



## Line Simulation





Example: 20000 kg/hr. process water at the outlet of a pump with operating pressure of 10 barg and operating temperature of 38C passes through a 500-meter mild-steel pipe to go to another unit. What is the pressure of water at the pipe outlet? The line size is 4”.

How to simulate:

1.Add water to component list:

Source Databank: HYSYS

Component	Type	Group
H2O	Pure Component	

Select: Pure Components Filter: All Families

Search for: Search by: Full Name/Synonym

Simulation Name	Full Name / Synonym	Formula
Methane	C1	CH4
Ethane	C2	C2H6
Propane	C3	C3H8
i-Butane	i-C4	C4H10
n-Butane	n-C4	C4H10
i-Pentane	i-C5	C5H12
n-Pentane	n-C5	C5H12
n-Hexane	C6	C6H14
n-Heptane	C7	C7H16
n-Octane	C8	C8H18
n-Nonane	C9	C9H20
n-Decane	C10	C10H22

Status: OK

2.Select NBS steam as the Fluid Package.

Set Up | StabTest | Phase Order | Notes

Package Type: HYSYS Component List Selection: Component List - 1 [HYSYS Databanks] View

Property Package Selection

- GCEOS
- General NRTL
- Glycol Package
- Grayson Streed
- IAPWS-IF97
- Kabadi-Danner
- Lee-Kesler-Plöcker
- MBWR
- NBS Steam**
- NRTL
- Peng-Robinson
- PR-Twu
- PRSV
- Sour PR
- Sour SRK
- Sour Water
- SRK
- SRK-Twu

Property Pkg: OK Edit Properties



3. Enter Simulation Environment and define stream 1 like below:

Material Stream: 1

Worksheet Attachments Dynamics

**Worksheet**

Stream Name	1	Aqueous Phase
Vapour / Phase Fraction	0.0000	1.0000
Temperature [C]	38.00	38.00
Pressure [kPa]	1101	1101
Molar Flow [kgmole/h]	1110	1110
Mass Flow [kg/h]	2.000e+004	2.000e+004
Std Ideal Liq Vol Flow [m3/h]	20.04	20.04
Molar Enthalpy [kJ/kgmole]	-2.840e+005	-2.840e+005
Molar Entropy [kJ/kgmole-C]	9.820	9.820
Heat Flow [kJ/h]	-3.153e+008	-3.153e+008
Liq Vol Flow @Std Cond [m3/h]	20.02	20.02
Fluid Package	Basis-1	
Utility Type		

OK

Delete Define from Stream... View Assay

Material Stream: 1

Worksheet Attachments Dynamics

**Worksheet**

	Mole Fractions	Aqueous Phase
H2O	1.0000	1.0000

Total 1.00000

Edit... View Properties... Basis...

OK

Delete Define from Stream... View Assay



4. Add a Pipe Segment to the flowsheet from Model Palette/ Hydraulic and Piping. On the first sheet, connect stream 1 to the inlet and define stream 2.

Pipe Segment: PIPE-100

Design Rating Worksheet Performance Flow Assurance Dynamics

**Design**

Connections  
Parameters  
Calculation  
Emulsions  
User Variables  
Notes

Name: **PIPE-100**

Inlet: **1** Outlet: **2**

Fluid Package: **Basis-1** Energy: **Energy**

Delete No Segment Added Ignored

5. Under Rating/Sizing, add segment.

Pipe Segment: PIPE-100

Design Rating Worksheet Performance Flow Assurance Dynamics

**Rating**

Sizing  
Heat Transfer

Length - Elevation Profile

Segment	1
Fitting/Pipe	Pipe
Length/Equivalent Length	<empty>
Elevation Change	0.0000
Outer Diameter	<empty>
Inner Diameter	<empty>
Material	Mild Steel
Roughness	4.572e-005
Pipe Wall Conductivity	45.00
Increments	5
FittingNo	<empty>

Append Segment Insert Segment View Segment...  
Delete Segment Clone Segment Clear Profile

Delete Unknown Pipe Diameter Ignored



6. Provide the info like below:

Pipe Segment: PIPE-100

Design Rating Worksheet Performance Flow Assurance Dynamics

**Rating**

Sizing  
Heat Transfer

Length - Elevation Profile

Segment	1
Fitting/Pipe	Pipe
Length/Equivalent Length	500.0
Elevation Change	0.0000
Outer Diameter	<empty>
Inner Diameter	101.6
Material	Mild Steel
Roughness	4.572e-005
Pipe Wall Conductivity	45.00
Increments	5
FittingNo	<empty>

Append Segment Insert Segment View Segment...  
Delete Segment Clone Segment Clear Profile

Delete Unknown Pipe Diameter ☐ Ignored



7. Assume the heat loss to be zero:

Pipe Segment: PIPE-100

Design Rating Worksheet Performance Flow Assurance Dynamics

**Rating**

Sizing

Heat Transfer

Heat Loss

Overall HTC

Segment HTC

Estimate HTC

Overall Heat Transfer

Heat Loss 0.0000 kJ/h

Delete OK Ignored

8. Results

Pipe Segment: PIPE-100

Design Rating Worksheet Performance Flow Assurance Dynamics

**Worksheet**

Conditions

Properties

Composition

PF Specs

Name	1	2	Energy
Vapour	0.0000	0.0000	<empty>
Temperature [C]	38.0000	38.0050	<empty>
Pressure [kPa]	1101	1078	<empty>
Molar Flow [kgmole/h]	1110.1798	1110.1798	<empty>
Mass Flow [kg/h]	20000.0000	20000.0000	<empty>
LiqVol Flow [m3/h]	20.0404	20.0404	<empty>
Molar Enthalpy [kJ/kgmole]	-2.840e+005	-2.840e+005	<empty>
Molar Entropy [kJ/kgmole-C]	9.820	9.821	<empty>
Heat Flow [kJ/h]	-3.15277e+08	-3.15277e+08	0.00000e-01



It sounds we have had 23 kPa pressure drop over the pipe.