The HVT-RF-Halmi Rectangular Flow Meter

Product Data Sheet Document 2021 - Rev02

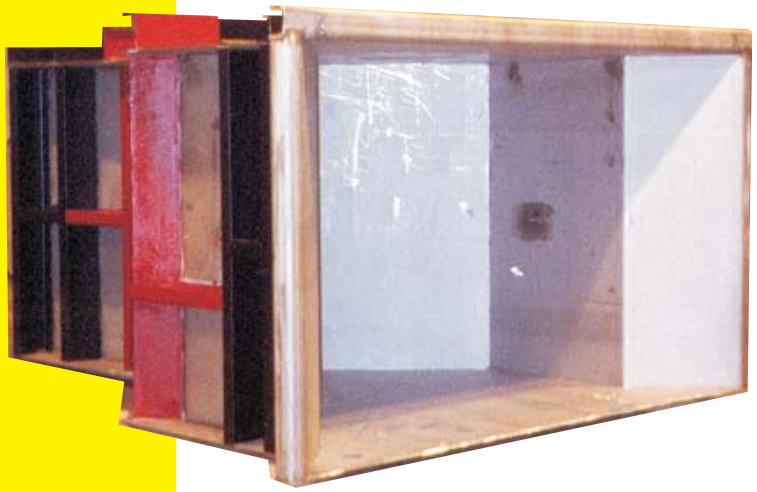
Flow Measurement in Large Rectangular Conduits Without Model Tests!

Accuracy:
+/- 0.75% of actual flow rate, statistically substantiated to 95% confidence level. +/-0.50% or better available with model testing.

Headloss:
Less than half the headloss of circular ASME venturi tubes (with 15° included recovery cone angle.)

Upstream Piping Effect:
Known.

Downstream Piping Effect:
None, even with flow control butterfly-valve close coupled to recovery section.



6' x 5' HVT-RF Halmi Rectangular Venturi weldment pressure vessel type meter. ***Accuracy +/-0.50% of actual rate.***

The PFS, Inc. research team has succeeded in demolishing the barrier that has previously separated the high accuracy and low headloss achieved by circular HVT meters from accuracies and head losses which are typical of rectangular flow venturi meters made by competitors. Now, the well established performance characteristics of the world-class HVT-Halmi Venturi meter for cylindrical lines has been adapted, scientifically, to the unique demands imposed by rectangular flow measurement applications.

Extensive research conducted on the performance of competitor's devices has enabled our impartial and penetrating comparative analysis with the demonstrated performance superiority of the HVT-RF Halmi Rectangular Venturi design.

Please compare what the HVT-RF Halmi Rectangular Venturi meter can do compared to others:

DISCHARGE COEFFICIENT - C

Figure 1 shows discharge coefficients obtained by flow calibrations on so-called rectangular venturi meters accumulated over the past three decades, designed and propounded by four different manufacturers.

All of these "rectangular venturi meters" were expected to have coefficients between 0.98 and 0.99. As figure 1 demonstrates, facts contradict these expectations in all but one design, the HVT-RF.

The manufacturers also hoped that there would be no Beta effect. The laboratory evidence suggests that in all cases except the HVT-RF, their coefficients are not independent of Beta.

One of the competition's most significant oversights has been their failure to correctly establish Line Size effect on their designs. As a result, the inevitable extrapolation of coefficient to line sizes not specifically calibrated cannot be scientifically justified.

Analyzing figure 1 demonstrates that the HVT-Halmi Rectangular design secures the following performance:

0.9900 Coefficient value (Identical to the HVT-circular design.) Applies to all line sizes and all Beta ratios.

An accuracy of +/-0.75% of the coefficient with a statistical substantiation of +/-0.46%, at 95% (twice standard deviation) confidence level.

Reliability, which a single line size model test cannot provide. Figure 1 shows the HVT-RF tests of multiple beta ratios and two different line sizes.

Coefficients of Discharge that is linear above pipe Reynolds number of 75,000.

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HEADQUARTERS LOCATION:
800 Wellington Avenue Cranston, RI 02910, USA
Toll Free: 1-877-737-3569 Ph: 401-461-6366 Fx: 401-461-4450

http://www.primaryflowsignal.com

PFS INDUSTRIAL PRODUCTS GROUP:
7136 South Yale, Suite 300 Tulsa, OK 74136, USA
Ph: 918-481-3210 Fx: 918-481-3205

HEADLOSS CONSIDERATIONS

Figure 2 shows the headloss exhibited by the rectangular venturi meters of the various competitors, expressed as a percentage of differential.

Figure 2 also displays the headloss for circular ASME venturi meters as well as HVT-Halmi rectangular venturis obtained by flow tests. The data clearly show the superiority in energy recovery of the HVT-Rectangular Venturi design.

C - UPSTREAM and DOWNSTREAM PIPING EFFECTS

We conducted selective upstream piping effect tests which indicate that the circular HVT upstream piping effect data can be utilized to accurately estimate the upstream piping effects on HVT-Rectangular coefficient.

We also conducted tests to establish the effects of a rectangular butterfly valve installed on the recovery section of the HVT-Rectangular venturi.

No appreciable effect was revealed either on the coefficient or on the flow control performance.

The most striking contrast that permits appreciation of the superiority and achievements of PFS, Inc. in this regard is to examine the words of our competitor reviewing the drawing of our 0.41 Beta HVT-RF (see figure 2) in a communication to our customer:

"...Engineering is flawed since the specified 13" headloss cannot be met with a 0.408 Beta ratio. Whoever engineered the PFS system apparently does not understand how to calculate headloss in a rectangular meter."

"...We calculated the proper headloss of the PFS meter as 14.1" or 22% (of the differential)..."

***NOTE:** See figure 2. The PFS HVT-RF model test showed 8.9% headloss (of differential) for subject meter.*

"...We have numerous rectangular calibrations...Example: a (156" x 60") x (68.6' x 60") —Beta 0.6631 – meter had an 18% loss."

***NOTE:** See figure 2. A PFS HVT-RF with identical Beta ratio has 4% loss!*

Figure 1

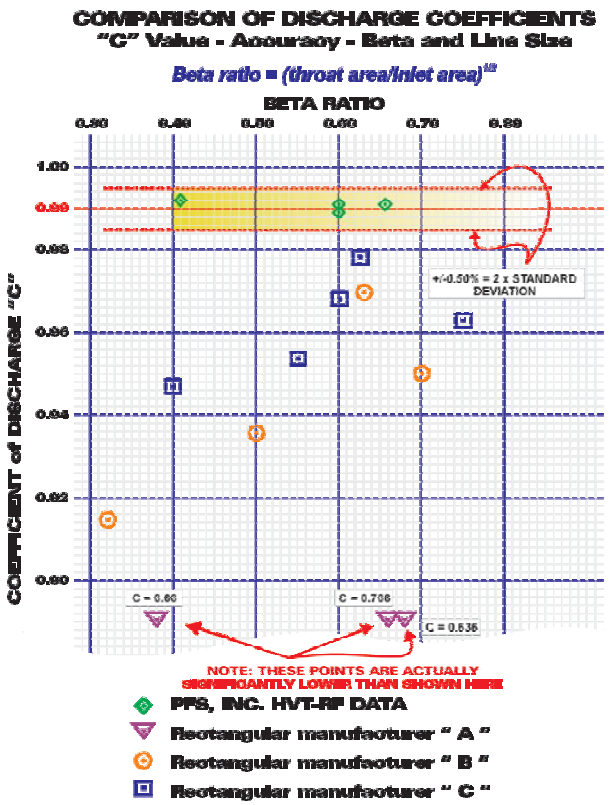
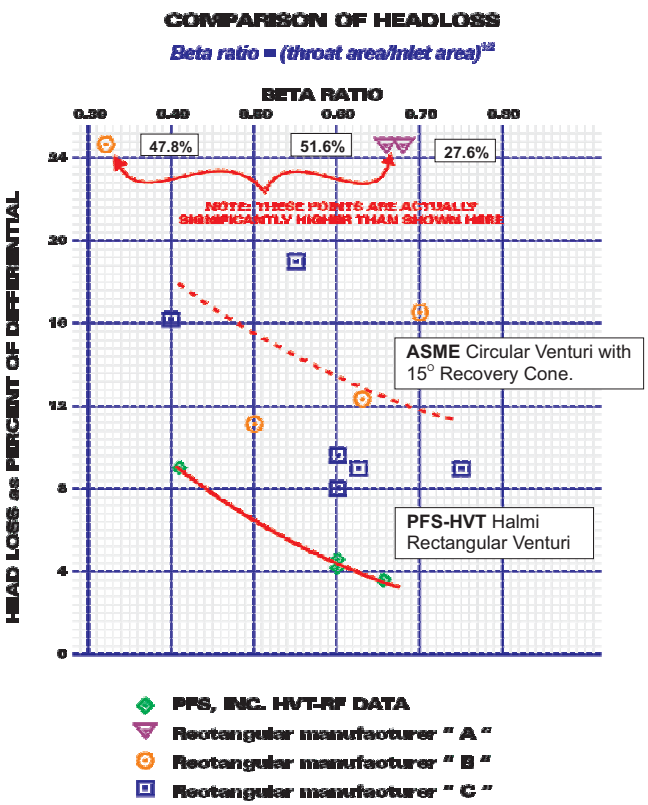


Figure 2



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"...It is a well known fact that rectangular venturi meters always have a higher headloss than circular ones."

***NOTE:* See figure 2. Compare the ASME circular headloss curve to the PFS-HVT-RF rectangular venturi headloss curve.**

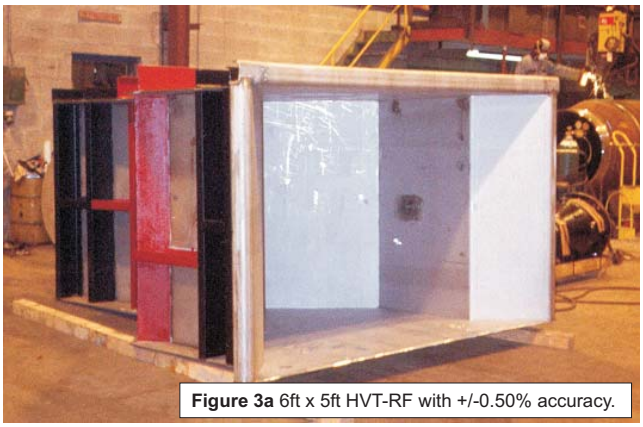

Figure 3a 6ft x 5ft HVT-RF with +/-0.50% accuracy.

APPLICATIONS

Pressure Vessel Type Weldment HVT-RF Halmi rectangular venturi.

Figure 3a illustrates the interior and exterior of a 6ft x 5ft Halmi rectangular meter. This meter measures flow with an accuracy of +/-0.50% (not the standard +/-0.75%) because the effect of upstream piping was established by properly designed model tests as shown in figure 3c.

Figure 3b 6ft x 5ft HVT-RF exterior view.

Component Type HVT-RF Halmi rectangular venturi.

Figure 3c illustrates a 10ft x 10ft HVT-RF Halmi rectangular venturi under construction. Primary Flow Signal, Inc. provides the inlet and throat components fabricated of suitable materials, along with construction drawings, specifications and instructions for the construction work, as well as on-site inspection and management, as required. The result is a top quality cast-in-place meter that will perform to the high standards for which PFS, Inc. has become recognized, worldwide.

Figure 3c 10ft x 10ft HVT-RF under construction. PFS supplies all fabricated meter components together with construction drawings, specifications and instructions, and management and inspection, assuring a successful cast-in-place meter installation, with optimum performance.

Summary

The HVT-Halmi rectangular venturi design principle, with its inherent geometric similitude, coupled with "PFS Flow Metering Know-How" results in rectangular flow measurement that can now obtain ***+/-0.50% accuracy, no large line size limitations, and no "bad" piping effects, since they can be eliminated by properly designed scale model tests.***

Figure 3d Model tests must be properly designed with hydraulic and geometric similitude. By using "PFS-Know-How" the accuracy obtained on these model tested HVT-RF installations is +/-0.50% of actual, including piping effects.

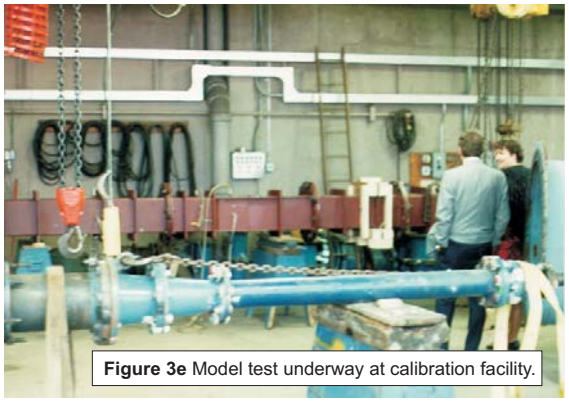

Figure 3e Model test underway at calibration facility.

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Look to Primary Flow Signal, Inc. for Reliable and Innovative Solutions for your Flow Measurement Needs!

HVT-CI *Halmi Cast Iron Venturi Flow Element*

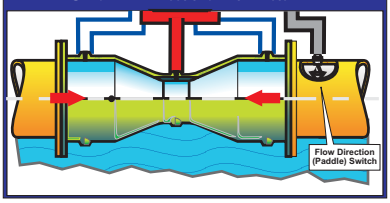
HVT-FV *Halmi Fabricated Venturi Flow Element*

HVT-PI *Halmi Plastic Insert Venturi Flow Element*

HVT-SM *Halmi Sealed Metering System*

HVT-FC *Halmi Rate of Flow Controller*

HVT-BC *Halmi Bi-Directional Flow Meter*



PFS-HN *Halmi Nozzle-Flume/Open Channel Flow*

Venturi Flow Meters

Rate of Flow Controllers

PFS Wedgetype™

Orifice Plates and Flanges

Turbine Flow Meters

Positive Displacement Flow Meters

Instrument Valve/ Manifolds

Monitors, Transmitters Flow Computers

Accessories and Specialty Items

CONTACT US IF WE CAN ASSIST YOU WITH ANY OF YOUR FLOW MEASUREMENT REQUIREMENTS.

AN EXTENSIVE STAFF OF ENGINEERS AND SPECIALISTS IS AVAILABLE SYSTEM-WIDE TO COURTEOUSLY, KNOWLEDGEABLY AND EFFICIENTLY PROVIDE APPLICATION AND DESIGN GUIDANCE.

PFS-HP *High Performance SMART Transmitter*

3MV-STD *3-Valve Manifold for All Applications.*

PFS-FM *PFS FlowMaster™*

PFS-ASME *Nozzles, Orifice Plates, Venturis, Etc.*

-ASME

-ISO

-ISA

-OTHER

PFS-WM *PFS WedgeType™ Flow Element*

APPLICATIONS:

Highly Viscous Line Fluids.

Contaminated Line Fluids.

Low pipe Reynolds Number situations.

Special materials for aggressive line fluids, high pressure and/or temperature.

Available in wide range of line sizes and end connections.

Turbine Meters *Meters and Monitors*

PFS-**Construction & Rehab Management**

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