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Let's Solve Water

SteamTeam®

Bell & Gossett®
McDonnell & Miller®

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How much water should a steam heating system need?

With steam heating systems, you can count on one thing: They will always need feed water. How much water they need depends a lot on the system's age and condition, but the feeding process never ends. Where does the water go? It leaves the system by evaporation, through leaky air vents on the radiators and mains. This type of leakage is especially aggravated by steam pressure that's kept higher than necessary for the system, a condition we see all the time. And then there are buried pipes. Even if there are just a few feet of buried return line on the system, there's a good chance it's leaking.

Some home owners like to feed their steam boilers by hand, but the vast majority of home owners choose the convenience and backup safety advantages of an automatic water feeder. That's because their heating contractors took the time to explain the benefits to them. For instance, suppose there's a leak in the system during the dead of winter when they aren't home. An automatic feeder will keep the boiler running at its safe, minimum water line, and will keep the house warm. A feeder can also protect a steam boiler by keeping it fed with water should the gas valve lock itself in the open position.

How much water a boiler needs to keep operating depends on its firing rate, and this is very easy to calculate. It works like this: All boilers, regardless of their size, lose water to steam at a constant rate. Ideally, they should be fed at 1 GPM per 250,000 Btu/hr., Gross Load (D.O .E. Heating Capacity). So, if a boiler is rated for, say, 500,000 Btu/hr., and the water level drops to the feed line, you should be adding about 2 GPM to keep the burner on.

In residential steam heating, you can do this very effectively with McDonnell & Miller's WFE Water Feeder. When boiler manufacturers reduced the size of new steam boilers, the people at M&M designed this feeder to protect those smaller boilers from

Series PSE-800 low water cut-off for steam boilers

nuisance shutdowns. The WFE Water Feeder takes its signal from either a Series PSE-800 probe-type or a Series 67 float-type low-water cutoff. It has a timing circuit that waits for a minute, feeds for a minute, waits for a minute, and so on. This well-thought-out feed cycle allows the condensate to return, greatly reducing the chance of a flooded boiler.

It's important to know that a new McDonnell & Miller WFE Water Feeder includes three separate orifices. There's one already installed in the feeder at the factory, and it's set to feed 2 GPM. This orifice will satisfy any steam heating boiler with a gross rating up to 500,000 Btu/hr. The feeder also comes with two additional orifices, one for a feed rate of 1 GPM, and the other for a feed rate of 4 GPM.

If you're working with a very small replacement steam boiler – say, one rated at 125,000 Btu/hr. – you should use the 1 GPM orifice, which is good for boilers up to 250,000 Btu/hr. This smaller orifice will feed at a slower rate and lessen the chance that returning condensate will flood the boiler. If you have a larger steam boiler, one rated up to 1,000,000 Btu/hr, switch to the 4 GPM orifice. This larger orifice will let the feeder keep up with the needs of a bigger boiler and stop it from shutting down should a leak develop in the system.

WFE Water Feeder

So how much water should a steam heating system need? That depends on the system's age and condition. But when the boiler needs water, it's good to know the WFE feeder is there, producing the right amount at the right time.

Ask your representative to show you a WFE Water Feeder, and tell your steam heating customers about the added security that automatic water feeders offer. They'll be glad you did, and so will you.

Find your local Representative:
http://mcdonnellmiller.com/sales-service/

Browse the WFE Water Feeder web page:
http://mcdonnellmiller.com/water-feeders/wfe-uni-match-electronic-feeder/

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Can a Domestic® condensate pump produce vacuum?

Yes it can. If you are interested to know more, please read on.

In addition to transferring condensate, one application for the Domestic Pump is to move air out of the way of the heating steam within a vacuum heating system. The advantages that come with vacuum systems are:

- Faster system heating
- Faster condensate return, to reduce system lag and prevent boiler cut-off on low level
- More even heating in remote sections of the system
- Lifting of low condensate returns without the use of an additional pump
- Energy savings, thanks to low-temperature boiling
- Installation savings, thanks to smaller pipes
- The ability to locate pipes in places you normally wouldn't

The vacuum units in the Domestic Pump product portfolio include both condensate return and boiler feed units. But, no matter the unit type, the vacuum production part employs the same working principle. Domestic Pump products use condensate pumps to

Vacuum boiler feed unit model VCMD. The vacuum production chamber is mounted on top of the boiler feed tank.

produce a so-called "liquid jet vacuum," which works on the basis of Bernoulli's Principle. This principle states that "pressure head + velocity head + elevation head = constant." The three main components required for the job here are a centrifugal pump, a multi-jet nozzle and a venturi pipe.

Fig. 1 represents a vacuum-producing chamber. I will use it to illustrate the process.

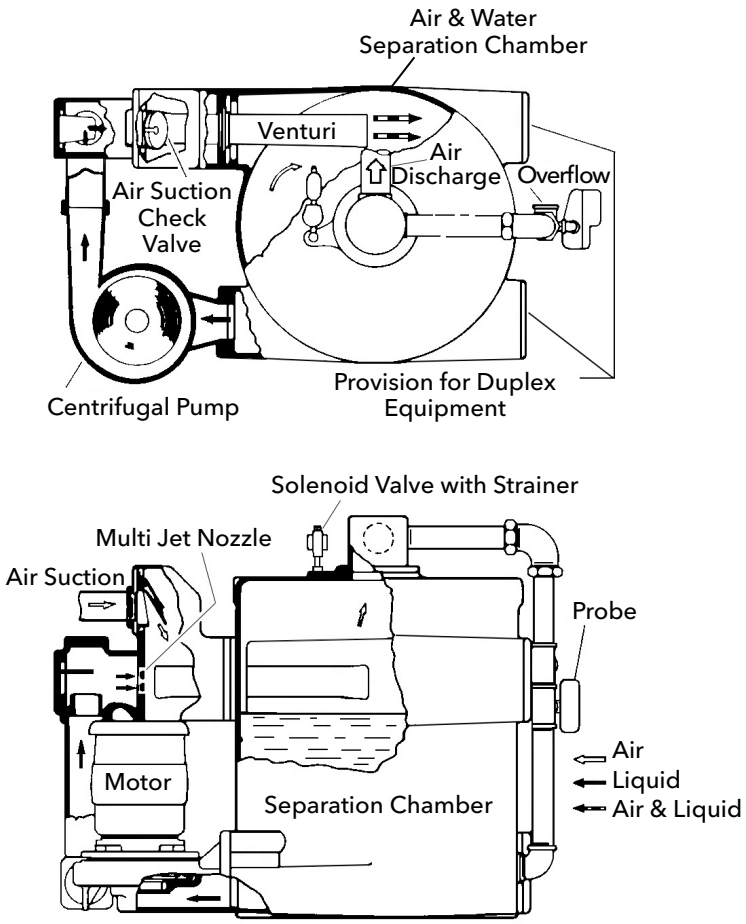

Figure 1

The pump delivers a stream of water up through the piping, then horizontally through the nozzle, and then through the venturi pipe. The horizontal direction of the flow means that the change in elevation is negligible here – essentially a constant. Once the water passes through the nozzle, it's broken into streams and injected into the venturi pipe, which narrows. But water is a non-compressible fluid, so the only way to get it through the narrowing is to accelerate the velocity. Following Bernoulli's equation, if the elevation stays the same and velocity increases, then the pressure must go down in order for the equation to remain constant. The water, forced at high velocity across the gap between nozzle and venturi, entrains air and gasses through the air suction check valve, which is open at this time, thus lowering the pressure and creating smooth, steady vacuum in the system.

Then the mixture of water and air is discharged tangentially through the venturi into the separation chamber. This causes a whirling motion inside the chamber, where the water is forced towards the walls of the vessel, and the lighter air flows to the center and is discharged through the vent of the chamber. An additional benefit of that centrifugal motion is more available pressure at the pump inlet and less pressure resistance at the venturi pipe outlet. The pump will stop once the vacuum set point is reached, and then the air check valve will close in order to separate the system under vacuum from the vented chamber.

Finally, the equipment takes a well-deserved rest before starting the next cycle, triggered by a call for duty from the vacuum switch, which is adjusted in the factory based on the application. Most commonly, an average set point of 5.5" Hg vacuum is maintained at 160°F condensate temperature. This is the ASHRAE recommendation for vacuum heating systems. However, using the described technology, the Domestic Pump MJ clinical and industrial vacuum units are capable of producing vacuums up to 28" of Hg. In this scale, 30" of Hg would be a perfect vacuum.

Cycle after cycle, the water in the vented separation chamber will slowly evaporate. That's why the tank has a water level control. It consists of a level switch (either a float switch or a probe) and a solenoid valve. The switch will follow the water level and will signal the valve to open if the water level gets too low. The solenoid itself is installed on a make-up water supply line, and will let water into the chamber following the signal from the level switch.

So, by extracting water from the bottom of the chamber and pumping it though the impeller… out of the pump discharge… through the manifold elbow and a diverter… then into the nozzle… then across a gap to the throat of the venturi… we produce vacuum.

Any questions? Let me know.

Check out our vacuum units: www.domesticpump.com

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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.xyleminc.com

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Let's Solve Water

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