APPLICATION NOTE

Solvation Studies with Agilitech Single-Use Mixers

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Summary

Solvation free energy and the behavior of ions and macromolecules in solvents can be modeled, but adding mixing considerations introduces complexities. Proper mixing of solutes like NaCl and NaOH might be assumed to be straightforward, yet factors such as equipment, mixing method, and solution characteristics, among others, may influence success.

We conducted simple solute and application-specific experiments that addressed the solvation and mixing of NaCl, NaOH, glucose, HEPES, IgG, and polysorbate 80, under different conditions.

These studies showed the capability of Agilitech's 10L single-use mixers to handle solvation and viscosity challenges and ensure macromolecular integrity, confirming robustness and utility of the mixers.

Temperature control in the 10L stainless steel jacketed mixer was also assessed. These pilot experiments demonstrate reliable temperature modulation and highlight potential for further studies with complex solutes.

The Agilitech 10L SUM demonstrates effective solvation and mixing capabilities under various conditions. The mixer's consistent performance across different solutes and temperature modulations makes for ideal integration into bioprocess development and manufacturing.

Agilitech invites further collaborations to explore custom mixing solutions and enhance process scalability.

For Mixing Study or Collaboration:
info@agilitech.bio

AGILITECH POWERING POSSIBILITIES

Introduction

Understanding the mechanism of solvation, solvation free energy and the behavior of salt ions and macromolecules in their respective solvents can be reduced to academic exercises. These mathematical treatments model the basic principles of intramolecular interactions that lead to chemical solvation.[1,2,4]

When we use mixing in practical applications to accelerate solvation, we add variables to the solvation equation. Yet, proper mixing and solvation of any solute is often viewed as simple operation. 2M NaCl solution: weigh 116.88g of NaCl, mix into 950mL H2O, QS to a final volume of 1L and on to more complex things. What could possibly go wrong?

When increasing the kinetic energy of a system to facilitate solvation (mixing), it's the complexity of mixing space geometry, the equipment used, the method, vortex, torque and shear of mixing, impeller geometry, tip-speed, turbulence and the infinite permutations of solutes and solvents that decide success of this seemingly simple method. Discussion of the energy of a mixing system and these characteristics, the ratio of which is represented as the Reynolds number (Re), can guide consideration of mixing conditions.

Controlling and understanding known variables and controlling for unknown variables is critical when undertaking something even as foundational as mixing salts and buffers.

Process Analytical Technology discussions (PAT) revolve around this topic, and there is much interest in the aspect of the quality and safety of therapeutics, as well as their manufacturing reproducibility.[6] Even as it relates to mixing, every step is scrutinized.

Herein we present a set of simple NaCl and NaOH mixing experiments. Then we follow-on with application studies designed to investigate the implementation of Agilitech single-use mixers within practical considerations of viscosity, shear, and macromolecular integrity. We complete this first-of-many mixer profiles with temperature studies so that the customer can advance their understanding of how our jacketed mixers might be integrated into their biotherapeutic process.

With the discussion of the simple data sets collected, we establish a basic precedence for using our single-use mixer (SUM), advance the validation of this product line, and offer our custom SUM line for the integration of our robust mixing solutions into bioprocess development and manufacturing as standalone or integrated solutions.

This also opens the door for additional mixing studies and customer mixing-evaluations where we can collaborate to generate data for customer-centric conditions.

Equipment and Methods

STUDY 1: SIMPLE SOLVATION

NaOH and NaCl solvation experiments employed an Agilitech Biotech 10L Single Use Mixer (10L SUM), bottom-fitted with a Levitronix PuraLev® motor magnetically rotating an impeller at 2500 and 3750 RPM, respectively. The impeller was pre-installed by Entegris into a custom 10L mixer bag designed specifically for Agilitech single-use mixers.

NaCl data was collected with a Thermo Scientific Orion Star A222 Conductivity Meter with DuraProbe Conductivity Probe. NaOH solvation was similarly monitored by conductivity. For the NaOH and NaCl experiments, either a solution of NaOH or NaCl solid were added to the mixer to a final concentration of 2M. In each experiment, agitation was started prior to the addition of the solute and the data recorded for 5 minutes.

STUDY 2: APPLICATION-SPECIFIC CHALLENGES

Testing for this second phase was performed by BioX LLC (bioxeng.com) at their Bioprocess Optimization and Development (POD) applications testing lab located in Salem, NH. Room temperature was controlled within a range of 17-22°C. All data was generated under controlled laboratory conditions in compliance with a quality management system utilizing NIST traceable measurement devices and standards. The following devices were utilized in data collection: Oakton pH/Conductivity Transmitter (PC-2700), Oakton pH Probe (UX-35805), Oakton Conductivity Probe (UX-35608-76), Cedex Bioanalyzer (N/A), Horiba Particle Analyzer (LA-930), Anton Paar Viscometer (SVM 4001), Anton Paar Raman Probe (Cora 5001), YSI Glucose Lactate Analyzer (2300) .

The mixer used was a fully-portable Agilitech benchtop mixer with a mixing-space geometry identical to the stainless-steel SUM and outfitted with an identical Levitronix motor and Entegris single-use 10L mixer bag. Speed was set at 5000RPM. Variables tested: HEPES (JT Baker 4809-04) modeled solute-clumping, Glucose (Emprove 1.08346.9013) modeled endothermic solvation on mixing time and efficiency, Polysorbate 80 (Sigma-Aldrich P1754-500) and Corn Syrup (Intermodal Food Products, 501146) modeled viscosity challenges. IgG was used to represent immunoglobulin therapeutic modalities and effect on macromolecular uniformity and integrity. Tests were run in triplicate, with target concentrations and data recorded. Particle, HPLC and Raman analysis were utilized to determine uniformity endpoints. Glucose, pH and conductivity analysis were used to determine solvation completion .

Buffer	Conc.	Vol.	# Runs	# of Agit. Speeds	Time to add chem	Time to Uniformity	Particle Size Dist.	Cond.	pH	HPLC	Gluc/Lac Analyzer	Visc.	Raman
Corn Syrup	300 cP	10L	3	1	Y	Y	N	N	N	N	N	Y	N
NaCl	5M	2.0L	3	1	Y	Y	Y	Y	N	N	N	N	Y
NaCl	5M	5.0L		1	Y	Y	Y	Y	N	N	N	N	Y
NaCl	5M	10.0L		1	Y	Y	Y	Y	N	N	N	N	Y
C6H12O6	350g/L	10.0L	3	1	Y	Y	Y	N	N	N	Y	Y	Y
C8H18N2O4S	1M	10.0L	3	1	Y	Y	Y	Y	Y	N	N	N	Y
IgG	0.5g/L	10.0L	3	1	Y	Y	N	N	N	Y	N	N	N
C64H124O26	0.2%	10.0L	3	1	Y	Y	N	N	N	Y	N	N	Y

Table 1 – Experimental setup, application-specific challenges, Agilitech 10L Singe-Use Mixer

STUDY 3: TEMPERATURE-SPECIFIC CHANGES

Temperature profiles were generated in an Agilitech 10L stainless steel single-use mixer, jacketed model. This model employs as part of its standard hardware package a temperature control unit.

(TCU): Thermo Scientific TF25 D A 200-230/GL T1 2.3KW LR+ - Part#: 12B7C23169220001, Coolant: Ethylene Glycol – Part#: 610000000001, and a temperature sensor model: C temperature sensor model Traceable 4048,94460-70 NIST Traceable Cert#: 221511620-4048-13364974

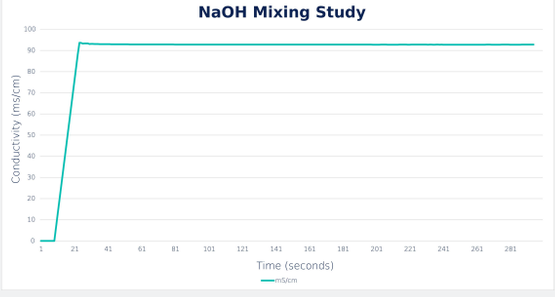
Results and Discussion

STUDY 1: SIMPLE SOLVATION

Figure A and B show reproducible liquid/liquid and solid/liquid mixing times in 10L total H2O volume for NaOH solution and NaCl solid conditions, respectively. Conductivity (mS/cm) data is shown.

Conductivity data collected at the bag top powder port over five minutes demonstrates that following the addition of solutes to a final mixer concentration of 2M, NaOH homogeneity was achieved after 24 seconds and NaCl homogeneity after 100 seconds over two data sets. Note that mixing dynamics may vary depending upon solution density, solute characteristics, and complexity of solution component profile.

A



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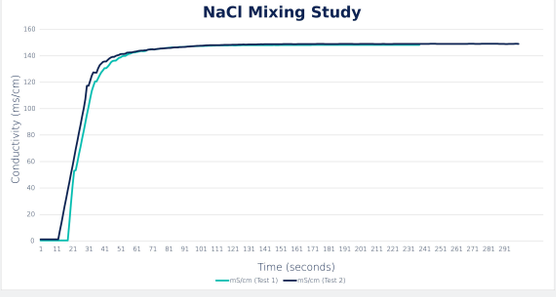


Figure A and B – 2M NaOH (liquid/liquid) and NaCl (solid/liquid), simple solubility

STUDY 2: APPLICATION SPECIFIC CONDITIONS

Uniformity and homogeneity data points for solvation of NaCl, glucose, HEPES, IgG, Polysorbate 80 and corn syrup were collected as indicated. The results are indicated in **Table 2a and 2b.**

Buffer	Time to add chem	Time to Uniformity	Particle Size Dist.	Conductivity	pH	HPLC	Gluc/Lac Analyzer	Viscosity
Corn Syrup	2	6	X	X	X	X	X	304
NaCl	3,4,5	12, 14, 15	X	262ms/cm	X	X	X	X
Glucose (C6H12O6)	2	17	X	X	X	X	349	5.1
HEPES (C8H18N2O4S)	2	5	X	28ms/cm	11.1	X	X	X
IgG	1	5	X	X	X	0.49g/L	X	X
Polysorbate 80 (C64H124O26)	1	4	X	X	X	2 mg/ml	X	X

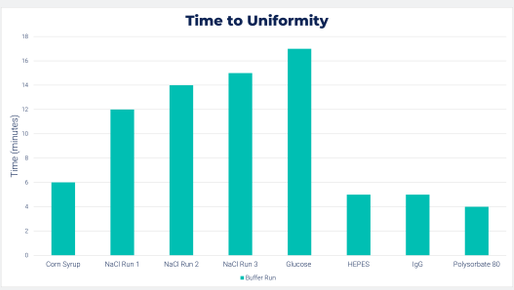


Table 2a and 2b – Experimental Results, application-specific challenges, Agiltech 10L Singe-Use Mixer

As suggested by the previous 2M NaCl and NaOH studies, simple salt mixing proceeded to homogeneity. 2, 5 and 10 L volumes of 5M targets reached uniformity at 12, 14 and 15 minutes, respectively, following the addition times noted. No comparisons are drawn between these and previous experiments as the concentrations tested in study 2 were higher target concentrations and at variable volumes. The results are consistent with the hypothesis that a higher salt concentration would require a longer mixing period. Also, larger volumes required slightly longer uniformity times. This is not an unexpected result, considering that differences in the solvent volume added to the fixed geometry of the mixer and therefore potentially affecting the resulting turbulence, is a variable that could affect mixing time.

Glucose solvation is a multivariate challenge in that the solvation of glucose is endothermic and that it can at higher concentrations and lower temperatures become increasingly viscous. Glucose is a solute that is present in many therapeutic manufacturing processes including fulfillment of cell-therapy metabolism media strategies, pH stabilization during plasmid isolation, and other methods. The data shows that in our mixing study under the conditions employed, adding glucose to a target of 350g/L in 2 minutes up to 10L total volume will result in uniformity within 17 minutes. Temperature data was not taken during this study and will be considered for future experiments.

It should be noted that glucose by itself at a concentration of 350g/L has a viscosity of 5.1cP . To challenge even further the concept of viscosity isolated from the temperature consideration, a separate study used corn syrup added over 2 minutes in a 10L total volume to a targeted viscosity of 304cP. The time to uniformity was 6 minutes. This condition could certainly be observed in practical application of any biotherapeutic modality (200+mg/mL Mab concentrations, plasmid preparations or other solutes at increasingly high concentrations) that may contribute by virtue their concentration or thermal profile to viscosity.

This study result demonstrates that in extreme cases, the torque of the i30 PuraLev® motor and impeller-geometry combination was sufficient to handle the 304cP challenge. This also suggests that viscosity, at least as a singular variable, is not problematic for this mixer under the conditions tested. It should be noted that a failure endpoint was not tested, could be a subject for further study.

Polysorbate 80 (PS-80) is a nonionic surfactant and emulsifier used in solutions to solubilize proteins, prevent the adherence of proteins to the walls of storage and delivery vessels and is used as an excipient to stabilize. It is quite viscous and unlike a glucose solvation, PS-80 presents the problem of addition to an aqueous solution as it can settle as a thick phase or move with the vortex with a slow-to-solubilize phase during mixing, yet it can't be vigorously mixed to overcome these challenges due to potential frothing (which in turn among other secondary effects can denature macromolecules and potentially affect the efficacy of a therapeutic). The results here indicate that following addition of PS-80 to a concentration of 0.2% (v/v) in 1 minute to a 10L volume, mixing uniformity is achieved in 4 minutes. This suggests that for typical PS-80 addition, the motor and impeller characteristics are sufficient to handle practical application of this commonly-used stabilization agent.

HEPES is a typical biological buffer used in the creation of biotherapeutics. The mixing challenge of HEPES is that it clumps during mixing and affords the unique opportunity to test the mixer in a practical situation. Addition of HEPES over 2 minutes to a concentration of 1M resulted in uniformity within 5 minutes of addition completion. This suggests that with concentrations one might see in the practical usage of HEPES in the creation of a therapeutic, clumping was not an issue for this mixer. It should be noted that other solutes were not present, and multiple component studies for HEPES could be an experimental target for future studies.

Finally, IgG addition to a 10L total volume to a concentration of 0.5g/L resulted in a uniform mix within 5 minutes and no denatured species were detected. The mixing of protein macromolecules should not result in their denaturation or cause aggregation of those molecules as these effects can lead to a host of undesirable therapeutic characteristics. Such concerns could include increased immune response to the therapeutic, decreased/variable overall potency of the therapeutic, and could even create a situation where solubility decreases, necessitating further processing/ filtration[7]. This study suggests that the mechanics of this mixer are gentle enough to facilitate solvation of protein molecules.

STUDY 3: TEMPERATURE-SPECIFIC CHALLENGES

Accurate, responsive and dependable mixer control of temperature within a required range or tolerance of target for any bioprocessing stage could be critical in determining which equipment or consumable to use. A mixer may be a standalone device that is locally controlled on a benchtop for production of a buffer, salt, or media in the development path of a biotherapeutic, or it could be part of an automated strategy in an established biotherapeutic scale-up production. In either deployment, or anywhere in the middle, mixers can serve all steps of a bioprocess as mixers, storage tanks, or break-tanks.

These could be included at or between such steps as bioreactor production, column chromatography methods, filtration (including depth filters, virus filters and others), in-line buffer production, tangential-flow filtration (TFF), dispensing and fill-finish automation, or other common bioprocess harvest, purification, clarification or dispensing steps. At each of these steps, mixing is a likely criticality, and temperature control of that process will serve to preserve the conformational integrity of the biomolecule. Any temperature-dependent changes to a macromolecule could have a profound effect on the therapeutic.[7]

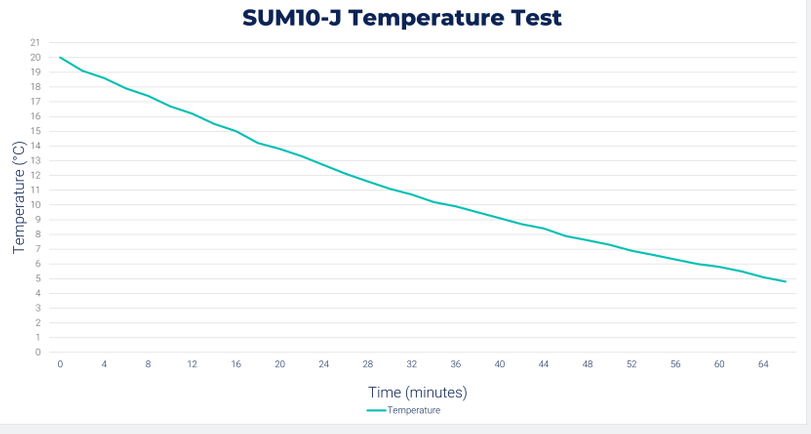


Figure C – Simple mixer cooling from 20°C to 5°C

This initial simple temperature ramp study demonstrates in our 10L single-use jacketed mixer, that over 60 minutes and targeting 5°C, the temperature drops almost linearly from 20°C to 4.8° C. This demonstrates a reliable response over a range of chilling from room temperature to slightly above freezing.

In its simplest form, the jacketed mixer fulfills its intended purpose. But what of a mixing profile, in a complexity of solutes with competing endothermic and viscosity profiles where multiple components are added at varied times? Further studies with our jacketed models can be used to address this question in future studies.

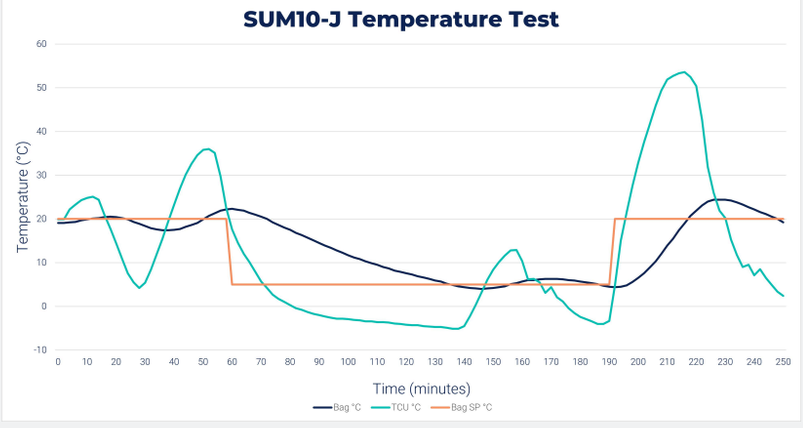


Figure D – Mixer cooling from 20°C to 5°C, then back to 20°C

Here, we performed a simple modulation without PID tuning and created a recipe to quickly modulate from 20°C to 5°C and then back again. Such a cyclical modulation might be needed in the case of solute addition where the free energy of solvation was endo or exothermic, followed by a stabilization of the mixture.

In **Figure D**, the results for temperature ramp-down were in 1 hour 4 minutes. That data echoes the first result of 1 hour 6 minutes. Repeatability is always important in any bioprocess consideration. Further studies can be done on repeatability across a wide range of challenges and can also be done in customer studies upon request (please contact Agilitech).

The following ramp up was 5°C to 20°C in 26 minutes. Of note, the heating process was twice as fast as cooling. Two things should be considered here. The temperature control data in Figure D shows a simple temperature decrease and increase profile. Future experiments where we challenge the capability of the system as designed, relative to the complexity of customer solutions and recipes can be conducted.

The applicability of those experiments would really depend on the customer requirement, and recipes can be easily developed or created with customer input for tight control. We'd love to work with you.

We provide a simple example below:

To highlight a wider potential for PID tuning and tighter temperature control with our jacketed mixer, we used a general condition that demonstrated that a tighter modulation of TCU and bag set points can be used to generate an increasingly tighter approach to the desired bag temperature (in this case 15°C), thus demonstrating that mixer temperature control can be used to decrease variability. This demonstrates just one scenario in an infinite variable set but demonstrates proof of concept that minimizing variability can be achieved with proper PID algorithm tuning. For the user, this addresses any potential requirements of specific macromolecules that might need control for stability or activity to maintain therapeutic effectiveness. We'd be happy to run any scenario with customers and we're confident that we can achieve any therapeutic development goal.

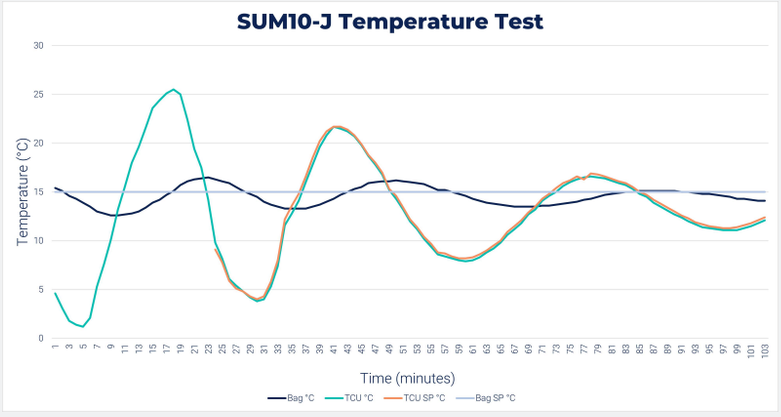


Figure E – PID tuning for 15°C demonstrates decreasing variability around a set point

Additional Considerations

The data contained herein establishes a simple precedent that under all conditions we tested, solvation (as evidenced by the observed uniformity) in the single-solute conditions tested occurred without any demonstrated problems or unexpected results. Reproducibility and control are demonstrated features of Agilitech single-use mixers.

Experiments are being planned for viscosity and solute variations and combinations. The ongoing generation of empirical data is necessary because of the nature of the topic. Biotherapeutic mixtures are infinitely numerous, complex, and have a wide range of requirements for purification and the maintenance of therapeutic stability.We consider these study evergreen and ongoing, and welcome input and suggestions from our customers. Collaborations on data are a critical part of our development cycle. Please contact Agilitech in this regard.

Mixer volume size and shape, motor size and torque, impeller size and operational variables like impeller RPM can seem overwhelming when designing an experiment to test their effect on solvation. It's impossible to prove every case, other than direct trial. However, an infinite data set is quite impossible. In such a circumstance, considerations of Reynolds number, which represents the ratio of inertial to viscous forces, can be used to discuss turbulence as a qualitative judgement of how measurable liquid-eddy currents contribute to mixing. Ensuring that a motor and impeller, and thus the torque, tip-speed and ultimately what you might observe as the effectiveness of mixing under conditions of challenge (high viscosity, clumping solutes etc) are matched in theory to the practical data is the goal when targeting conditions. Then, end-users can create observable studies, under specifically controlled conditions, and these studies can be validated by an understanding of how impeller geometry, mixing space and the energies imparted through increased or decreased RPM effect the outcome.[5]

Practical data may take on even more importance when we consider that the single-use mixer space for 10L through 50L is vastly underserved by other manufacturers. Considering the all-included nature of our mixer (its motor and impeller are integrated, and don't require charging), and the fact that it can be combined with other equipment like in-line dilution and tangential flow filtration skids, it's important that we provide a practical basis for customers to become familiar with this flexible technology, and work with them to address their specific conditions.

Our mixer geometry scales from 5L to 1,000L, making it a consistent component of your integrated process from bench to manufacturing. The equipment, bags, impellers, motors and designs are from a consistent and collaborative partnership of technologies, and the technologies that you use at benchtop are relatable to their scale-up counterparts in that the same technologies are employed throughout.

The data herein provides a foundational fidelity for mixing and solvation in bioprocess development and manufacturing. Future studies will follow.

Conclusion

Understanding solvation mechanisms, solvation free energy, and the behavior of ions and macromolecules in solvents can be theoretically modeled but adding practical mixing introduces complexities. Proper mixing of solutes like NaCl and NaOH is often considered straightforward, yet various factors such as equipment, mixing method, and solution characteristics influence success.

Using the Agilitech 10L Single Use Mixer (SUM), NaCl and NaOH solvation experiments demonstrated that homogeneity could be achieved rapidly (NaOH in 24 seconds and NaCl in 50-100 seconds) by monitoring conductivity.

Experiments addressed challenges in solvation and mixing of various solutes, including glucose, HEPES, and polysorbate 80, under different conditions. These studies showed the mixer's capability to handle viscosity challenges and ensure macromolecular integrity, confirming the mixer's robustness and efficiency.

Temperature control in the 10L stainless steel jacketed mixer was assessed. The mixer effectively managed temperature changes, maintaining solution stability crucial for bioprocessing stages. The experiments demonstrated reliable temperature modulation and highlighted potential for further studies with complex solutes.

The Agilitech 10L SUM demonstrates effective solvation and mixing capabilities under various conditions. The mixer’s consistent performance across different solutes and temperatures supports its integration into bioprocess development and manufacturing. Agilitech invites further collaborations to explore custom mixing solutions and enhance process scalability.

References

[1]The Chemical Physics of Solvation, Part A : Theory of solvation; A edited by Revaz R. Dogonadze [et al.] Amsterdam; New York; Tokyo : Elsevier, 1985

[2]Molecular theory of solvation: Methodology summary and illustrations, Condensed Matter Physics, 2015, Vol. 18, No 3, 32601: 1–2, 22Oct 2015

[3]BioX LLC (bioxeng.com) is a Bioprocess Applications Testing Laboratory in Salem, NH. BioX is an independent third-party specializing in single use materials and equipment testing intended for use in the cGMP Manufacturing

[4]Mastering Mixing Fundamentals: A technical guide from the experts in the industry. Hayward Gordon, 2019.

[5]Levitronix, unpublished communication

[6]Guidance for Industry PAT — A Framework for Innovative Pharmaceutical Development, Manufacturing, and Quality Assurance, U.S. Department of Health and Human Services, Food and Drug Administration, Docket Number: FDA-2003-D-0032, September 2004

[7]Pang et al., Understanding and controlling the molecular mechanisms of protein aggregation in mAb therapeutics, Biotechnology Advances, Volume 67, October 2023, 108192

Agilitech Single-Use Mixers

Floorstanding Single-Use Mixers

Uniquely Flexible Brand-Agnostic Design

Agilitech single-use mixers provide unmatched flexibility to meet your unique needs. With models from 5 L to 1000 L, there is a mixer available to support small-volume to full-scale production applications.

Key Features:

- Models available: 5 L, 10 L, 25 L, 50 L, 100 L 250 L, 400 L, 650 L, 1000 L
- Unique built-in motor offers flexible control and easy handling
- Fully customizable single-use mixer bags
- Jacketed or non-jacketed varieties
- Low-shear mixing using Levitronix® MagLev Mixers
- Control manually or easily integrate with your automation and control platform
- Built-in load cells for monitoring the weight of solution
- Resistance temperature detector (RTD) provides increased stability, precision, and repeatability of temperature measurements
- Durable stainless steel construction with heavy-duty casters for easy transport

Technical specifications

Technical Specifications, All Models

Attribute	
Jacket Maximum Working Pressure	15 PSI
Tank and Frame Material	304L SS, #4 Finish (29-40 RA)
Legs	Threaded stem leveling caster; swiveling; clean room compatible
Agitator Motor	Levitronix®
Maximum Working Temperature (°C)	50
Control System	Rockwell MicroLogix® with 7-inch PanelView® 800
Communications	Ethernet IP/Modbus TCP
Load Cells	Minebea Intec PR 6211 / PR 6012; ± 1%
RTD Temperature Sensor	Included; ± 0.2°C
Input Power	100-240 VAC, 50/60 Hz (See model specifications for amperage)
Options	
pH Sensors	Hamilton SU or Mettler Toledo SU pH sensors for bags Traditional probes with insertion sheath
Conductivity Sensor	Hamilton SU conductivity sensors for bags Traditional probe with insertion sheath
Temperature Control	Thermo Fisher TCU

Technical Specifications

Model	M10	M25	M50	M100	M250	M400	M650
Bag Size	10 L	25 L	50 L	100 L	250 L	400 L	650 L
Vessel Width (in)	14	17	20	24	31	36	42
Vessel Depth (in)	26	29	32	36	43	48	54
Vessel Height (in)	42	42	42	42	50	50	50
Bag Edge Dimensions (in)	10	13	16	20	27	32	37
Minimum Mixing Volume (L)	1.1	4	6.3	10	25.9	34.6	47.9
Minimum Sampling Volume (L)	3.4	6.3	10	15.9	29.2	40	55.3
Maximum Working Volume (L)	12	30	60	120	300	480	780
Agitator Motor Model	i30	i600	i600	i600	i2048	i2048	i2048
Max Rotation Speed (rpm)	4600	1650	1650	1650	1100	1100	1100
Amperage	3	8	8	8	15	15	15
Motor Voltage (VDC)	24	24	24	24	48	48	48
Optional							
Maximum number of side ports	1	2	3	3+	3+	3+	3+
Inlet/Outlet Tubing ID	1M 1/4 in.	1M 1/4 in.	1M 1/2 in.	1M 1/2 in.	1M 1/2 in.	1M 1 in.	1M 1 in.

Benchtop Single-Use Mixers

Key Features:

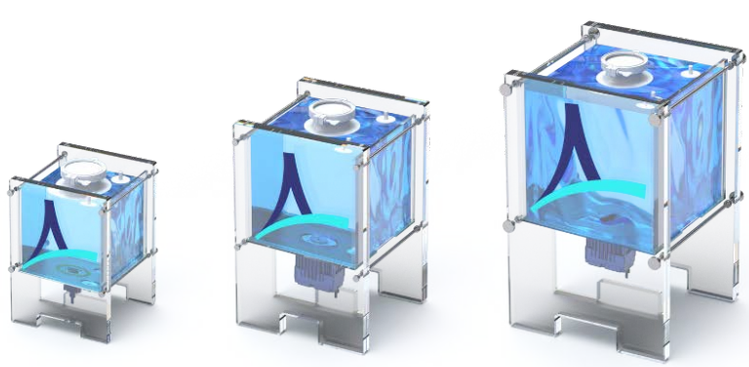
- **Models:** 5 L, 10 L, 25 L, 50 L
- **Low-Shear:** Levitronix® PuraLev® Impeller for lowshear mixing
- **Customizable Consumables:** Fully customizable single-use mixer bags
- **Effortless Mobility:** Assembles/Disassembles in under 10 minutes, designed for the dynamic needs of your workspace.
- **Portable Powerhouse:** Lightweight design for easy storage in compact spaces, ensuring convenience without compromising performance.
- **Flexible Control:** Detachable motor and panel for flexible design
- **Custom Integrations:** Manual control with optional custom modifications

Performance Meets Portability: Configurable, Customizable, Convenient

Agilitech's benchtop single-use mixers are tailored for bench-to-scale endeavors, paving the way for eventual commercial production. Wherever you are, our mixers empower you to assemble on-site, disassemble for storage, or conveniently transport as luggage for on-the go use in satellite locations.

Technical Specifications

Attribute	
Tank and Frame Material	Polycarbonate frame, 6061 aluminum base. 304L assembly rods.
Agitator Motor	Levitronix®
Maximum Working Temperature	0-50°C (32-122°F)
Control System	7-inch Levitronix control panel
Input Power	100-240 VAC, 50/60 Hz; 10L: 3A; 25 L, 50 L: 8A
Options	
RTD Temperature Sensor	± 0.2°C, within working temperature range
pH Sensor	Available custom, quoted on request
Conductivity Sensor	Available custom, quoted on request
Travel Case	Available for purchase with benchtop unit
Weighing platform*	Available custom, vendor of choice



ABOUT AGILITECH

We believe in the power of science and medicine to solve health problems and make lives better – today and in the future. As a pioneering partner to the biotech industry, we help to drive this progress by designing and implementing state-of-the-art equipment for biotech labs through to full-scale manufacturing, along with providing game-changing bioprocess engineering and automation services.

In a fast-moving industry that is constantly evolving, we have the flexibility and experience to tailor our offerings to the specific requirements of each and every customer. We ask the right questions and take the time to understand both what you're doing and where you're going, so that we can offer fresh perspectives and develop custom solutions to real problems.

Our goal is to exceed your expectations, to offer you the full benefit of our industry insights and expertise and to establish a long-term business relationship built on trust.

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