

HYDRAULICS RESEARCH DIVISION

Technical Note

DATE: July 29, 1976

REPORT NO: 76-6

TITLE: Venturi Meter Calibration

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REASON FOR REPORT:

The following is a brief summary of the venturi meter calibration performed by the Hydraulics Research Division, Canada Centre for Inland Waters as requested by Canadian Ingersoll-Rand Company Ltd. (Canadian Machinery Corporation).

T.M. Dick

July 29, 1976

W. Moody
W.K. Stage

DATA ANALYSIS

DEFINITIONS:

- Δh (Hg) = differential head in centimetres of mercury
 Q_m = flow in USGPM measured during the calibration
 Q_c = flow in USGPM calculated using the equation from the "least squares fit" program
 ΔQ = $Q_m - Q_c$ in USGPM

RESULTS:

Graphs were made on log log paper of Q_m vs Δh (Hg) for both metres.

The values of Q_m and Δh (Hg) were put into a "least squares fit" program and the following equations for the calibrations were derived.

6 x 3 VENTURI

$$Q_c \text{ (USGPM)} = 109.37 \Delta h \text{ (cm Hg)}^{.5133}$$

REGRESSION COEFFICIENT = .9975

8 x 4.25 VENTURI

$$Q_c \text{ (USGPM)} = 231.60 \Delta h \text{ (cm Hg)}^{.4979}$$

REGRESSION COEFFICIENT = .9991

Using the formulae derived from the "least squares fit" program, the calculated values for flow (Q_c) of both venturi meters were computed for each Δh . By subtracting this value (Q_c) from the measured flow (Q_m), we produced ΔQ which can now be put into the "error of estimate" formula

$$S_e = \sqrt{\frac{\sum \Delta Q^2}{n-3}}$$

where n = number of points.

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6 x 3 VENTURI

$$S_e = \pm 7.05 \text{ USGPM}$$

8 x 4.25 VENTURI

$$S_e = \pm 7.92 \text{ USGPM}$$

CONCLUSIONS:

In order to get maximum accuracy, the equations should be used to calculate the flow. We have included tables, in $\frac{1}{2}$ mm increments, for rapid calculation of flows. We have also included graphs of the calibration which can be used for quick references, but should not be used when an accurate reading is required.

TABLE 1.

VENTURI CALIBRATION DATA

DATE: July 29, 1976 SIZE: 6 x 3
 VENTURI NO: TECH. INT: W.K.S., W.M.
 CUSTOMER: Canadian Ingersoll-Rand Corp.

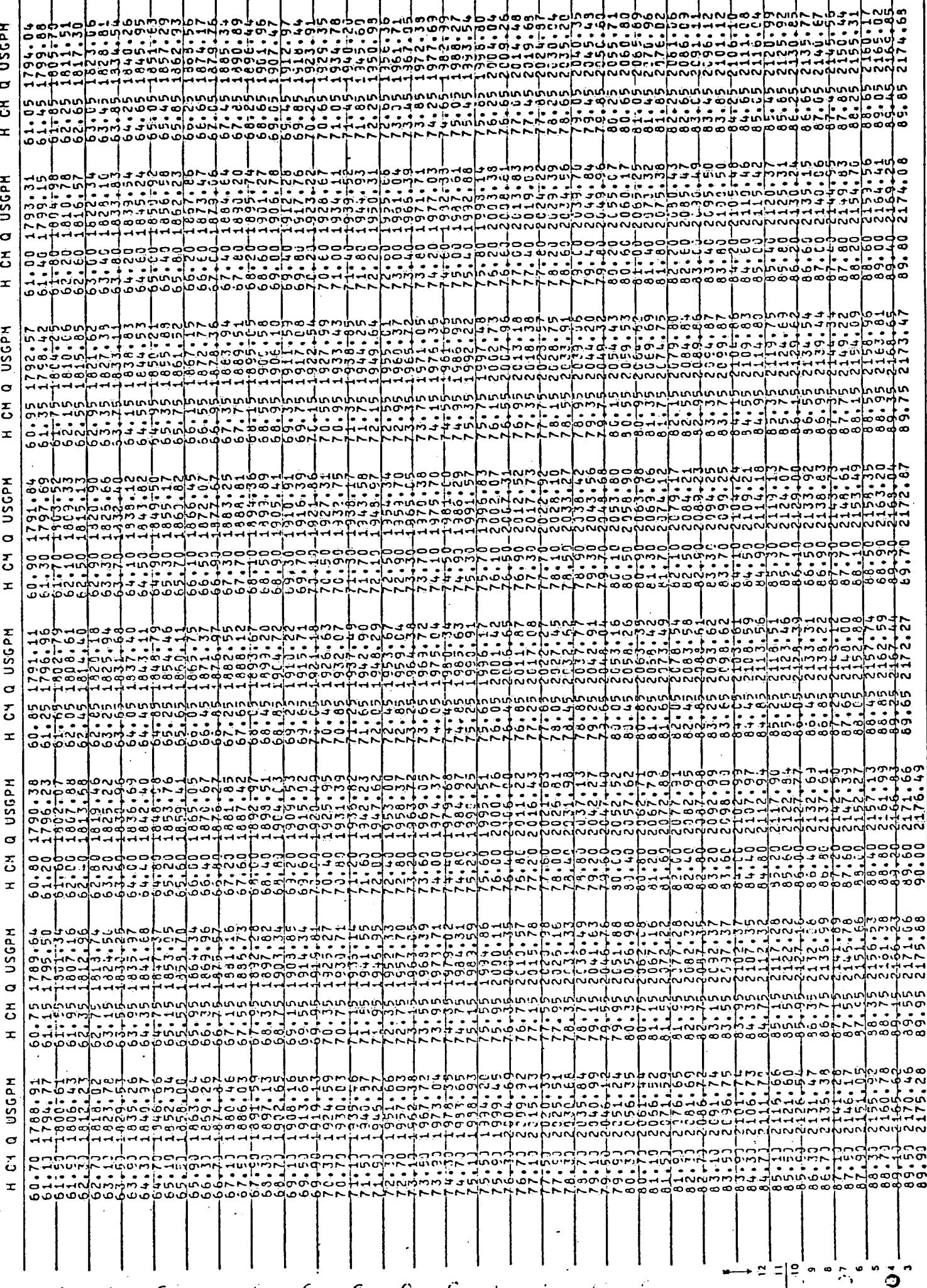
Δh (Hg) cm	Q_m USGPM	Q_c USGPM	$\Delta Q = Q_m - Q_c$ USGPM
78.49	1,031.85	1,026.85	5.00
67.01	952.60	946.79	5.81
53.71	855.92	845.15	10.77
42.98	749.72	753.80	- 4.08
35.50	683.15	683.33	- 0.18
24.70	567.44	567.24	+ 0.20
20.10	502.45	510.30	- 7.85
19.35	492.94	500.44	- 7.50
17.30	475.51	472.48	3.03
15.10	431.13	440.62	- 9.49
12.70	397.84	403.16	- 5.32
11.30	383.58	379.70	3.88
9.70	350.29	351.08	- 0.85
8.85	345.54	334.94	10.60
7.60	304.33	309.76	- 5.43
6.55	296.40	287.00	9.40
5.60	255.19	264.82	- 9.62
4.20	233.00	228.46	4.54
3.85	218.73	218.48	0.25

TABLE II.

VENTURI CALIBRATION DATA

DATE: July 29, 1976 SIZE: 8 x 4.25
 VENTURI NO: 4409 TECH. INT: W.K.S., W.M.
 CUSTOMER: Canadian Ingersoll-Rand Corp.

Δh (Hg) cm	Q_m USGPM	Q_c USGPM	$\Delta Q = Q_m - Q_c$ USGPM
86.30	2,136.62	2,131.47	5.15
75.70	2,006.65	1,996.83	9.82
64.00	1,846.56	1,836.69	9.87
56.10	1,726.10	1,720.07	6.03
49.30	1,613.56	1,612.90	0.66
43.20	1,520.04	1,510.24	9.80
34.50	1,352.03	1,350.26	1.77
30.20	1,264.85	1,263.67	1.18
26.60	1,188.77	1,186.28	2.49
23.30	1,117.45	1,110.57	6.88
19.40	1,014.42	1,013.76	0.66
16.10	911.39	923.88	- 12.49
13.00	814.71	830.56	- 15.85
10.25	732.28	737.87	- 5.59
8.05	645.11	654.24	- 9.13
6.05	567.44	567.51	- 0.07
4.20	470.75	473.21	- 2.46
3.20	412.11	413.29	- 1.18
2.30	361.39	350.63	10.76
2.05	324.93	331.10	- 6.17
1.70	307.50	301.63	5.87



A circular logo containing the text "C.C. & S. MICROGRAPH".

6x3 VENTURI CALIBRATION

Logarithmic, 3 X 2 Cycles
MADE IN CANADA

July 29, 1976

A log-log plot showing a linear relationship between two variables. The x-axis ranges from 1 to 1000, and the y-axis ranges from 1 to 9. A straight line is drawn through the points (10, 1), (100, 10), and (1000, 100).

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Logarithmic, 3 X 2 Cycles
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8 x 4 VENTURI CALIBRATION

