Inside Diameter & Pressure Loss

Straight sections, Valves and Fittings

1	***Project and Fluid data:***			
2	Service =	Centrifugal pump discharge (water)		
3	P [bar] =	Pipeline design pressure		45
4	Q [m^3/h] =	Operating flow		150
5	v [m/s] =	Project Velocity		2,50
6	v [m/s] =	Real Velocity in the pipeline		2,48
7	T [ºC] =	Operating temperature		100
8	ρ [kg/m^3] =	Fluid Density		960,0
9	μ [kg/ms] =	Dynamic Viscosity @ operating temperature		0,0002829
10	ν [m^2/s] =	Kinematic Viscosity @ operating temperature		0,0000003
11	***Piping Data:***			
12	Material =	Material Metallurgy to determine pipe roughness		Commercial Steel
13	NPS [in] =	Nominal Pipe Size		6
14	De [mm] =	External Diameter		168,3
15	SCH [adim] =	Schedule		80
16	D [mm] =	Internal Diameter		146,36
17	L [m] =	Straight sections length		475
18	ε [mm] =	Clean pipe roughness		0,0500
19	***Total pressure loss in the system***			
20	hf [mcl] =	System's total pressure loss	=	26,024
21	hf [bar] =	System's total pressure loss	=	2,549
22	***Pressure loss in straight sections***			
23	hft [mcl] =	f*L*v2 / D*2g pressure loss in straight pipeline sections (Darcy-Weisbach)	=	16,224
24	htf [bar] =		=	1,589
25	Re [adim] =	D*ρ*v / μ -> D*v / Vc Reynolds number	=	1.230.027
26	f [adim] =	64/Re Laminiar flow -> RE < 2000 (Poiseuille)	=	NA
27	f [adim] =	Chuchill 1977, reproduces Moody in all regimes	=	0,0160
28	f [adim] =	Cheng 1979, good performance for turbulent regime -> as a reference	=	0,0159
29	***Pressure loss in valves, fittings and others***			
30	hff [mcl] =	Pressure loss in fittings	=	9,800
31	hff [bar] =		=	0,960
32	f [adim] =	Crane, commercial steel pipe, total turbulent flow -> for valves and fittings	=	0,015

Number of fittings according to system configuration

Item	Condition	Nº Fittings	Angle	Ratio D/d	($f_T L/D$, K)
			V obturator (m/s)		
Gate valves (K)					
Full bore, threaded					**0**
Reduced bore, flanged					
Reducing cone angle (Ø)	Ø ≤ 45º		27	0,75	0,000
	45º < Ø ≤180º		90	0,75	0,000
Globe and angle valves, full bore and inclined (K)					
Normal obturator and full bore, all joining methods		4			20,400
Inclined obturator and full bore, welded ends					0,000
90º Angle and full bore, welded or flanged ends					0,000
90º Angle and reduced, welded or flanged ends				0,75	0,000
90º Angle and full bore, threaded ends					0,000
90º Angle and reduced, threaded ends				0,75	0,000
Swing check valve, all joint types (K)					
Inclined disc, threaded ends		4			6,000
Minimum velocity to lift the obturator (m/s)			0,046		
Normal disc, flanged ends					0,000
Minimum velocity to lift the obturator (m/s)			0,077		
Lift check valves (K)					
Full bore, horizontal	Threaded ends				0,000
Reduced bore, horizontal				0,75	0,000
Minimum velocity to lift the obturator (m/s)			0,029		
Reduced bore, inclined	Welded ends				0,000
Reduced bore, inclined				0,75	0,000
Minimum velocity to lift the obturator (m/s)			0,098		
Tilting disc check valves, flanged (K)					
Disc angle with respect to the horizontal line: 5º					
50 mm ≤ Pipe Diameter ≤ 200 mm					0,000
250 mm ≤ Pipe Diameter ≤ 350 mm					0,000
400 mm ≤ Pipe Diameter ≤ 1200 mm					0,000
Minimum velocity to lift the obturator (m/s)			0,102		
Disc angle with respect to the horizontal line: 15º					
50 mm ≤ Pipe Diameter ≤ 200 mm					0,000
250 mm ≤ Pipe Diameter ≤ 350 mm					0,000
400 mm ≤ Pipe Diameter ≤ 1200 mm					0,000
Minimum velocity to lift the obturator (m/s)			0,041		
Stop check valves, flanged (K)					
Full bore, horizontal					0,000
Reduced bore, horizontal				0,75	0,000
Minimum velocity to lift the obturator (m/s)			0,040		
Full bore, inclined					0,000
Reduced bore, inclined				0,75	0,000
Minimum velocity to lift the obturator (m/s)			0,055		