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	Ethanol Laminar flow QA		

Ethanol Laminar Flow Worked Example, ref. 2500 Solved Problems in Fluid Mechanics and Hydraulics, Jack B. Evett et.al. Example 9.54 on pg 207.
Ethanol at 20 deg C flows from an upper tank to a lower one through a 2mm diameter pipe 1.2m long submerged 0.8m into the lower tank.

Calculation Results	Publication	Helix Calculation	
Flow rate	7.59 l/hr	7.59 l/hr	
Reynolds number		881	- less 2000 ie laminar

Changing the pipe roughness has no effect due the laminar condition.
See Help file topics Reynolds Number and Darcy Weisbach for theory.

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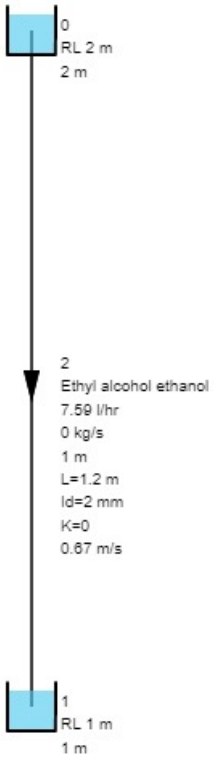

Ethanol Laminar flow QA

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Description	Ethanol Laminar flow QA		

Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Liquid	Ethyl alcohol ethanol	Viscosity	1.2 cp
Temperature	20 C	Density	788 kg/m3
Vapour Pressure	5.95 kPa		
Pipe Description	Polypropylene	Pipe Class	12
Nominal Diameter	2 mm	Inside Diameter	2 mm
Outside Diameter	4 mm	Pipe Length	1.2 m
Pipe Roughness	0.003 mm	Allowable Press.	1200 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	7.59 l/hr	Velocity	0.67 m/s
Friction Loss	1 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 m	Total Pressure Drop	7.73 kPa
Entry Total Head	2 m	Exit Total Head	1 m
Entry Gauge Head	0 m	Exit Gauge Head	0 m
Reynolds No.	880.99	Friction Factor	0.07265 (Darcy f)

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Node No	0	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	2 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	2 m		

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