**Helix Technologies Pty Ltd**

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|---|---|---|---|
| Project | Quality Assurance | Client | Helix Demo |
| Project No. | 4567 | Design Date | 24/02/2021 |
| Category | Demo Air | Atmos. Press | 100.19 psi |
| Network Type | Gas | Calc. Method | Modified Darcy |
| Description | Piping Calculations Manual ex 5.8 pg265 | | |

Air flows at 50ft/f through a 2-in inside diameter pipe at 80 deg F at an initial pressure of 100psig.
If the pipe is horizontal and 1000ft long, calculate the pressure drop.

| Results | Publication | Helix delta-Q |
|---|---|---|
| Mass flow | 0.6265 lb/s | 0.6257 lb/s |
| Velocity (given) | 50.0 ft/s | 50.0078 ft/s |
| Pressure Drop | 20.52 psi | 20.55 psi |

Helix model assumed a pipe roughness of 0.002 inches, friction factor is calculated.

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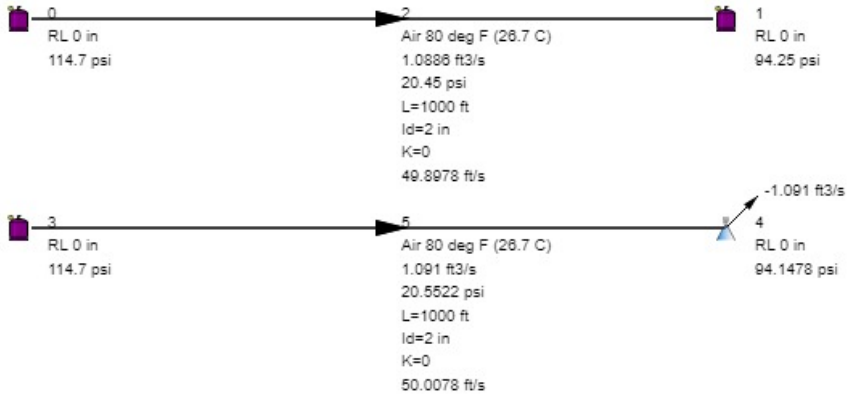


Piping Calculations Manual ex 5.8 pg265

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| | | | |
|---|---|---|---|
| Pipe No | 2 | From node to node | 0 - 1 |
| Description | | Equipment No | |
| Gas | Air 80 deg F (26.7 C) | Molecular Mass | 28.96 kg/kmol |
| Ratio Cp/Cv | 1.4 | Viscosity | 0.016 cP |
| Temperature | 26.7 C | Density | 9.1864 kg/m3 |
| Gas SG to Air | 1 | Gas Specific Vol | 0.1089 m3/kg |
| Gas Constant R | 287.0991 | Abs. Gas Temp. | 0.1089 deg K |
| Flow Condition | Free Flow | Net Exp.Factor Y | 0.9442 |
| Pipe Description | Steel Pipe 2" ISO 336 / BS 3600 5.0mm wall | Pipe Class | |
| Nominal Diameter | 2 in | Inside Diameter | 2 in |
| Outside Diameter | 2.5 in | Pipe Length | 1000 ft |
| Pipe Roughness | 0.002 in | Allowable Press. | 0 psi |
| Orifice Plate Dia | - | Non Return Valve | No |
| Total Fittings k | 0 | Total Fittings kf | 0 |
| Flow Rate | 1.0886 ft3/s | Flow at SMC | 8.1606 ft3/s |
| Mass Flow Rate | 0.6243 lbs/s | Velocity | 49.8978 ft/s |
| Mach number | 0.537 | | |
| Friction Loss | 20.45 psi | Fitting Losses | 0 psi |
| Orifice Losses | 0 psi | Fixed Pressure Drop | 0 psi |
| Total Pressure Drop | 20.45 psi | | |
| Entry Total Pressure | 114.7 psi | Exit Total Pressure | 94.25 psi |
| Reynolds No. | 4075053.7295 | Friction Factor | 0.0197127 (Darcy f) |

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| Description | Piping Calculations Manual ex 5.8 pg265 | | |

| | | | |
|---|---|---|---|
| Pipe No | 5 | From node to node | 3 - 4 |
| Description | | Equipment No | |
| Gas | Air 80 deg F (26.7 C) | Molecular Mass | 28.96 kg/kmol |
| Ratio Cp/Cv | 1.4 | Viscosity | 0.016 cP |
| Temperature | 26.7 C | Density | 9.1864 kg/m3 |
| Gas SG to Air | 1 | Gas Specific Vol | 0.1089 m3/kg |
| Gas Constant R | 287.0991 | Abs. Gas Temp. | 0.1089 deg K |
| Flow Condition | Free Flow | Net Exp.Factor Y | 0.9439 |
| Pipe Description | Steel Pipe 2" ISO 336 / BS 3600 5.0mm wall | Pipe Class | |
| Nominal Diameter | 2 in | Inside Diameter | 2 in |
| Outside Diameter | 2.5 in | Pipe Length | 1000 ft |
| Pipe Roughness | 0.002 in | Allowable Press. | 0 psi |
| Orifice Plate Dia | - | Non Return Valve | No |
| Total Fittings k | 0 | Total Fittings kf | 0 |
| Flow Rate | 1.091 ft3/s | Flow at SMC | 8.1786 ft3/s |
| Mass Flow Rate | 0.6257 lbs/s | Velocity | 50.0078 ft/s |
| Mach number | 0.532 | | |
| Friction Loss | 20.5522 psi | Fitting Losses | 0 psi |
| Orifice Losses | 0 psi | Fixed Pressure Drop | 0 psi |
| Total Pressure Drop | 20.5522 psi | | |
| Entry Total Pressure | 114.7 psi | Exit Total Pressure | 94.1478 psi |
| Reynolds No. | 4084031.2052 | Friction Factor | 0.0197125 (Darcy f) |

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| Description | Piping Calculations Manual ex 5.8 pg265 | | |

| | | | |
|---|---|---|---|
| Node No | 0 | Node Type | Tank |
| Description | | Equipment No | |
| Rel. Level (RL) | 0 ft | Pressure Input | 114.7 psi |
| Ext Flow (+In/-Out) | - | Abs. Node Pressure | 114.7 psi |
| Int.(Gauge) Head | 0 psi | | |

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| Description | Piping Calculations Manual ex 5.8 pg265 | | |

| | | | |
|---|---|---|---|
| Node No | 1 | Node Type | Tank |
| Description | | Equipment No | |
| Rel. Level (RL) | 0 ft | Pressure Input | 94.25 psi |
| Ext Flow (+In/-Out) | - | Abs. Node Pressure | 94.25 psi |
| Int.(Gauge) Head | 0 psi | | |

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| Description | Piping Calculations Manual ex 5.8 pg265 | | |

| | | | |
|---|---|---|---|
| Node No | 3 | Node Type | Tank |
| Description | | Equipment No | |
| Rel. Level (RL) | 0 ft | Pressure Input | 114.7 psi |
| Ext Flow (+In/-Out) | - | Abs. Node Pressure | 114.7 psi |
| Int.(Gauge) Head | 0 psi | | |

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| Project No. | 4567 | Design Date | 24/02/2021 |
| Category | Demo Air | Atmos. Press | 100.19 psi |
| Description | Piping Calculations Manual ex 5.8 pg265 | | |

| | | | |
|---|---|---|---|
| Node No | 4 | Node Type | Nozzle |
| Description | | Equipment No | |
| Rel. Level (RL) | 0 ft | Pressure Input | 94.25 psi |
| Ext Flow (+In/-Out) | -1.091 ft3/s | Abs. Node Pressure | 94.1478 psi |
| Int.(Gauge) Head | 3706.6075 psi | | |