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Let's Solve Water

SteamTeam®

Bell & Gossett®
McDonnell & Miller™

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Steve Almgreen
Assistant Product Line Manager –
Steam Products

Vacuum systems don't suck!

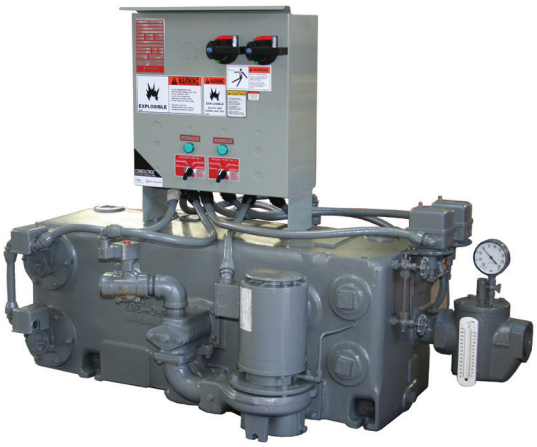
A customer recently asked how a vacuum system works and what the vacuum in a combination vacuum/condensate return pump actually does. We explained that vacuum units don't suck the steam through the system; they remove air in front of the steam. This lets the steam move through the system faster and more efficiently, because it doesn't have to push air out of the way. That preserves the boiler's energy for heating.

Removing air also makes the system's pressure lower than that of the surrounding atmosphere. Because high pressure always flows to low pressure, increasing the differential causes steam to move rapidly even to remote sections of the system, providing quick and even distribution. In addition, the vacuum allows for lifting condensate from low or wetted returns. The Domestic Pump and Hoffman Pump vacuum units can actually lift condensate 5 feet—and even farther with a mechanical step lift.

Sub-atmospheric pressure also results in low-temperature boiling. A review of the properties of saturated steam tables shows that at 8" of mercury, for example, water boils at 197°F instead of 212°F. Less heat is required to re-heat condensate to steam, translating into additional energy savings.

Installation benefits include the potential to downsize the return pipes from, say, 6" to 4" or even 3", cutting installation costs. You can also put pipes in places where you might not normally install them. And the vacuum lift capability may make it easier to pitch pipes for return or to resolve low return line issues.

While vacuum units offer benefits for steam heating systems, they also require maintenance of the unit as well as the traps and vents. For instance, trap failures



Bell & Gossett Domestic® Pump Series VLR Vacuum Heating Unit

that cause condensate to return at temperatures above 160°F can damage the vacuum unit and shorten its life.

Facilities looking to downsize maintenance staff or cut back on service and repairs often consider replacing their vacuum system with straight condensate return/boiler feed equipment. This change can lead to daunting and sometimes expensive problems; hence the adage, "Once a vacuum system, always a vacuum system." Remember, system design and operation are predicated on using the vacuum to assist in steaming. Replacing the unit without understanding its function can result in poor performance or no performance at all.

Vacuum units may be more expensive to install than simple condensate return or boiler feed units, but savings over the life of the unit can easily offset costs. Maintaining the system properly is preferable to a complete replacement.

If you're faced with repairing or replacing vacuum systems, it's smart to involve consulting or design engineers and factory reps to help customers make an informed choice.

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McDonnell & Miller Product Specialist

Question: Why do I have to set the main valves at different pressures?

Setting the valves at different pressures lets the system respond efficiently to variations in demand.

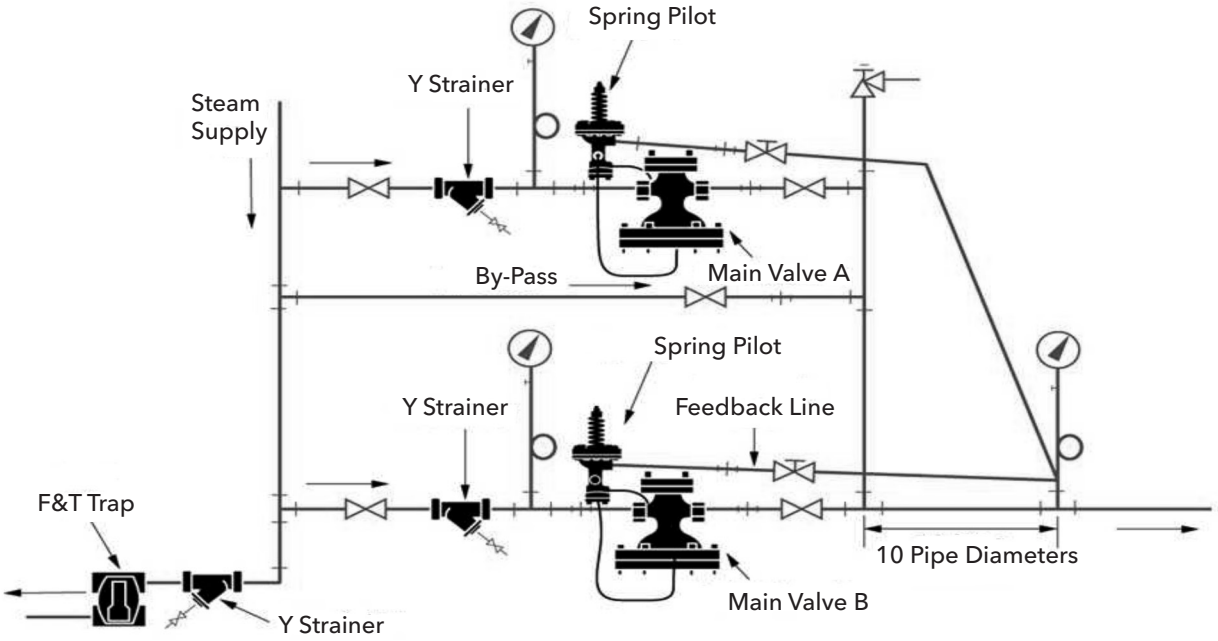
Main Valves A and B with spring pilots are, together, sized for the maximum stream flow. During peak demand, both valves supply steam to the system.

Valve B, the smaller of the two main valves, is sized for "off-peak" demand. Valve B's spring pilot pressure is set 10% (minimum 2 psig) above valve A's spring pilot setting.

Bell & Gossett Hoffman Specialty®
Pressure Reducing Valve 2000

As system demand decreases, the pressure rises, meeting the setting of the larger Valve A and shutting it down. Valve B remains open to satisfy off-peak requirements.

As demand increases and Valve B cannot handle the demand, the delivery pressure drops, and Valve A opens.



Two Pressure Reducing Valves (PRV's) in Parallel

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