

Gas Box

Summary

Flow Control in a Pipe Network

This application computes the back pressure in a network of pipes fed by a system of mass flow controllers (MFC). Each MFC supplies a given flow rate to one of the pipes, and can only function correctly if the back pressure remains below 760 Torr.

The Pipe Flow Module is used to compute the pressure distribution inside the network of pipes.

# Results

**The given design based on the input data below will meet the specifications. The back pressure is 80.23 Torr.**

# Input: Model Parameters

Parameters

| **Name** | **Expression** | **Value** | **Description** |
| --- | --- | --- | --- |
| Lpipe | 2[m] | 2.00 m | Pipe length |
| dpipe | 3.5[mm] | 0.00350 m | Pipe diameter |
| T0 | 300[K] | 300 K | Temperature |
| Pout | 10[Torr] | 1.33E3 Pa | Process chamber pressure |
| Lspace | 0.125[m] | 0.125 m | Spacing between pipes |
| Nmfc | 8 | 8.00 | Number of flow controllers |

# Input: Mass Flow Controller Properties

Mass flow controller values

| **Flow rate (sccm)** | **Molecular weight (kg/mol)** | **Dynamic viscosity (Pa-s)** |
| --- | --- | --- |
| 100 | 0.032 | 2.0E-5 |
| 200 | 0.028 | 1.78E-5 |
| 300 | 0.146 | 1.38E-5 |
| 1000 | 0.004 | 1.9E-5 |
| 250 | 0.032 | 2.0E-5 |
| 700 | 0.004 | 1.9E-5 |
| 2000 | 0.04 | 2.1E-5 |
| 600 | 0.028 | 1.78E-5 |

# Detailed Results

## Pressure



Line: Pressure (Torr)

## Velocity



Arrow: Velocity vector. Color: Velocity magnitude (m/s)

## Back Pressure

Back Pressure Value

| **Back Pressure Value (Torr)** |
| --- |
| 80.226 |