Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Network Type	Liquid	Calc. Method	Darcy
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Hydraulics of Pipeline Systems, CRC Press, Bruce E Larock, Roland W Jeppson, Gary Z Watters. Example 4.3 Figure 4.11.

A 9 pipe 6 node network with one pump and one Pressure Relief Valve (PRV). Pump head is 34.88m and pipes as drawn. To model the PRV in the Helix program we need to break the network at the PRV by adding a fixed head node (Tank) at the RL equal to the upstream pressre setting of the PRV, in this case 195m. Then add a junction as the downstream connection of the PRV and continue with the pipe length and diameter from the junction to the rest of network. Solve the network and note the flow rate in pipe upstream of the PRV. Now set the same flow rate as an injection flow rate at the node which is the downstream of the PRV. Re-solve the network and adjust the PRV injection flow rate to match the upstream flow rate. Repeat as required until the flow rates stabilise as equal values (0.0074 m3/s in the above model).

The pump head is entered as the head read from the pump curve at the flow rate in the pump, a few iterations may be required to get a balanced flow.

Calculation Results		Publication		Helix	
Pipe no		Flow Rate	Head Loss	Flow Rate	Head Loss
1		0.102 m3/s	15.58m	0.1043 m3/s	15.576m
2		0.004 m3/s	0.75m	0.0037 m3/s	0.6962m
3		0.091 m3/s	4.28m	0.0930 m3/s	4.2696m
4		0.006 m3/s	0.06m	0.0074 m3/s	0.0341m
5		0.009 m3/s	1.90m	0.0076 m3/s	1.2770m
6		0.015 m3/s	5.69m	0.0156 m3/s	5.6887m
7		0.035 m3/s	33.11m	0.0356 m3/s	32.5955m
8		0.065 m3/s	25.25m	0.0656 m3/s	24.6505m
9		0.014 m3/s	4.03m	0.0120 m3/s	2.9006m

Node No	Demand Flow	Elevation	HGL	Elevation	HGL
1	0.015	140 m	199.25 m	140 m	199.3038 m
2	0.020	140 m	195.02 m	140 m	195.0341 m
3	0.015	70 m	129.08 m	70 m	130.8224 m
4	0.020	60 m	130.97 m	60 m	132.0499 m
5	0.020	80 m	136.66 m	80 m	137.7882 m
6	0.030	100 m	169.78 m	100 m	170.3837 m

The published results are close to the Helix calculated results, but not exactly the same, probably due to rounding errors, especially as the flow rate is in m3/s with accuracy to 3 digits only, in Helix we set the decimals to 4 to show better accuracy. Also, the total length of pipe 4 is 2000m with 800m up to the PRV but the table of results shows 2000m as input, so value used for published solution is in doubt. Also, flow direction of pipe no 6 is shown incorrectly as being from node 4 towards node 6, it should be the reverse for continuity of flow at the junctions as shown in Helix model.

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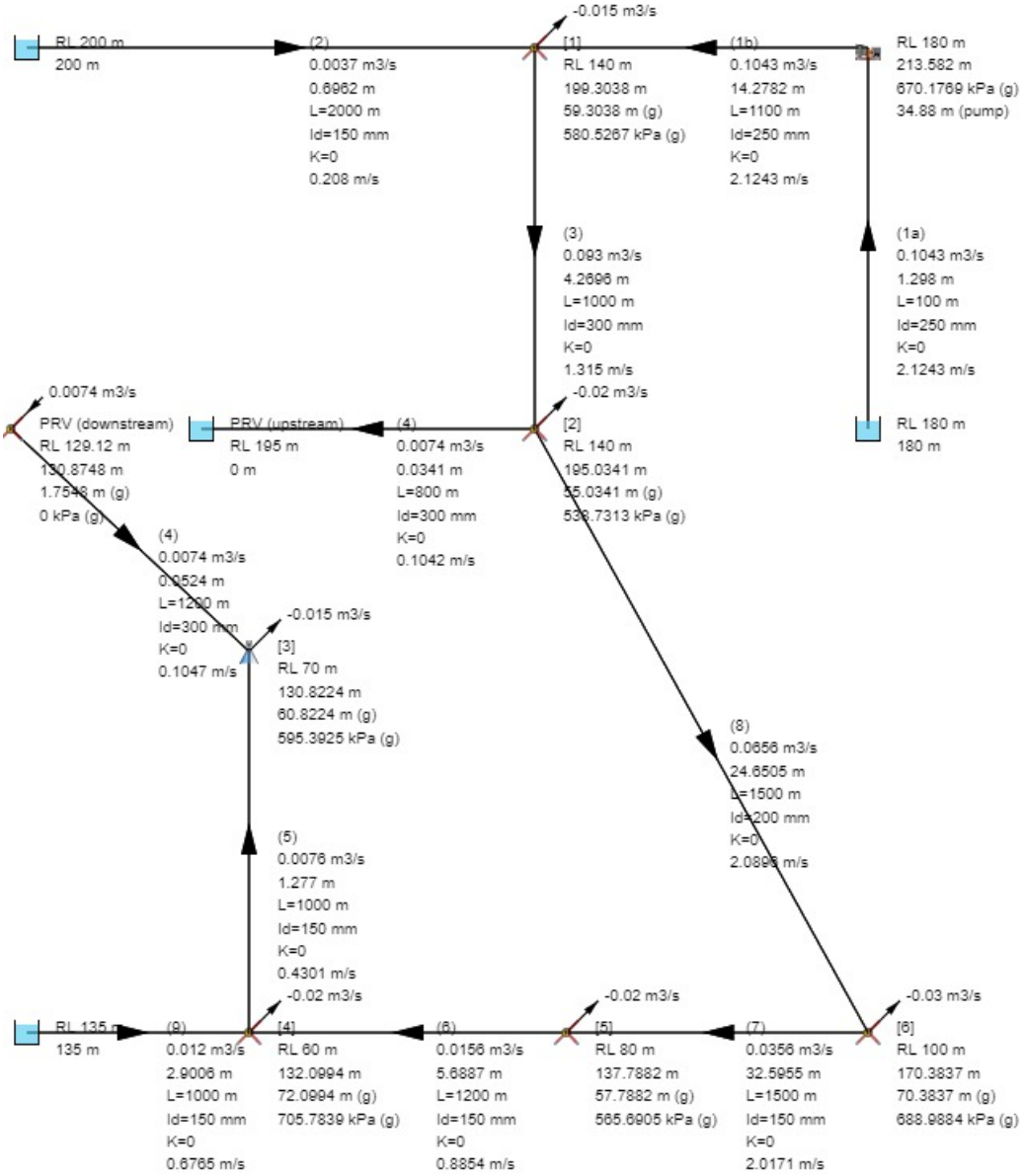
Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		



Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3

Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	11	From node to node	0 - 1
Description	(1a)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	250 mm	Inside Diameter	250 mm
Outside Diameter	268 mm	Pipe Length	100 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.1043 m3/s	Velocity	2.1243 m/s
Friction Loss	1.298 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	1.298 m	Total Pressure Drop	12.7064 kPa
Entry Total Head	180 m	Exit Total Head	178.702 m
Entry Gauge Head	0 m	Exit Gauge Head	-1.298 m
Reynolds No.	529054.0016	Friction Factor	0.014101 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	12	From node to node	1 - 2
Description	(1b)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	250 mm	Inside Diameter	250 mm
Outside Diameter	268 mm	Pipe Length	1100 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.1043 m3/s	Velocity	2.1243 m/s
Friction Loss	14.2782 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	14.2782 m	Total Pressure Drop	139.77 kPa
Entry Total Head	213.582 m	Exit Total Head	199.3038 m
Entry Gauge Head	33.582 m	Exit Gauge Head	59.3038 m
Reynolds No.	529052.957	Friction Factor	0.014101 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	13	From node to node	3 - 2
Description	(2)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	150 mm
Outside Diameter	168 mm	Pipe Length	2000 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0037 m3/s	Velocity	0.208 m/s
Friction Loss	0.6962 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	0.6962 m	Total Pressure Drop	6.8155 kPa
Entry Total Head	200 m	Exit Total Head	199.3038 m
Entry Gauge Head	0 m	Exit Gauge Head	59.3038 m
Reynolds No.	31087.4376	Friction Factor	0.0236532 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	14	From node to node	2 - 4
Description	(3)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	300 mm	Inside Diameter	300 mm
Outside Diameter	318 mm	Pipe Length	1000 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.093 m3/s	Velocity	1.315 m/s
Friction Loss	4.2696 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	4.2696 m	Total Pressure Drop	41.7954 kPa
Entry Total Head	199.3038 m	Exit Total Head	195.0341 m
Entry Gauge Head	59.3038 m	Exit Gauge Head	55.0341 m
Reynolds No.	393002.2466	Friction Factor	0.0145251 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	15	From node to node	4 - 9
Description	(4)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	300 mm	Inside Diameter	300 mm
Outside Diameter	318 mm	Pipe Length	800 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0074 m3/s	Velocity	0.1042 m/s
Friction Loss	0.0341 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	0.0341 m	Total Pressure Drop	0.3343 kPa
Entry Total Head	195.0341 m	Exit Total Head	195 m
Entry Gauge Head	55.0341 m	Exit Gauge Head	0 m
Reynolds No.	31154.5171	Friction Factor	0.0234599 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	16	From node to node	7 - 8
Description	(5)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	150 mm
Outside Diameter	168 mm	Pipe Length	1000 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0076 m3/s	Velocity	0.4301 m/s
Friction Loss	1.277 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	1.277 m	Total Pressure Drop	12.5011 kPa
Entry Total Head	132.0994 m	Exit Total Head	130.8224 m
Entry Gauge Head	72.0994 m	Exit Gauge Head	60.8224 m
Reynolds No.	64266.4094	Friction Factor	0.020309 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	17	From node to node	7 - 6
Description	(6)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	150 mm
Outside Diameter	168 mm	Pipe Length	1200 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0156 m3/s	Velocity	0.8854 m/s
Friction Loss	5.6887 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	5.6887 m	Total Pressure Drop	55.6873 kPa
Entry Total Head	137.7882 m	Exit Total Head	132.0994 m
Entry Gauge Head	72.0994 m	Exit Gauge Head	46.4107 m
Reynolds No.	132304.007	Friction Factor	0.0177881 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	18	From node to node	5 - 6
Description	(7)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	150 mm
Outside Diameter	168 mm	Pipe Length	1500 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0356 m3/s	Velocity	2.0171 m/s
Friction Loss	32.5955 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	32.5955 m	Total Pressure Drop	319.0787 kPa
Entry Total Head	170.3837 m	Exit Total Head	137.7882 m
Entry Gauge Head	70.3837 m	Exit Gauge Head	57.7882 m
Reynolds No.	301426.1711	Friction Factor	0.0157083 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	19	From node to node	4 - 5
Description	(8)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	200 mm	Inside Diameter	200 mm
Outside Diameter	218 mm	Pipe Length	1500 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0656 m3/s	Velocity	2.0896 m/s
Friction Loss	24.6505 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	24.6505 m	Total Pressure Drop	241.3044 kPa
Entry Total Head	195.0341 m	Exit Total Head	170.3837 m
Entry Gauge Head	55.0341 m	Exit Gauge Head	70.3837 m
Reynolds No.	416332.0345	Friction Factor	0.0147603 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	20	From node to node	10 - 7
Description	(9)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	150 mm
Outside Diameter	168 mm	Pipe Length	1000 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.012 m3/s	Velocity	0.6765 m/s
Friction Loss	2.9006 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	2.9006 m	Total Pressure Drop	28.3939 kPa
Entry Total Head	135 m	Exit Total Head	132.0994 m
Entry Gauge Head	0 m	Exit Gauge Head	72.0994 m
Reynolds No.	101084.3785	Friction Factor	0.0186446 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Pipe No	22	From node to node	21 - 8
Description	(4)	Equipment No	
Liquid	Water	Viscosity	1.002 cp
Temperature	20 C	Density	998.204 kg/m3
Vapour Pressure	2.34 kPa		
Pipe Description	Steel Pipes AS1836 (ANSI B36.10)	Pipe Class	
Nominal Diameter	300 mm	Inside Diameter	300 mm
Outside Diameter	318 mm	Pipe Length	1200 m
Pipe Roughness	0.02 mm	Allowable Press.	5430 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.0074 m3/s	Velocity	0.1047 m/s
Friction Loss	0.0524 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	0.0524 m	Total Pressure Drop	0.5129 kPa
Entry Total Head	130.8748 m	Exit Total Head	130.8224 m
Entry Gauge Head	1.7548 m	Exit Gauge Head	60.8224 m
Reynolds No.	31287.594	Friction Factor	0.0234372 (Darcy f)

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	0	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	180 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	180 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	1	Node Type	Pump
Description		Equipment No	
Rel. Level (RL)	180 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	213.582 m		
Pump Head	34.88 m	Pump Flow Rate	0.1043 m3/s
Pump / Fan Efficiency	70 %	Pump Absorbed Power	50.8624 kW
Casing Pressure	670.1769 kPa		
Pump NPSH required	0 m	Pump NPSH available	8.8143 m

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Project	Demo QA	Client	Helix QA
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Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	2	Node Type	Junction
Description	[1]	Equipment No	
Rel. Level (RL)	140 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-0.015 m3/s
Int.(Gauge) Head	59.3038 m	Int.(Gauge) Pressure	580.5267 kPa
Total Node Head	199.3038 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	3	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	200 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	200 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	4	Node Type	Junction
Description	[2]	Equipment No	
Rel. Level (RL)	140 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-0.02 m3/s
Int.(Gauge) Head	55.0341 m	Int.(Gauge) Pressure	538.7313 kPa
Total Node Head	195.0341 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	5	Node Type	Junction
Description	[6]	Equipment No	
Rel. Level (RL)	100 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-0.03 m3/s
Int.(Gauge) Head	70.3837 m	Int.(Gauge) Pressure	688.9884 kPa
Total Node Head	170.3837 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	6	Node Type	Junction
Description	[5]	Equipment No	
Rel. Level (RL)	80 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-0.02 m3/s
Int.(Gauge) Head	57.7882 m	Int.(Gauge) Pressure	565.6905 kPa
Total Node Head	137.7882 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	7	Node Type	Junction
Description	[4]	Equipment No	
Rel. Level (RL)	60 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-0.02 m3/s
Int.(Gauge) Head	72.0994 m	Int.(Gauge) Pressure	705.7839 kPa
Total Node Head	132.0994 m		

Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	8	Node Type	Nozzle
Description	[3]	Equipment No	
Rel. Level (RL)	70 m	Pressure Input	0 kPa
Nozzle K value	0	Ext Flow (+In/-Out)	-0.015 m3/s
Int.(Gauge) Head	60.8224 m	Int.(Gauge) Pressure	595.3925 kPa
Total Node Head	130.8224 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	9	Node Type	Tank
Description	PRV (upstream)	Equipment No	
Rel. Level (RL)	195 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	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	10	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	135 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	135 m		

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Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	15/07/2017
Category	Demo Liquid Network	Atmos. Press	101.33 kPa
Description	Liquid Network Pump and PRV with 9 pipes 6 nodes Example 4.3		

Node No	21	Node Type	Junction
Description	PRV (downstream)	Equipment No	
Rel. Level (RL)	129.12 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0.0074 m3/s
Int.(Gauge) Head	1.7548 m	Int.(Gauge) Pressure	0 kPa
Total Node Head	130.8748 m		