RELIANT Water Technologies

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The Wet Well Wizard Air Ejector – Increasing Dissolved Oxygen in Water Quickly, Without Cavitating Pump Impellers

During the development of the Wet Well Wizard Air Ejection System there were three primary process criteria that required development –

1. The ejector had to cause enough wet well surface turbulence to, not only emulsify fats, oils and grease (FOG), but to never allow FOG matts to form again.
2. To produce enough dissolved oxygen in the well water to allow, and convert, aerobic microbial activity in the well water 100% of the time.
3. To never allow bubbles to enter pump volutes which could cause cavitation, and eventually, damage pump impellers.

As it turned out, the last of these criteria became the genesis, or driving force, that not only allowed the developers to meet the first two criteria, but this process led to achieving a patent on the ejector design.

The wastewater industry has been the driving force for the prevalent use of fine bubble generation technologies in order to provide dissolved oxygen to enhance the aerobic digestion process. But as many collection system Operators and Superintendents have leaned, fine bubbles in wet wells end up adding to air entrainment in pumps, thereby increased downtime and maintenance costs.

So Reliant developers began to look at coarse bubble dynamics and efficiencies. The low water level (LWL) in most wet wells is commonly quite shallow – usually under 2 to 3 feet of water depth. While coarse bubbles could initiate and retain criteria number 1, the normal laws of oxygen diffusion seemed to eliminate the use of coarse bubbles in the Wizard ejector design.

Eventually, by testing various baffle designs for the interior of the ejector it was realized that a highly used “sorting and separation” technology common to laboratories could be improved upon to make bubbles do very strange things. The final design was so unique that it is now the basis of the patent for the Wet Well Wizard.

Basically, the Wizard ejector uses antipodal and edged separation plates which surround the air inlet pipe into the ejector. By developing a 3” diameter bubble 9” from the bottom of the ejector tube, the bubble has to work its way up the ejector tube,

through the multiple antipodal plate orifices, until it is released as smaller ¾" to 1½" inch bubbles. And these smaller bubbles are spinning at such an aggressive manner that if one was to hold their hand over the top of the tube it feels like the skin is being taken off. But the key element of this development is that the coarse bubbles are spinning so viciously that oxygen molecules are being pulled away from the surface of the bubbles by the friction of the water, thereby increasing the dissolved oxygen in the water.

See **Figure 1** below. This was only one of 15 trials of the Wet Well Wizard system during development testing. An 8' diameter wet well (the blue bar) that was automatically pumped less than every hour had an increase in dissolved oxygen in the well water from almost zero to 2.5PPM in one day, and in 17 days the DO rose to over 5PPM continuously. Levels in some lift stations have been recorded at 7PPM DO.

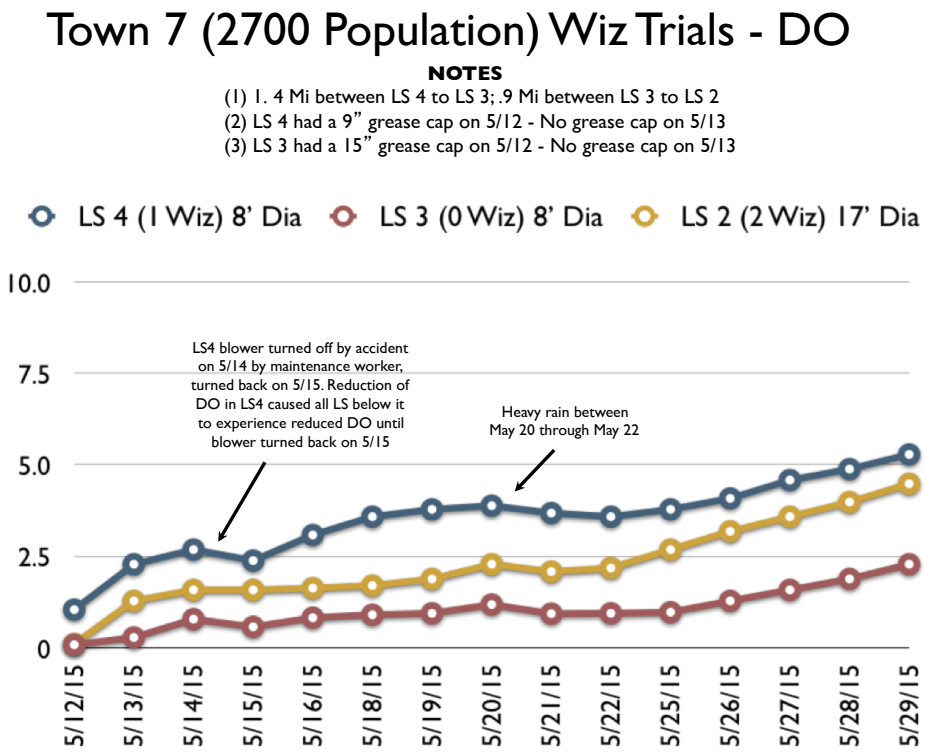

Figure 1

And finally, as the top of the Wizard injector is 24 inches off the bottom, there is no way for the coarse bubbles to get to the volutes of pumps in the wet well. Many trials in clear water tanks and pools have never shown the ability of air to leave the bottom of the Wizard Ejector.