

Thermal Notes

A publication of Fluid Handling, Inc.

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New Taco Load Match Pumping System Reduces Installed AND Operating Costs, While Increasing Occupant Comfort

If someone were to tell you of a hydronic system concept that reduces installed costs, results in low operating costs, and provides better occupant comfort levels than conventional systems, would you be interested? If so, read on.

For the past few weeks, we have been introducing Taco's new Load Match Pumping system to Milwaukee area customers, and we have been pleased by the enthusiasm that it has generated. The late Mr. Walter Stetham, a hydronic systems innovator, pioneered the Load Match concept for Taco. Load Match combines proven products, the latest in control technology, and innovative new products including the Stetham Tee, named after its creator.

Figure 1 shows the basic concept, which utilizes a **single pipe distribution system** (note the absence of "return" piping) along with a variant of Taco "00" circulators to provide hot or chilled water to each terminal unit. Conspicuous by their absence are such costly items as:

- Most return piping
- Balance valves at each terminal unit
- Control valves at each terminal unit

Let's look at the key elements of Load Match in more detail:

Reduced Piping Costs Due to the Elimination of a Return Piping Loop

This is made possible by utilizing secondary circulators for each terminal unit and one or more single loop, cascading temperature distribution systems.

No Maintenance, High Reliability Circulators

With 85% of the U.S. Market for small circulators, Taco has built not hundreds or thousands or even millions of "00" pumps, **but tens of millions (Figure 3)**. With a three-year warranty and a warranty failure rate of 0.4%, one could expect to install six projects with 50 circulators each in order to experience a single warranty failure. The circulators are water lubricated and require NO maintenance. Should a failure occur, repair involves simply removing four cap screws and sliding in a new cartridge. In fact, a maintenance person can change a cartridge in a matter of minutes.

Typical for Any Building, Any Size

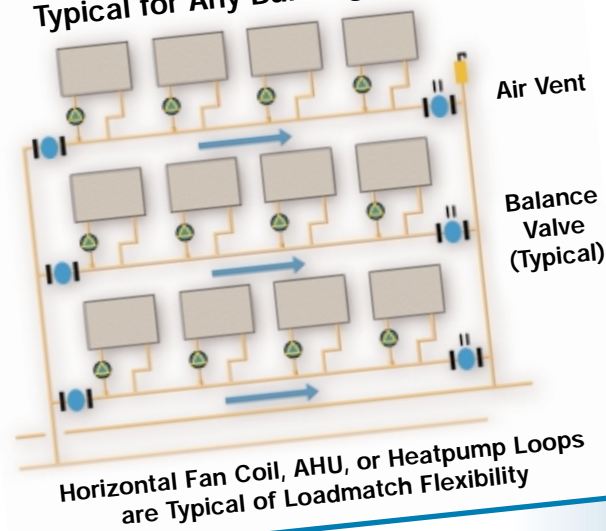


Figure 1



Figure 3



Figure 2

Stetham Piping Tees

These patented tees (**Figure 2**) provide convenient take offs from the loop. They house a terminal supply tap, a terminal return tap and a splitter to prevent short-circuiting. Stetham Tees reduce the time and materials required compared to

continued on page 2

installing two conventional tees, and make it extremely simple to set up a cascading loop for present or future tenant finishing.

Elimination of Terminal Balance Valves

Terminal balancing is critical in a conventional supply-return piping system. Envision a string of terminal units in a conventional system. Fairly precise balancing is required to ensure that each terminal receives its “design” flow, because any excess flow quantity that circulates to one unit will not be available for any other unit. Therefore, without proper balancing, some terminal units will be short of flow and capacity. Lack of good hydronic balancing is the primary reason for occupant discomfort. ***With a Load Match system, if one terminal receives excess flow, it does not affect the flow to any other terminal units.*** The excess flow taken out of the loop is simultaneously returned to the main and available to all other units. Therefore, the designer need only choose a circulator that will supply at least as much flow and head as required by the terminal branch circuit – ***the distribution system is self balancing.***

Elimination of Control Valves

Another big savings results from the elimination of control valves. Load Match pumps provide the variation in flow that determines the terminal unit output. Off-on valves are replaced by start-stop circulators. (Note that starting and stopping circulators of this size is not detrimental to longevity). For applications that would normally require modulating valves, Load Match circulators can be supplied with variable speed cards mounted in the circulator junction boxes. Utilizing a 4-20 mA or a 0-10 VDC signal from a controller, the circulators will vary speed to provide modulated flow rates.

Reasonably Priced Circulators

Load Match circulators are priced to be nearly the same price as actuated valves. Wiring costs are minimal, especially on projects involving terminal units with fan motors that must also be wired (fan coils, unit ventilators, fan-powered VAV boxes, and heat pumps for example). Amp draws are extremely low (a 7 GPM circulator requires 1/25 HP).

Low Pumping Power

To understand why Load Match Systems require so little power, we might first consider the alternative, which is

a system using one pump to circulate water to multiple zones equipped with control valves. Assume that the terminal units have a typical booster coil with single tube serpentine design. An average size serpentine coil might have a pressure drop of 7 ft. of water column. A control valve with proper authority would have a pressure drop of around 7 ft. as well. A circuit setting type device would typically have a pressure drop of 5 ft. This results in a total terminal loop drop of 19 feet plus a small amount of piping friction. Savings with Load Match occur due to:

- **Lower pressure drop:** By eliminating the manual balance valve and the automatic control valve, we reduce terminal loop pressure drop would only be 7 ft. plus piping friction, ***a savings of about 64%***. Since theoretical horsepower is proportional to head, this is significant!
- **Elimination of Control Throttling:** Control valves throttle at partial loads. Throttling three-way valves saves no pumping power. With two-way valves, a minor savings occurs as the pump rides its curve. However with load match, significant savings occur. In the case of off-on circulators, the savings is proportional to load reduction, as the circulator will simply be off during a time proportional to demand. In the case of variable speed Load Match circulators, power consumption is theoretically proportional to the cube of the speed ratio, so that at half flow, the power consumption is only 1/8 or 12% of full load power.
- **Elimination of Balance Valve Throttling:** In a conventional system, the designer must size the pump to handle the largest terminal pressure drop in the loop. The largest drop occurs in the unit with the combination of the worst coil pressure drop and piping pressure drop. At start up, the system balancer must throttle the flow to all remaining terminal units using circuit-setting devices. Thus every gallon is pumped at the maximum head required by the system, resulting in unnecessary power consumption at all other units! With Load Match, each pump generates only the head required to overcome its terminal circuit. There are no terminal balancing losses.

Load Match Experience

During the past few years, Taco has quietly built a portfolio of Load Match applications in anticipation of

a full-scale introduction. Taco hired an HVAC consultant, Mr. Greg Cunniff, to help design and evaluate each system. Well over 100 projects have been designed and installed. Let's look at the breadth of Load Match experience:

- Load Match has been installed on a broad cross section of **system types**, including booster coil reheat systems, fan coil systems, heat pump systems, and VAV reheat systems.
- Load Match has been applied on a variety of **building types**, including hotels and motels, resorts, office buildings, large apartment/condominium complexes, and even in industrial processes.
- Load Match has been used in a wide variety of **climate types**, including mild weather heating systems, cold weather heating systems, dry climate cooling systems, and humid climate cooling systems. Taco's careful approach in field proving Load Match pumping has led to system improvements, new products, refinement of control concepts, and extensive applications knowledge. In short, Taco has done its homework.

After reviewing the Load Match concept and the work that has gone into it, we at Fluid Handling are confident that Load Match will provide the best solution **for many projects in our territory.**

If You Wish To Investigate Load Match on a Specific Project

Taco does not design projects. That is the job of the consulting engineer or the designer at the contracting or wholesale firms. However, with a considerable backlog of Load Match experience on which to rely, Taco is prepared to suggest strategies and piping layouts that would be expected to be the most successful and provide the lowest installed cost. Whether you would like to try a Load Match system, or simply compare costs on a Load Match system to other designs, please contact your Fluid Handling sales representative. We will arrange a no cost review of your project and recommend ideas that can be used in a Load Match design. By the time you contact us, we should be prepared to talk to you about some very interesting system design software as well!

New Controls Now Available From Fluid Handling

We seem to be getting more involved in HVAC controls as a natural part of our growth. Here are some new items that we have available:

Motor Controls

Fluid Handling has signed an agreement with Advance Controls Inc., a controls manufacturer from Bradenton, Florida. The agreement covers motor starters, control panels, and miscellaneous controls for the HVAC industry. The equipment is high quality and we are receiving good coverage from our regional manager, Mr. Steve Schwitters, who operates out of Rockford, Il. We have already had two training sessions, so we are ready to talk starters. One very positive thing about ACI starters is that they come pretty well "loaded" as standard. Each magnetic starter comes as standard with a control circuit transformer, a hand-off-auto switch, auxiliary contacts (more than one on larger starters), and adjustable overload relay as standard. This makes pricing quite simple and ensures that the standard starter will cover the majority of applications. Prices are competitive.

Level, Flow and Pressure Switches

Taco's new line of high quality flow switches and level switches is being very well received (we sheepishly admit that we have sometimes been unable to keep up with demand). ACI offers pressure switches with adjustable set point and differential. We would love to be your supplier of any of these controls. We have samples available and good catalog information if you are interested in evaluating these products.



Taco flow switches are available in general purpose or NEMA 4 configurations.

New Controls Now Available From Fluid Handling (cont.)

Variable Frequency Drives

We are a little early on this one because we have not yet signed a formal agreement, pending a November meeting with a major VFD supplier. However, we are approved to process inquiries, so if you have one let us quote it! We think the November meeting will be a "rubber stamp" affair, and we will be happy to tell you more once we get the OK from our supplier. Note that ACI provides VFD transfer switches, so we seem to have a nice match from that perspective. Hopefully our product gains will be advantageous to you, as they will allow you to purchase more products from the same source. We hope that you will honor us with your inquiries!

4

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