

Helix Technologies Pty Ltd

Project	New Project	Client	ABC Metals ..
Project No.	4567	Design Date	15/06/2017
Category	Demo Gas QA	Atmos. Press	1 bar
Network Type	Gas	Calc. Method	Modified Darcy
Description	Steam Flow Crane 410M pg3-22 Example 1		

Steam Flow - Crane Technical Paper 410M pg3-22 Example 1

Steam at 24 bar and 250 deg C flows through an 8" Schedule 40 steel pipe at a rate of 100,000 kg/hr. Find the pressure drop in bar per 100m of pipe. Pipe roughness is not given assumed 0.015mm.

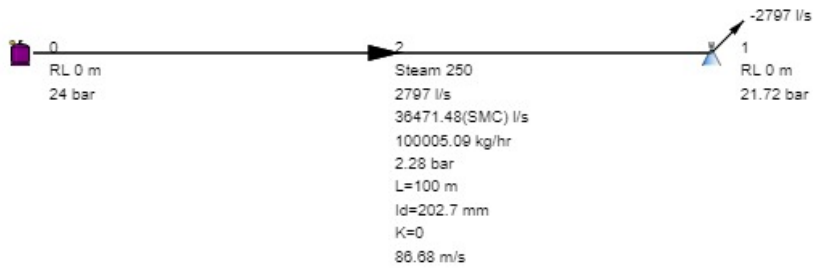
Flow at nozzle adjusted by trial and error to yield 100,000 kg/hr.

Calculation Results	Publication	Helix delta-Q
Pressure drop bar	2.34	2.28

Close correlation even though Crane method uses Nomographs.

Helix Technologies Pty Ltd

Project	New Project	Client	ABC Metals ..
Project No.	4567	Design Date	15/06/2017
Category	Demo Gas QA	Atmos. Press	1 bar
Description	Steam Flow Crane 410M pg3-22 Example 1		



Steam Flow Crane 410M pg3-22 Example 1

Helix Technologies Pty Ltd

Project	New Project	Client	ABC Metals ..
Project No.	4567	Design Date	15/06/2017
Category	Demo Gas QA	Atmos. Press	1 bar
Description	Steam Flow Crane 410M pg3-22 Example 1		
Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Gas	Steam 250	Molecular Mass	18 kg/kmol
Ratio Cp/Cv	1.3	Viscosity	0.0183 cP
Temperature	250 C	Density	9.93 kg/m ³
Gas SG to Air	0.62	Gas Specific Vol	0.1 m ³ /kg
Gas Constant R	461.91	Abs. Gas Temp.	0.1 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	0.96
Pipe Description	Steel Pipes 8" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	200 mm	Inside Diameter	202.7 mm
Outside Diameter	219.1 mm	Pipe Length	100 m
Pipe Roughness	0.015 mm	Allowable Press.	7180 bar
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	2797 l/s	Flow at SMC	36471.48 l/s
Mass Flow Rate	100005.09 kg/hr	Velocity	86.68 m/s
Mach number	0		
Friction Loss	2.28 bar	Fitting Losses	0 bar
Orifice Losses	0 bar	Fixed Pressure Drop	0 bar
Total Pressure Drop	2.28 bar		
Entry Total Pressure	24 bar	Exit Total Pressure	21.72 bar
Reynolds No.	94855941.58	Friction Factor	0.01135 (Darcy f)

Helix Technologies Pty Ltd

Project	New Project	Client	ABC Metals ..
Project No.	4567	Design Date	15/06/2017
Category	Demo Gas QA	Atmos. Press	1 bar
Description	Steam Flow Crane 410M pg3-22 Example 1		

Node No	0	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	24 bar
Ext Flow (+In/-Out)	-	Abs. Node Pressure	24 bar
Int.(Gauge) Head	0 bar		

Helix Technologies Pty Ltd

Project	New Project	Client	ABC Metals ..
Project No.	4567	Design Date	15/06/2017
Category	Demo Gas QA	Atmos. Press	1 bar
Description	Steam Flow Crane 410M pg3-22 Example 1		
Node No	1	Node Type	Nozzle
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 bar
Ext Flow (+In/-Out)	-2797 l/s	Abs. Node Pressure	21.72 bar
Int.(Gauge) Head	21.72 bar		