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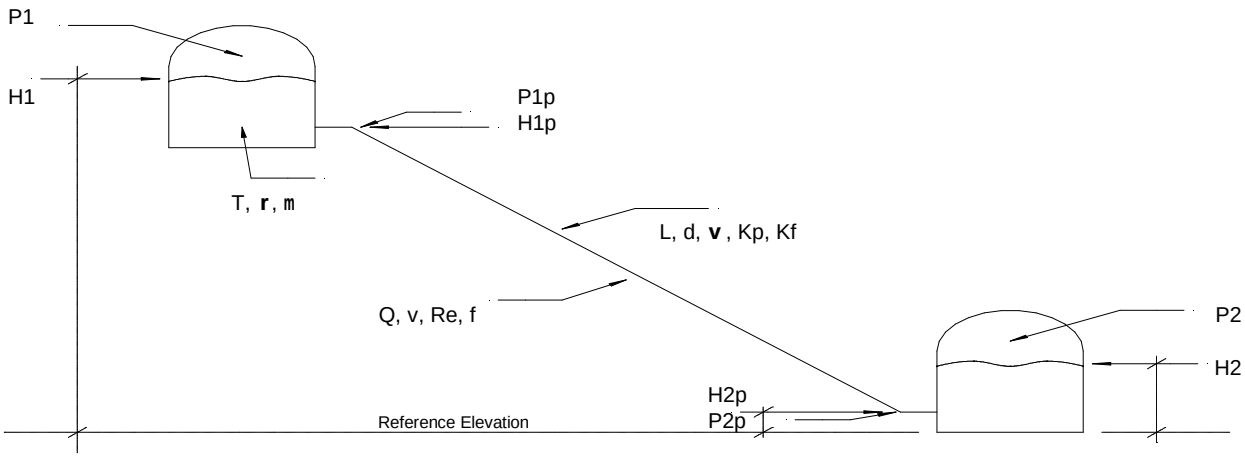
Content Based
Chemical Engineering

ENGINEERING DESIGN CALCULATION - DENNIS KIRK

Pipe and Fittings Pressure Drop Calculation (refer Crane Flow of Fluids) Ver 1.020 Feb-03

Client: Project:
Task: By:



Upstream Conditions:

At Fluid Surface:			
Pressure	P1	2695	kPa(g)
Elevation	H1	5	m
At Pipe Inlet:			
Elevation	H1p	1.5	m
Pressure	P1p	2729	kPa(g)

Downstream Conditions:

At Fluid Surface:			
Pressure	P2	371	kPa(g)
Elevation	H2	12.0	m
At Pipe Inlet:			
Elevation	H2p	3	m
Pressure	P2p	460	kPa(g)

Pipe Size:

	Reference Pipe Size		
	Size (in)	4	
	Sched	40	
User Selections:	Type	6	
		Steel Pipe-clean	
	Roughness v	0.05	mm
	Inside Dia. d	102.26	mm
Pipe K Factor:	Kp	18878.2	
Fittings K Factor:	Kf	124.4	
Valves K Factor:	Kv	544.5	
	Ktot	19547	
	Le(ref)	7,748	m

Fluid Details:

Fluid Type	Water	
T	15	oC
r	1000	kg/m3
m	198	cP

Fluid Flow:

Q	14,202	kg/hr
q	236.7	l/min
v	0.48	m/sec
Re	248	
f	0.25798	
f_T (fully turbulent flow)	0.01662	
dPfrict	-2255.0	kPa
dPelev	-14.7	kPa
dPtotal	-2269.7	kPa
dPf/P1	81%	
dPf/100m	-29.1	kPa/100m

Pipe Details:

Select the size, schedule and type (1 to 17) of pipe and provide the length of each.

Select the type and number of fittings of each size in the line.

Select the type and number of valves of each size in the line.

Where valve manufacturers data is available as Cv or K values these may be entered.

The library provides a storage area for valve Cv and K values.

Size (in)		4	1.5	2	2
Sched		40	10S	10S	10S
Type		6	14	6	13
		Steel Pipe-clean	Galvanised Iron	Steel Pipe-clean	Epoxy Lined
Roughness	v mm	0.05	0.15	0.05	0.007
NB	mm	100	40	50	50
OD	mm	114.3	48.3	60.3	60.3
WT	mm	6.02	2.77	2.77	2.77
Inside Dia.	d mm	102.26	42.76	54.76	54.76
L	m	6500	7	12	50
v	m/sec	0.5	2.7	1.7	1.7
Kp		16398.4	17.7	30.3	126.1
Le	m	6500.0	7.0	12.0	50.0
dPfrict	kPa	1891.7	66.6	42.5	177.0
dP/100m	kPa	29.1	952.0	353.9	353.9
Kp(ref)		16398.3969	577.6416	368.1618	1534.0073
Le(ref)	m	6500.0	229.0	145.9	608.1

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Fittings Details:			**Size**	4	1.5	2	2
Elbow B/W	90º	SR(r/d)=1	20				
		LR(r/d)=1.5	14		2	4	
		r/d=2	12				
		r/d=3	12				
		r/d=4	14				
		r/d=6	17				
		r/d=8	24				
		r/d=10	30				
		r/d=12	34				
		r/d=14	38				
		r/d=16	42				
		r/d=20	50				
	45º	SR (r/d=1)	15				
		LR (r/d=1.5)	10				
	180º	SR (r/d=1)	30				
		LR (r/d=1.5)	22				
Other	180º	r/d=6.0	30.2	42			
Mitre Bend	Angle	0º	2				
		15º	4				
		30º	8				
		45º	15				
		60º	25				
		75º	40				
		90º	60				
Tee B/W	Thru Run		7.5	17	2	1	
	Thru Branch		35				
Pipe Entry	Projecting		0.78				
	Flush	Sharp	0.5	1			
		Rounded 0.1	0.09				
Pipe Exit	Projecting		1				
	Flush	Sharp	1			1	
		Rounded 0.1	1				
Reducer ANSI	d1/d2=	0.4	36º				
Included angle < 45º		0.5	30º			1	
		0.6	23º		1		
Note: Enter reducers in the		0.75	18º				
column for the smaller size		0.8	10º				
	other	0.7	20º				
Enlargement ANSI	d1/d2=	0.4	36º				
Included angle < 45º		0.5	30º			1	
		0.6	23º		1		
Note: Enter enlargements in the		0.75	18º				
column for the smaller size		0.8	10º				
	other	0.62	21º				
Contraction Sudden	d1/d2=	0.8	180º				
Enlargement Sudden	d1/d2=	0.5	N/A		1		
Included angle > 45º	Note: Enter in column for the smaller size						
			Kf	23.70992775	2.053172167	2.75373265	0
			Kf(ref)	23.7099	67.1580	33.4882	0.0000

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Valve Details:	Type		Size	4	1.5	2	2
Gate	FB		8	6		2	
	RB	d1/d2=**b**	0.666				
		a	15º				
Plug	Parallel	d1/d2=1	18				
		d1/d2=**b**	0.77				
		a	16				
Ball	FB		3				
	RB	d1/d2=**b**	0.77				
		a	23º				
Butterfly			45				
Check	Swing	Angle Seat	100				
		Vert Seat	50				
	Lift Check	Hor Seat	600				
	(d1/d2=1)	Angle Seat	55				
	Wafer		Varies				
	Axial						
Foot Valve	Vertical Disc		420				
	Hinged Disc		75				
Globe (d1=orifice)	Inline	d1/d2=1	340				
	Angled	d1/d2=1 45º	55				
		d1/d2=1 90º	150				
	Inline Red.	d1/d2=**b**	0.35	1			
Other Valves							
Stockham Wafer Check 2 in		Cv=	54.3			1	
Stockham Wafer Check 3 in		USGPM	139.3				
Stockham Wafer Check 4 in			271.3	1			
Stockham Wafer Check 6 in			725				
Stockham Wafer Check 8 in			1509				
Stockham Wafer Check 10 in			2640				
Stockham Wafer Check 12 in			4075				
Kitz Ball RB 2 in			160				
Kitz Ball RB 3 in			440				
Kitz Ball RB 4 in			780				
Kitz Ball RB 6 in			1500				
Kitz Ball RB 8 in			1700				
Kitz Ball RB 10 in			3100				
Kitz Ball RB 12 in			5800				
Richards Ball RB (Series 11) 2 in			115				
Richards Ball RB (Series 11) 3 in			320				
Richards Ball RB (Series 11) 4 in			600				
Richards Ball RB (Series 11) 6 in			1000				
Richards Ball RB (Series 11) 8 in			2000				
Starline Ball RB 2 in			125				
Starline Ball RB 3 in			319				
Starline Ball RB 4 in			580				

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Other Valves						
	Cv= UKGPM					
Other Valves						
	K=					
		Kf	461	0	7	0
		Kf(ref)	461	0	83	0