Helix Technologies Pty Ltd

Project	Helix QA	Client	Helix QA
Project No.	4567	Design Date	15/03/2017
Category	Demo Liquid QA	Atmos. Press	100.19 kPa
Network Type	Liquid	Calc. Method	Darcy
Description	Lube Oil Crane 410M ex 4-7 pg 4-4		

Oil Flow ref. 'Flow of Fuids Through Valves, Fittings and Pipe', Crane Technical Paper 410 M Example 4-7 pg 4-4

SAE 10 Oil at 15 deg C flows through a pipe 3" Sch 40, 60m long with several fittings with a differential head of 7m. Determine the flow rate in l/min.

Fitting Description	Kft	K	Qty
Bend - 90 degree elbow r/d = 8	30	0.54	6
Entrance - flush 1/2	0	0.5	1
Exit - Sharp edged	0	1	1
Ball Valve, full bore	3	0.58	1

Calculation Results	Crane 410	Helix
Flow Rate	456 l/min (1st iteration)	482.99 l/min (11 iterations)
Velocity	1.6 m/s	1.69 m/s
Reynolds no	1020 (1st iteration)	1152
Friction factor	0.063	0.05558

Correlation is not as good as some of the other models but the Crane 410 example uses a trial value and only one iteration is performed. Better accuracy can be extpected with more iterations as noted in the example.

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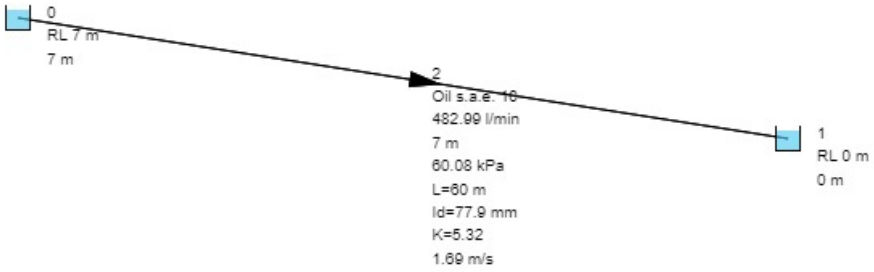

Lube Oil Crane 410M ex 4-7 pg 4-4

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Description	Lube Oil Crane 410M ex 4-7 pg 4-4		

Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Liquid	Oil s.a.e. 10	Viscosity	100 cp
Temperature	15 C	Density	875.2 kg/m3
Vapour Pressure	0 kPa		
Pipe Description	Steel Pipes 3" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	80 mm	Inside Diameter	77.9 mm
Outside Diameter	88.9 mm	Pipe Length	60 m
Pipe Roughness	0.03 mm	Allowable Press.	12100 kPa
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Bend - 90 degree elbow r/d = 8	6	0.54	30
Entrance - flush 1/2	1	0.5	0
Exit - Sharp edged	1	1	0
Ball Valve, full bore	1	0.58	3

Total Fittings k	5.32	Total Fittings kf	0
Flow Rate	482.99 l/min	Velocity	1.69 m/s
Friction Loss	6.23 m	Fitting Losses	0.77 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	7 m	Total Pressure Drop	60.08 kPa
Entry Total Head	7 m	Exit Total Head	0 m
Entry Gauge Head	0 m	Exit Gauge Head	0 m
Reynolds No.	1151.52	Friction Factor	0.05558 (Darcy f)

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Node No	0	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	7 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	7 m		

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Description	Lube Oil Crane 410M ex 4-7 pg 4-4		

Node No	1	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	0 m		