



- Lower maintenance cost due to fewer parts
- Compact / Light Weight Design occupies less space with less stress to tank
- Eliminates the effects of valve leakage and waste of blanketing gas
- One valve system
- Horizontal or Vertical Mounting
- Set Pressure is the only Adjustment
- 316 SS Trim and Seats Standard
- Pilot Filter Standard on 1" and 2" Model
- Optional Filter, Check Valve, Pressure Gauge

## The Shand & Jurs Model 94270 Vapor Guard Tank Blanketing Valve

### WHAT IS TANK BLANKETING?

Gas blanketing systems are used to prevent the escape of liquid vapors into the atmosphere or to prevent moisture from entering a tank and contaminating its contents. A tank blanketing valve maintains an inert gas blanket (usually nitrogen or carbon-dioxide) in the vapor space of a pressure-tight liquid storage vessel. This process is accomplished by utilizing a steady high-pressure gas source and the Shand & Jurs Model 94270 "VAPOR GUARD" so that flow is limited to a constant value when the main valve is opened below the set point. The valve limits the minimum pressure of the gas blanketing to cope with outdoor temperature reductions or pump outs without in-breathing air. When pressure inside the vessel exceeds the valves set point the main valve shuts off. If pressure increases due to outdoor thermal heating, or product pump-ins, the separate breather valve opens and relieves the excess pressure. One advantage of using the Shand & Jurs "VAPOR-GUARD" is that only one valve is needed to maintain precise blanketing regulation while conventional recovery systems require several regulators to achieve the same results.

### HOW DOES IT WORK?

The Shand & Jurs 94270's compact design allows the valve to be mounted directly on the tank which in turn not only reduces the number of necessary connections, but also possible leak points. Models are available with female thread connections & welded or threaded-on flanges.

The 94270 has a balanced, piston operated, main valve so that the set point pressure is virtually unchanged at any given inlet pressure within the specified operating range. The "VAPOR GUARD" has a modulating type action valve that opens and closes automatically, maintaining a closely controlled blanket pressure and gas flow. The modulating action simplifies the valve design thus increasing reliability and reducing maintenance costs. The "VAPOR GUARD" operates in the closed position whenever the tank pressure is satisfied or exceeds the set pressure. Whenever the sensed pressure decreases, the set pressure spring and diaphragm assembly causes a downward force such that the main valve will open proportionately to control pressure and limited capacity.

### FLOW DISC CONTROL PORT

Each valve is fitted with a percentage flow control port to meet specific calculated gas blanketing flow requirements based on a steady gas pressure supply. Referral to a flow capacity chart is necessary to size each valve for a particular gas blanketing system. Standard flow control ports are available in five options: 10%, 25%, 50%, 75% and 100% of the published flow charts to reduce the flow rate to optimum operating conditions. On 1/2" model, 200% and 150% flow control ports are available to increase flow rate at inlet pressures up to 100 psig.

### SET PRESSURES

Set pressures are available from 0.50" WC to 15.0 psig. Inlet pressures range from 20 to 200 psig.

## Theory of Operation/Model 94270

The latest innovations in valve design include a balanced, piston operated, main valve so that the set point is virtually unchanged at any given inlet pressure within the specified operating range. This type of valve is not a pressure reducing regulator, but rather a modulating valve that automatically opens and closes, as needed, to maintain a closely controlled blanket pressure. Modulating action is preferred over pressure regulation because of the simplified valve design and its inherent reliability and maintainability. Typical operation calls for the valve to operate in the closed position whenever the tank pressure is satisfied or when it exceeds the set pressure. As the sensed pressure decreases, the set pressure spring and diaphragm assembly causes a downward force such that the main valve will open proportionately to control pressure and limit flow capacity.

Should the pressure in the pilot chamber drop to a point where it can no longer hold against the pilot set pressure, the pilot spindle moves downward, causing the pilot to unseat. This creates a flow from the pilot inlet, through a small orifice, out the pilot discharge tube and into the tank. The pressure above the main valve is then reduced by a pressure drop downstream. When sufficient pressure drop is achieved, the supply pressure will push open the piston and allow the blanketing gas to enter the tank. When the blanketing gas brings the tank pressure up to the set point, the pilot flow then stops and full supply pressure builds above the piston to close the main valve.

## Sizing A Vapor Guard

There are two criteria for sizing the valve for tank blanketing: (A) blanketing gas replacement for liquid loss during pump out and (B) the condensation/contraction of tank vapors during atmospheric thermal cooling. Required amount of blanketing gas and correct size of valve must be determined on the basis that both conditions could occur simultaneously. The maximum flow rate through the valve will determine its size.

## To Size A Valve

1. Determine the gas flow rate due to pump out (Table A).
2. Determine the gas flow rate due to atmospheric thermal cooling. (Table B) See excerpt from API 2000.

## Excerpt from API 2000

For tanks with a capacity of 20,000 bbl or more, the requirements for the vacuum condition are very close to the theoretically computed value of 2 cubic feet of air per hour per square foot of total shell and roof area. For tanks with a capacity of less than 20,000 bbl, the requirements for the vacuum condition have been based on 1 cubic foot of free air per hour for each barrel of tank capacity. This is substantially equivalent to a mean rate if vapor space temperature change is 100°F per hour in the vapor space.

3. Add the requirements of 1 & 2 and select the valve size based on the blanketing gas capacity.
4. Check table C or D for the gas flow rate at 100% to determine the smallest valve size that will approximately meet the flow rate at the corresponding supply pressure. See Table E.

If further flow rate reduction is required, select the 75%, 50% 25% or 10% flow port option that will adequately cover all operating contingencies. On 1/2" model, 200% and 150% flow control ports are available to increase flow rates. This includes the capacity sizing of the breather valve in the unlikely event of a failed open main valve at maximum inlet pressure.

**NOTE:** In order to ensure reliable operation, a filter is required within 6" of valve inlet. This filter must be sized for inlet requirements determined above.

**Table C**

Capacities Based on 14.7 PSIA Outlet Pressure & 60°F						
Inlet Pressure PSIG	Flow Capacity - SCFH @ 60°F Gas Temp.					
	1/2" Size					
	Ext. & Dip-Tube Sense 100% Flow Control			Internal Sense 25% Flow Control		
	Air	Nitrogen	0.6G Nat. Gas	Air	Nitrogen	0.6G Nat. Gas
20	450	457	574	112	114	143
30	610	620	779	153	155	195
40	750	762	957	188	191	240
50	870	884	1110	218	221	278
60	1030	1046	1315	258	262	329
70	1180	1199	1506	295	300	377
80	1310	1331	1672	328	333	419
90	1460	1483	1864	365	371	466
100	1600	1625	2042	400	406	511
110	1750	1777	2334	438	445	559
120	1880	1909	2400	470	477	600
130	2020	2052	2578	505	513	645
140	2160	2194	2757	540	548	689
150	2300	2336	2936	575	584	734
160	2430	2468	3102	608	618	776
170	2570	2610	3280	643	653	821
180	2700	2742	3446	675	686	862
190	2840	2885	3625	710	721	906
200	2980	3027	3804	745	757	951

**Table D**

Capacities Based on 14.7 PSIA						
Inlet Pressure PSIG	Flow Capacity - SCFH @ 60°F Gas Temp.					
	1" Size			2" Size		
	100% Flow Control Ext. & Dip Tube Sense					
	Air	Nitrogen	0.6 G Nat. Gas	Air	Nitrogen	0.6 G Nat. Gas
30	17,100	17,368	21,826	67,000	68,051	85,519
40	20,500	20,821	26,166	83,000	84,301	105,941
50	24,500	24,884	31,272	99,000	100,552	126,364
60	28,500	28,947	36,377	115,000	116,803	146,786
70	32,500	33,010	41,483	130,000	132,038	165,932
80	36,600	37,174	46,716	146,000	148,289	186,354
90	40,500	41,135	51,694	161,000	163,524	205,500
100	44,500	45,198	56,800	177,000	179,775	225,923
110	48,500	49,260	61,905			
120	52,500	53,323	67,011			
130	56,000	56,878	71,478			
140	60,000	60,941	76,584			
150	62,700	63,683	80,030			
160	67,000	68,050	85,519			
170	71,000	72,113	90,624			
180	74,000	75,160	94,454			
190	78,000	79,223	99,559			
200	82,000	83,286	104,664			

**Table B**

Vessel	Capacity	In Breathing SCFH Air Required
Barrel	Gallons	
60	2,000	60
100	4,200	100
500	21,000	500
1,000	42,000	1,000
2,000	84,000	2,000
3,000	126,000	3,000
4,000	168,000	4,000
5,000	210,000	5,000
10,000	420,000	10,000
15,000	630,000	15,000
20,000	840,000	20,000
25,000	1,050,000	24,000
30,000	---	28,000
35,000	---	31,000
40,000	---	34,000
45,000	---	37,000
50,000	---	40,000
60,000	---	44,000
70,000	---	48,000
80,000	---	52,000
90,000	---	56,000
100,000	---	60,000
120,000	---	68,000
140,000	---	75,000
160,000	---	82,000
180,000	---	90,000

\* API 2000 6<sup>th</sup> Ed Appendix A

**Table A**

Multiply Max. Pump Out rate In	B	To Obtain
U.S. GPM	8.021	SCFH Air Required
U.S. GPH	0.1337	SCFH Air Required
Barrels/hr.	5.615	SCFH Air Required
Barrels/day	0.2340	SCFH Air Required

**Table E**

Standard Flow Coefficients			
Sizes	To Obtain Reduced Flow of:	Multiply Table C or D Figures by:	To Obtain:
ALL	75%	.75	SCFH
ALL	50%	.50	SCFH
ALL	25%	.25	SCFH
ALL	10%	.10	SCFH
1/2"	200%	2.0	SCFH
1/2"	150%	1.5	SCFH

**Table F**

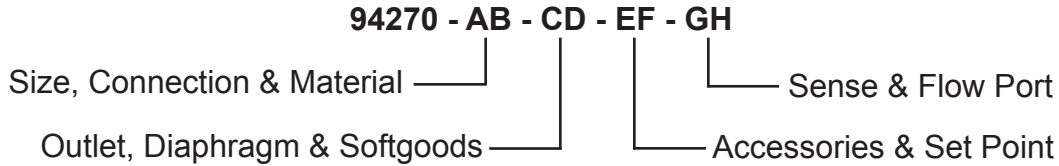
Correction Factor From 60°F Temp. Base					
Actual Temp.	Correction Factor	Actual Temp.	Correction Factor	Actual Temp.	Correction Factor
-20	1.087	60	1.000	150	.9233
0	1.063	80	.9813	200	.8876
20	1.041	100	.9636	250	.856
40	1.020	120	.9469	---	---

(Apply to Tables C & D)



**MODEL NUMBER SELECTION:**

The model number will consist of a base number 94270 followed by four 2 digit numbers which represent the options listed in the following tables.



**ORDERING INFORMATION**

Specify:

1. Model 94270
2. Select Size, Connection & Material
3. Select Diaphragm Type
4. Select Set Point
5. Select Flow Port
6. Select Accessories



**TABLE (A) - CONNECTION**

OPTION	FLANGE TYPE	THREAD TYPE
0	ANSI RF	NPT
1	DN 15 PN16	-
2	DN 25 PN16	-
3	ANSI 150 lb RF Weld Neck*	-
4	ANSI 300 lb RF Weld Neck*	-

\*Weld Neck Flange only available on 1" and 2" model

**TABLE (B) - SIZE, CONNECTION AND MATERIAL**

SIZE	TYPE OF CONNECTION	MATERIAL			
		304 SS BODY / CS DIAPHRAGM HOUSING	316 SS BODY DIAPHRAGM HOUSING	316 SS BODY LOWER DIAPHRAGM HOUSING / CS Upper	316 SS BODY / CS DIAPHRAGM HOUSING
		OPTION #	OPTION #	OPTION #	OPTION #
1/2"	Threaded	1	2	9	D
1/2"	Flanged	3	4	A	E
1"	Threaded	5	6	B	F
1"	Flanged	7	8	C	G
2"	Threaded	H	K	M	P
2"	Flanged	J	L	N	R

**TABLE (D) - DIAPHRAGM & SEALS**

OPTION #	DIAPHRAGM	SEALS
1	Buna	Buna
2	Viton	Viton
3	Teflon	Viton
4	Teflon	EPDM
5	TCF*	Kalrez
6	TCF*	Chemraz
7	Teflon	Buna

\*Teflon Coated Fiberglass

**TABLE (C) - OUTLET**

OPTION #	OUTLET
0	Vertical
1	Horizontal

**TABLE (E) - ACCESSORIES**

OPTION #	ACCESSORIES
0	Standard*
1	1/2" Zinc Inlet Filter
3	1/2" Stainless Steel Inlet Filter
4	1" & 2" Stainless Steel Pilot Filter
5	1/2" Zinc Inlet Filter with Check Valve
6	1" & 2" Aluminum/Zinc Pilot Filter with Check Valve
7	1/2" Stainless Steel Inlet Filter with Check Valve
8	1" & 2" Stainless Steel Pilot Filter with Check Valve
9	Inlet and outlet Pressure Gauges
A	1" & 2" Aluminum/Zinc Pilot Coalescing Filter

\*Standard Construction Includes the following:

1/2" - No Filters or Check Valves

1" & 2" - Aluminum/Zinc Pilot Filter, No Check Valves

**TABLE (F) - SET POINT SELECTION**

RANGE	0.5 to 2" wc	1.9 to 4" wc	3.5 to 10" wc	9 to 20" wc	18 to 29" wc	27 to 39" wc	1.3 to 1.8 psig	1.7 to 2.3 psig	2.2 to 3.0 psig	2.9 to 5.0 psig	4.9 to 10.0 psig	9.9 to 15.0 psig
OPTION #	1	2	3	4	5	6	7	8	9	A	B	C

**TABLE (GH)- SIZE, SENSE, & FLOW PORT**

SIZE	SENSE	OPTION						
		% OF STANDARD FLOW PORT						
		200%	150%	100%	75%	50%	25%	10%
1/2"	External	06	04	01	08	20	23	NA
	Dip Tube*	07	05	02	09	21	22	NA
	Internal*	NA	NA	NA	NA	NA	03	NA
1"	External	NA	NA	11	12	13	14	10
	Dip Tube*	NA	NA	16	17	18	19	15
2"	External	NA	NA	24	25	26	27	28

\*Vertical Mount Only