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 1 from chapter 8		

Slurry Transport Using Centrifugal Pumps 3rd Edition, 2006, Springer, Wilson, Addie, Sellgren and Clift, Pg 407, Worked Example 1 from chapter 8. Vertical Iron ore hoisting.
Slurry with S = 4.9, Cv = 20% and d50 = 0.04mm is pumped 2625ft in vertical pipe 7.87" diameter

Calculation Results	Publication	Helix deltaQ
Pressure required	2055 psi	2066.1 psi

Results are close, within about 0.5% . For some reason the publication used a length of 2624 in the calculation, when the result is changed to a length of 2625 the published result would be 2056 psi.

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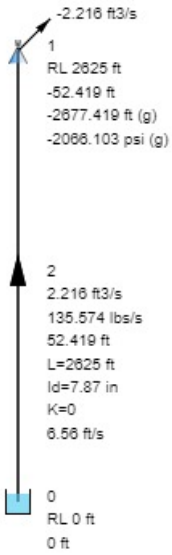
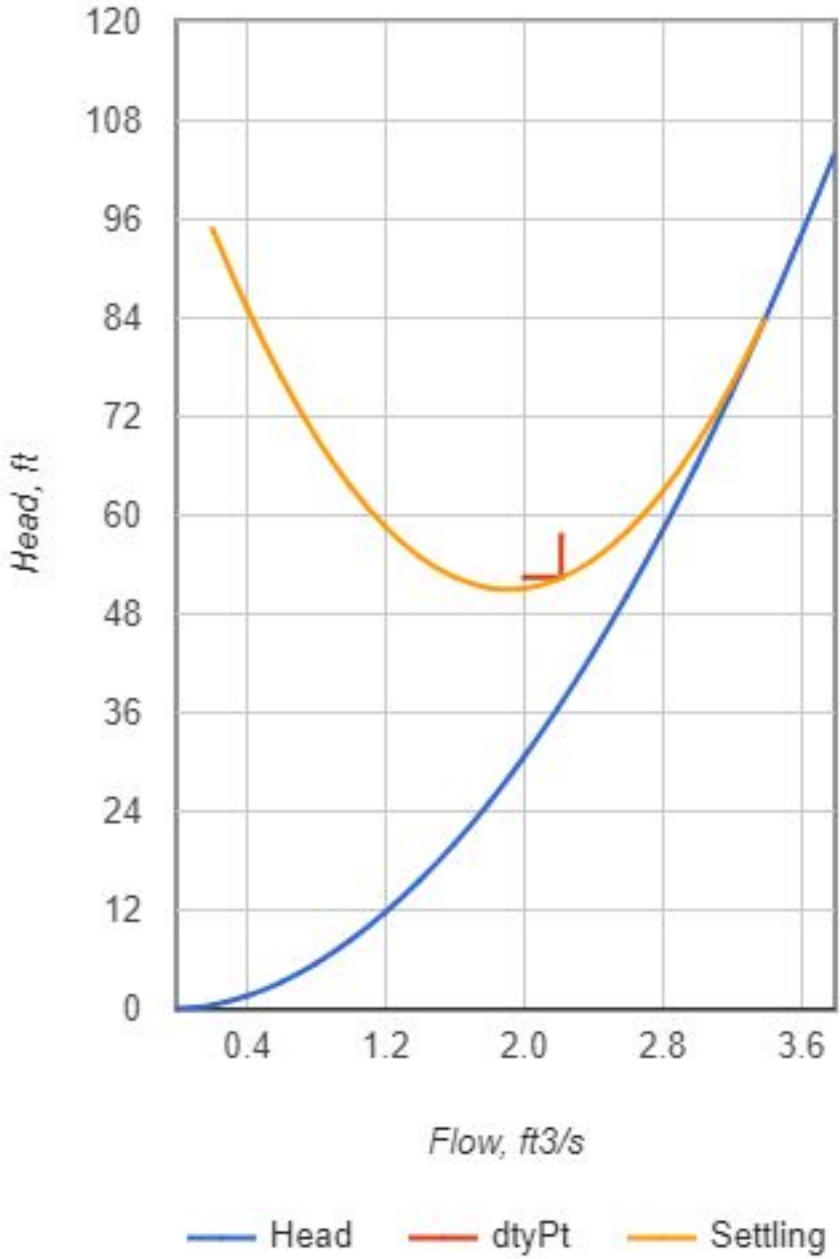


Slurry Transport Worked Example 1 from chapter 8

System Curve Pipe No 2
7.87 in



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Description	Slurry Transport Worked Example 1 from chapter 8		

Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Slurry Type	Settling Slurry		
Slurry Description	Gravel Slurry	Slurry Reference	Wilson, Addie, Clift Ex 7.1
SG Carrier Liquid Sl	1	Liquid Viscosity	1 cP
SG of Dry Solids	4.9	SG of Mixture	1.78
Conc. by Mass Cw	55.056 % w/w	Concentration by Vol	1.78 % v/v
Solids Flow Rate	135.574 lbs/s	Particle Size d50	0.04 in
Grading	Closely Graded		
Durand co-eff. Fl	0.604	Settling Velocity Vl	7.749 ft/s
Settling Flow Rate	163.414 ft3/s		
Pump Wear Factor Pw	0.99	Pump Head Ratio HR	0.915
Pipe Description	Steel	Pipe Class	300
Nominal Diameter	8 in	Inside Diameter	7.87 in
Outside Diameter	9 in	Pipe Length	2625 ft
Pipe Roughness	0.0008 in	Allowable Press.	1600 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	2.216 ft3/s	Velocity	6.56 ft/s
Friction Loss	52.419 ft	Fitting Losses	0 ft
Slurry Losses	15.204 ft	Orifice Losses	0 ft
Fixed Head Loss	0 ft	Booster Pump Head	0 ft
Total Head Loss	52.419 ft	Total Pressure Drop	40.45 psi
Entry Total Head	0 ft	Exit Total Head	-52.419 ft
Entry Gauge Head	0 ft	Exit Gauge Head	-2677.419 ft
Reynolds No.	711434.888	Friction Factor	0.013899 (Darcy f)

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Description	Slurry Transport Worked Example 1 from chapter 8		

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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Category	Demo Slurry QA	Atmos. Press	100.19 psi
Description	Slurry Transport Worked Example 1 from chapter 8		

Node No	1	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	2625 ft	Pressure Input	0 psi
Nozzle K value	0	Ext Flow (+In/-Out)	-2.216 ft3/s
Int.(Gauge) Head	-2677.419 ft	Int.(Gauge) Pressure	-2066.103 psi
Total Node Head	-52.419 ft		