

The equivalent pipe length concept is the most convenient method for calculating the overall pressure loss in a pipe. The method adds some hypothetical length of the pipe to the actual length of the fitting, giving an equivalent length of pipe that has the same total loss as the fitting.

$\rho_{60} = 73.6 \text{ lb/ft}^3$, respectively.

At the flowing conditions, temperature, $t = 555^\circ\text{F}$, $S = 1.04$ and $\rho = 64.87 \text{ lb/ft}^3$. Viscosity of the gas oil, $\mu = 0.6 \text{ cP}$

Pipe details:

Schedule 40	Suction line	Discharge line
Nominal size, in.	6	4
Inside dia., d , in.	6.065	4.026
Actual pipe length, ft	39	156
Fittings:		
Long radius 90° elbows	5	20
Reducer, in.	4.026	3.068
Gate valve	1	4
Entrance	1	1
Exit		2

Table 5 shows the results of the pressure losses from the printout.

Copies of the program are available on 3.5 or 5.25-in. diskettes (specify SI or English units) for a nominal fee of \$15 to cover postage and duplication costs from Dr. A. K. Coker, 131 George Frederick Rd., Sutton Coldfield, West Midlands, B73 6TC, U.K.

NOMENCLATURE

A	Pipe internal cross-sectional area, ft^2
d	Internal pipe diameter, in.
D	Internal pipe diameter, ft
f_D	Darcy friction factor
K	Excess head loss for a fitting, velocity heads
K_1	K for fitting at $N_{Re} = 1$, velocity heads
K_∞	K for very large fitting at $N_{Re} = \infty$, velocity heads
L_{eq}	Equivalent length of pipe, ft
L_{st}	Actual length of pipe, ft
L_{TOTAL}	Total length of pipe, ft
n	Number of fittings of a given type
N_{Re}	Reynolds Number, $Dv\rho/\mu$
P_1	Pipe inlet pressure, psi.
P_2	Pipe outlet pressure, psi.
ΔP_{100}	Pressure drop per 100 ft. of pipe; psi./100 ft.
ΔP	Overall pressure drop of pipe, psi
t	Fluid temperature, $^\circ\text{F}$
ρ	Fluid density, lb/ft^3
ϵ	Absolute roughness of pipe wall, ft
μ	Fluid viscosity, cP

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TABLE 5—Calculated results for the suction and discharge lines

Schedule 40	Suction line	Discharge line
Nominal size, in.	6	4
Inside diameter, d , in.	6.065	4.026
Fluid flowrate, gpm	250	250
Fluid viscosity, cP	0.6	0.6
Fluid density, lb/ft^3	64.87	64.87
Fluid velocity, ft/sec	3.333	7.565
Velocity head loss due to fittings, K	3.247	9.503
Equivalent length of pipe, ft	94.012	179.748
Actual length of pipe, ft	39	156
Total length of pipe, ft	133.012	335.748
Reynolds number, N_{Re}	225,715	340,030
Pipe roughness, ϵ , ft	0.00015	0.00015
Darcy friction factor, f_D	0.01745	0.01774
Excess head loss, ft	0.551	10.956
Pipe pressure drop/100 ft, psi/100 ft	0.18628	1.46856
Overall pressure drop of pipe, psi	0.2478	4.9307

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