Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix Demo
Project No.	4567	Design Date	10/06/2017
Category	Demo Slurry Bingham	Atmos. Press	100.19 psi
Network Type	Liquid	Calc. Method	Darcy
Description	Bingham Slurry Worked Example 5-1 Slurry Systems Handbook		

Slurry Systems Handbook, Baha Abulnaga, McGraw Hill Example 5-1 pg 5.5
A slurry consists of a clay and water mixture. It is tested and classified as a Bingham mixture with a yield stress of 17 Pa. The pipe inner diameter is 63 mm. The pipe length is 6500 m. Determine the start-up pressure, ignoring any static head.

Description	Published value	Helix deltaQ
Start-up Pressure	1017.6 psi	1017.93 psi

Helix has very good correlation.

Click Graph tab and click on the pipe to view the system curve.

Solution in SI Units
Using Equation 5-1: Pst= 4 0L/Di Pst = 4 × 17 × 6500/0.063 = 7,015,873 (1018 psi)
Solution in US units Pst= 4 0L/Di 0= 17 Pa/6895 = 2.465 × 10 –3 psi
L= 6500 m/0.0254 = 255,905 in Di = 63/25.4 = 2.48 in
Start-up pressure Pst = 1017.6 psi

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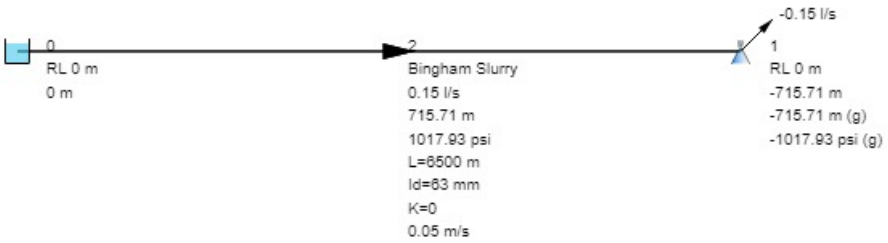

Bingham Slurry Worked Example 5-1 Slurry Systems Handbook

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Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Slurry Type	Bingham Plastic		
Slurry Description	Bingham Slurry		
Slurry Reference	Slurry Systems Handbook 5-1		
SG Carrier Liquid Sl	1	Liquid Viscosity	1 cP
SG of Dry Solids	1	SG of Mixture	1
Conc. by Mass Cw	50 % w/w	Concentration by Vol	50 % v/v
Solids Flow Rate	0.07 kg/s	Particle Size d50	0 mm
Yield Stress To	17 Pa	Co-eff of Rigidity n	0.001 Pa-s
Yield Stress Tw 8V/D	17.006 Pa	Shear Rate 8V/D	6.110 -s
Hedstrom No.	67469626	Pressure Drop / m	1079.75 Pa/m
Critical Velocity Vc	2.08 m/s	Critical Flow Rate	6.48 l/s
Reynolds No at Vc	65233.14		
Pump Wear Factor Pw	1	Pump Head Ratio HR	1
Pipe Description	Polyethylene PE100 AS4130	Pipe Class	PN12.5
Nominal Diameter	65 mm	Inside Diameter	63 mm
Outside Diameter	70 mm	Pipe Length	6500 m
Pipe Roughness	0 mm	Allowable Press.	1250 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.15 l/s	Velocity	0.05 m/s
Friction Loss	715.71 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	715.71 m	Total Pressure Drop	1017.93 psi
Entry Total Head	0 m	Exit Total Head	-715.71 m
Entry Gauge Head	0 m	Exit Gauge Head	-715.71 m
Reynolds No.	3031.37	Friction Factor	58.75924 (Darcy f)

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

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Description	Bingham Slurry Worked Example 5-1 Slurry Systems Handbook		

Node No	1	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Nozzle K value	0	Ext Flow (+In/-Out)	-0.15 l/s
Int.(Gauge) Head	-715.71 m	Int.(Gauge) Pressure	-1017.93 psi
Total Node Head	-715.71 m		