Helix Technologies Pty Ltd

Project	Helix Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	08/06/2017
Category	Demo Slurry QA	Atmos. Press	100.19 psi
Network Type	Liquid	Calc. Method	Darcy
Description	Slurry Transport Worked Example 2 pg 408		

Slurry Transport Using Centrifugal Pumps 3rd Edition, 2006, Springer, Wilson, Addie, Sellgren and Clift, Pg 408, Worked Example 2 from chapter 8. Vertical Iron ore hoisting.
Slurry with S = 2.65, Cv = 20% and d50 = 1.50mm is pumped 328ft in vertical pipe 3.94" diameter

Calculation Results	Publication	Helix deltaQ
Calculated Head ft Sm	336.5 ft	343.2 psi

Results are close, within 2% .

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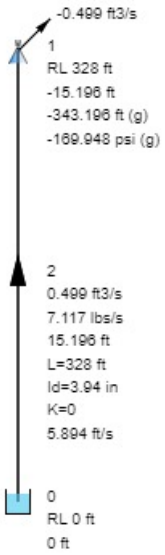
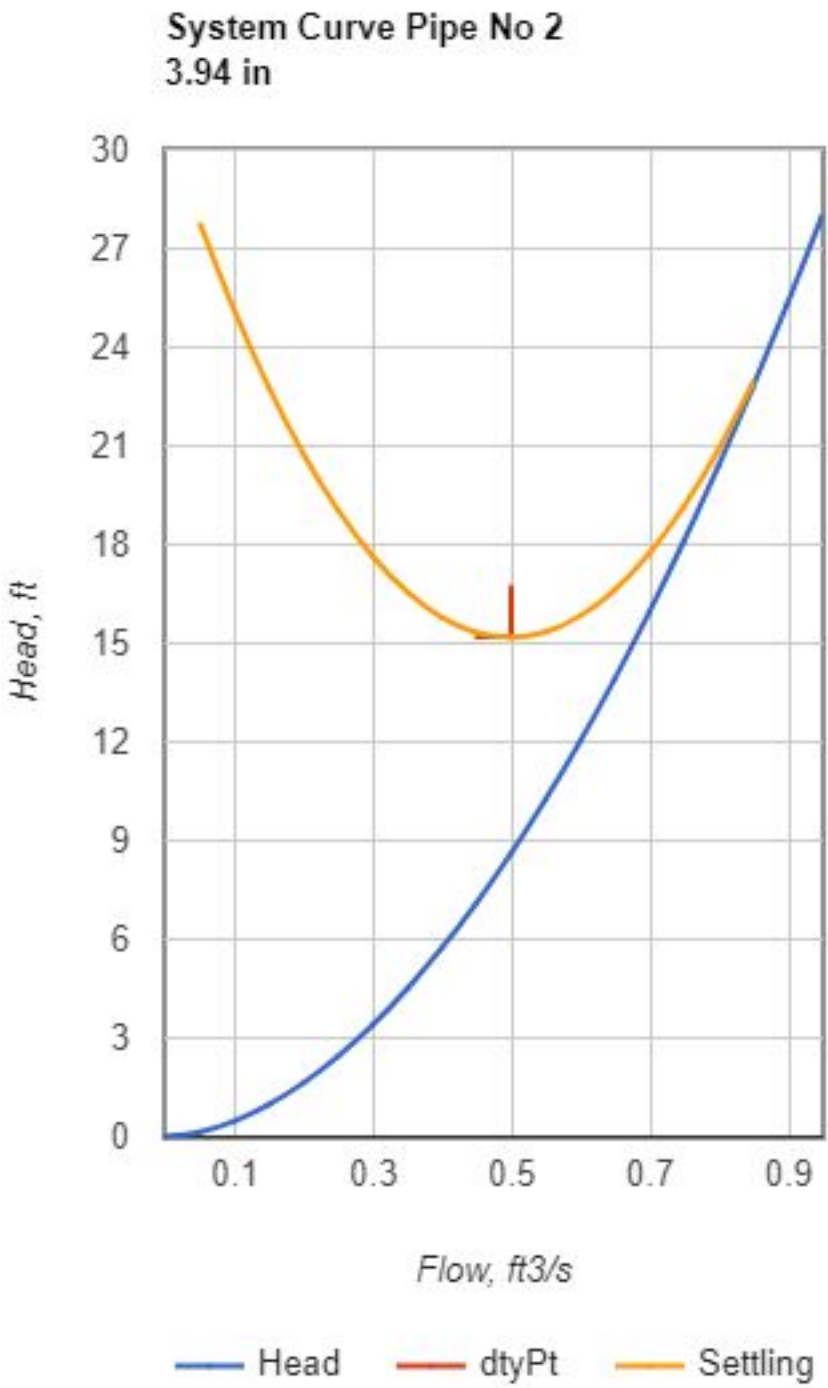


Slurry Transport Worked Example 2 pg 408


System Curve Pipe No 2
3.94 in
30
27
24
21
18
15
12
9
6
3
0
Head, ft
0.1
0.3
0.5
0.7
0.9
Flow, ft3/s
Head
dtyPt
Settling

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Description	Slurry Transport Worked Example 2 pg 408		

Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Slurry Type	Settling Slurry		
Slurry Description	Sand Slurry	Slurry Reference	Wilson, Addie, Clift Ex 7.1
SG Carrier Liquid Sl	1	Liquid Viscosity	1 cP
SG of Dry Solids	2.65	SG of Mixture	1.142
Conc. by Mass Cw	20 % w/w	Concentration by Vol	1.142 % v/v
Solids Flow Rate	7.117 lbs/s	Particle Size d50	1.5 in
Grading	Closely Graded		
Durand co-eff. Fl	1.362	Settling Velocity Vl	8.042 ft/s
Settling Flow Rate	0.681 ft3/s		
Pump Wear Factor Pw	0.99	Pump Head Ratio HR	0.884
Pipe Description	Steel	Pipe Class	300
Nominal Diameter	4 in	Inside Diameter	3.94 in
Outside Diameter	4.5 in	Pipe Length	328 ft
Pipe Roughness	0.0002 in	Allowable Press.	1600 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	0.499 ft3/s	Velocity	5.894 ft/s
Friction Loss	15.196 ft	Fitting Losses	0 ft
Slurry Losses	6.583 ft	Orifice Losses	0 ft
Fixed Head Loss	0 ft	Booster Pump Head	0 ft
Total Head Loss	15.196 ft	Total Pressure Drop	7.525 psi
Entry Total Head	0 ft	Exit Total Head	-15.196 ft
Entry Gauge Head	0 ft	Exit Gauge Head	-343.196 ft
Reynolds No.	205344.687	Friction Factor	0.015968 (Darcy f)

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Description	Slurry Transport Worked Example 2 pg 408		

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

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Project	Helix Demo QA	Client	Helix Demo QA
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Category	Demo Slurry QA	Atmos. Press	100.19 psi
Description	Slurry Transport Worked Example 2 pg 408		

Node No	1	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	328 ft	Pressure Input	0 psi
Nozzle K value	0	Ext Flow (+In/-Out)	-0.499 ft3/s
Int.(Gauge) Head	-343.196 ft	Int.(Gauge) Pressure	-169.948 psi
Total Node Head	-15.196 ft		