	Cylindrical	2.03	3.45	10.76	Ellipse	Ellipse	HF-N	1.67	1.97	3.6	55%	00:00:22	0.96	10/10	3/10	Suspension	Fully Suspended
4		Cylindrical	1.78	3.02	7.211	Ellipse	Ellipse	RDT	1.0	2.35	2.4	97%	00:00:20		5/10		Stages	
5	✓	Cylindrical	2.03	2.84	8.784	Ellipse	Ellipse	SWPV	1.2	3.97	7.9	50%	00:00:23		7/10		HTR Coils	
6		Rectangular	5.17	3.50	71.4	Angled	Flat	HF-W	2.0	6.4	3.0	213%	00:01:12		3/10		Side Entering	
7	✓	Cylindrical	1.78	2.27	5.362	ASME	ASME	PUMPS	1.4	7.65	24.6	31%	00:00:21		7/10		Pumper	
8	✗	Cylindrical	2.03	3.00	9.289	Ellipse	Ellipse	BDT	1.3	3.76	33.5	11%			0/10	0/10	Gas Dispersion	Turbine + 2 Up Pumping Impellers
9	✓	Cylindrical	2.54	4.49	21.97	ASME	ASME	SWPV	1.5	6.11	57.7	11%	00:00:31	0.41	7/10	1/10	Draft Tube	

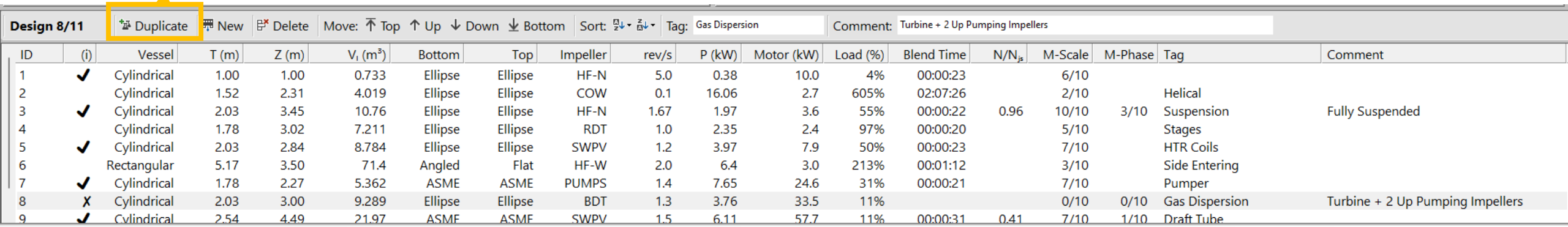
Managing Designs - Undo and Redo



Undo and Redo can be accessed from the ribbon and the Edit menu. There is one Undo level



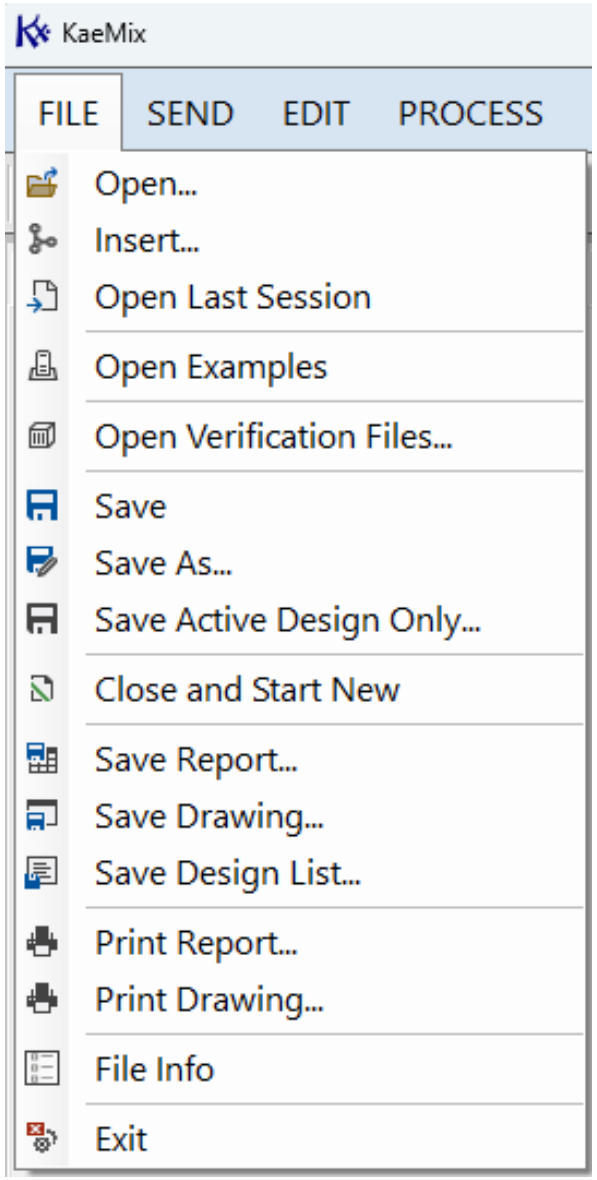
If you are going to make a lot of changes, it's a good idea to first Duplicate Design so that you still have a copy from before the changes



ID	(i)	Vessel	T (m)	Z (m)	V_l (m^3)	Bottom	Top	Impeller	rev/s	P (kW)	Motor (kW)	Load (%)	Blend Time	N/N_{js}	M-Scale	M-Phase	Tag	Comment
1	✓	Cylindrical	1.00	1.00	0.733	Ellipse	Ellipse	HF-N	5.0	0.38	10.0	4%	00:00:23		6/10			
2		Cylindrical	1.52	2.31	4.019	Ellipse	Ellipse	COW	0.1	16.06	2.7	605%	02:07:26		2/10		Helical	
3	✓	Cylindrical	2.03	3.45	10.76	Ellipse	Ellipse	HF-N	1.67	1.97	3.6	55%	00:00:22	0.96	10/10	3/10	Suspension	Fully Suspended
4		Cylindrical	1.78	3.02	7.211	Ellipse	Ellipse	RDT	1.0	2.35	2.4	97%	00:00:20		5/10		Stages	
5	✓	Cylindrical	2.03	2.84	8.784	Ellipse	Ellipse	SWPV	1.2	3.97	7.9	50%	00:00:23		7/10		HTR Coils	
6		Rectangular	5.17	3.50	71.4	Angled	Flat	HF-W	2.0	6.4	3.0	213%	00:01:12		3/10		Side Entering	
7	✓	Cylindrical	1.78	2.27	5.362	ASME	ASME	PUMPS	1.4	7.65	24.6	31%	00:00:21		7/10		Pumper	
8	✗	Cylindrical	2.03	3.00	9.289	Ellipse	Ellipse	BDT	1.3	3.76	33.5	11%			0/10	0/10	Gas Dispersion	Turbine + 2 Up Pumping Impellers
9	✓	Cylindrical	2.54	4.49	21.97	ASME	ASME	SWPV	1.5	6.11	57.7	11%	00:00:31	0.41	7/10	1/10	Draft Tube	

Menus

File Menu



Only one file can be open at a time. So, if you *Open* a file, it will close the current file and then open the new file

If you *Insert* a file, the current file will stay open, and all the designs from the file you select will be copied into the current file

Open Last Session opens the file that was automatically saved when you exited KaeMix previously

Open Examples opens a file with several helpful examples

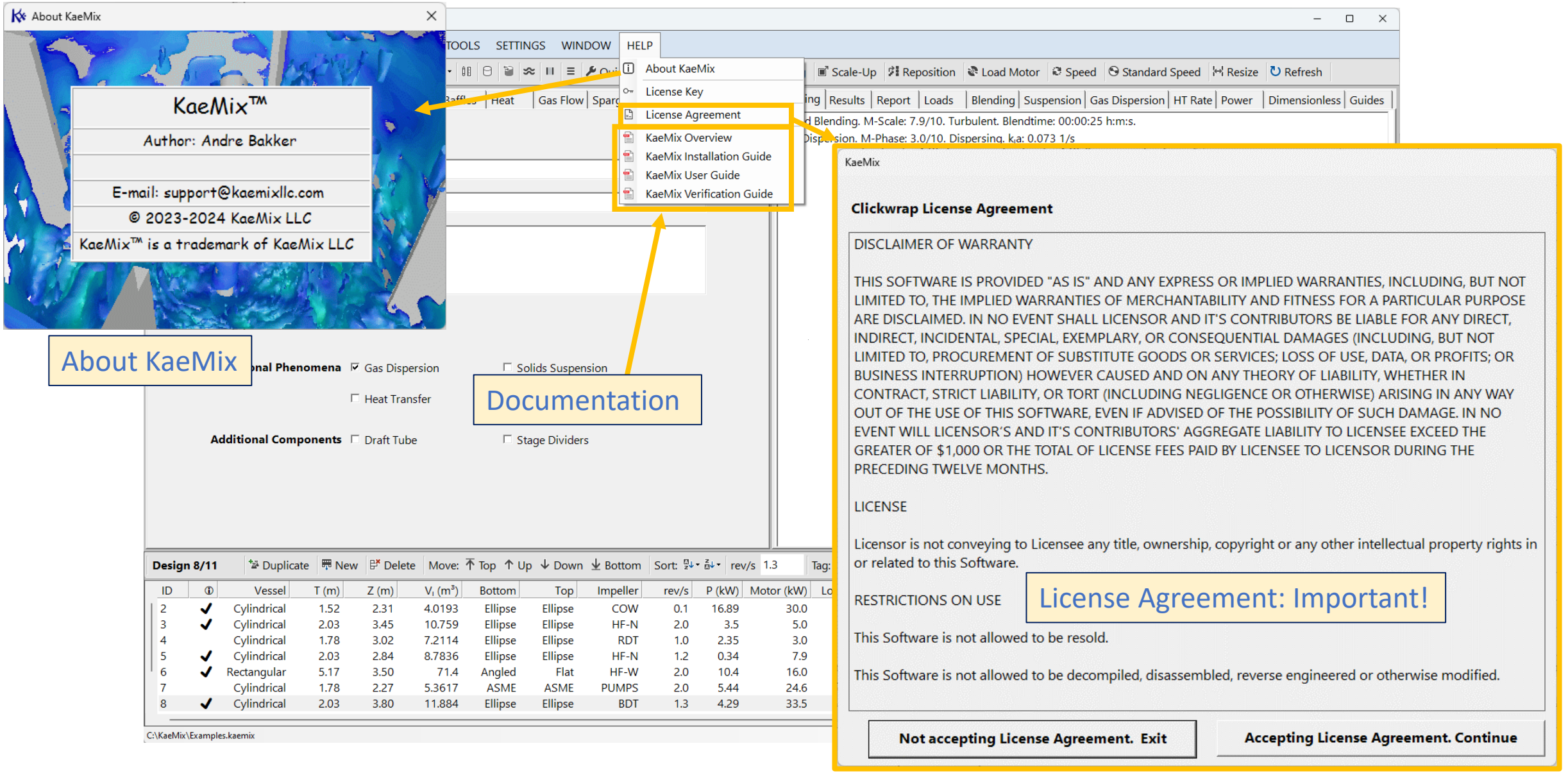
Save and *Save As* save all the designs in the file

Save Active Design Only saves a new file with only the active design (the design selected in the Design List). Then if you open another existing file and insert the file you just saved you have in effect copied that design into your existing file

Close and Start New closes the open file and starts a new file

Save Report saves the HTML report for the active design. *Tip: the HTML report can also be read into Excel, Word, Calc, and Writer*

Help Menu


About KaeMix
KaeMix™
Author: Andre Bakker
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KaeMix Overview
KaeMix Installation Guide
KaeMix User Guide
KaeMix Verification Guide
Documentation
Gas Dispersion
Solids Suspension
Heat Transfer
Additional Components
Draft Tube
Stage Dividers
Design 8/11
Duplicate
New
Delete
Move: Top Up Down Bottom
Sort:
rev/s 1.3
Tag:
ID Vessel T (m) Z (m) Vl (m³) Bottom Top Impeller rev/s P (kW) Motor (kW)
2 Cylindrical 1.52 2.31 4.0193 Ellipse Ellipse COW 0.1 16.89 30.0
3 Cylindrical 2.03 3.45 10.759 Ellipse Ellipse HF-N 2.0 3.5 5.0
4 Cylindrical 1.78 3.02 7.2114 Ellipse Ellipse RDT 1.0 2.35 3.0
5 Cylindrical 2.03 2.84 8.7836 Ellipse Ellipse HF-N 1.2 0.34 7.9
6 Rectangular 5.17 3.50 71.4 Angled Flat HF-W 2.0 10.4 16.0
7 Cylindrical 1.78 2.27 5.3617 ASME ASME PUMPS 2.0 5.44 24.6
8 Cylindrical 2.03 3.80 11.884 Ellipse Ellipse BDT 1.3 4.29 33.5
C:\KaeMix\Examples.kaemix
KaeMix
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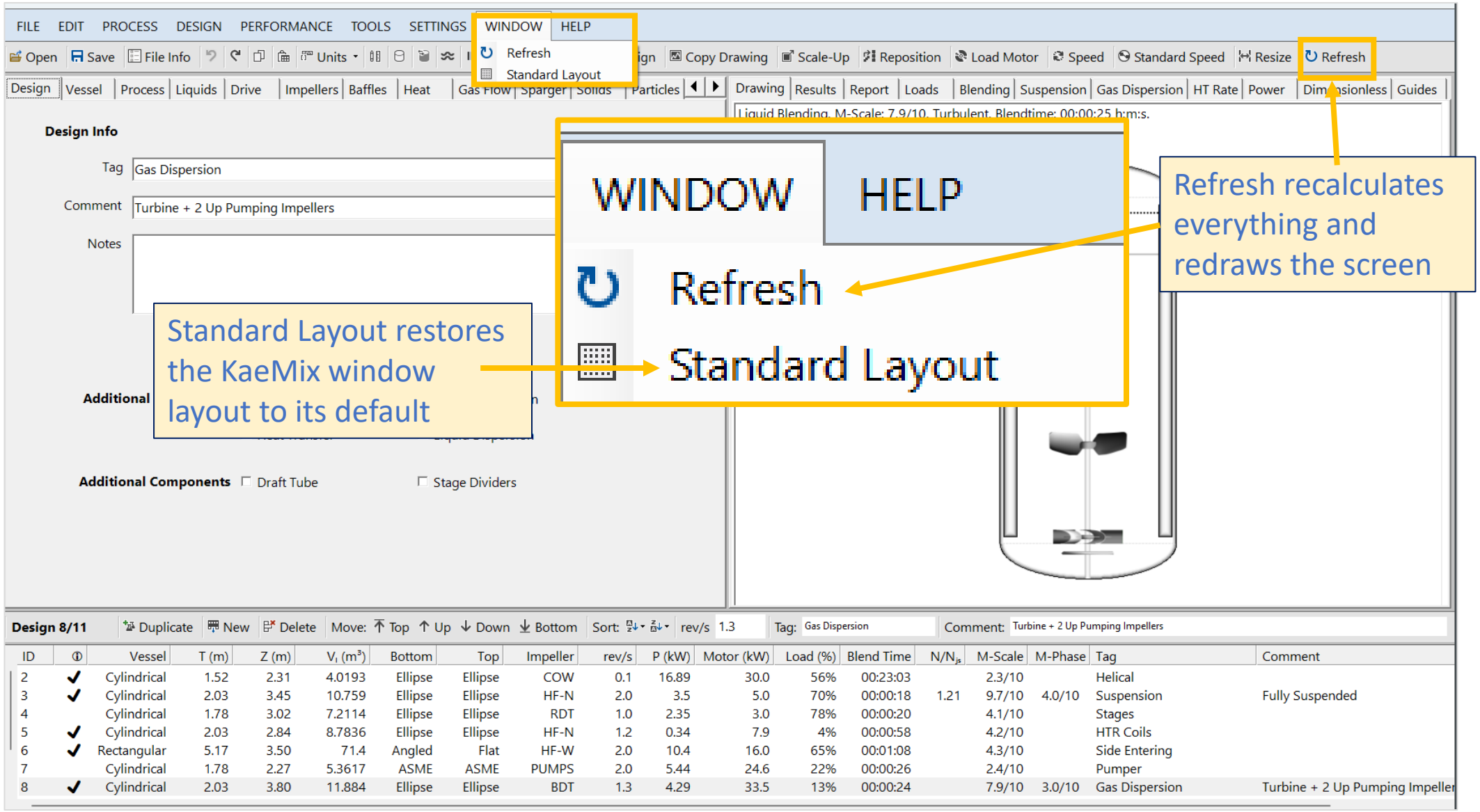
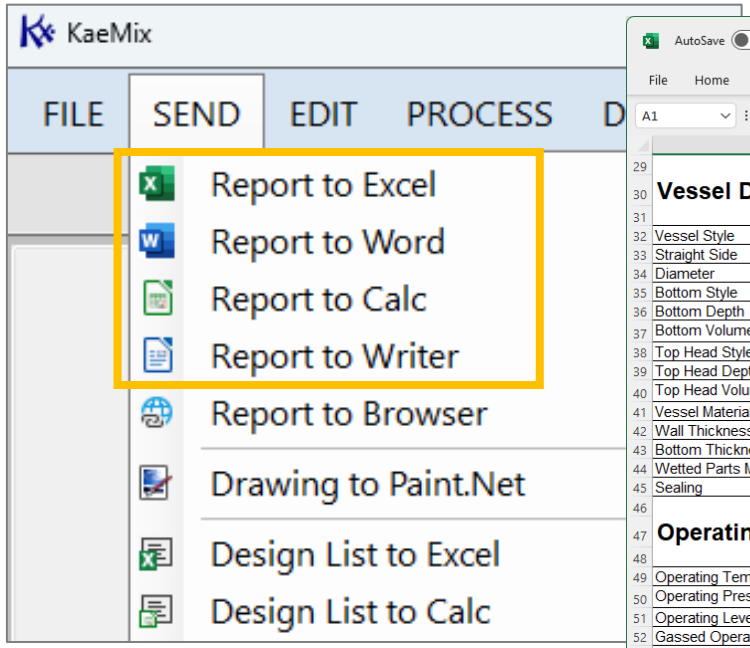
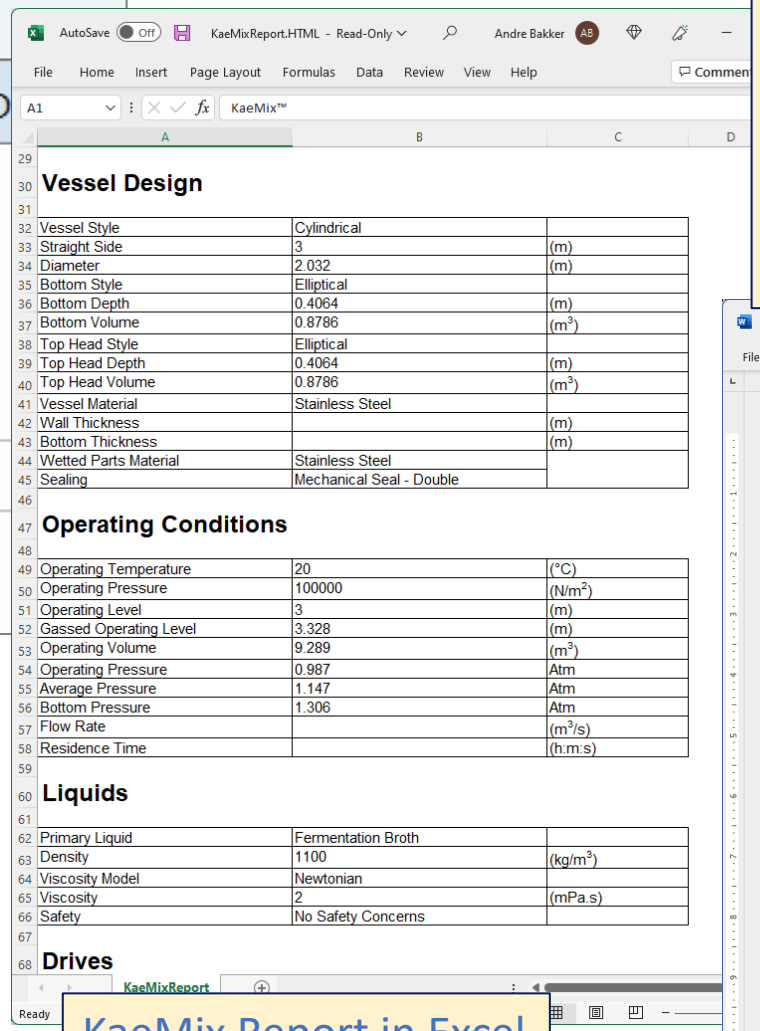
Window Menu



Send

Send to Office Applications

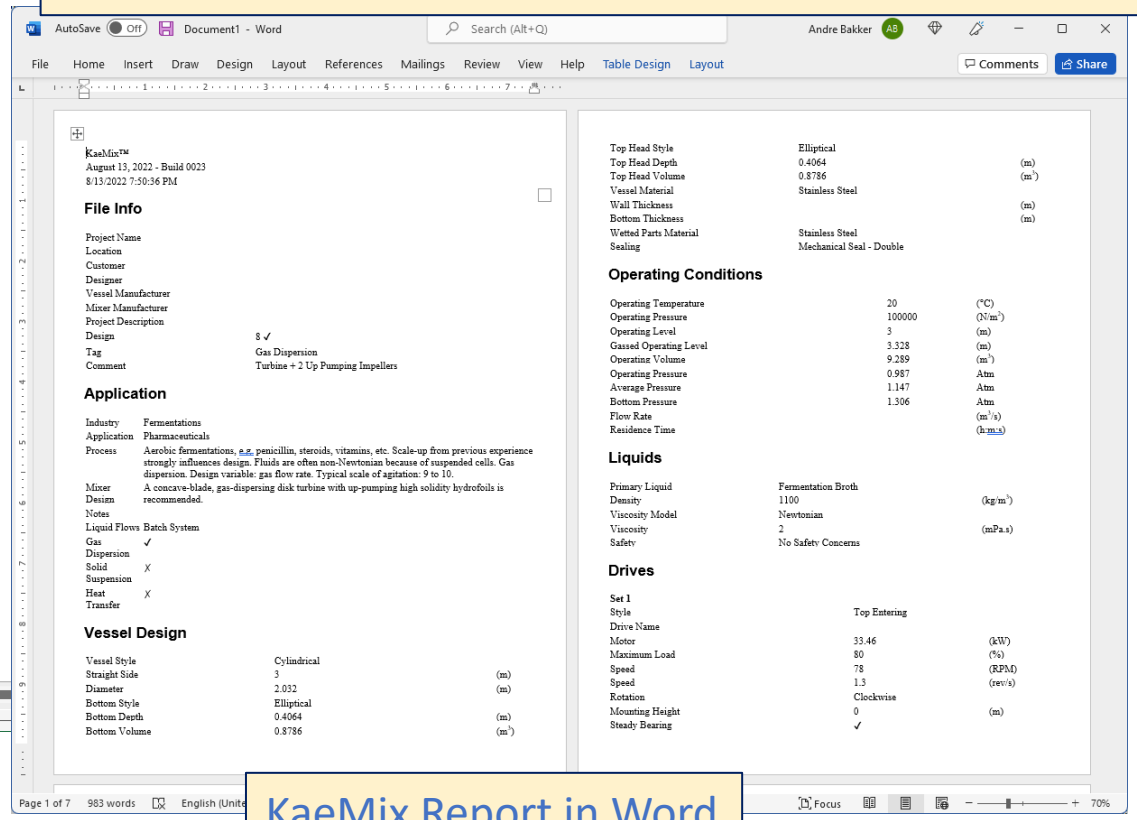




KaeMix Report in Excel

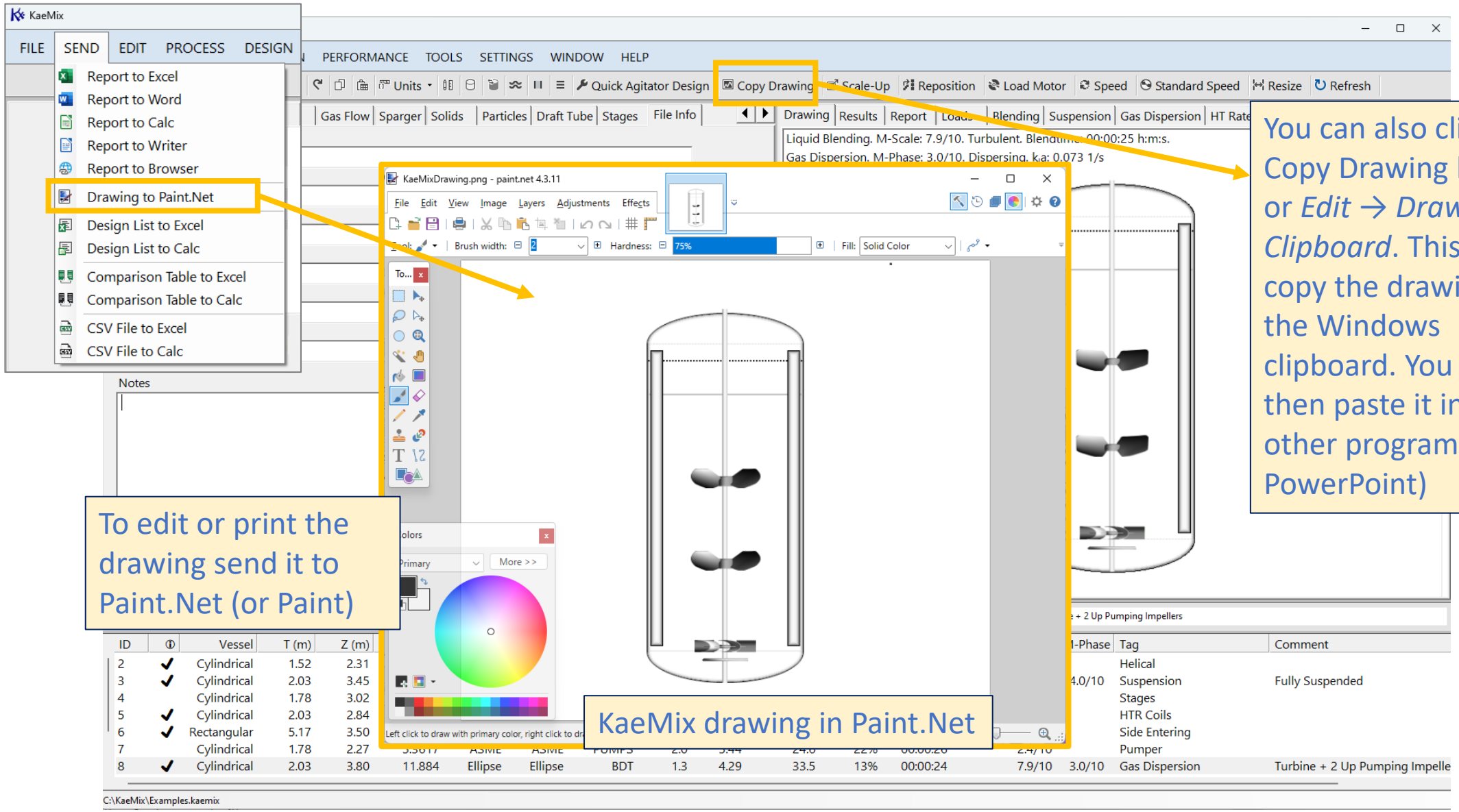
KaeMix checks if these applications are installed, and if so, enables Send To functionality:

- Microsoft Office ("C:\Program Files\Microsoft Office")
- LibreOffice ("C:\Program Files\LibreOffice\program")
- Paint.Net ("C:\Program Files\paint.net"). If Paint.Net is not found it will enable Microsoft Paint instead



KaeMix Report in Word

Send Drawing to Paint or Paint.Net



You can also click the Copy Drawing button or *Edit → Drawing to Clipboard*. This will copy the drawing to the Windows clipboard. You can then paste it into other programs (e.g., PowerPoint)

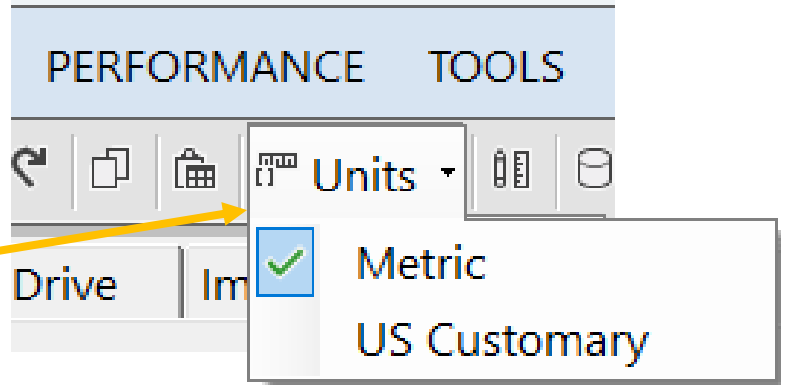
To edit or print the drawing send it to Paint.Net (or Paint)

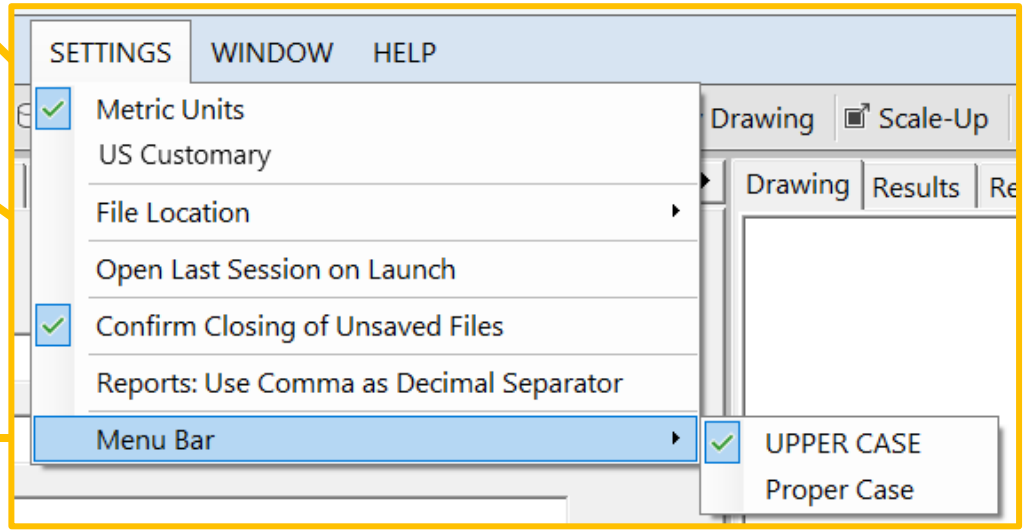
KaeMix drawing in Paint.Net

Settings

Settings

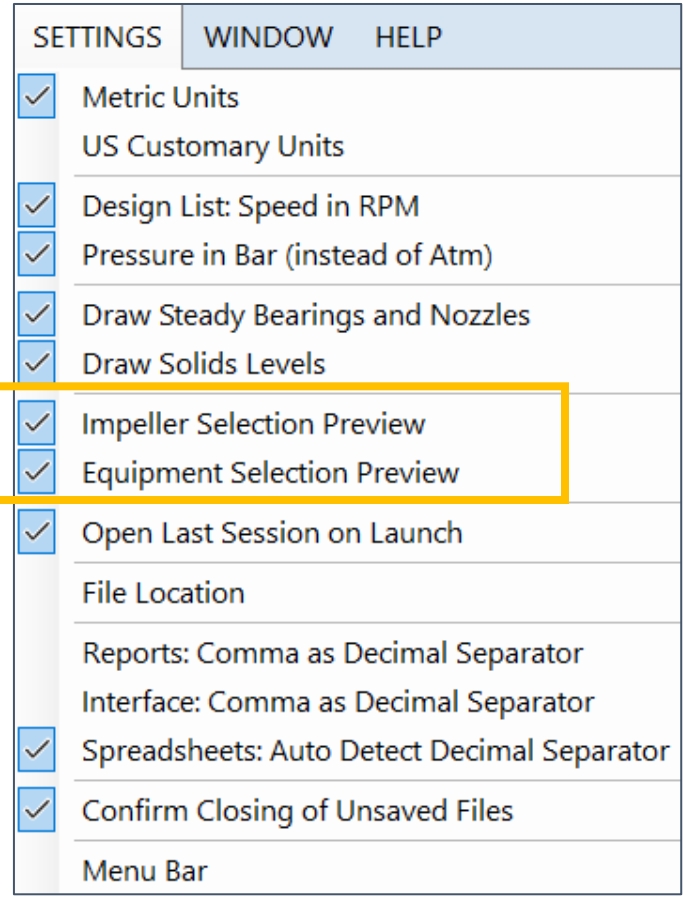
- You can easily switch between Metric and USA units using the Units button in the ribbon or the Settings menu
- If you want your last session automatically restored when you launch KaeMix then select the *Open Last Session on Launch* setting
  - Note, you can also do this manually from *File* → *Open Last Session*
- The text in the menu bar is by default in upper case font. If you prefer proper case, you can select this in the Settings menu

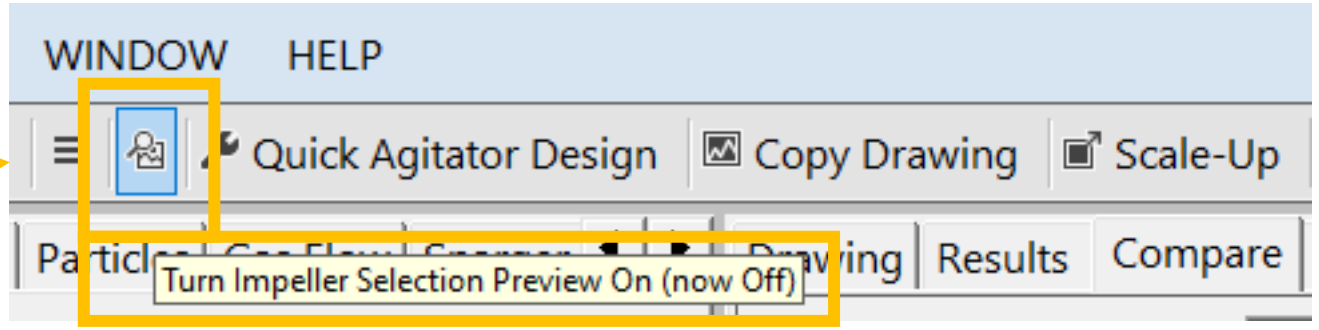




Settings - Previews

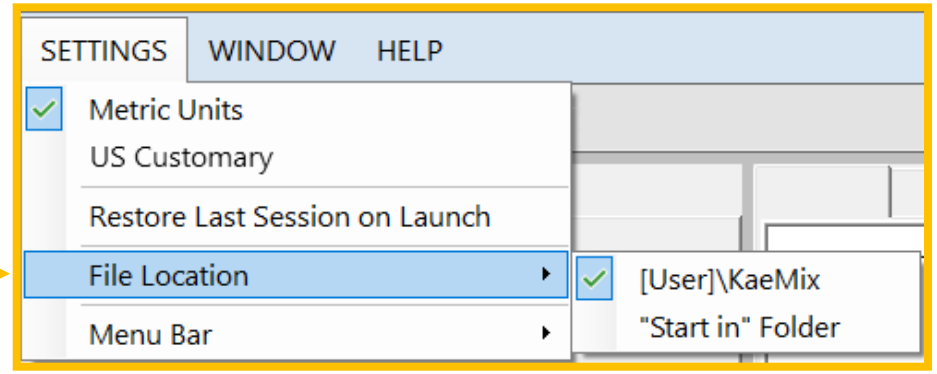
- Equipment and impeller selections can be made graphically using Previews or using standard text dropdowns
- This feature is enabled from the Settings menu. There is one setting for Equipment (bottoms, heads, baffles, spargers) and one for impellers
- Previews can also be enabled or disabled from the corresponding icon in the ribbon

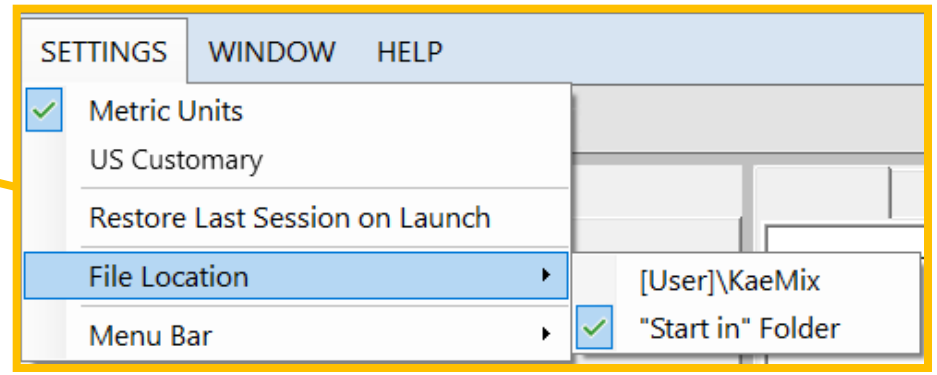


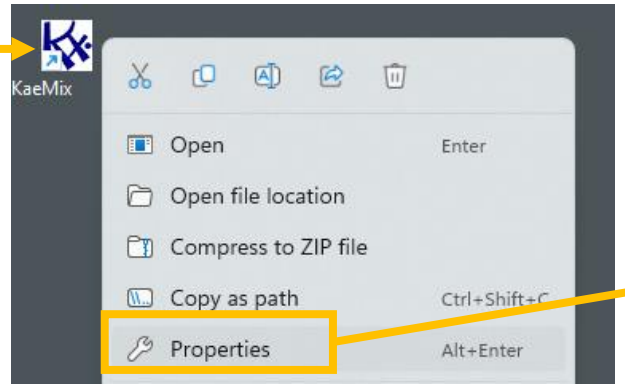


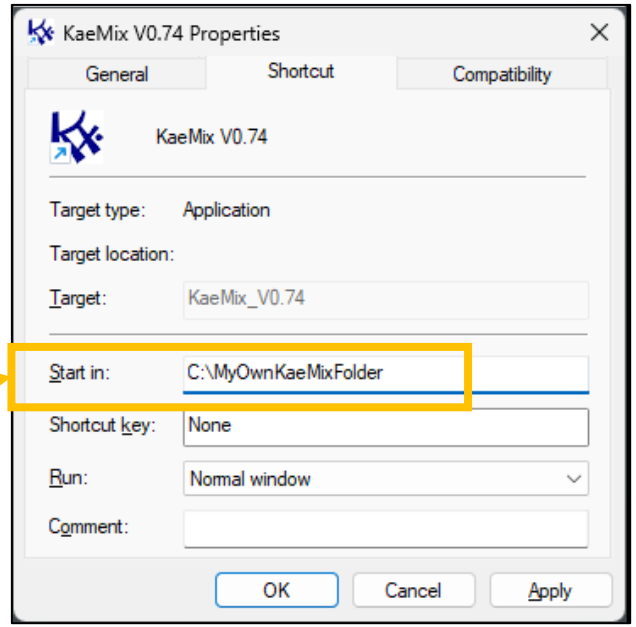
Settings – File Location

- You can control where KaeMix files are saved by default
- Default is [User]\KaeMix folder and usually looks like this: "C:\Users*yourname*\KaeMix"
- To change the default, select *"Start in" Folder* instead
- Specify the *"Start in" Folder* as follows
  - Right click on the KaeMix icon on the desktop and then click on Properties
  - Then specify the "Start In" folder and click Apply. Next time you launch KaeMix it will default to the "Start In" folder that you specified here



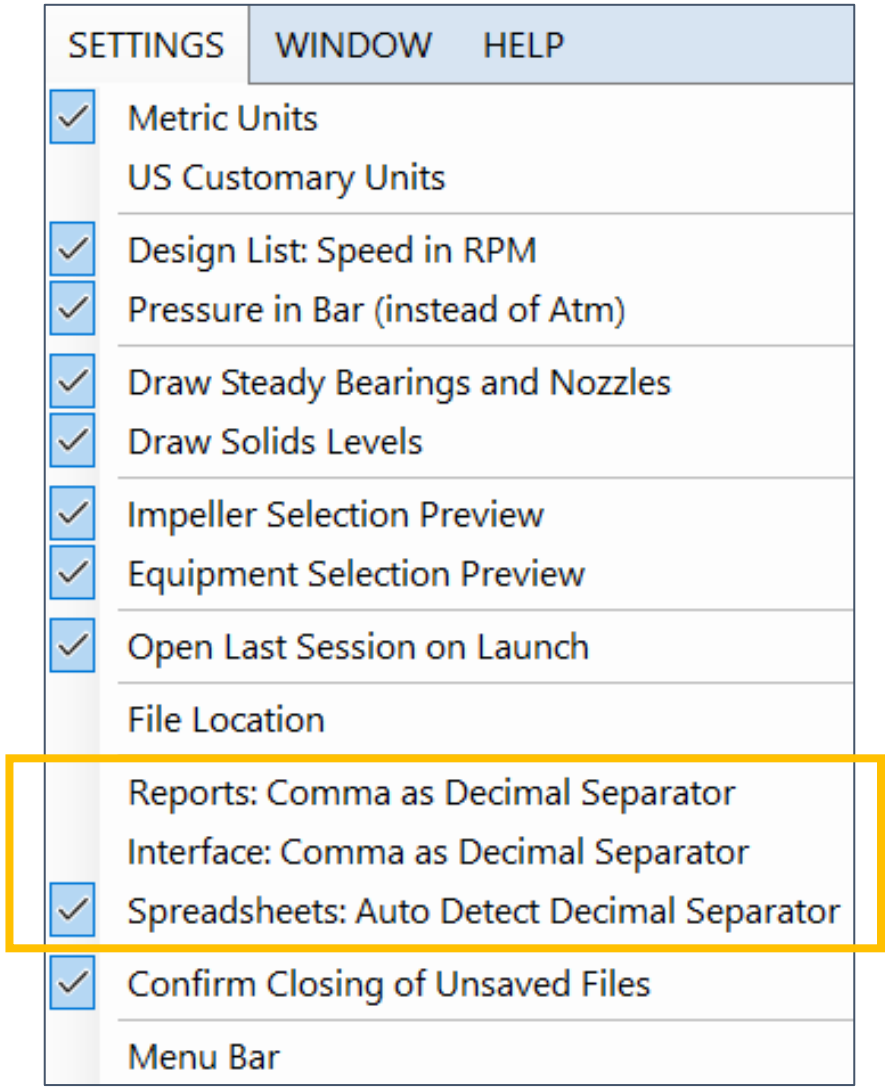






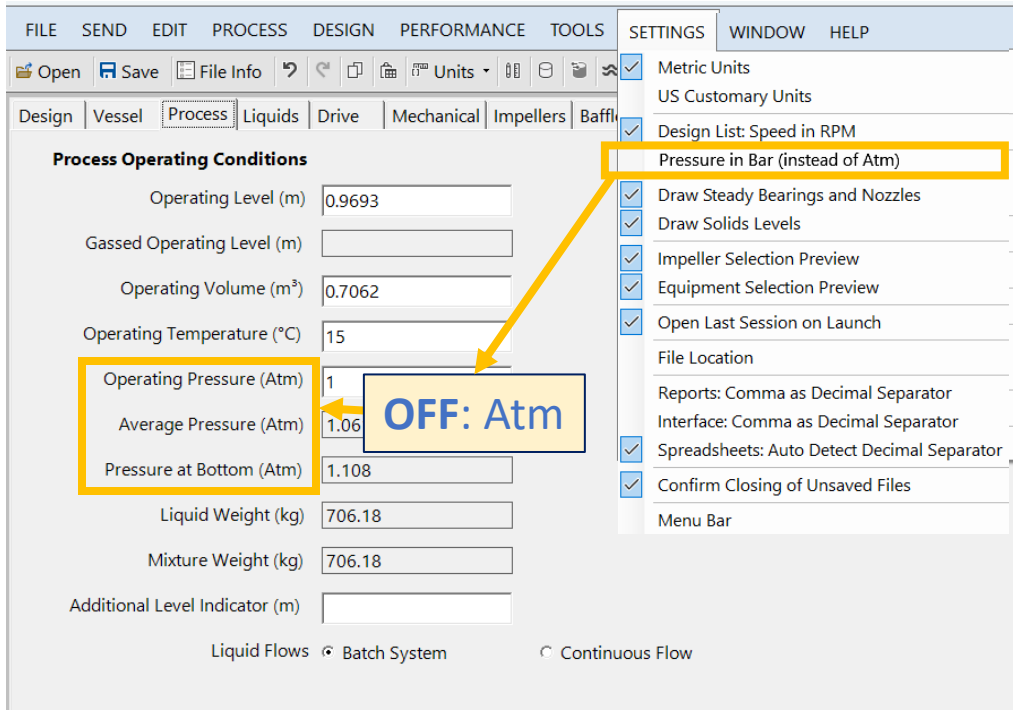
Settings: Decimal Separator

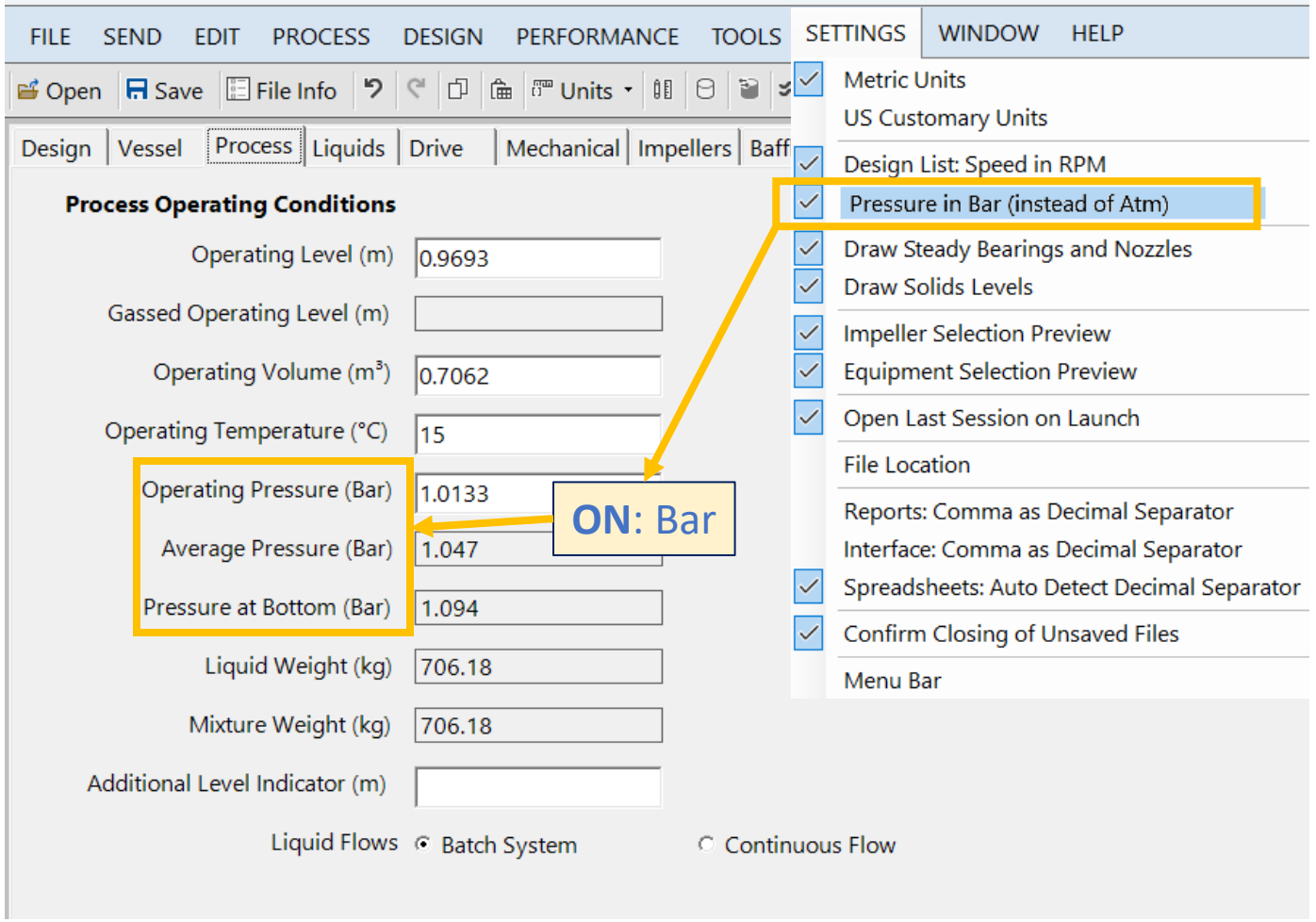
- By default, KaeMix uses the decimal point as the decimal separator, e.g. “3.14”
- This can be changed to the decimal comma, e.g. “3,14” from the Settings menu



Settings: Pressure in Bar (instead of Atm)

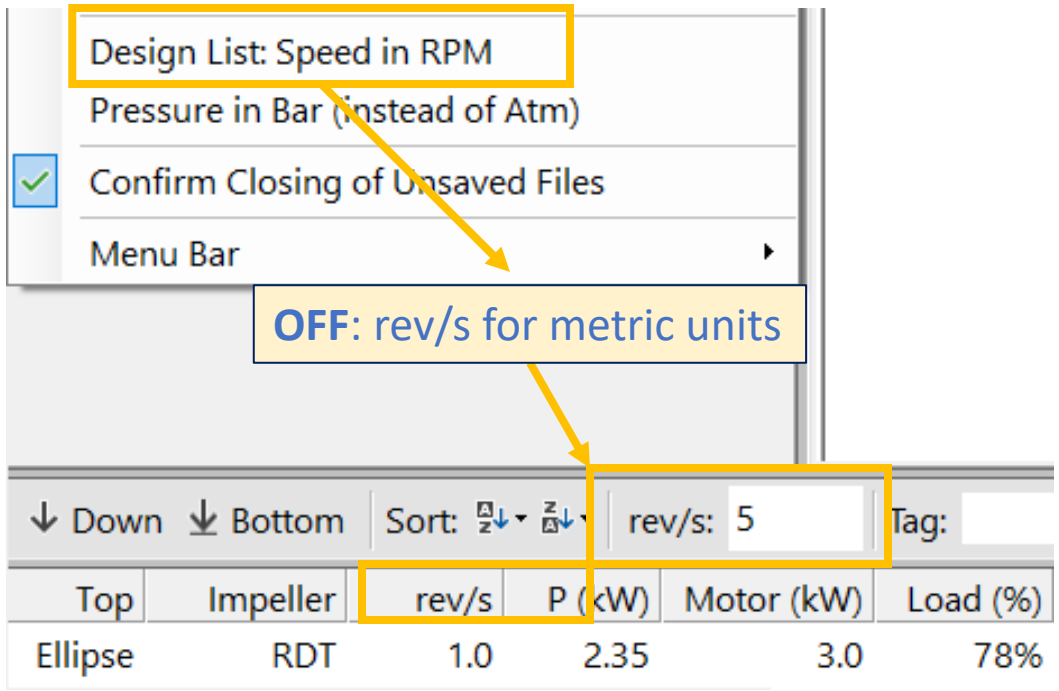
Setting: “Pressure in Bar (instead of Atm)”
Atmosphere is KaeMix default
This can be changed to Bar

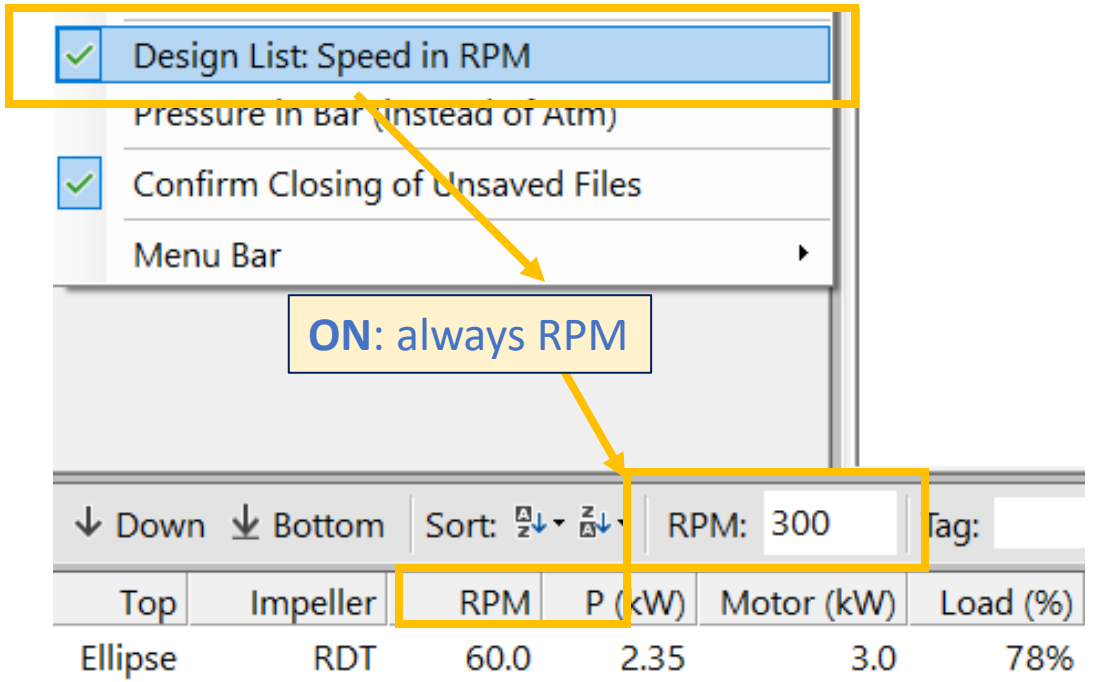




Settings: Design List Speed in RPM

Setting: “Design List: Speed in RPM.”
OFF: KaeMix switches between rev/s for metric units and RPM for US units
ON: Always uses RPM





END