

Products & Systems Division

LOSS CONTROL FOR REFINERIES

CHEMICAL PLANT AND OFFSHORE PLATFORMS



Measurement on a Relief Valve

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6 Control Location: Date: Context: 7 5 Value: Signal Pressure Intel: 6 8 Intel: Feat: Context: 7 7 10 Level Difference Size: Size: Value: Size: Feat: F	3				- VI	PAC	GAS	S L	EΑ	KCA	ALCU	LAT	ION			
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7 Test Valve Signal Pressure Pressure Intel Gate Ball Leak Pluid Cubic Loss Cost Total Loss 9 0rd Lo. Level Difference Difference Size Valve Rate Density Feet/ per Indulars 10 - (dB) PSI Obr (ms HB) (ym) (lgmin) (lgmin) Hour Tonnee for Valves 11 B0V401 58 200 14 2 N 175 0.960 39.8 89.9 89.0 89.2 19.0 11.1 13.023 39.0 18.1 111.8 400.0 11.2 3400.0 19.1 15 F/C200A 62 1050 7.1 3 N N 53.67 11.8 133.2 398.1 3400.0 19.1 16 F/C200A 62 1050 7.1 3 N N 53.7 11.8	6	сом	PANY:			LOCATIC	N:			Date:		Contact:				
B Tesh Signal Pressure Pressure <th< td=""><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	7															
$ \hline \begin barbar barb$	8	Test	Value	Signal	Pressure	Pressure	Inlet	Gate	Ball	Leak	Fluid	Cubic	Loss	Cost	Total Loss	
	9	Point	I.D.	Level	Difference	Difference	Size	Valve	Value	Rate	Density	Feet/		per	In dollars	
If e.g. Image <	10			(dB)	PSI	(bar)	(ins NB)	(y/n)	(y/n)	(l/min)	(kg/m^3)	Hour	Tonnes/yr	Tonne	for Valve/yr	
12 1 BOV401 58 200 14 2 V N 175 0.980 398.8 68.9 \$520.00 88 15 5 <i>H</i> 2000 42 17 6 N N 180.0 11.8 400.5 117.2 3400.00 88 15 5 <i>H</i> 2000 42 17.6 N N 180.0 11.8 111.8 111.8 325.5 3400.00 411 15 7 <i>H</i> 2100 52 245 17 6 N N 524.8 11.8 111.8 325.5 3400.00 411 15 7 <i>H</i> 2100 71 24.5 17 6 N N 433.3 11.8 1033.2 396.1 3400.00 411 16 8 80.6 6.0 3 N 1052.1 1.18 238.6 640.1 \$400.00 \$42.9 16 9 <i>H</i> 2000 52 280	11	e.g														
13 14 D/Y N 175 0.980 389.8 689.8 869.8	12															
16 4 PC100A 62 245 17 6 N N 1880 1.18 400.5 117.2 340.00 341 15 F/C200A 82 1050 71 31 N N 524.8 11.8 111.8 325.5 3400.00 341 16 F/C200A 88 1800 12.2 21 N N 538.7 1.16 111352.2 396.1 3400.00 341 17 F/C000 71 224 17 61 N N 433.3 1.16 1023.2 396.1 3400.00 431 18 PC200D 88 800 50 3 N N 1052.1 1.16 128.6 640.1 340.00 432 30 12 F0200D 88 180 1.08 1.16 128.6 540.00 432 31 12 F0200D 52 2.20 0 6.1N Y 447 1.18 445.5 138.6 <	13	1	BDV401	58	200	14	2	Y	N	175	0.980	369.8	89.9	\$620.00	\$55,744	
IS 5 6 PIC200A 62 1050 71 3 N N 5248 1.18 1111.8 3225 3400.00 4111 17 7 PIC100 71 245 17 6 N N 6537 1.18 11332 3981 \$400.00 4101 17 7 PIC100 71 245 17 6 N N 4533 1.18 11332 2987 \$400.00 4101 18 8 PIC2000 68 680 50 3) N N 1032.1 1.18 1138 2185 \$400.00 4121 18 8 PIC2000 68 680 50 3) N N 632.4 1.18 1335 391.2 \$400.00 4121 12 PC100 52 20 20 N N 630.4 1.18 947.2 727 \$400.00 411 12 PC1400 52 230 6 N	14	4	FIC100A	62	245	17	6	N	N	189.0	1.18	400.5	117.2	\$400.00	\$46,892	
16 6 6 7 1/2 2 1/k N 6.387 1.18 1133.2 3961 3400.00 9181 17 7 7 7 1/2 1/k 1/33.2 3961 3400.00 9181 18 6 7/7 7 1/k 1/33.2 2987 3400.00 9181 18 6 7/7 7 6/10.00 81 1/k 1/3.8	15	5	FIC200A	82	1050	71	3	N	N	524.8	1.18	1111.8	325.5	\$400.00	\$130,189	
T P P P P P CO P P P CO P	16	6	FIC300A	89	1800	122	2	N	N	638.7	1.18	1353.2	396.1	\$400.00	\$158,455	
18 6 PIC2000 68 8801 60 3 N N 1002.1 1.18 2186.5 6401 9400.00 6428 19 9 76300 69 1808 128 21 N N 503.05 11.18 1335.5 591.2 3400.00 6431 201 12 FCV100 52 220 0 8 N Y 447 1.18 1335.5 591.2 3400.00 813 13 FCV100 52 220 0 8 N Y 447 1.18 495.7 136.5 540.00 818 21 3 FCV300 43 445 30 6 N N 22.0 1.18 495.7 156.5 540.00 \$434 31 FCV300 83 1091 74 4 N 1410.1 1.18 2367.5 \$674.6 \$400.00 \$434 34 4 - - - - \$41.28 </td <td>17</td> <td>7</td> <td>FIC100D</td> <td>71</td> <td>245</td> <td>17</td> <td>6</td> <td>N</td> <td>N</td> <td>483.3</td> <td>1.18</td> <td>1023.9</td> <td>299.7</td> <td>\$400.00</td> <td>\$119,894</td> <td></td>	17	7	FIC100D	71	245	17	6	N	N	483.3	1.18	1023.9	299.7	\$400.00	\$119,894	
19 9 PfC300 69 1880 128 2 N N 630.8 1.18 130.5 391.2 8400.00 611 21 12 FCV300 52 220 20 8 N Y 44.7 1.18 947.2 27.1 \$400.00 81 21 13 FCV300 43 44.5 30 6 N N 22.0 1.18 947.2 72.7 \$400.00 81 21 13 FCV300 43 44.5 30 6 N N 22.0 1.18 947.2 7.15 \$440.00 \$434 21 14 FCV300 89 1091 7.4 4 N N 1410.1 1.18 2987.5 \$74.6 \$400.00 \$434 23 24 - - - - \$41.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 \$42.2 <	18	8	FIC200D	88	880	60	3	N	N	1032.1	1.18	2186.6	640.1	\$400.00	\$256,043	
201 12 PCV100 52 230 12 N Y 44.7 1.18 94.7 22.7 3400.00 131 21 31 FCV300 43 444.5 30 61N N 22.0 1.18 465.7 13.6 35400.00 131 22 14 FCV300 43 444.5 30 61N N 1410.1 1.18 456.5 364.00 434 22 14 FCV300 43 144.5 30 61N N 1410.1 1.18 456.5 874.6 \$400.00 434 24 41.2 \$42.7 \$400.00 \$43.45 24 \$41.23 25 \$41.23 26	19	9	FIC300D	89	1880	128	2	N	N	630.8	1.18	1336.5	391.2	\$400.00	\$156,497	
21 13 FCV300 43 445 30 6 N N 22.0 1.18 46.5 13.6 \$400.00 \$43 22 14 FCV300 69 1091 74 4 N N 1410.1 1.18 2987.5 674.6 \$400.00 \$43 23 24 - - - - \$12 \$12 26 - - - - - \$12 \$12 26 - - - - - - \$12	20	12	FCV100	52	290	20	8	N	Y	44.7	1.18	94.7	27.7	\$400.00	\$11,094	
22 14 FCV300 89 1031 74 4 N 1410.1 1.8 2387.5 674.6 \$400.00 434 23 FCV300 89 1031 74 4 N 1410.1 1.8 2387.5 674.6 \$400.00 \$34 24 F F F F F \$123 \$123 \$123 \$26 F F F \$123 <t< td=""><td>21</td><td>13</td><td>FCV200</td><td>43</td><td>445</td><td>30</td><td>6</td><td>N</td><td>N</td><td>22.0</td><td>1.18</td><td>46.5</td><td>13.6</td><td>\$400.00</td><td>\$5,448</td><td></td></t<>	21	13	FCV200	43	445	30	6	N	N	22.0	1.18	46.5	13.6	\$400.00	\$5,448	
23	22	14	FCV300	89	1091	74	4	N	N	1410.1	1.18	2987.5	874.6	\$400.00	\$349,833	
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Spreadsheet Calculation of Losses



5131 Portable Intrinsically Safe Monitor

VPAC[™]

- Identifies through-valve gas losses
- Estimates Leak Rate
- Totally Non-invasive
- Helps plants to comply to EPA Reg. 40 CFR Part 61
- Works on steam valves especially in power generating plants (heat loss)
- On-line Measurement
- Field-proven by British Petroleum[™]
- 10-year Database
- Portable Instrument
- Intrinsically Safe (Atex EEx ia IIC T3; Factory Mutual Class I, Div. 1, Groups A, B, C, D, T4)
- Simple Operation
- 300 Point Memory
- PC Loss Calculator

VPAC[™]/5131 - Loss Control for Valves in Process Plants

VPAC[™] estimates through-valve leakage based on measurements made using a Physical Acoustics Model 5131 portable monitor together with data on valve size, type, and differential pressure. Developed for use in refineries, chemical plants and offshore platforms by British Petroleum[™] (B.P.), VPAC is sold under licence exclusively by Physical Acoustics Limited. This technology package is primarily used for estimating gas losses, gas-to-gas or liquid-to-gas, but limited data on liquid leakage is also included. The system is immune to environmental noise by virtue of the advanced sensor technology. This ensures that measurements are easily made on-line and does not require extensive training of operators.

DATABASE

The basis of VPAC is a database built up by British Petroleum over the past decade that estimates leak rate from the acoustic signal level, taking into account valve type, size, and pressure. The database was built up by removing valves from service that had been identified as leaking by the use of the portable monitor, and testing them under controlled conditions in the laboratory. Several hundred measurements were made. This data is included in the package in both numeric and graphical form, together with procedures for making site measurements and calculating losses.

BENEFITS

B.P. uses this technology in its operations and loss-control, resulting in a very fast payback. Site experience has shown that 5-10% of valves leak, and 1-2% of valves cause 70% of total loss. Savings in excess of \$100,000 per site are easily achieved. Where gas recovery systems are in use, monitoring product valve leakage helps to identify and estimate the extent of the downgrading of valuable products to fuel gas due to valve leakage. This is something previously identified by the flare, but goes unseen with gas recovery in use. Cost savings are achieved in maintenance planning, troubleshooting plant operations and monitoring of losses for environmental purposes.

PREDICTIVE EQUATION

Using their database, B.P. developed an calculation that estimates losses from the input data. This is provided as part of the package in a spreadsheet form, which makes use very easy on a PC. It is particularly useful on large sites that have many hundreds of valves. It is also provided in a graphical form for quick use out in the plant.

CUSTOMER COMMENTS

"... by using this instrument we can identify with much more certainty (and much faster) the leaking valve, enabling a quick repair (without trial and error attempts in finding the faulty valve) and thus reducing the hydrogen leakage which translates into more hydrotreating capacity (= more money!). " Shell Oil

". . .our hydrotreater was losing \$900,000 per year through <u>one valve</u>. The VPAC helped us justify \$60,000 of bypass lines to eliminate future problems." Mobil

". . .our survey found 20% leaks of all sizes, and the estimated value was several hundred thousand \$ worth in a <u>one week</u>. The survey didn't even cover the most valuable unit, which was shutdown at the time." UOP

". . .we can check a valve in under 20 seconds." Tosco

VPAC CONSISTS OF:

- · License for its use on a single site, plus technology package containing:
- · Product Manual/Information: Introduction, Background, Instrument Operation, Operating Procedure and Maintenance
- · Database Graphical and Numeric (MS EXCEL)
- · Reference Materials and Papers

MEASUREMENT HARDWARE:

- To use VPAC you will need the Physical Acoustics Model 5131 Portable Monitor and D9203IS sensor to make the measurements.
- On-site training is optional.
- Ordering information and specifications as follows:

Model 5131 monitor, Model D9203IS sensor and cable, charger (specify 110/220V), field carrying case, 300 point memory, fully autoranging measurement, 85dB dynamic range.

• Intrinsically Safe to : Atex EEx ia IIC T3; Factory Mutual Class I, Div. 1, Groups A, B, C, D, T4

VPAC Procedures and Database developed by British Petroleum, 5131 System by Physical Acoustics.

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