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Episode 15 Show Notes Get Pumped Up

Chemical feed pumps are an important part of the water treatment process. They are used to enhance a treatment process such as iron reduction or as a solo treatment such as pH adjustment. There are differences between diaphragm and peristaltic pumps. Urbans Aqua sells mostly peristaltic type pumps such as Stenner. For purposes of these show notes we are referring to and describing Stenner Pumps.

Types

The purpose of a chemical feed pump is to pump chemical from a batch tank into the water supply at a higher psi than what would normally be found in home plumbing. Pressure in a home is typically 40psi to 60psi. The chemical pump will pump at 100 psi, which overcomes the pressure and pumps a calculated amount of chemical.

Peristaltic Pumps

The action of swallowing is called a peristaltic wave. A peristaltic pump has a roller tube (similar looking to stethoscope tube) which when pinched by a motorized roller mechanism, will roll out a liquid as a pumping action. The pinch rollers go round and round; each time pinching out a small, calculated amount of chemical.

- Peristaltic pumps don't lose prime. They will pump air in the absence of liquid.
- Accuracy – the pinch roller is consistent.
- Recurring revenue – dealer must visit application site to replace roller tubes annually.
- Interchangeability of parts enables dealers to keep minimal parts/tanks in stock.

Diaphragm Pumps

A diaphragm pump uses vacuum and pressure to operate. The action is similar to squirting pool water between your palms. Opening your palms (vacuum) allows the water in squeezing them together (pressure) squirts the water out. A diaphragm pump has a plastic or acrylic plate on one side and a rubber diaphragm on the other. A mechanical vacuum is drawn to bring the chemical in; it releases to move the chemical out.

- Diaphragm pumps can lose prime.
- Good for larger applications – boiler rooms & process plants
    - Pump at high pressures – greater than 100psi
    - Pump high volumes, greater than 40 gallons per day
- Accuracy comes at a higher cost.

- No forced maintenance

Common Installation Mistakes (peristaltic pumps)

- Wrong placement of injector. Place the injector in the tee, not before the tee, to ensure that the chemical and water are thoroughly mixed. The injection "quill" or tip must be in/or close to the center of the moving water stream.
- Insufficient retention time - in order for the chemical to react with the contaminant it must be in contact with it for a set amount of time.
- Poor chemical strength or choice.
- Mixing contaminated water with hydrogen peroxide
- Soda ash –
    - Too much puts you over the saturation point causing it to congeal in bottom of the batch tank.
    - Mixing with contaminated water may cause soda ash to go from a liquid to a solid.
- Not using a mixer
- Hazardous chemical combinations.
- Overfeeding chemicals such as sodium hydroxide NaOH.
    - Not recommended for use in a residence. To counteract the effects of excessive exposure to sodium hydroxide you must rinse with water – if this problem occurs in a residence where do they go to rinse?
- Wrong method of pump actuation.
    - Pump is wired into the well switch – no neutral wire, no electrical ground.
    - As an in-line meter alternative there are many valves – Clack, Fleck, EcoWater, etc. which have an internal meter pump actuator that can be used.

Pump Sizing

In order to size the pump, the following information is needed:

- Well pump rate
- Demand gpm
- Solution strength
- Batch solution strength

Each installation is different. Once installed test downstream of the pump as many times as is necessary to address the application.

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Use the 50% rule for setting up the chemical feed system for soda ash:

- Use a half pound of soda ash to a gallon of water. So, if you have a 50-gallon batch tank put in 25 pounds of soda ash.
- Set your pump at 50% - 50% of a 17 gallon per day pump or 50% of a 20 gallon per day pump.
- Run the water and start testing. Adjust your solutions strength from this point. Saturation is 1 pound per gallon of water – anymore, you risk precipitating dust and crud in the bottom of the tank.

Using chlorine and peroxide is simpler.

- The pump is set according to the strength of the chemical and the desired endpoint – e.g. 1 ppm residual chlorine in the finish water. Use formulas in the pump manual.

Pre-Programing Stenner Pumps

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PRE-PROGRAMMING REQUIREMENTS

Before programming the pump, collect or calculate the data in steps A through D then continue with the instructions for the Seconds, Auxiliary or Flow Switch mode.

A. Determine the **Maximum System Flow Rate** or **Well Pump Flow Rate in Gallons per Minute.**

If well pump output is unknown, refer to example below:

Calculate well pump output rate in gallons per minute (gpm).

Determine the output rate by opening a faucet until the well pump turns on. Immediately turn off the faucet and time how long the well pump runs. Next, measure the volume of water drawn from the faucet until the well pump turns on again.

$$\frac{\text{volume of water until the pump turns on (gal.)}}{\text{how long the pump runs (min.)}} = \textbf{Well Pump Output Rate (gpm)}$$

Example: After drawing 10 gallons of water, the well pump took 2 minutes to fill the pressure tank and stop.

$$\frac{\text{10 gallons}}{\text{2 minutes}} = \text{5 gpm}$$

B. Determine **Solution Strength Percentage** and the **Dosage Requirement in Parts per Million.**

If dosage is unknown, refer to example below:

Calculate required dosage in parts per million (ppm).

Refer to Oxidation Rates below. Estimate dosage and include the ppm of required residual.

Common Chemical Solution Strengths in ppm

Name	%	ppm
Sodium Hypochlorite	5.25 6.125 12.5	52,500 61,250 125,000
Potassium Permanganate Dissolved at 1/4 lb per gallon	3	30,000
Hydrogen Peroxide	7	70,000
Polyphosphate Dissolved at 1 lb per 10 gallons	1.2	12,000

Oxidation Rates

For each ppm of	Iron	Manganese	Hydrogen Sulfide
Required ppm of Chlorine	1	2	3
Required ppm of Hydrogen Peroxide	0.5	1	1.5

Example: To treat a water supply containing 2 ppm iron and 4 ppm hydrogen sulfide with a chlorine residual of 1 ppm, a dosage 15 ppm of chlorine is required.

2 ppm iron x 1 ppm chlorine = 2
4 ppm hydrogen sulfide x 3 ppm chlorine = 12
1 ppm chlorine residual = 1
Total 2 + 12 + 1 = 15 ppm

C. Calculate **Metering Pump Output Requirement in Gallons per Day .**

$$\frac{\text{Maximum System Flow Rate (gpm) x Dosage (ppm) x 1440}}{\text{Solution Strength ppm}^*} = \textbf{Metering Pump Output Requirement (gpd)}$$

* Solution Strength % x 10,000 = Solution Strength ppm

D. Reference the chart below to confirm the selected pump's maximum output slightly exceeds the pump output requirement calculated in C.

FP Pump (up to 80 psi/5.5 bar)

Item Number Prefix	Pump Tube	Roller Assembly	Maximum Output (gpd)
E20PHF	F	White	4.5
E20PHG	G	Black	16.0
E20PHH	H	Black	30.0