GRUNDFOS

WHITE PAPER

WHY BOOSTER SYSTEMS?

by Steve Wilson

In order to make the best possible booster system selection, it is often necessary to take a step back and review exactly what booster systems are and why they are used.

Booster systems are variable volume devices used to maintain required pressure in an installation, regardless of the flow requirements.

As demand increases or decreases, pumps are turned on and off to provide users with the water they need at constant apparent pressure, regardless of water demand elsewhere in the installation.

Booster systems in today's marketplace are typically multi-pump, factory assembled, parallel pumping packages: the term "Booster System" has become virtually synonymous with such packages. To understand why such packages are used, let's review some of the options available to the plumbing designer:

Option #1

A single fixed-speed pump sized for total system capacity and allowed to run continuously can be used. The addition of a pressure regulating valve to regulate down stream (discharge) pressure to an acceptable constant is often added.

Unfortunately, this method, while exhibiting the lowest initial cost, has severe drawbacks which render its use neither practical nor desirable.

Since the pump must be sized for maximum flow – and maximum flow (which is a predicted number at best) will seldom be required – the pump must be operated at greatly reduced loads much of the time.

Such a movement away from the best efficiency point adversely affects pump life (radial loads are increased) and operating costs (pump and motor efficiencies and power factors are reduced). Further, no standby capacity is maintained, as would be needed if the pump fails.

Option #2

A single (or multiple) pump can be piped to a large "rooftop" storage tank. From a pure operating cost standpoint, this is perhaps the best solution: The large pump will have superior efficiencies to smaller pumps, and it is not running at all for a majority of the time.

Water from the tank is used to satisfy demand. As the level in the tank is reduced to a predetermined point, the pump is started and used to fill the tank. When the tank is full, the pump is shut down. This method also has several drawbacks. For example:

- The pump must again be oversized, including accommodation for the increased static head to the tank.
- The building structure must be strengthened to support the weight of the tank and water, which, in many cases (particularly those with building codes which offer earthquake protection), such tanks are not allowed.
- In areas with building height limitations, rentable/salable penthouse space must be converted to tank space.
- The water in the tank is susceptible to bacteria and other contaminants.
- Piping costs are increased, and standby capacity is limited.

Option #3

A single variable speed pump (or perhaps a single pump with an auxiliary standby unit) can be used, as can the single pump previously discussed. In this case, however, PRV's should not be used; rather, the speed of the pump used to match the pump curve to the system curve.

This approach has widely gained acceptance in recent years with the development of cost-

effective variable speed drives. However, several drawbacks still apply.

Most of the pressure required will be used to overcome building static head, so that variation in speed will generally be limited. The drives themselves impart an inherent inefficiency to the system. Standby capacity is still limited. (Variable speed systems are discussed in a separate paper.)

Option #4

Multiple pump systems can be designed with the rest of the plumbing system and constructed by the contractor. Though once this was a popular approach, the complications associated with integrating the necessary pumps, piping, sequencing devices, and controller have rendered this approach impractical. Unit responsibility is lost.

SUMMARY

So, the factory assembled, packaged booster systems remain the logical choice for the majority of applications, even if only through the process of elimination. They should be used and selected to provide

- Maximum energy savings
- Standby capacity
- Reliability
- Long life
- Ease of installation and maintenance
- Unit responsibility

Making a selection for any other reason, or ignoring any of the above reasons, will quite possibly result in unsatisfactory installations. The installation will have to operate for an extended period of time, and saving a few dollars in initial cost (at the risk of compromising the above considerations) seems “penny wise and pound foolish.”