

Polymer costs can rank high in the percentage of a facilities annual operating costs. Polymer makedown equipment manufacturers offer conventional wetting/mixing technologies in an effort to minimize one time capital costs. Available equipment simply prepares dilute polymer solutions with little thought placed on polymer hydration optimization and efficiencies and subsequent operating costs. At Aquafy, we feel this is a tremendous disservice to the customer and results in unnecessary costs. In an effort to optimize polymer preparation, along with a key understanding of polymer chemistry, Aquafy Water Technologies Inc. (Aquafy) has partnered with IKA® Works, Inc. to offer the latest innovation in dry polymer makedown technology. Aquafy offers a complete turnkey polymer makedown system consisting of a disperser (polymer wetting system), powder feeder, powder handling, low shear mixing, and instrumentation all controlled by a master PLC based control panel.

POLYMER WETTING & DISPERSION

At the heart of the Aquafy dry polymer makedown system is the Solid-Liquid Turrax (SLT) Jet Stream Assisted Ultra Polymer Disperser unit. The SLT disperser uses high shear mixing technology and is especially designed for incorporating and homogenizing the most difficult powders, even at high concentrations. The SLT generator tip speed of approximately 23 m/s ensures dry polymer particles are

efficiently dispersed in the dilution water at the moment of initial wetting. By effectively dispersing dry polymer powder into the dilution water flow, “fish-eyes” and agglomerations, which cannot be hydrated, are prevented. Furthermore, by minimizing the polymer particle sizes after dispersion, the rate of hydration is reduced considerably according to the following formula:

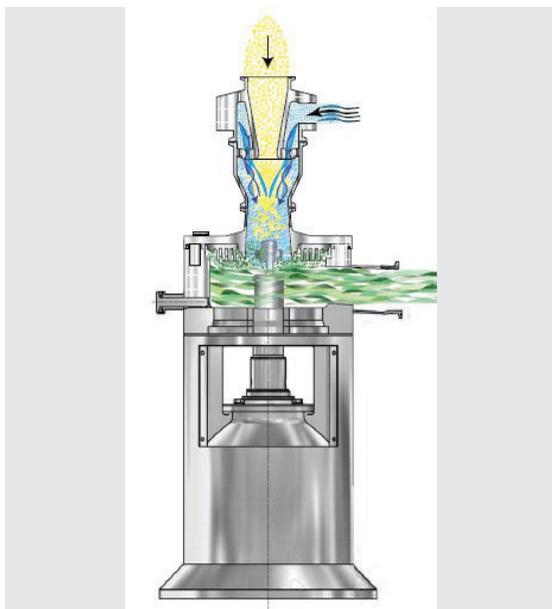
$$\text{Rate of Polymer Hydration} \propto (\text{Polymer Particle Radius})^2$$

Proper polymer dispersion also allows for the ability to makedown a highly concentrated stock polymer solution.



SLT Jet Stream Assisted Ultra Polymer Disperser by IKA® Works

The SLT disperser completely separates the powder zone and the liquid zone eliminating the potential for build-up of polymer gels, a maintenance issue. Furthermore, the powder only enters the dilution water stream, aided by a dilution water jet-stream, at the high mixing energy zone and not upstream. Aquafy offers the widest range of flows in the dry polymer wetting industry ranging from 1.5 to 550 gpm.



Dry Polymer Dispersion in SLT

HOW IS DRY POLYMER DISPersed?

The Aquafy Dry Polymer System uses high shear mechanical mixing energy at the Moment of Initial Wetting using the SLT Jet Stream Assisted Ultra Polymer Disperser. This unmatched energy ensures individual polymer particles are surrounded by a layer of water, allowing each particle to hydrate. No agglomerations. No fish-eyes.

HOW MUCH MIXING TIME IS REQUIRED?

Following polymer dispersion, the concentrated stock polymer solution is mixed in a tank using a low shear mixer. 30 minutes for cationic polymer and 40 minutes for anionic polymer is all that is required to reach peak hydration with the Aquafy Dry Polymer System. Why? The smaller the polymer particle within the dilution water, which results from superior dispersion, the faster the polymer hydrates. If the particle doubles in size it will take four times longer to hydrate. Utilize the IKA® Works laboratory to confirm what the optimal mixing time is for your application specific polymer.

IS AGING TIME REQUIRED?

The short answer is no when using the Aquafy Dry Polymer System. There is no additional benefit to aging polymer beyond the recommended mix time. As a result, the batch time is further reduced.

HOW CAN YOU VALIDATE THAT PEAK POLYMER HYDRATION HAS BEEN ACHIEVED?

The best method to validate polymer hydration is to measure and plot viscosity versus time. The viscosity, starting at zero, will increase with time. When the viscosity plateaus, the polymer is fully hydrated. The concept of measuring conductivity is flawed. Although conductivity mimics the viscosity curve, conductivity will actually increase with polymer fracturing that may result with over mixing.

HOW CONCENTRATED CAN THE STOCK POLYMER SOLUTION BE MADE?

Conventional polymer makedown systems limit their makedown capability to 0.25 - 0.50%. With the Aquafy Dry Polymer System, standard practise is to prepare the stock polymer solution at 1.0% for cationic polymer and 0.5% for anionic polymer. This can be achieved as a direct result of the dispersion capabilities of the high shear SLT disperser. The makedown concentration has no bearing on the time to full hydration.

DISPENSER SKID MOUNTED SYSTEM

The SLT disperser is integrated into a skid mounted system comprising the dry polymer storage hopper and feeder, dilution water control and monitoring, and instrumentation for an installation ready, engineered package. No compressed air is required to operate the system. The entire batching system (including the mix tanks, mixers, and transfer valves) is controlled by the master PLC based control panel.



Aquafy Dispenser Skid

WHAT ARE THE BENEFITS OF PREPARING A HIGH CONCENTRATION STOCK POLYMER SOLUTION?

The system footprint can be significantly reduced as can the energy demand. A more concentrated stock polymer solution requires smaller mix/holding tanks, smaller horsepower mixers, and lower capacity polymer metering pumps. It is preferred that polymer be made down using potable water. However, non-potable or effluent water can be used for post dilution, reducing the concentration to the final feed concentration demanded by the process. This can save a significant amount of potable water annually. Finally, the more concentrated the stock polymer solution, the longer it will last in a useable, effective form. Therefore, there is no need to dump batches of polymer following a weekend, resulting in less wastage.

WILL POLYMER CONSUMPTION BE REDUCED?

The Aquafy Dry Polymer System is designed around the chemistry of polymer hydration. By preventing polymer agglomerations (which leads

to unhydrated polymer), by fully hydrating each polymer particle, and by preventing polymer fracturing that results from extended mixing, you can be sure that polymer consumption will be reduced. Another benefit is that the process will perform better as a result of larger floc formation.

MAINTENANCE?

The Aquafy Dry Polymer System was designed with our customers in mind. Agglomerations not only leads to more polymer consumption (via wastage) but has the negative consequence of being a source of plugging. This nuisance has been eliminated. The SLT disperser completely separates the dry polymer powder from the dilution water except at the point of high shear energy. There is no water splashing and subsequent polymer gels building up in the dispersion chamber. The SLT disperser is oversized for the intended application allowing for operating flexibility in the field. Finally, the Aquafy Dry Polymer System is industrial in design for product durability and longevity.

AVAILABLE OPTIONS

- Rapid Tank Fill
- Polymer Solution Feed Pumps
- Post Dilution Systems
- Custom Control Panels
- Various Hopper Sizes
- Bulk Bag Frame Systems
- Dust Collection Systems
- Emulsion Polymer Feed Option
- Various Materials of Construction
- Polymer Hydration Validation Systems



SLT JET STREAM ASSISTED ULTRA POLYMER DISPERSER

MODEL	DILUTION WATER GPM/LPM	CONNECTIONS POLYMER/WATER/DISCHARGE	OUTPUT SPEED RPM	POWER HP
SLT2000/04	1.5/5.7	1/0.5/0.75	7900	5
SLT2000/05	10/38	2/1/1.5	5800	7.5
SLT2000/10	35/132	2.5/2/2	4200	10
SLT2000/20	90/341	3/2/2.5	3000	30
SLT2000/30	175/662	6/3/4	1500	50
SLT2000/50	550/2082	8/4/6	1100	150

EXAMPLE SYSTEM CAPACITIES (Larger Capacities Are Available)

TANK VOLUME GALLONS/LITRES	ORIENTATION	DISPERSER MODEL	CAPACITY @ 0.5% KG/HR	CAPACITY @ 1% KG/HR
150/568	Stacked	SLT2000/04	1.3	2.5
300/1136	Stacked	SLT2000/05	5.1	10.2
600/2271	Flip-Flop	SLT2000/10	14.5	29.0
1000/3785	Flip-Flop	SLT2000/10	19.4	38.8
1500/5678	Flip-Flop	SLT2000/10	23.4	46.8
2000/7570	Flip-Flop	SLT2000/10	26.0	52.1
2500/9463	Flip-Flop	SLT2000/20	49.1	98.3
3000/11355	Flip-Flop	SLT2000/20	53.8	107.6

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