FLOMETRIQ FILTRATION AND INSTRUMENTATION (P) LTD

Engineering Flow...

Pressure Drop Calculation

To calculate Total pressure drop the following formula is to be used,

Pressure drop due to area ratio $(Pa) = P1 \times C$

Where, P1 – From pressure curve for respective strainer.

C – Area ratio factor

Pressure drop due to flow $(Pf) = Pa \times sg$

Where, Pa – Pressure drop due to area ratio

sg – Specific gravity for the respective fluid used.

Pressure drop due to component factor $(Pc) = Pf \times k$

Where, Pf1 – Pressure drop due to flow

K – Component Factor

Initial pressure drop $(Pi) = Pc - Pf$

Where, Pc – Pressure drop due to component factor

Pf1 – Pressure drop due to flow.

Pressure drop due to friction $(Pv1) = Pc \times f1$

Where, Pc – Pressure drop due to component factor

f1 – Body Loss Factor

Pressure drop due to Screen loss $(Pv2) = Pi \times V1 \times V2$

Where, Pi – Initial pressure drop

V1 – Perforation factor

V2 – Mesh Factor.

Prefinal Pressure Drop $(P) = Pv1 + Pv2$

Refer the tables from next page for unknown factors.

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Size Range	Area ratio factor (C)							
	Perforated Plate					Mesh lined		
	% Screen Material Opening Area					% Screen Material Open Area		
	60%	50%	40%	30%	20%	50%	40%	30%
25nb - 40 nb	0.45	0.55	0.7	1	1.15	1.05	1.05	1.2
50nb - 1200nb	0.65	0.8	1	1.4	2.15	1.05	1.05	1.2

Table : A - To find C,

Size	Component Factor (k)
25-40nb	0.25
50 - 250nb	0.3
250 - 1200nb	0.35

Table: C - To find k

Viscosity	Body Loss factor	Viscos factor			
(C_P)	(f_1)	Perforation factor (V_1)	Mesh Correction factor(V_2)		
			20 mesh	30, 40 mesh	60 - 300 mesh
10	1.00	1.15	1.3	1.4	1.5
25	1.20	1.25	2	2.2	2.5
100	1.60	1.40	3	4	6.5
200	2.20	1.50	4.5	7	11.5
500	4.40	1.60	10	15	25
750	6.20	1.65	12	24	36
1000	8.20	1.70	15	30	50
1500	11.30	1.80	22	42	75
2000	15.50	1.90	30	60	100

If no perforation is used mesh correction factor(V_2) is to be taken as 1

Table: D - To find f1, V1 and V2

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Free Straining Area to Pipe Area (R)							
% Clogging	**10:1**	**8:1**	**6:1**	**4:1**	**3:1**	**2:1**	**1:1**
10%	-	-	-	-	-	-	3.15
20%	-	-	-	-	-	1.15	3.9
30%		-		-	-	1.4	5
40%	-	-	-	-	-	1.8	6.65
50%	-	-	-	-	1.25	2.5	9.45
60%	-	-	-	1.15	1.8	3.7	14.5
70%	-	-	-	1.75	2.95	6.4	26
80%	-	1.1	1.75	3.6	6.25	14	58
90%	2.3	3.45	6	13.5	24	55	-

Table: E- To Find Clogging factor (λ)

Area ratio $(\mathbf{R}) = \frac{Af}{100\ Ap}$ Where, A_f – Filtration area

A_p – Nominal Pipe area.

Filtration Area $(A_f) = A_s \times P_a$ Where, A_s - Screen area

P_a - Percentage of open area in screen.

Example 1:

Assuming a Y Strainer of size 100 mm nominal diameter, having a perforated sheet with 6mm hole diameter.

Ratio of free straining area to the pipe area $(\mathbf{R}) = \frac{Af}{100\ Ap}$

$$= \frac{As \times Pa}{100\ Ap}$$

$$= \frac{7.85 \times 10^6 \times 0.4}{100 \times 7850}$$

Ratio of free straining area to the pipe area R = 4

Actual / Final Pressure drop $(P_{act}) = R\ \lambda$

From table: E when R= 4, Clogging accurse at 20%

P_{act} ***= 4 λ at 20 % Clogging condition.***