Bulk Handling Solutions

Lime Milk Solution Preparation

CON-V-AIR SOLUTIONS

Lime Milk Solution Preparation

Our goal is to facilitate handling dry hydrated lime and dry powder quicklime and render them as operator friendly as their liquid counterparts. We recognize the economic and chemical benefits of using lime in your process and realize that these benefits can be even greater when implementing a well designed system to handle the task. We have also seen and appreciate the problems that many operators are faced with when using poorly designed solution preparation systems.

In an effort to reduce these problems we have designed our systems to benefit from the following:

Storage

- Silo complete with cone activation system that promotes lime flow in the cone as well as within the silo walls
- Bulk Bag Unload station complete with vibrator and bag jostling system designed to empty 1 ton bags
- Bag Dump Station complete with hopper fluidising system and integral dust collection system providing dust free operation while transferring product

Handling

- Cast iron rotary valves complete with steel rotor to ensure dust free operation
- Pneumatic transfer of dry powder lime right to the point of injection eliminates risk of line clogging due to calcination/scaling
- Stainless steel volumetric screwfeeder designed and calibrated for lime applications

Traditional System

Our traditional system consists of preparing solution in tanks located directly beneath the storage silo or hopper. Volumetric screwfeeders, specifically calibrated for lime, feed the required dry powder lime directly into the tanks.

Water is fed to the first tank, called the mixing tank, through a liquid eductor. The material feed inlet of the eductor is piped directly to the mix tank. The resultant vacuum, created through the nozzle/venturi combination within the eductor, consequently draws in any effluent dust back into the eductor creating a dust free environment. An ultrasonic level detector is included and programmed to detect high and low levels of solution as well as an overfill condition. A paddle type mixer ensures that the lime remains suspended in solution. Optimal solution concentrations of 5%-10% lime/water are attained.

Once the solution prepared it is transferred, via peristaltic pumps, to the distribution tank. Peristaltic pumps are manufactured to be used in chemical distribution systems and are generally not requiring any maintenance due to blockages.

The distribution tank also incorporates a paddle type mixer as well as a level detection system. A second peristaltic pump, operated on variable frequency, pumps the required lime milk to the dosing point. It is recommended that flexible tubing be used for distributing the lime milk in order to facilitate de-calcinations via tube compression.

The traditional system is a time tested lime milk preparation method that has proven effective over the years.

Pneumatic Handling

One of the advantages of using dry hydrated lime is that it does not have the tendency of calcinating in the transfer lines. This allows users to pneumatically convey right to the dosing point eliminating the need to have flexible tubing that may require maintenance to remove scaling.

To accomplish this transfer a blower system is installed in close proximity to the storage silo/hopper and the dry hydrated lime is pneumatically transferred, in essence blown, through rigid steel pipes right to the dosing point. This system allows operators the flexibility of transferring the required lime to a single or to multiple dosing points within the plant. On the receiving end the lime is fed into one of two types of receivers; an intermediate receiver, which incorporates a valve system that allows product to fill the receiver while letting air pass through, or an end of line receiver which incorporates dust collection capabilities. Whether dust collection is performed on the end hopper or back in the silo itself the filter media is effective to 99.99%. Cleaning of the filter media is done automatically via an integrated pulse jet system thereby extending filter media life.

Located beneath the receiving hopper the screwfeeders dose the correct amount of lime directly into the mix tanks located above the dosing point which then overfeed into the water to be treated. This configuration eliminates the need for feed pumps and minimizes operator/maintenance intervention due to scaling.

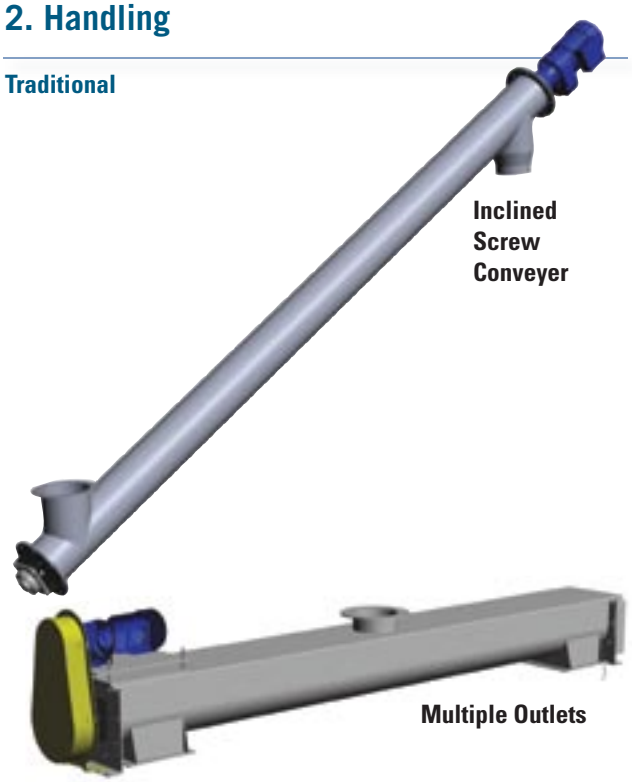
Alternatively, in applications where the mix tanks cannot be located directly above the dosing point, a wetting cone/flexible ejector combination is used. This patent pending technology provides the flexibility of having the dosing point located remotely. The wetting cone provides instantaneous mixing of lime/water without any accumulation of solution within the cone. This eliminates the possibility of calcination within the cone. Coupled with the self cleaning flexible ejector, the flexturi, this system provides operators with a continuous, maintenance free method to prepare lime milk solutions.

Components

1. Storage

2. Handling

Traditional



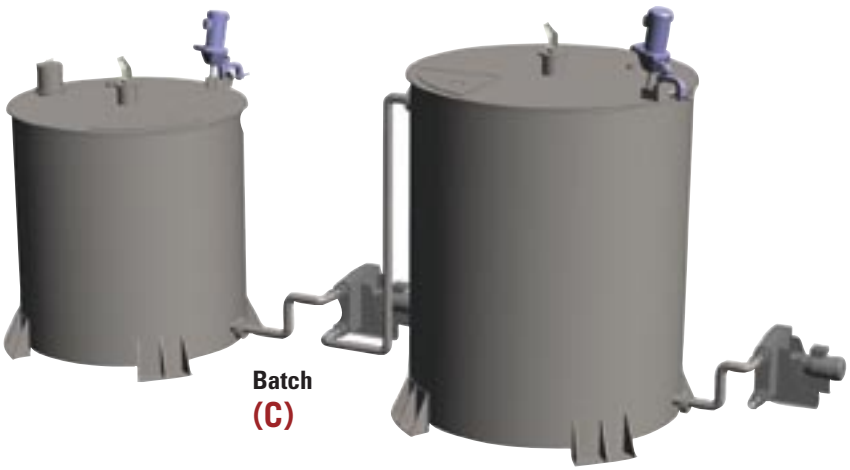
Pneumatic (A)

Lime milk solution systems require proper selection of essential components in the following stages:

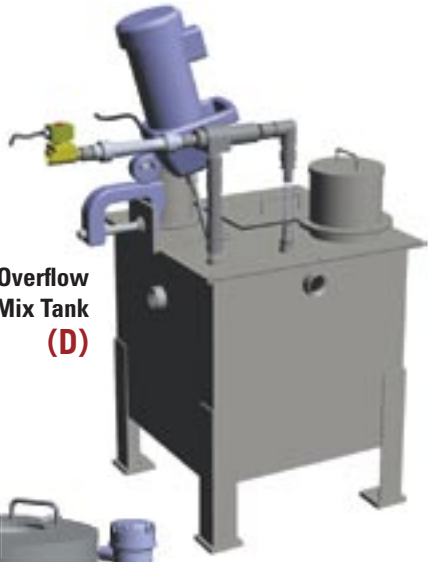
- Storage
- Handling
- Dosing
- Wetting

The first step consists of selecting the type of storage equipment and capacity that is needed. Next, the method by which the lime milk be transferred is selected; traditional or pneumatic. The final step combines the dosing and wetting process. Here, batch or continuous methods will be selected depending on, among other criteria, location of dosing point.

4. Solution Preparation



Batch (C)



Overflow Mix Tank (D)

Wetting Cone / Overflow / Flexturi (E)

3. Dosing (B)

Lime Milk

See next page for technical data

Lime Consumption

Lime dosage required as a function of concentration wanted per 10 000 m^3 /day water throughput (as an example, to obtain lime dosage required for a 25 mg/L concentration in a plant that processes 90 000 m^3 /day of water, multiply 0,174 kg/min. x 9 to obtain 1,566 Kg/min.)

Lime Dosage ppm [mg/L]	**Lime Dosage** [kg/min.]
5	0.035
10	0.069
15	0.104
20	0.139
25	0.174
30	0.208
40	0.278
50	0.347
60	0.417
70	0.486
80	0.556

Pneumatic Transfer Pipe Diameter (A)

Pipe diameter for pneumatic transfer of dry lime as a function of lime dosage and transfer distances. This table also provides recommended receiver hopper sizes and model numbers.

Transfer Line Diameter [inches]	**Equivalent Pneumatic Transfer Distance** (feet) (elbow = 20 ft)								**Receiver Hopper Model**	**Hopper Volume** m^3 [ft^3]
	50'	**100'**	**150'**	**200'**	**300'**	**400'**	**500'**	**600'**		
	Lime Dosage [kg/min.]									
1 1/2"	4.50	2.50	1.60	1.08	0.50	0.15	-	-	RC-1.5	0.085 [3]
2"	9.60	5.85	4.00	2.90	1.65	0.95	0.50	0.20	RC-2.0	0.14 [5]
2 1/2"	15.50	9.80	6.95	5.20	3.10	2.00	1.25	0.75	RC-2.5	0.14 [5]
3"	27.50	18.50	13.60	10.50	6.80	4.70	3.35	2.35	RC-3.0	0.28 [10]

Screwfeeder Throughput rates (B)

Maximum screwfeeder capacity as a function of screw diameter.

Screw [inches]	**Throughput** [kg/hour]
1/2"	0.04 - 1.2
3/4"	0.16 - 4.8
1"	0.40 - 12
1 1/2"	1.5 - 45
2"	4.3 - 129
2 1/2"	9 - 270
3"	14 - 420

Solution Capacities

The tables below indicate lime milk solution capacities according to solution preparation type.

Batch Solution Preparation (C)

The following table provides operators with a guideline for preparing a 7% solution. Distribution pump flow, approximate reservoir size and lime consumption are some of the values provided.

Lime Feed [Kg/min.] max.	**% concentration**	**Distribution Pump Flow** [L/sec.]		**Distribution Tank Volume** [L]	**Mix Tank Volume** [L]	**Transfer Pump Flow** [L/sec.]		**Volumetric Screw Feeder Model**
		Min	Max			Min	Max	
0.03	7	0.000	0.009	75	50	0.002	0.043	SF.1
0.10	7	0.001	0.029	200	133	0.007	0.143	SF.1.5
0.50	7	0.007	0.143	825	550	0.036	0.714	SF.2
1.00	7	0.014	0.286	1650	1100	0.071	1.429	SF.2.5
2.00	7	0.029	0.571	3250	2167	0.143	2.857	SF.2.5
3.50	7	0.050	1.000	5700	3800	0.250	5.000	SF.3
5.00	7	0.071	1.429	8000	5333	0.357	7.143	See Manufacturer
6.50	7	0.093	1.857	9750	6500	0.464	9.286	See Manufacturer

Continuous Solution Preparation - Overflow (D)

The following table provides operators with a guideline for selection of screwfeeders, reservoir volume and more.

Lime Feed [Kg/min.] max.	**Volumetric Screw Feeder Model**	**Tank Volume** [L]	**Solution Overflow Rate** [L/min.]	**% Max. Concentration Tank**	**Tank Outlet ∅** [inches]
0.03	SF.075	225	20	0.013	4
0.10	SF.1	225	20	0.044	4
0.50	SF.1.5	225	20	0.222	4
1.00	SF.2	225	20	0.444	4
2.00	SF.2	225	20	0.889	4
3.50	SF.2.5	225	20	1.556	4
5.00	SF.3	225	20	2.222	4
6.50	SF.3	225	20	2.889	4

Continuous Solution Preparation - Wetting Cone & Flexturi (E)

The following table provides operators with a guideline for selection of screwfeeders, wetting cone size and more.

Lime Feed [Kg/min.] max.	**Volumetric Screw Feeder Model**	**Wetting Cone Model**	**Flexturi Model**	**Motive Water Pressure** Min- Max [psig]	**Motive Water Flow** [L/min.]	**% Max. Concentration**	**Head loss** [ft.]
0.03	SF.075	CDM-120	1.5"	55 - 85	140	0.020	15
0.10	SF.1	CDM-120	1.5"	55 - 85	140	0.071	15
0.50	SF.1.5	CDM-120	1.5"	55 - 85	140	0.357	15
1.00	SF.2	CDM-120	1.5"	55 - 85	140	0.714	15
2.00	SF.2	CDM-160	1.5"	55 - 85	140	1.429	15
3.50	SF.2.5	CDM-160	1.5"	55 - 85	180	1.944	15
5.00	SF.3	CDM-160	1.5"	55 - 85	250	2.000	15
6.50	SF.3	CDM-160	1.5"	55 - 85	325	2.000	15

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