



Application Notes

Date:

Ref No:

V-cone flowmeter

93-11-24

93-21890/ 1064

Application

Gas in serpentine piping system

Customer

ABB Stal, Finspong, Sweden (gas and steam turbin manufacturer)

THE PROBLEM

ABB Stal, Finspong - manufacturer of steam and gas turbines for power stations asked Ansko, the local rep for the McCrometer V-cone flowmeter for a solution to a measure gas during the commissioning of gas turbines where almost no strait pipe runs were available.

Since ABB Stal had experience with the V-cone in various applications they already know that the requirements for strait pipe runs for the V-cone were extraordinary small. Thus they gave asked Ansko to talk to the manufacturer McCrometer regarding the possibilities of measurement with the V-cone flowmeter.

THE SOLUTION

After the meter had been installed and the first test runs had been made Ansko was asked to look at the results since ABB Stal began to question the flowmeter results since they indicated more than 100 % efficiency for the turbine.

An investigation started to find out if there had been any mistakes made in the installation, auxiliary instrumentation etc. but everything was found to be correct. Therefore McCrometer offered to test the meter including the serpentine pipework in the USA both in their own flow facility and also at CEESI in Colorado which is a world wide recognized flowlab for gases and liquids. However, if the test would confirm the original data for the V-cone the customer would have to cover the costs of testing.

ABB Stal agreed to this and the flowmeter with pipe sections were sent to the USA.

Ceesi confirmed in their tests that what McCrometer stated in their original calibration report was true and correct.



LABORATORY/OFFICE:
54043 County Rd. 37
Nunn, Colo. 80648
Phone: 303-897-2711
FAX: 303-897-2710

**COLORADO ENGINEERING
EXPERIMENT STATION INC.**

CERTIFICATE OF CALIBRATION

This calibration is traceable to the
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Model: V8202 Serial Number: 93033101 (TC11834)

For: McCrometer Order: P502335-00

Data File: 95KTM12 Disc: 0395030 Date: 16 March 1995

The uncertainty in indicated flowrate is estimated to be $\pm 0.5\%$ of reading to 95 % confidence.

The calibration identified by the above CEESI data file was performed using standards that are traceable to the National Institute of Standards and Technology.

This calibration was performed in accordance with the current revision of PROC-10 and MIL-STD 45662A.

This Calibration is: As Found As Left

Calibration performed by:

Dean M. Standiford
Asst. Quality Assurance Manager

Steve Caldwell
Vice President

Re-calibration is recommended to be no more than 12 months from the date of this Certificate



**COLORADO ENGINEERING
EXPERIMENT STATION INC.**

LABORATORY/OFFICE:
54043 County Rd. 37
Nunn, Colo, 80648
Phone: 303-897-2711
FAX: 303-897-2710

Calibration of a 2 Inch V-Cone
 Model: V8202 Serial Number: 93033101 (TC11834)
 For: McCrometer Order:P502335-00
 Data File: 95KTM12 Disc: 0395-030 Date: 16 March 1995
 Meter diameter: 2.104 inches Cone diameter: 1.108 inches
 Test gas: AIR Standard density= .074915 lbm/cu-ft
 at standard conditions of 529.69 deg R, and 14.696 psia
 Cd: Coefficient of Discharge
 Flow: Mass flowrate in pounds per second
 Diff: Differential pressure in std inches of water @ 20 deg C
 Rey No: Meter diameter Reynolds number
 Press: Inlet static pressure in psia
 Temp: Inlet temperature in degrees Rankine
 Density: Inlet density in pounds mass per cubic foot
 Ratio of specific heats: 1.4
 Y: Gas expansion factor

L	Diff	Density	Cd	Rey No	Temp	Press	Flow	Y
1	130.400	2.05700	0.7820	6.852E+006	500.9	377.180	5.8149	0.9838
2	115.470	2.05800	0.7765	6.418E+006	500.7	377.180	5.4442	0.9856
3	133.620	2.06700	0.7764	6.924E+006	498.7	377.180	5.8554	0.9834
4	88.511	2.05900	0.7769	5.645E+006	500.4	377.180	4.7865	0.9890
5	67.332	2.05200	0.7697	4.870E+006	502.0	377.180	4.1400	0.9916
6	87.867	2.06600	0.7725	5.616E+006	498.9	377.180	4.7507	0.9890
7	49.914	2.05100	0.7679	4.190E+006	502.3	377.180	3.5631	0.9937
8	34.529	2.04200	0.7801	3.528E+006	504.3	377.180	3.0098	0.9957
9	49.342	2.05100	0.7679	4.167E+006	502.2	377.180	3.5429	0.9938
10	30.518	2.04100	0.7734	3.288E+006	504.5	377.180	2.8061	0.9962
11	15.194	2.02600	0.7782	2.317E+006	508.1	377.180	1.9884	0.9981
12	25.821	2.03800	0.7763	3.032E+006	505.2	377.180	2.5902	0.9968
13	8.124	2.01000	0.7744	1.672E+006	511.8	377.180	1.4426	0.9990
14	3.855	1.99300	0.7765	1.144E+006	515.7	377.180	.9928	0.9995
15	8.578	2.00400	0.7758	1.715E+006	513.1	377.180	1.4829	0.9989
16	33.415	2.00600	0.7805	3.397E+006	512.8	377.170	2.9362	0.9958
17	26.543	2.01100	0.7794	3.035E+006	511.6	377.170	2.6186	0.9967
18	13.322	2.00200	0.7761	2.134E+006	513.6	377.170	1.8466	0.9983
19	10.488	1.99800	0.7797	1.898E+006	514.5	377.170	1.6450	0.9987
20	7.527	1.99300	0.7754	1.595E+006	515.8	377.170	1.3846	0.9991
21	5.189	1.98500	0.7765	1.320E+006	517.7	377.170	1.1493	0.9993
22	3.391	1.97700	0.7729	1.057E+006	519.7	377.170	.9230	0.9996
23	2.238	1.96900	0.7725	8.541E+005	521.7	377.170	.7481	0.9997
24	1.311	1.95600	0.7698	6.463E+005	524.8	377.170	.5687	0.9998

Average values for above results:
 Press: 377.18 psia Density: 2.0214 lbm/cu-ft
 Temp: 509.2 Deg R Viscosity: .00000098773 lbm/inch-set
 Compressibility factor:

