Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix QA
Project No.	4567	Design Date	11/07/2017
Category	Demo Gas 14 mile pipeline	Atmos. Press	101.33 kPa
Network Type	Gas	Calc. Method	Modified Darcy
Description	Gas flow in 14 mile pipeline Fluid Flow Handbook Ex 9.2 pg 9.8		

Fluid Flow Handbook, 2002, McGraw-Hill, Jamal Saleh, Ex 9.2 pg 9.8

Calculation results.		Publication	Helix
Calculated flow rate at SMC			
Panhandle A Equation	MMCFD	141 (0.166 Mm3/hr)	--
Panhandle B Equation	MMCFD	137.77 (0.1626 Mm3/hr)	--
AGA Equation	MMCFD	114.78 (0.1354 Mm3/hr)	--
Weymouth Equation	MMCFD	101.77 (0.1201 Mm3/hr)	--
Crane Simplified Equation	MMCFD	104.3 (0.1231 Mm3/hr)	0.1292 Mm3/hr - Modified Darcy method
			0.1318 Mm3/hr - Isothermal method

Published results vary quite widely depending on method used.
Helix results are close to the publicsed result using Crane Simplified method.
Exact gas properties not specified in publication, typical natural gas viscosity and Mw used in Helix calcultations.

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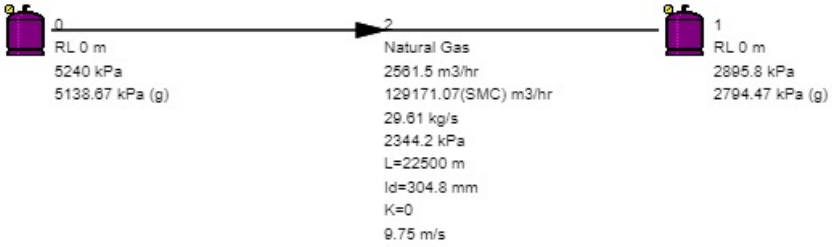

Gas flow in 14 mile pipeline Fluid Flow Handbook Ex 9.2 pg 9.8

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Pipe No	2	From node to node	0 - 1
Description		Equipment No	
Gas	Natural Gas	Molecular Mass	19.5 kg/kmol
Ratio Cp/Cv	1.27	Viscosity	0.012 cP
Temperature	22.2 C	Density	41.61 kg/m3
Gas SG to Air	0.67	Gas Specific Vol	0.02 m3/kg
Gas Constant R	426.38	Abs. Gas Temp.	0.02 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	0.86
Pipe Description	Steel Pipes 12" AS1836 (ANSI B36.10)	Pipe Class	Sch 40
Nominal Diameter	300 mm	Inside Diameter	304.8 mm
Outside Diameter	323.9 mm	Pipe Length	22500 m
Pipe Roughness	0.03 mm	Allowable Press.	999 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	2561.5 m3/hr	Flow at SMC	129171.07 m3/hr
Mass Flow Rate	29.61 kg/s	Velocity	9.75 m/s
Mach number	1		
Friction Loss	2344.2 kPa	Fitting Losses	0 kPa
Orifice Losses	0 kPa	Fixed Pressure Drop	0 kPa
Total Pressure Drop	2344.2 kPa		
Entry Total Pressure	5240 kPa	Exit Total Pressure	2895.8 kPa
Reynolds No.	428848161.1	Friction Factor	0.01195 (Darcy f)

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Node No	0	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	5240 kPa
Ext Flow (+In/-Out)	-	Abs. Node Pressure	5240 kPa
Int.(Gauge) Head	0 kPa		

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Node No	1	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	2895.8 kPa
Ext Flow (+In/-Out)	-	Abs. Node Pressure	2895.8 kPa
Int.(Gauge) Head	0 kPa		