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Project	New Project	Client	ABC Metals ..
Project No.	4567	Design Date	15/03/2017
Category	Demo Liquid QA	Atmos. Press	100.19 bar
Network Type	Liquid	Calc. Method	Darcy
Description	Water Flow Example Crane 410M ex 4.14		

Water Flow ref. 'Flow of Fuids Through Valves, Fittings and Pipe', Crane Technical Paper 410 M Example 4-14 pg 4-8
Bernoulli's Theorem. Water flows through a system of three pipes in series at a rate of 1500l/min. Static head is 22m. Find the pressure difference between nodes.

Calculation Results	Crane 410	Helix
Pressure Differential P1 - P2	2.6 bar	2.64 bar
Reynolds no 4" pipe	2.83 x 10^5	2.82584 x 10^5
Reynolds no 5" pipe	2.25 x 10^5	2.25494 x 10^5
Velocity 4" pipe	3.04 m/s	3.042 m/s
Velocity 5" pipe	1.94 m/s	1.937 m/s

Good correlation

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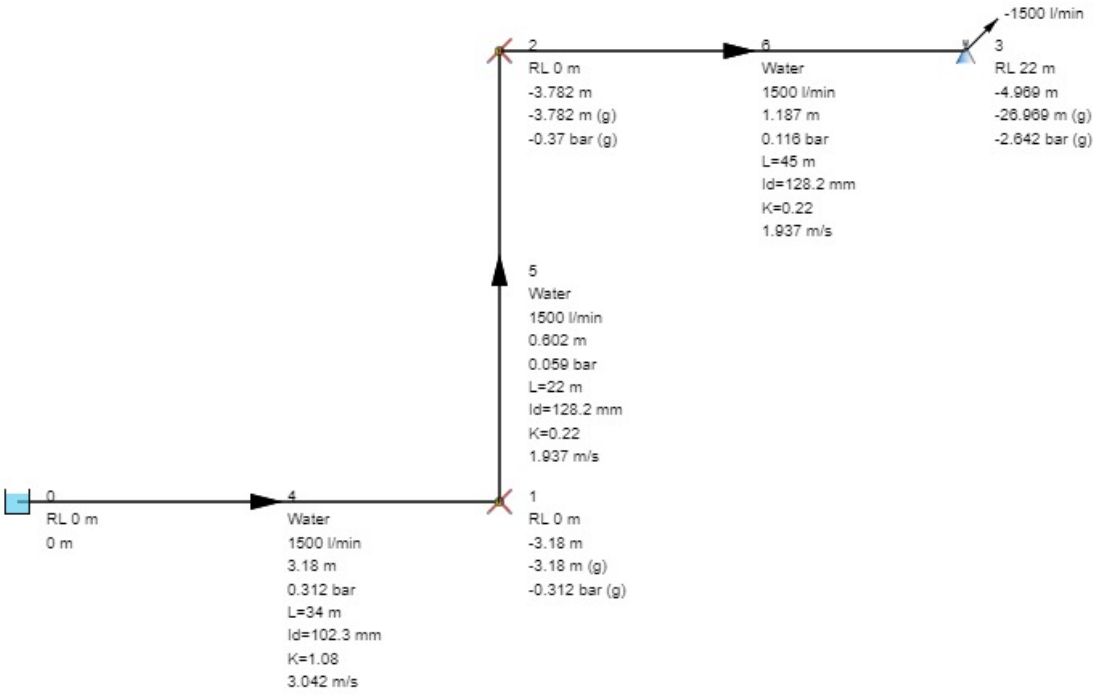

Water Flow Example Crane 410M ex 4.14

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Description	Water Flow Example Crane 410M ex 4.14		

Pipe No	4	From node to node	0 - 1
Description		Equipment No	
Liquid	Water	Viscosity	1.1 cp
Temperature	15 C	Density	999 kg/m3
Vapour Pressure	1.6 bar		
Pipe Description	Steel Pipes 4" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	100 mm	Inside Diameter	102.3 mm
Outside Diameter	114.3 mm	Pipe Length	34 m
Pipe Roughness	0.03 mm	Allowable Press.	10200 bar
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Bend - 90 degree elbow r/d = 1.5	1	0.28	14
Sudden Enlargement - 4:5	1	0.8	8

Total Fittings k	1.08	Total Fittings kf	0
Flow Rate	1500 l/min	Velocity	3.042 m/s
Friction Loss	2.67 m	Fitting Losses	0.509 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.18 m	Total Pressure Drop	0.312 bar
Entry Total Head	0 m	Exit Total Head	-3.18 m
Entry Gauge Head	0 m	Exit Gauge Head	-3.18 m
Reynolds No.	282583.823	Friction Factor	0.017028 (Darcy f)

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Description	Water Flow Example Crane 410M ex 4.14		

Pipe No	5	From node to node	1 - 2
Description		Equipment No	
Liquid	Water	Viscosity	1.1 cp
Temperature	15 C	Density	999 kg/m3
Vapour Pressure	1.6 bar		
Pipe Description	Steel Pipes 5" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	125 mm	Inside Diameter	128.2 mm
Outside Diameter	141.3 mm	Pipe Length	22 m
Pipe Roughness	0.03 mm	Allowable Press.	999 bar
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Bend - 90 degree elbow r/d = 2	1	0.22	14

Total Fittings k	0.22	Total Fittings kf	0
Flow Rate	1500 l/min	Velocity	1.937 m/s
Friction Loss	0.56 m	Fitting Losses	0.042 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.602 m	Total Pressure Drop	0.059 bar
Entry Total Head	-3.18 m	Exit Total Head	-3.782 m
Entry Gauge Head	-3.18 m	Exit Gauge Head	-3.782 m
Reynolds No.	225493.956	Friction Factor	0.017058 (Darcy f)

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Category	Demo Liquid QA	Atmos. Press	100.19 bar
Description	Water Flow Example Crane 410M ex 4.14		

Pipe No	6	From node to node	2 - 3
Description		Equipment No	
Liquid	Water	Viscosity	1.1 cp
Temperature	15 C	Density	999 kg/m3
Vapour Pressure	1.6 bar		
Pipe Description	Steel Pipes 5" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	125 mm	Inside Diameter	128.2 mm
Outside Diameter	141.3 mm	Pipe Length	45 m
Pipe Roughness	0.03 mm	Allowable Press.	999 bar
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Bend - 90 degree elbow r/d = 2	1	0.22	12

Total Fittings k	0.22	Total Fittings kf	0
Flow Rate	1500 l/min	Velocity	1.937 m/s
Friction Loss	1.145 m	Fitting Losses	0.042 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.187 m	Total Pressure Drop	0.116 bar
Entry Total Head	-3.782 m	Exit Total Head	-4.969 m
Entry Gauge Head	-3.782 m	Exit Gauge Head	-26.969 m
Reynolds No.	225493.956	Friction Factor	0.017058 (Darcy f)

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Description	Water Flow Example Crane 410M ex 4.14		

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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Node No	1	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 bar
Nozzle K value	-	Ext Flow (+In/-Out)	0 l/min
Int.(Gauge) Head	-3.18 m	Int.(Gauge) Pressure	-0.312 bar
Total Node Head	-3.18 m		

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Node No	2	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 bar
Nozzle K value	-	Ext Flow (+In/-Out)	0 l/min
Int.(Gauge) Head	-3.782 m	Int.(Gauge) Pressure	-0.37 bar
Total Node Head	-3.782 m		

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Description	Water Flow Example Crane 410M ex 4.14		

Node No	3	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	22 m	Pressure Input	0 bar
Nozzle K value	0	Ext Flow (+In/-Out)	-1500 l/min
Int.(Gauge) Head	-26.969 m	Int.(Gauge) Pressure	-2.642 bar
Total Node Head	-4.969 m		