Helix Technologies Pty Ltd

Project	QA	Client	Helix QA
Project No.	4567	Design Date	10/03/2017
Category	Demo QA Petroleum	Atmos. Press	100.19 kPa
Network Type	Liquid	Calc. Method	Darcy
Description	Petroleum Transport 15km QA		

Piping Calculations Manual, 2005, McGraw-Hill, E. Shashi Menon, P.E., Page 337, Example 6.17
Check Values

Description	Piping Manual	Helix deltaQ
Pump Pressure Required	1792 kPa	1784.5 kPa (1778.5 + 4)
Friction Factor	0.013	0.01261 based on pipe roughness 0.03mm

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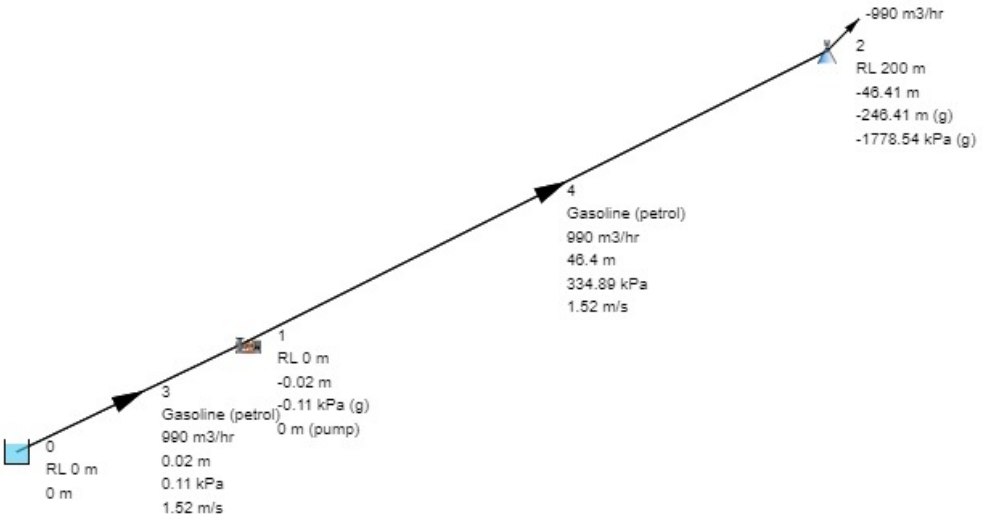

Petroleum Transport 15km QA

Helix Technologies Pty Ltd

Project	QA	Client	Helix QA
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Category	Demo QA Petroleum	Atmos. Press	100.19 kPa
Description	Petroleum Transport 15km QA		

Pipe No	3	From node to node	0 - 1
Description		Equipment No	
Liquid	Gasoline (petrol)	Viscosity	0.4416 cp
Temperature	20 C	Density	736 kg/m3
Vapour Pressure	1 kPa		
Pipe Description	Steel Pipes 20" 10mm wall	Pipe Class	Sch 40
Nominal Diameter	500 mm	Inside Diameter	480 mm
Outside Diameter	508 mm	Pipe Length	5 m
Pipe Roughness	0.03 mm	Allowable Press.	999 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	990 m3/hr	Velocity	1.52 m/s
Friction Loss	0.02 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	0.02 m	Total Pressure Drop	0.11 kPa
Entry Total Head	0 m	Exit Total Head	-0.02 m
Entry Gauge Head	0 m	Exit Gauge Head	-0.02 m
Reynolds No.	1215766.92	Friction Factor	0.01261 (Darcy f)

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Description	Petroleum Transport 15km QA		

Pipe No	4	From node to node	1 - 2
Description		Equipment No	
Liquid	Gasoline (petrol)	Viscosity	0.4416 cp
Temperature	20 C	Density	736 kg/m3
Vapour Pressure	1 kPa		
Pipe Description	Steel Pipes 20" 10mm wall	Pipe Class	Sch 40
Nominal Diameter	500 mm	Inside Diameter	480 mm
Outside Diameter	508 mm	Pipe Length	14995 m
Pipe Roughness	0.03 mm	Allowable Press.	999 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	990 m3/hr	Velocity	1.52 m/s
Friction Loss	46.4 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	46.4 m	Total Pressure Drop	334.89 kPa
Entry Total Head	-0.02 m	Exit Total Head	-46.41 m
Entry Gauge Head	-0.02 m	Exit Gauge Head	-246.41 m
Reynolds No.	1215766.93	Friction Factor	0.01261 (Darcy f)

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Project	QA	Client	Helix QA
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Category	Demo QA Petroleum	Atmos. Press	100.19 kPa
Description	Petroleum Transport 15km QA		

Node No	0	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		

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Project	QA	Client	Helix QA
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Category	Demo QA Petroleum	Atmos. Press	100.19 kPa
Description	Petroleum Transport 15km QA		

Node No	1	Node Type	Pump
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	1792 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	-0.02 m		
Pump Head	0 m	Pump Flow Rate	990 m3/hr
Pump / Fan Efficiency	70 %	Pump Absorbed Power	0 kW
Casing Pressure	-0.11 kPa		
Pump NPSH required	4 m	Pump NPSH available	13.84 m

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Description	Petroleum Transport 15km QA		

Node No	2	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	200 m	Pressure Input	0 kPa
Nozzle K value	0	Ext Flow (+In/-Out)	-990 m3/hr
Int.(Gauge) Head	-246.41 m	Int.(Gauge) Pressure	-1778.54 kPa
Total Node Head	-46.41 m		