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 bar
Network Type	Liquid	Calc. Method	Darcy
Description	Lube Oil Example 1/2 pg 3.12 Crane 410		

Lube Oil Laminar Flow ref. 'Flow of Fuids Through Valves, Fittings and Pipe', Crane Technical Paper 410 M Example 1 and 2 pg 3-12

Ethanol with density 897 kg/m3 and viscosity of 450 cP flows through a pipe at 3000 l/hr. Find the pressure drop per 100m of 6" Sch 40 pipe.

Calculation Results	Crane 410	Helix Calculation	
Ex 1 Pressure Drop per 100m	1.63 bar	1.626 bar	
Reynolds number		823	< 2000
Laminar			
Ex 2 Pressure Drop per 100m	1.0 bar	0.978 bar	
Ex 2 Pressure Drop per 40 m	0.4 bar	0.391 bar	
Reynolds number	1450	1460	< 2000
Laminar			

Crane results are read from charts and will not be as accurate as calculated values, nevertheless results are close

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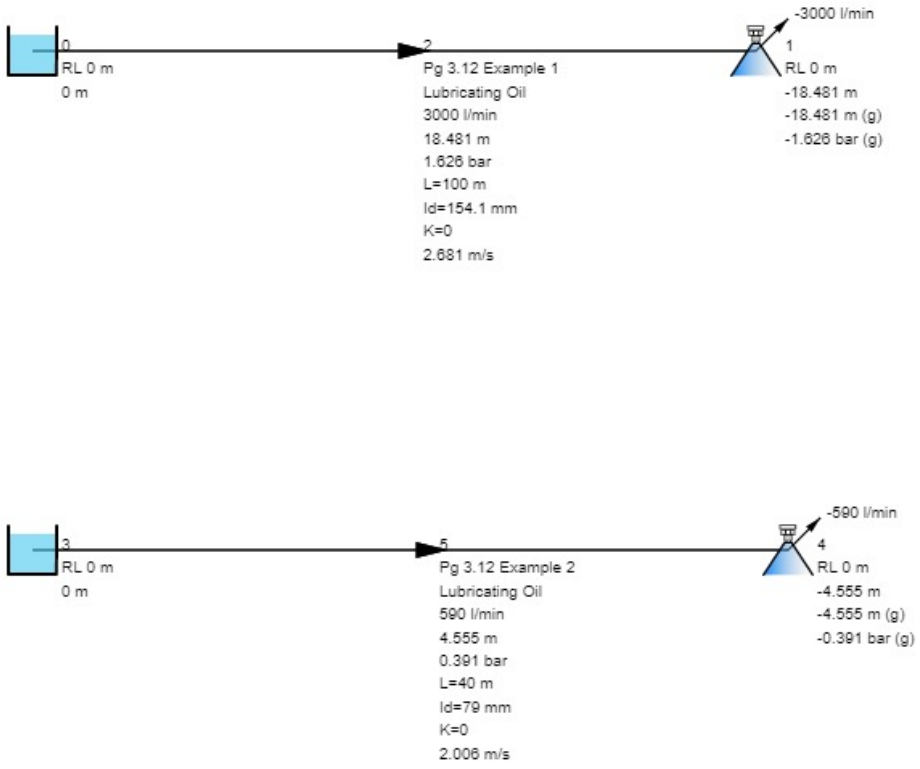

Lube Oil Example 1/2 pg 3.12 Crane 410

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Pipe No	2	From node to node	0 - 1
Description	Pg 3.12 Example 1	Equipment No	
Liquid	Lubricating Oil	Viscosity	450 cp
Temperature	30 C	Density	897 kg/m3
Vapour Pressure	0 bar		
Pipe Description	Steel Pipes 6" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	150 mm	Inside Diameter	154.1 mm
Outside Diameter	168.3 mm	Pipe Length	100 m
Pipe Roughness	0.03 mm	Allowable Press.	8130 bar
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	3000 l/min	Velocity	2.681 m/s
Friction Loss	18.481 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	18.481 m	Total Pressure Drop	1.626 bar
Entry Total Head	0 m	Exit Total Head	-18.481 m
Entry Gauge Head	0 m	Exit Gauge Head	-18.481 m
Reynolds No.	823.488	Friction Factor	0.077718 (Darcy f)

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Description	Lube Oil Example 1/2 pg 3.12 Crane 410		

Pipe No	5	From node to node	3 - 4
Description	Pg 3.12 Example 2	Equipment No	
Liquid	Lubricating Oil	Viscosity	95 cp
Temperature	30 C	Density	875 kg/m3
Vapour Pressure	0 bar		
Pipe Description	Steel Pipes 3" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	80 mm	Inside Diameter	79 mm
Outside Diameter	86 mm	Pipe Length	40 m
Pipe Roughness	0.03 mm	Allowable Press.	8130 bar
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	590 l/min	Velocity	2.006 m/s
Friction Loss	4.555 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	4.555 m	Total Pressure Drop	0.391 bar
Entry Total Head	0 m	Exit Total Head	-4.555 m
Entry Gauge Head	0 m	Exit Gauge Head	-4.555 m
Reynolds No.	1459.716	Friction Factor	0.043844 (Darcy f)

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Category	Demo Liquid QA	Atmos. Press	100.19 bar
Description	Lube Oil Example 1/2 pg 3.12 Crane 410		

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

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Description	Lube Oil Example 1/2 pg 3.12 Crane 410		

Node No	1	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 bar
Nozzle K value	0	Ext Flow (+In/-Out)	-3000 l/min
Int.(Gauge) Head	-18.481 m	Int.(Gauge) Pressure	-1.626 bar
Total Node Head	-18.481 m		

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Description	Lube Oil Example 1/2 pg 3.12 Crane 410		

Node No	3	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 bar
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	0 m		

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Description	Lube Oil Example 1/2 pg 3.12 Crane 410		

Node No	4	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 bar
Nozzle K value	0	Ext Flow (+In/-Out)	-590 l/min
Int.(Gauge) Head	-4.555 m	Int.(Gauge) Pressure	-0.391 bar
Total Node Head	-4.555 m		