

## SERIES 35-300 DRY AND LIQUID POLYMER SYSTEMS

Wallace & Tiernan Products Series 35-300 Polymer Systems produce batches of completely activated, fully aged polymer solution from liquid or dry polymer. The systems are designed for efficiency, performance and economy; the entire process is automatically controlled through all operations. Unique, efficient wetting techniques, thorough mixing, and positive aging logic produce highly-reactive polymer solutions. The polymer feed and the dilution water are continuously monitored to maintain the desired concentration and viscosity.

Polymers are very effective as flocculants and coagulants in potable water systems and wastewater treatment. Their application produces a substantial reduction in the amount of conventional chemical required to settle suspended particles. Polymer increases the capture of solids and improves the clarity of the water being treated.

### FEATURES

- Packaged Systems, pre-tested and pre-wired
- Wide choice of capacities for customized arrangements
- High yield polymer production
- Positive aging
- Automatic monitoring of water-to-chemical ratio
- Highly effective wetting techniques
- Central control system
- Solution from dry or liquid polymers



### APPLICATIONS

Wallace & Tiernan Products Polymer Systems are ideal for potable and wastewater treatment or industrial processes, including:

- Sedimentation of municipal water, sewage, and industrial wastes.
- Settling of hydrous metal oxides in metal-finishing water.
- Improving solids capture and supernatant clarity; increases throughput in centrifugation of alum muds.
- Gravity settling of steel mill scale, waste pickle liquor, rolling mill wastes, zinc, chromate, latex and sugar mill wastes, tannery wastewater.
- Brine clarification in recovering magnesium compounds from seawater.
- Clarification of beet and sugar cane juice.
- Thickening of coal refuse; dewatering aid for vacuum filters and drying beds; sludge conditioning for improved dewatering in secondary wastewater treatment.
- Imparting a charge to the filter media in filtration of alum muds, sewage sludges, and fermentation broths as a filter aid.
- Increasing retention of fillers, pigments, and other wet-end additions on cylinder paper machines.

**USFilter**

# FEATURES

## COMPLETE SYSTEMS

Series 35-300 Polymer Systems are available in 6 models with capacities ranging from 5,400 to 86,400 gpd (capacities based on 5-minute batch-aging time). Wallace & Tiernan Products provides complete, coordinated systems and a full range of complementary accessories from W&T standard line of equipment and components. Polymer systems are delivered pretested, pre-wired, and prepiped. (Larger arrangements require some wiring and piping between modules.) This assures performance-ready systems and fast, trouble-free installation.

## FULLY AUTOMATIC

The batch production of completely activated and fully aged polymer solution is automatically controlled through all stages. The ratio of polymer to water is precisely regulated. Timers control mixing and aging periods. Automatic-level controls monitor solution levels in tanks. The operating sequence of the feeder, wetting unit, and mixer are electrically interlocked with electric level sensors and timers.

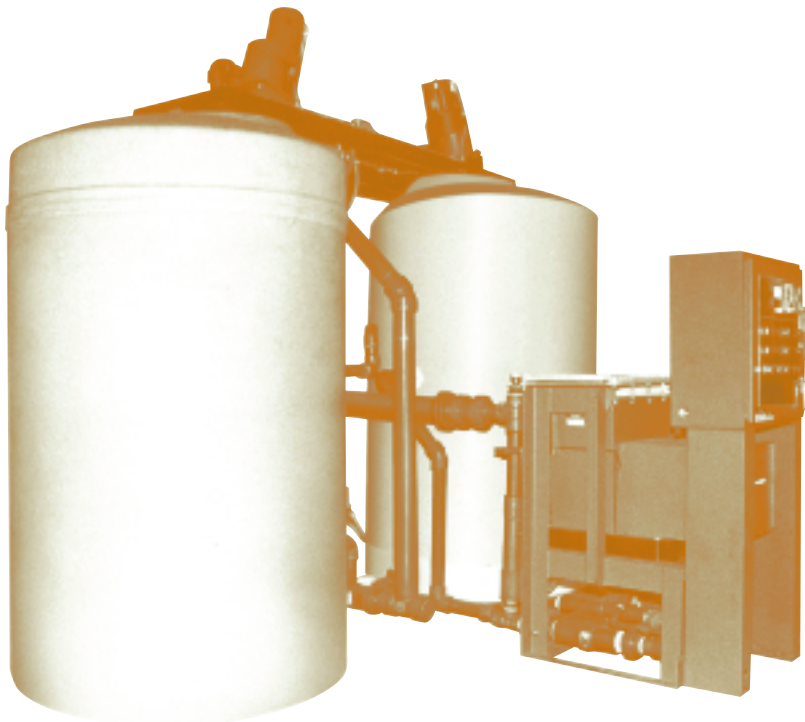
## HIGH EFFICIENCY WETTING

Wallace & Tiernan Products Series 35-300 Polymer Systems use 2 unique, highly effective wetting techniques. In the lower capacity arrangements, high-velocity nozzles (in the Wallace &



Tiernan Products patented Jetspray Wetting unit) generate a strong water bombardment inside a wetting chamber. The hydraulic activity creates a down-draft in the chamber that draws polymer into the powerful spray pattern.

Additional spray nozzles direct water on the interior wall to minimize material build-up. A unique cone-eductor wetting unit is used in the higher-capacity unit. As polymer is metered into the cone-shaped unit, a powerful water stream causes water to swirl around the inside of the cone. The induced water vortex covers the wall of the cone with water. The velocity effectively disperses the polymer for thorough wetting and prevents build-up. An orificed disc in the dilution water piping directs high velocity water jets on the pre-wetted polymer as it exits the cone. The impact acts to break up any lump formations and to further dispense the polymer. An eductor downstream mixes and moves the polymer solution to the tanks for additional mixing and aging.



## **OPERATOR RESPONSIBILITY AND LABOR MINIMIZED**

Automatic feeding eliminates the need to weigh dry chemical for each batch. The potential for error is removed. Keeping the hopper filled with dry polymer is the only manual operation.

## **LIQUID-DRY CHEMICAL CAPABILITY**

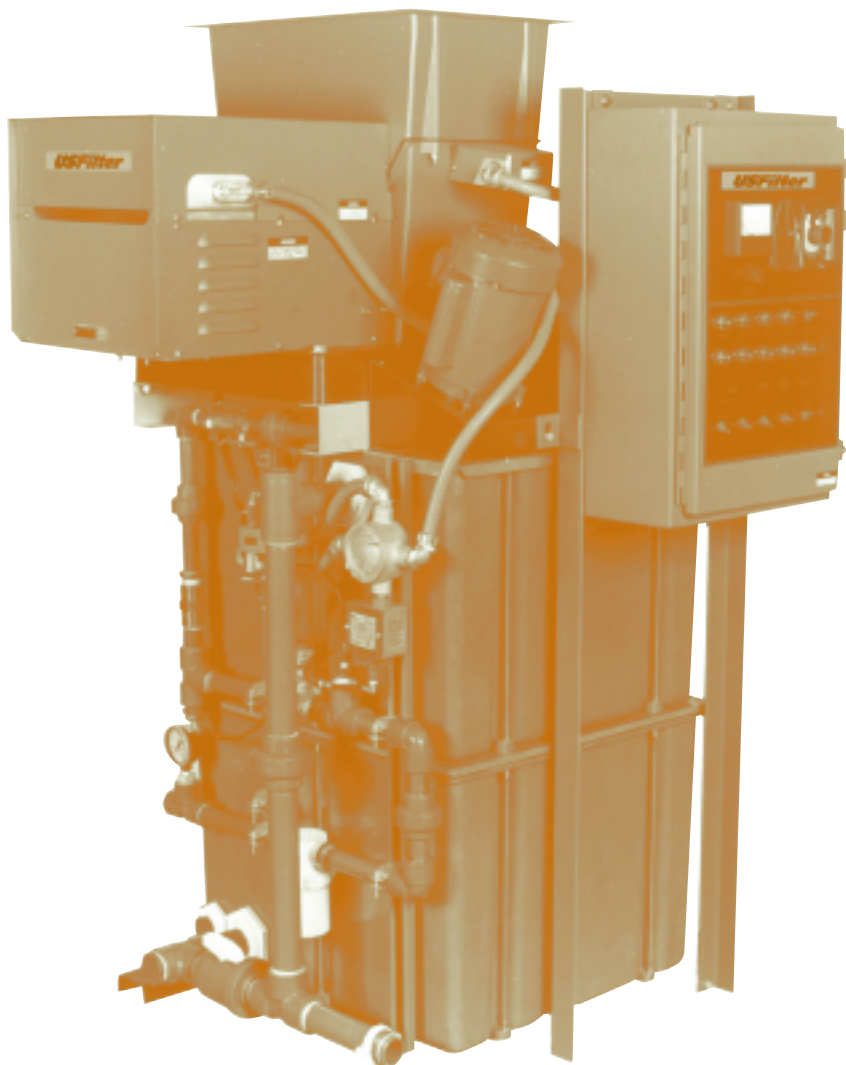
Wallace & Tiernan Products Series 35-300 Polymer Systems can prepare aged polymer solution from both dry chemical and liquid concentrate. A switch on the control panel sets the operating mode. Conversion from either the dry or liquid mode requires only simple adjustment to the supply connections.

## **ENGINEERED FOR PERFORMANCE**

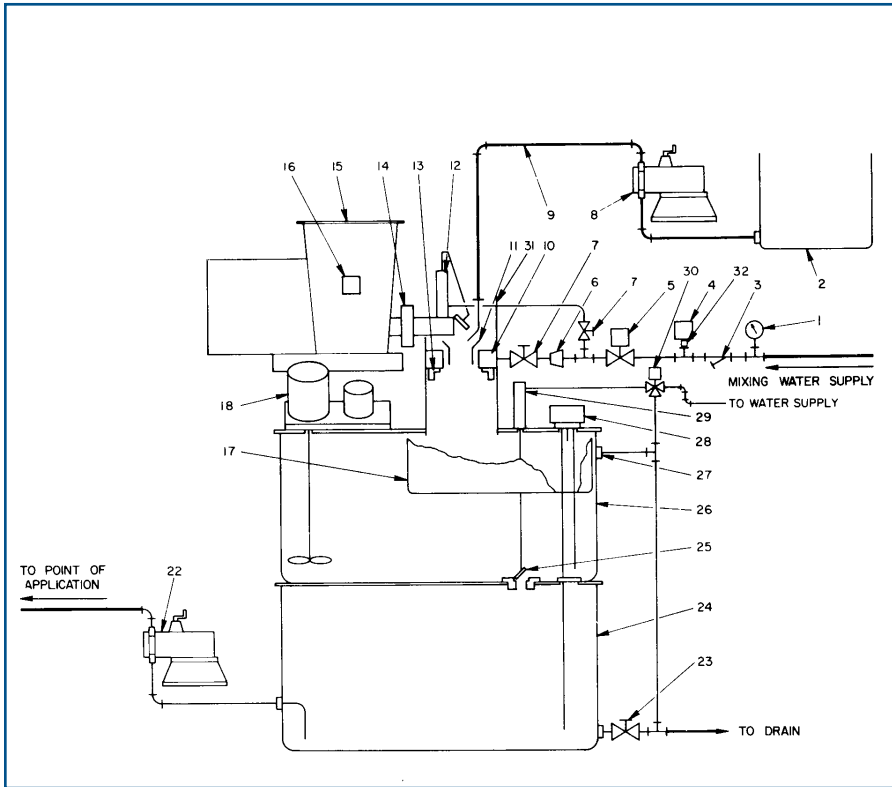
All operations are controlled from the control panel which can be mounted on-site or remote. Feed rate and aging time can be adjusted without shutdown. The system is designed for automatic operation but manual overrides are provided for water, feeder, and mixer operation. It is easy to flush the system and recalibrate for a polymer solution with different ionic characteristics, viscosity or concentration.

## **SAVINGS FROM OPERATING EFFICIENCY**

Precise system controls maintain the optimum water to polymer ratio. Positive wetting and programmed aging helps the polymer reach the most effective molecular weight and produce the highest yield of reactive solution from these expensive chemicals.



# DESIGN AND OPERATION



KEY NO.	DESCRIPTION
1	Water Pressure Gauge
2	Liquid Polymer Supply
3	Strainer
4	Pressure Switch
5	Solenoid Valve
6	Flow Controller
7	Shut-Off Valve
8	Liquid Polymer Feed Pump
9	Liquid Polymer Line
10	Liquid Unit - Spray Jet Type
11	Insert
12	Feed Spout Shut-off Unit
13	Spray Jets
14	Heater
15	Series 32-055 Screw Feeder
16	Low Hopper Control
17	Control Panel
18	380 RPM Mixer
22	Polymer Solution Metering Pump
23	Drain Valve
24	Solution Tank
25	Transfer Valve
26	Aging Tank
27	Overflow Connection
28	Level Control & Low Level Alarm for Solution Tank
29	Transfer Valve Hydraulic Piston
30	3-Way Solenoid Valve
31	Windshield
32	Snubber

Wallace & Tiernan Products packaged polymer systems are available in 6 capacity models. There are two types: integrated systems with capacities to 27,600 gpd and high capacity, "flip-flop" systems that can handle 86,400 gpd. (Capacities based on 5 minute aging time).

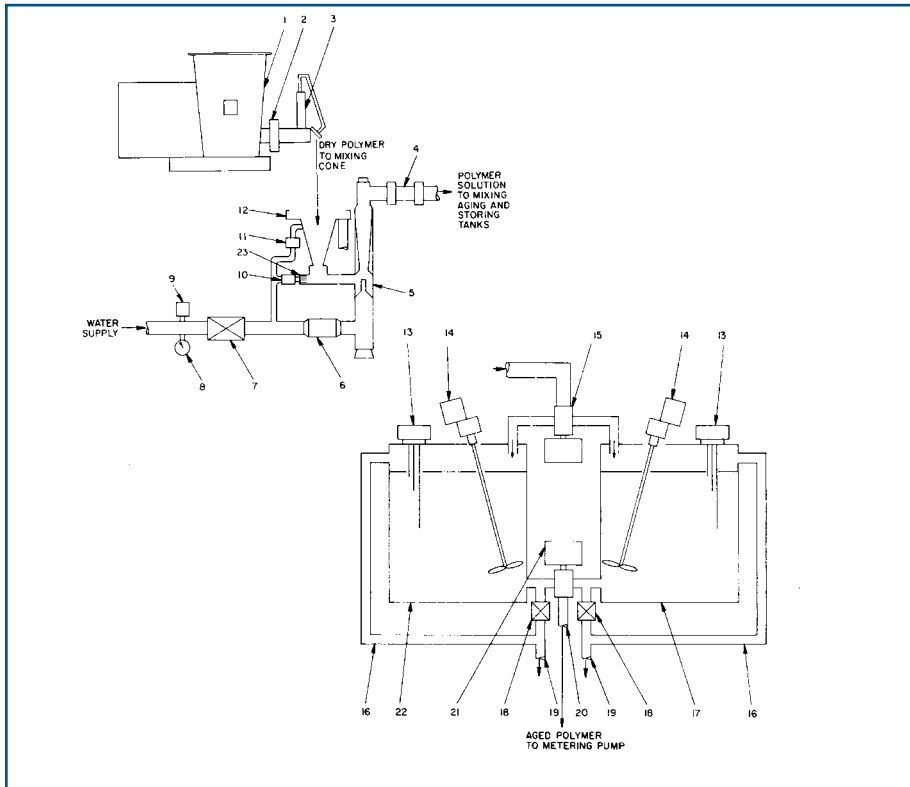
## INTEGRATED SYSTEMS

Integrated systems (Models 15, 25, 50, and 100). are 3-level stacked arrangements with the feeder, wetting unit, and mixer mounted at the upper level over the mixing-aging tank the solution-metering tank is at floor level. The stacked tanks are of stainless steel construction for increased structural strength in the Model 25, 50, and 100 systems. Control panel is mounted at convenient eye level.

Dry polymer is loaded into the hopper of the volumetric feeder. Agitating plates in the hopper walls are designed to prevent caking or material arching. A rotating feed screw carries the dry chemical to the discharge where a hydraulically operated feed-spout isolating valve releases polymer into the wetting chamber. A heater on the stainless steel spout minimizes caking of the polymer through condensation. In the integrated systems, high velocity jets in the patented Wallace & Tiernan Products Jetspray Wetting Unit develop a dynamic spray pattern. The turbulent hydraulic activity within the wetting chamber creates a vacuum that promotes the gravity flow of the dry polymer and minimizes polymer dusting. Offset nozzles inside the chamber simultaneously flush the interi-

or wall to prevent material build-up. The clear lucite chamber provides easy observation of wetting action and can be easily removed for adjusting spray nozzles or routine maintenance. The wetted polymer passes into the mixing-aging tank. When the tank is at capacity, the high-level sensor stops the chemical feed and water flow. A slow-speed mixer gently agitates the solution without severing the polymer's long molecular chains. When the mixing and aging cycle is completed, the aging timer opens the transfer valve and aged solution flows (by gravity) to the metering tank below. When the level in the mixing-aging tank reaches its low point, a low level sensor causes the transfer valve to close. Feeder and wetter will then resume operation and the cycle repeats.

# DESIGN AND OPERATION



KEY NO.	DESCRIPTION
1	Series 32-055 Screw Feeder
2	Heater
3	Feed Spout Shut Off Unit
4	Ball Check Valve
5	Eductor Jet Pump
6	Flow Controller (70 gph)
7	Solenoid Valve
8	Water Pressure Gauge
9	Water Pressure Switch
10	Flow Controller (8 gpm)
11	Flow Controller (5 gpm)
12	Mixing Cone
13	Level Control Probes
14	Low Speed Mixer
15	Tank Filling Valve 3-way
16	Overflow
17	Aging Tank "B"
18	Drain Valve
19	Tank Drains
20	Aged Polymer Discharge
21	Tank Discharge Valve 3-way
22	Aging Tank "A"
23	Multiple Spray Jets

## "FLIP-FLOP" SYSTEMS

In the "flip-flop" systems (Models 200 and 400), the feeder wetting unit, and control panel are mounted on a steel frame stand. Tanks are mounted separately and have interconnecting piping with ball valves. A steel bridge supports the mixers and mixer control box. Each tank has its own mixer and level sensor probe unit. The volumetric feeder discharges a measured flow of dry polymer through the hydraulically operated isolation valve into a cone shaped wetting unit. A high velocity stream of water enters at the top of the cone and swirls around the inside, keeping the wall covered with water. The induced-water vortex thoroughly wets the polymer. A strong spray from an offset nozzle at the base of the cone prevents caking and clogging. Dilution water, passing through

a multiple-orifice disk, impacts on the polymer as it discharges from the cone. An eductor farther downstream disperses the wetted polymer and carries it to the tank. The mixer starts when polymer solution begins to enter the tank or, using the time delay, when the solution in the tank reaches a certain pre-set level. Tanks are used alternately in a flip-flop sequence with two electric operated ball valves controlling the flow-in and flow-out for both tanks. When the first tank is filled to capacity, the high-level sensor causes the feeder to shut down. Water will continue to flow for a brief period to flush out the cone and piping. The mixing and aging in the first tank will continue for a period preset on the aging timer. When the aging cycle is complete, the aging timer will actuate the two elec-

tric operated ball valves. One changes the flow path so that polymer solution from the wetting unit is now routed to the second tank. The other ball valve will route the discharge of the aged polymer in the first tank to a metering pump. When the aged-polymer level in the first tank reaches its low limit and the aging cycle in the second tank is complete, the ball valve will switch over and the aged polymer in the second tank will be routed to the metering pump. The controls will then start the mixing water flow to the cone and the dilution water pressure will open the flapper valve on the feed spout. After a time delay the feeder will resume operation, feeding dry polymer to the cone-eductor wetting unit. The positive-aging-logic function will not allow the system to meter unaged polymer.

## CONTROLS

The control panel for the stacked systems, Model 15, 25, 50 and 100, has running lights that indicate power on, liquid or dry operating mode, mixing-water flow, mixer on, and transfer valve open. There is an alarm light for low-water pressure. (Low-hopper level and low-solution-level alarms are optional.) The feed-rate indicator, feed-rate-control potentiometer, aging timer reset and alarm-acknowledgement button are all conveniently located on the control panel.

For Models 200 and 400, the system controls, including disconnect switch, indicators, running lights and alarm lights are all conveniently displayed and easily accessible on the centralized control panel. The panel includes: feed rate meter and control knob, aging timer, liquid-dry mode selector switch, and auto-off manual switches for feeder, mixers, and mixing-water flow. Running lights indicate the operation taking place in each tank. Alarm lights for low-water pressure, cone overflow, and solution overfeed are standard. Alarm lights for low-hopper level and high-tank level are optional. Reset button is conveniently mounted for reactivation alarms. A separate-mixer control panel is mounted on the mixer bridge between the two tanks. This panel features a disconnect switch and an auto-off safety switch for each tank mixer.

## LIQUID-POLYMER MODE

When any of the Wallace & Tiernan Polymer Systems are to be operated in the liquid polymer mode, simple connections are provided for liquid polymer hook-up to the systems. An optional metering pump is used to draw from the liquid polymer supply. In Models 15, 25, 50 and 100, the liquid polymer concentrate is fed through the wetting unit; in Models 200 and 400, it is introduced after the eductor. After that point, system operation in the liquid mode is the same as operation in the dry mode.



## TECHNICAL DATA

### Capacity

System capacity is a function of tank size, solution-aging time, and metering rate. Typical capacities (at 5- and 30-minute aging time, 0.5 % solution concentration) for each model are listed below.

Model	gpd	Aging Time		Dry Polymer required per day
15	5400	5 minutes	(180 batches of 30 gallons each)	224 lb.
	1290	30 minutes	(43 batches of 30 gallons each)	52 lb.
25	8125	5 minutes	(125 batches of 65 gallons each)	338 lb.
	2535	30 minutes	(39 batches of 65 gallons each)	106 lb.
50	16320	5 minutes	(136 batches of 120 gallons each)	680 lb.
	4800	30 minutes	(40 batches of 120 gallons each)	200 lb.
100	27600	5 minutes	(92 batches of 300 gallons each)	1150 lb.
	10500	30 minutes	(35 batches of 300 gallons each)	436 lb.
200	61750	5 minutes	(130 batches of 470 gallons each)	2576 lb.
	19000	30 minutes	(40 batches of 470 gallons each)	774 lb.
400	86400	5 minutes	(72 batches of 1130 gallons each)	3538 lb.
	38400	30 minutes	(32 batches of 1130 gallons each)	1508 lb.

# TECHNICAL DATA

## TECHNICAL DATA

### Operating Range

20:1.

### Accuracy

Batch repeatability is within 3%.

### Viscosity Limits

Model 15-5000cps; all others, 10,000cps (cps as measured with Brookfield Viscometer, no. 3 spindle at 3 rpm).

### Dry Polymer Feeder

Screw-type with electric variable-speed control. High-speed continuously adjustable gearbox ratios and 4-step drive pulleys produce maximum theoretical feedrates of 0.8 to 2.4 cu ft per hour with 1-1/2-inch feed screw (Models 15 and 25), and 4.0 to 12.0 cu ft per hour with 2-1/2 inch feed screw (Models 50, 100, 200, and 400).

Operating range is 20: 1, extendable to 60:1. Hopper has a capacity of 1.6 cu ft and is designed for easy cleaning and corrosion resistance. Upper hopper is fiberglass; hopper-wall agitators are Buna-N; the feed screw, trough, and discharge spout are stainless steel. Feed rate is controlled manually from a potentiometer on the system control panel with speed (feed rate) readout on a meter calibrated 0-100% of capacity.

### Optional Metering Pumps

Wallace & Tiernan Products offers a full line of metering pumps for polymer-system applications.

#### Wallace & Tiernan Encore®700

##### Diaphragm Metering Pumps

Operating range is 10:1 with constant speed induction motor; 20:1 with SCR-controlled motor. Maximum capacity for single-head arrangement is 7600 gpd; double-head, 15,200 gpd. Feed rate for each head can be set and adjusted manually with a turn handle that controls stroke length. Remote manual control and automatic flow-proportional control are optional with variable-speed drive. A second Encore®700 Pump is available for pumping liquid polymer concentrate if system is to be operated in liquid mode. Pump with special spring-loaded valve sets can handle viscosities to 5,000 cps. For more information see publication 58 440.400 UA.

#### Wallace & Tiernan Chemtube®2000

##### Hydraulically-activated Tubular-diaphragm Metering Pumps

Operating range is 10: 1 with constant-speed induction motor 20:1 with SCR-controlled variable-speed drive. Maximum capacity is 12,600 gpd per head. Pumps are available in single simplex or double simplex arrangements. With optional SCR variable speed drive, motor speed (feed rate) can be controlled from control panel or pump can be operated with automatic flow proportional control in response to 4-20 mA input. For operation in liquid poly-

mer mode, W&T Chemtube®2000 tubular-diaphragm metering pumps can pump liquid polymer at viscosities to 10,000 cps. For more information, see publication SB430.500 UA.

### Water Requirements

Models 15 and 25; 12 gpm at 40 psi minimum pressure; Model 50 and 100 35 gpm at 50 psi minimum pressure; Models 200 and 400, 80 gpm at 55 psi minimum pressure. Maximum water pressure for all models is 125 psi. (Water supply and temperature limits are 35°F to 100°F.)

The mixing-water-supply line has a pressure gauge, pressure switch, solenoid valve, flow controller and a shut-off valve, all preceding the wetting unit. The flow controller maintains constant flow by a pressure sensitive variable orifice. If line pressure falls to less than set minimum, the pressure switch will interrupt system operation, activate the control-panel alarm light, and closed contacts for optional remote alarm. The solenoid valve is electrically interlocked with tank level controls and the aging timer for automatic control of mixing water supply.

### Tanks

Model 15, 40 gal. (30-gal. batch) rectangular molded plastic; Model 25, 90 (65), Model 50, 150 (120), Model 50, 390 (300) gal. rectangular stainless steel; Model 200, 550 (475), Model 400, 1500 (1200) gal. cylindrical polyethylene.

## SERIES 35-300 DRY AND LIQUID POLYMER SYSTEMS

### Power Requirements

#### Total System

Model 15	115 volts, 1 ph	15 amps
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#### Control and Feeder Circuits

Model 25, 50, 100	115 volts, 1 ph	6 amps
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Model 200, 400,	115 volts, 1 ph	7.5 amps
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#### Mixer Motors

Model 25, 50,	115 volts, 1 ph	9 amps
	or	
	230 volts, 1 ph	4 amps

Model 100	230 volts, 1 ph	8 amps
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Model 200	460 volts, 3ph	5 amps
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Model 400	460 volts, 3 ph	7 amps
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### Motor Characteristics

**Dry feeder:** 1/6 hp, 90 volt dc TENV, 4 amps

**Mixer:** 1/2 hp 115/230 volt, 1ph, 60 Hz; 1-1/2, 2hp 230/460 volt, 3ph, 60 Hz;

**Metering pump:** (induction motor) 1/4 or 1/2 hp, 115/230 volt, 1 ph, 60 Hz; (variable-speed motor) 1/4 or 1/2 hp, 115 volt, 1 ph, 60 Hz.

**Pump controls:** 115 volt, 1 ph, 60 Hz, 4.5 amps.

### Temperature

water, 35- 100°F, ambient, 35-125°F.

### Optional System Accessories

W&T Encore®700 or Chemtube®2000 Metering Pumps to meter aged polyelectrolyte solution into the process or to pump liquid concentrate from the polymer supply to the wetting unit. Available with inductor motor or SCR. SCR variable-speed drive provides capability for automatic polymer metering according to flow proportional, turbidity or other milliamperage input. The polymer application rate can also be manually adjusted from the control panel. Varea-Meter® indicates dilution flow at a set ratio between 10:1 and 50:1 of the maximum metering rate. Also available are hopping accessories, alarms for low-polymer-powder level and low-polyelectrolyte solution level.

### Dimensions

For dimensions see literature: Model 15, CN 351.300; Model 25, CN 351.309; Model 50, CN 351.310; Model 100, CN 351.311; and Models 200 and 400, CN 351.304.

### Shipping Weight

Model 15, 480 lb; Model 25, 500 lb; Model 50, 625 lb; Model 100, 1100 lb; Model 200, 1500 lb; Model 400, 1700 lb. (Tank weight not included for Models 200 and 400. For ea. 550 gal tank, add 175 lb; ea. 1500 gal tank, add 315 lb.)

### REFERENCES

Literature on system components and related distribution equipment is available on request.

*Progressive changes in design may be made without prior announcement*

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