MiXR

CFD-optimized mixing for complex liquids at lab scale

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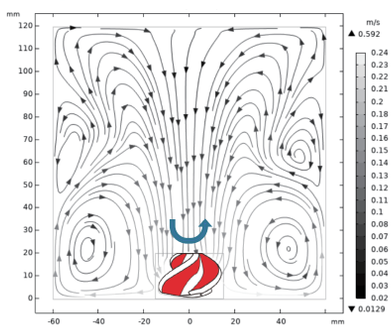
A word from FLXR

Our Passion: Our focus is on simplifying lab work for scientists through the use of 3D printing, making processes easier and more efficient.

Our Mission: We aim to advance scientific progress while ensuring environmental responsibility is a core part of our work.

The world's first CFD-optimized stir bar

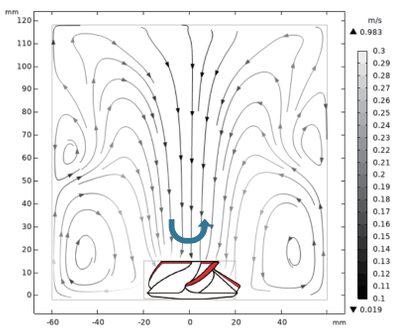
High Turnover Design (SRS)



CFD-optimized HIGH-TURNOVER:

- Higher vorticity and power number
- Fluid adaptive hybrid radial/axial flow
- Bi-directional design for diverse viscosity (1 – 1,500 cP)

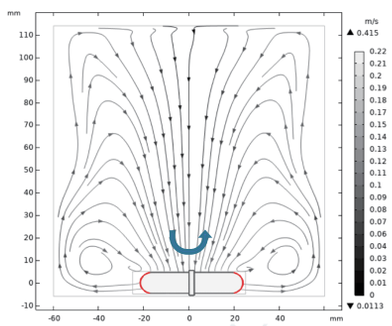
High Shear Design (SDA)



CFD-optimized HIGH-SHEAR:

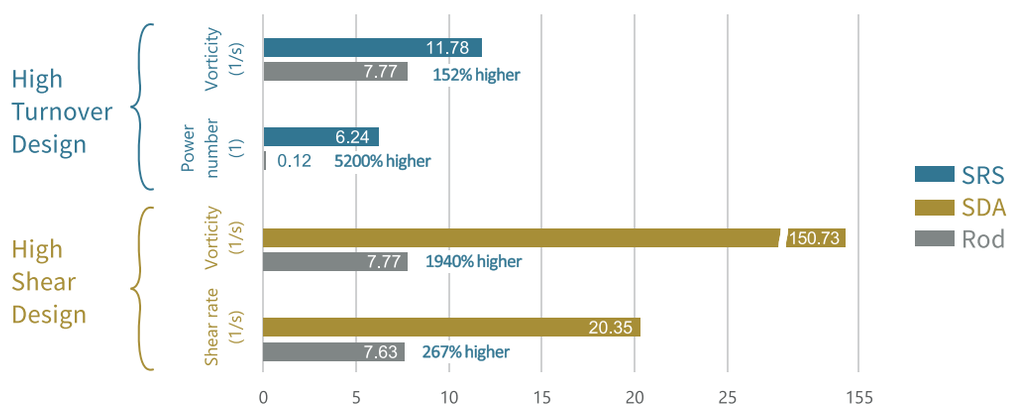
- Engineered to achieve higher shear rates
- Generates large velocity gradients between fluid layers
- Able to achieve droplet size of 40 to 60 µm

Conventional Rod



CFD of Conventional Rod:

- Radial only flow pattern
- Works well for low-viscosity fluids
- Emulates straight paddle impeller



A more eco-friendly alternative to PTFE

Shell Material Options

- PEN (polyethylene naphthalate)– a new, recyclable, and PFAS-free material choice
  - Highly chemical resistant, though not as perfect as PTFE
- PEEK (polyether ether ketone) – also available
- PTFE concerns:
  - Though inert, manufacturing and disposal extremely toxic
  - Incineration by-products 7,000x more potent than CO_2 and do not decompose

Made by 3D-Printing

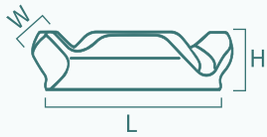
- Able to manufacture complex geometries to optimize fluid dynamics for the application
- 3D printing enables design iteration of stir bars, evolving with user feedback
- Offer shapes and sizes of stir bar from 5 mm to 250 mm in diameter
- Additive manufacturing reduces material waste and energy consumption

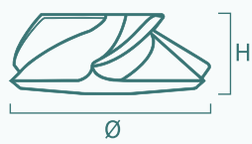
Strong SmCo Magnet

- 4X stronger coupling strength than standard AlNiCo to ensure strong coupling
- Improved temperature stability (-273°C to 300°C) compared to NdFeB magnetics which are stable up to 80°C
- Highest resistance to demagnetization (coercivity) vs. AlNiCo and NdFeB for consistent coupling over product lifecycle

High-shear design

- Reference impeller: Cowl disk 
- Applications: Emulsion and suspension polymerization; cosmetic creams, ceramic slurries, and polishing compounds; conductive inks and nanoparticle suspensions

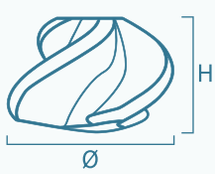
Product	SAN		SDA
Flow movement	Hybrid axial/radial		Hybrid axial/radial
Flow direction	Down		Down
Weight	01 8.00 ± 0.25 g 02 8.10 ± 0.25 g 31 6.90 ± 0.25 g 32 12.40 ± 0.25 g		01 4.90 ± 0.25 g 02 11.70 ± 0.25 g
Viscosity range	1-200 cP	Preferred vessel  01, 02 31, 32	1-200 cP
RPM range	200-1400 RPM		200-1400 RPM
Dimension	L(mm) x W(mm) x H(mm)		Ø(mm) x H(mm)
	01 40 x 13 x 15	02 55 x 13 x 15	01 17 x 12
	31 39 x 13 x 9	32 57 x 13 x 9	02 40 x 16



Preferred vessel 

High-turnover design

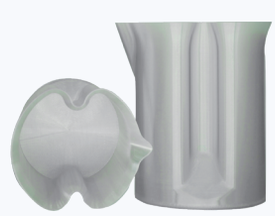
- Reference impeller: Pitched-blade paddle 
- Applications: Solid catalysts; powder in resins, paints, and creams; powdered flocculants

Product	SRS		SPP
Flow movement	Hybrid axial/radial		Hybrid axial/radial
Flow direction	Up/Down		Up/Down
Weight	6.20 ± 0.25 g		1.30 ± 0.25 g
Viscosity range	1-1500 cP	Preferred vessel 	1-1500 cP
RPM range	100 –1100 RPM		100-1100 RPM
Dimension	Ø(mm) x H(mm)		
	28 x 19		9 x 25

Preferred vessel 

- Applications: Additives in paints, resins, and adhesives, reduce the use of defoaming agent

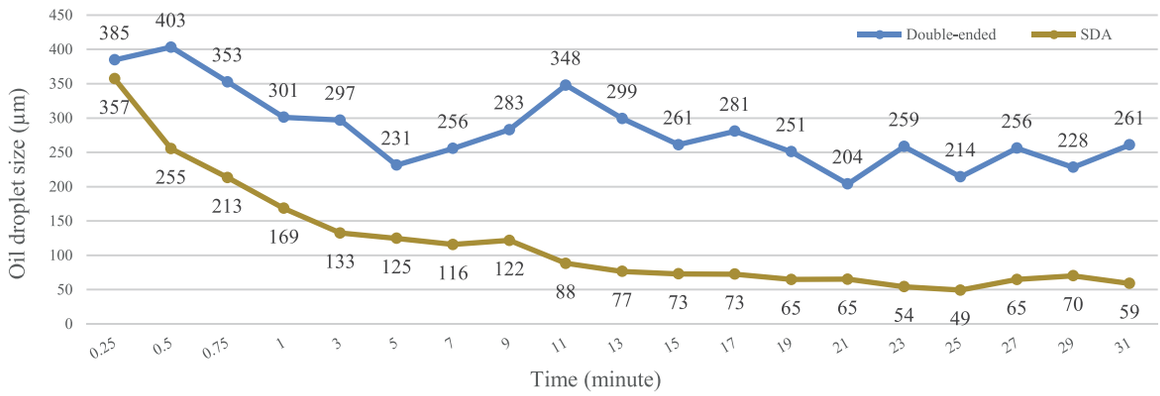
Product	Baffled beaker			
Volume	500 mL	750 mL	1000 mL	2000 mL
Diameter	87 mm	100 mm	109 mm	139 mm
Height	113 mm	130 mm	143 mm	180 mm
Baffle width	17 mm	20 mm	22 mm	28 mm
Baffled beaker thickness	1.3 mm	1.3 mm	1.3 mm	1.3 mm
Weight	61.60 ± 2.00 g	70.50 ± 2.00 g	100.70 ± 2.00 g	188.50 ± 2.00 g



Recommended geometric proportions
Impeller diameter / Baffled beaker diameter = 0.30 ~ 0.50
Liquid height / Baffled beaker diameter = 1
Clearance of the impeller from the bottom of the baffled beaker / Baffled beaker diameter = 0.30 ~ 0.50

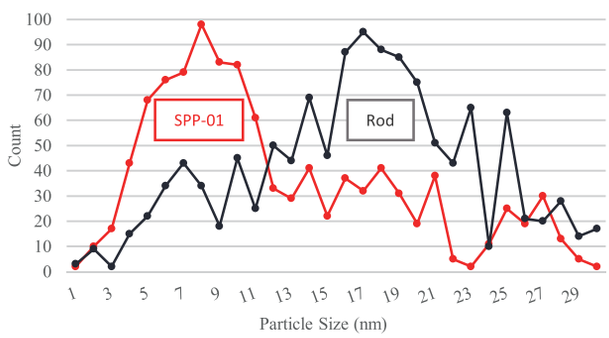
Usage examples

Emulsion Droplet-size Experiment



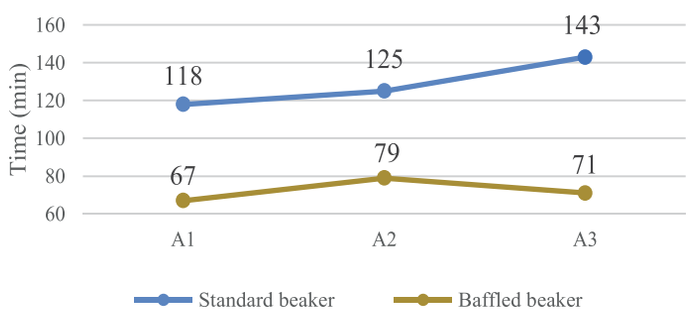
- After 31 minutes, SDA produced 367% smaller droplets than the double-ended conventional stir bar.
- High shear is a crucial feature in determining quality of emulsion.

Au Nanoparticle Synthesis



- The gold nanoparticle produced by high turnover SPP-01 is 41% smaller than those of a conventional rod stir bar.
- The higher vorticity and turbulence of the SPP-01 reduced particle agglomeration.

Defoaming Time Experiment



- 800 mL of a 1,345 cP liquid was stirred using a pitch-blade impeller at 1,100 RPM in baffled vs. standard beakers.
- The baffled beaker defoamed approximately 2x faster than the standard beaker, reducing the cycle time and dosage of defoaming agent used.

Chemical resistance

	PEN	PVDF	PTFE
Acetic acid (10%)	A	A	A
Acetic acid (40%)	A	A	A
Acetone	B	D	A
Ammonium chloride (25%)	A	A	A
Benzene	B	A	A
Chloroform	C	A	A
Cyclohexane	A	A	A
Cyclohexanol	A	A	A
Calcium chloride (10%)	A	A	A
Chromic acid (10%)	A	A	A
Citric acid	A	A	A
Diethyl ether	A	A	A
Dimethyl sulfoxide (DMSO)	C	C	A
Dimethyl formamide (DMF)	C	D	A
Ethanol	A	A	A
Ethyl acetate	A	D	A
Ethylene diamine	C	B	A
Ethylene glycol	A	A	A
Formaldehyde (40%)	A	A	A
Formic acid (10%)	A	A	A
Formic acid (30%)	C	B	A
Gasoline	A	A	A
Glycerol	A	A	A
Heptane	A	A	A
Hexane	A	A	A
Hydrobromic acid (10%)	A	A	A
Hydrobromic acid (47%)	A	A	A
Hydrochloric acid (10%)	A	A	A
Hydrochloric acid (37%)	A	A	A
Hydrofluoric acid (5%)	A	A	A
Hydrofluoric acid (50%)	D	B	A

	PEN	PVDF	PTFE
Hydrogen peroxide (30%)	A	A	A
Isopropyl alcohol (IPA)	A	A	A
Methanol	A	A	A
Methyl ethyl ketone (MEK)	A	D	A
Nitric acid (10%)	A	A	A
Nitric acid (20%)	A	A	A
Nitric acid (67%)	D	A	A
Phosporic acid (10%)	A	B	A
Phosphoric acid (85%)	D	B	A
Potassium hydroxide (10%)	A	A	A
Potassium hydroxide (30%)	B	A	A
Sulfuric acid (10%)	A	A	A
Sulfuric acid (30%)	C	A	A
Sulfuric acid (>80%)	D	A	A
Sodium acetate (40%) sol.	A	A	A
Sodium chloride (sat.) (32%)	A	A	A
Sodium bicarbonate (sat.)	A	A	A
Sodium hydroxide (10%) sol.	A	A	A
Sodium hydroxide (30%) sol.	A	C	A
Sodium hypochlorite	A	A	A
Styrene (monomer)	A	A	A
Tetrahydrofuran (THF)	B	B	A
Toluene	A	A	A
Triethanolamine	C	A	A
Vinyl chloride (monomer)	A	A	A
Xylene	A	A	A

Resistance at 23 °C, immersed for 30 days

Ranking definition:
A: weight change < 1%, tensile > 95%
B: weight change between 1 ~ 10%, tensile > 75%
C: weight change > 10%, tensile < 75%
D: dissolved or swelled

Application

Chemistry
Cosmetic
Breweries
Paint
Pharmaceutical industry
Food industry
Agriculture chemistry
Analytical chemistry
Electronic industry

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