

Tracking the steam

Clamp-on flow measurement survey at University of Vermont (UVM) supports a campus-wide project

The University of Vermont (UVM) was planning on renovating and adding additional buildings to its 450-acre campus. Planners questioned whether the existing underground network of steam pipelines around the campus had enough capacity to support the proposed new buildings. If not, adding new steam pipelines, boilers and control systems would significantly affect development cost of the expansion plan. UVM needed a way to perform a steam survey without interrupting steam service throughout the campus.

Critical aspects

Part of the analysis involved making steam flow measurements at points in the distribution system that had no flowmeters. UVM needed to make flow measurements without penetrating the pipe or disrupting service. UVM selected GE Sensing's clamp-on gas flowmeters that could make steam flow measurements from outside the pipe without interrupting service to area buildings. In addition, the clamp-on fixtures were installed and left in place, which saved installation time for subsequent flow surveys.

Qualitative results

UVM obtained the critical information it needed to evaluate any additional development costs for the campus expansion plan. Because service was never disrupted, the survey didn't incur additional costs or inconvenience. Subsequently, UVM purchased the four flowmeter systems so it could perform future surveys at will.

Under the leadership of new president Daniel Fogel, the University of Vermont in Burlington, Vermont, launched a progressive campaign in late 2003 to improve the university infrastructure. The plan called for renovating several buildings and dormitories, new parking structures and a new 800-bed dormitory.

The campus has its own central plant that supports heating in the cold Vermont winters, as well as air conditioning in summer months for all campus buildings. Planners questioned whether the existing underground network of steam pipelines around the 450-acre campus had enough capacity to support the new buildings. If not, adding new steam pipelines, boilers and control systems would significantly affect development cost of the expansion plan.

The Challenge

The university needed a way to survey the steam lines to determine capability without disrupting service. The UVM Energy Management Office of the Physical Plant Department decided to take a look at its steam plan for three, five and 10 years for both the North and South campuses. Part of the analysis involved making steam flow measurements at points in the distribution system that had no flowmeters.

In February 2004, UVM contacted GE Sensing about its ability to make these flow measurements without penetrating the pipeline. UVM engineers needed a non-intrusive flow measurement

because the university couldn't shut down the steam system for installation of wetted flow technology on a system still in use for heating buildings.

The solution

GE offered to perform a steam flow survey using ultrasonic clamp-on flowmeters at four different measurement locations during a period of approximately two weeks. Application details for the four measurement points are shown in Table 1. Figure 1 illustrates a sample installation.

	Building Name/Measurement Point Location			
	Christie	Givens	Living and Learning	HSRF
Pipe size OD (inches)	4.500	5.536	4.500	10.750
Pipe wall thickness (inches)	0.237	0.285	0.237	0.365
Nominal temperature (°F)	353	377	360	382
Nominal flow range measured over test period (lb/hr)	1840 – 5185	3160 – 11310	1770 – 4945	146 – 4735

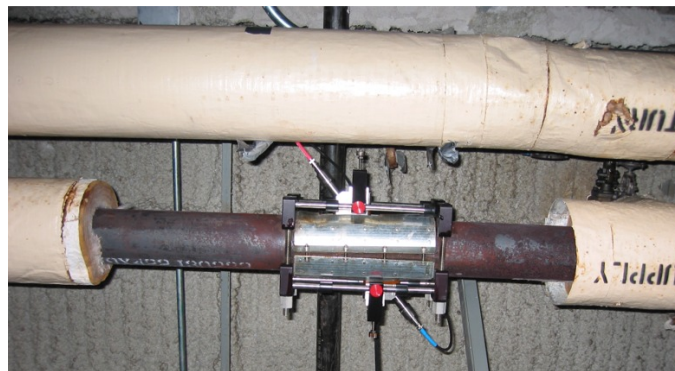


Figure 1: Clamp-on steam ultrasonic flowmeter installation on 4-inch CS Sch 40 steam supply line at Living and Learning Building. Photo shows clamp-on transducer installation, clamping fixture and pipe dampening jacket.

UVM engineers and GE Sensing Field Services verified Application details and installation locations for clamp-on steam ultrasonic flow measurement as being suitable. UVM technicians prepared the installation sites by erecting staging where necessary to reach overhead steam pipes and by stripping back pipe insulation materials. GE's field service engineers installed the clamp-on transducers, pipe dampening jackets and flowmeter electronics.

After two weeks of operation, GE engineers returned to the university, downloaded data logs from each flowmeter and removed the systems. The data was subsequently presented to engineers at the Energy Management Office for analysis (Figure 2).

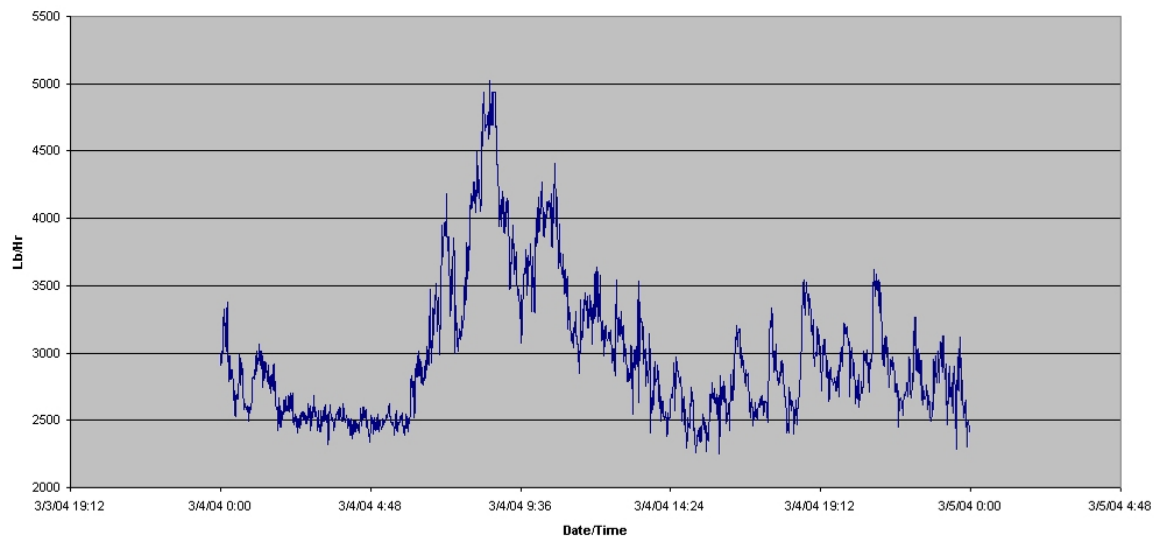


Figure 2: Steam mass flow data from Christie measurement point on March 4, 2004. Usage is low until early morning when demand spikes throughout the morning due to steam usage for heating for student showers and building heat.

At the end of the flow survey, GE field service engineers removed the flowmeter electronics, but left the clamping fixtures, dampening jackets and clamp-on transducers in place.

In January 2005, GE field service engineers returned to perform a 10-day flow survey. Re-installation of the flowmeter electronics and validation of the system showed that the dampening material held up to long-term installation on hot steam pipes. Indeed, the dampening material's ability to dampen pipe noise actually improves after initial installation as the material cures to an almost cork-like consistency. In some cases the ultrasonic couplant had to be re-applied to maximize flowmeter performance - typical recommendation for most clamp-on ultrasonic flowmeter installations for almost any application.

The benefits

When plant engineers look for an accurate and easy to use non-intrusive flow measurement solution, clamp-on ultrasonic flowmeters are typically the first technology considered. However, clamp-on technology hasn't been available until recently. Thanks to new technology developed at GE Sensing, clamp-on steam flow measurement is now a reality for many of these common types of steam applications.

Using this new technology, GE Sensing provides customers, like UVM, with easy to use and accurate flow measurement without disrupting their processes. UVM got the critical information it needed to account for any additional development costs for the campus expansion plan without disrupting service. Subsequently, GE field service never removed the survey equipment because UVM purchased the four flowmeter systems to conduct their own future flow surveys.