Variable Speed Pressure Boosters and Hydropneumatic Tanks

Bell & Gossett
a xylem brand

The question is being asked more frequently: do commercial pressure boosting packages *require* a hydropneumatic tank? The answer is no. Without a tank, a pressure boosting package will still operate as intended. In response to feedback from the system, the package will provide varying discharge pressures and flows relative to the changing requirements of the application. So, if not an intrinsic requirement for the booster, the question then becomes: *should* a hydropneumatic tank be utilized in pressure boosting applications? Bell and Gossett strongly recommends the latter.

One of the key advantages of a variable speed system as opposed to the constant speed systems of old is the ability to adjust pump speed and staging in relation to actual demand or changes in incoming city pressure. By providing what is required, when required, significant cost savings can be realized by utilizing a variable speed package. Additionally, whereas a single large fixed speed pump may have been required in the past to meet peak demand, a modern pressure boosting package affords the opportunity to apply a few smaller pumps in parallel, which spreads out the mechanical wear on the products but also provides redundancy in the case of planned or unplanned downtime.

How does all of this apply to the inclusion of a hydropneumatic tank in a pressure boosting application? As mentioned, the demand profile of commercial and residential buildings has the potential to vary dramatically depending on time of the day or day of the week.

The 80/20 principle is applied as a rule of thumb, meaning that 80% of the time demand is less than 20% of design flow, 20% of the time the demand is greater than 80% of design flow.

This means that while you will size a pressure boosting package for peak demand, the reality is that the vast majority of the time in service, the package will not be required to operate at that point. This leads us to our first benefit of utilizing a tank in conjunction with a variable speed package.

Minimal system demand will not force the package to run

In times of minimal demand (think nights or weekends for an office building) there will still inevitably be some usage in the system. This is either through intended usage, a person creating demand, or through gradual leaks in the system plumbing and/or fixtures. In a situation like this, a hydropneumatic tank provides a buffer, allowing the required pressure and flow to be maintained without needing the package to operate. While variable speed and soft start capabilities work in conjunction to minimize energy consumption and strain on the motors, the fact remains that regardless how efficiently a package is operating, the more efficient package is the one that remains off when not absolutely needed.

In addition to being helpful in times of minimal demand, a tank is useful to a pump package during times of normal or expected demand as well.

Hydropneumatic tanks help prevent short cycling

The Bell and Gossett recommendation is to remain below 5-6 starts per hour. The enemy of the induction motor is heat, which is more prominent while starting the product. Short cycling the product, meaning starting and stopping frequently does not allow heat to properly dissipate as intended. Over time this will damage motor windings and lead to premature failure. Even with the benefits of variable speed operation baked into the equation, allowing a

package to remain idle until absolutely necessary is beneficial to the longevity of the investment. A tank will provide a cushion of sorts to ensure that the package is not ramping up and down with every small change in demand or spike in usage. Once the buffer provided by the tank has been used up, the package will then ramp up and run. The package will then continue to run, meeting system demand but also recharging the tank at the end of the cycle prior to ramping down and returning to standby. This methodology is meant to not only limit cycles, but ensure that if the package does cycle on, it has sufficient run time to cool the motor as intended.

There are other advantages as well that may be application specific. For example, in a system with predominantly flush valves as opposed to flush tanks, the demand for water is immediate. This rapid change in demand may not match the ramp up speed of the variable speed drive on the pump package, resulting in insufficient supply to the fixture. To prevent this situation, the hydro-pneumatic tank containing the pressurized reserve water, will immediately supplement the pressure/flow gap to the valves until the correct pump speed is established to meet the demand. In an application where small leaks are not uncommon, a tank can help stabilize the system on the discharge of the package and prevent small changes in pressure from causing the package to “hunt” for the programmed set point.

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services, and agricultural settings. With its October 2016 acquisition of Sensus, Xylem added smart metering, network technologies and advanced data analytics for water, gas and electric utilities to its portfolio of solutions. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com

xylem
Let's Solve Water

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, Illinois 60053
Tel. (847) 966-3700
Fax (847) 965-8379
www.acfirepump.com

Xylem Inc.
55 Royal Road, Guelph, Ontario
N1H 1T1, Canada
Tel. (519) 821-1900
Fax (519) 821-5316