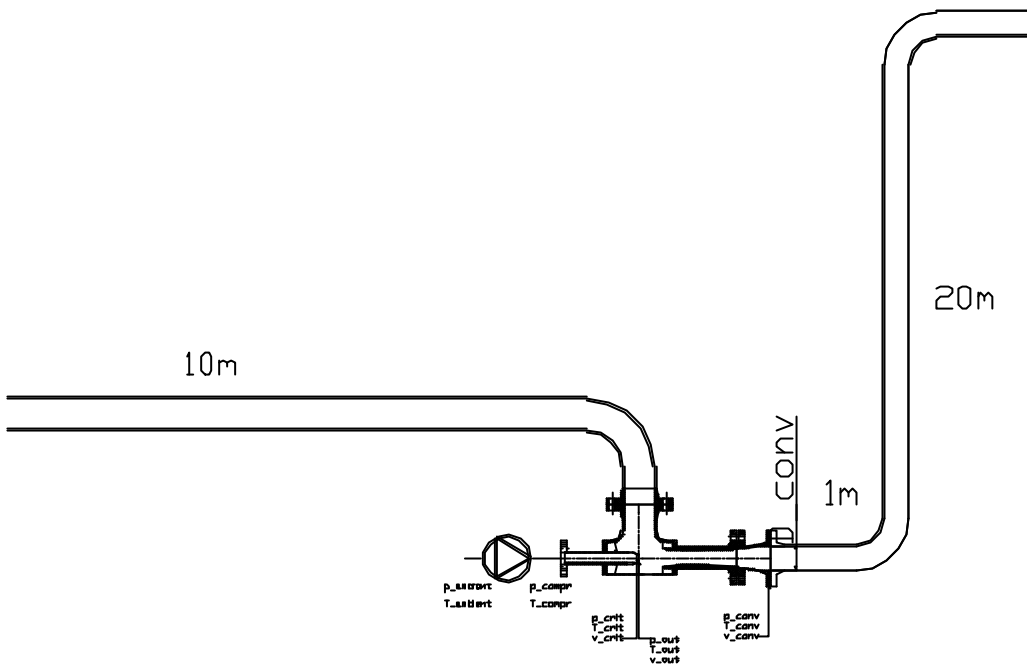
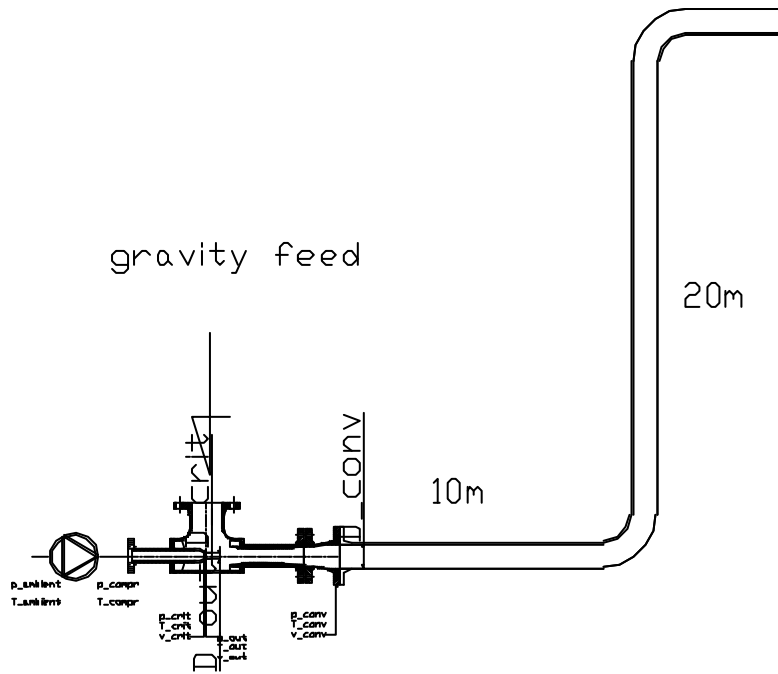


gravity feed



Pressure pneumatic conveying calculation Input screen

Client: \_\_\_\_\_ File path: Quick modeling Product: LLDPE pellets Date: 10-07-2012 Time: 20:13:49

Gas medium:  Air  Nitrogen (generator)  Oxygen

Gas pump:  Screwcompressor  Blower  Compressor data  Predefined screwcompressor  Blower data  Predefined blower  Predefined Hybrid blower  Const. mass pump (sonic choke/turbo/oil filled)  Blower data curve operating points

Max. compr. press. 3.5 bar  
 Maximum conveying pressure 35000 mmWC  
 Compr. displ. 0.2398 m3/sec < 0.4782 m3/sec  
 Compr. displ. \_\_\_\_\_ CFM = \_\_\_\_\_ m3/sec

Booster:  Installed  Screwcompressor  Blower data  
 Predefined screwcompressor  Predefined blower  
 Constant mass at  Fixed \_\_\_\_\_ bar

Rotary lock feeder (RLF) / screw-feeder (SF)  
 Rotary Lock Feeder  Screw Feeder

0

Eductor feeder:  No  
 Eductor feeder  Yes  
 Eductor pressure 8000 mmWC

Calculate

Back to start menu

Ambient (Compressor intake)

Ambient temperature 35 degr C Altitude 0 m  
 Inlet temperature 35 degr C Altitude pressure 1013 mbar  
 Inlet pressure drop 15 mbar 0.015 bar  
 Ambient pressure 1000 mbar 1 bar <- Accept  
 Relative Humidity 80 % Show air intake conditions  
 Override RH air density calculation for >373 degrC and >220 bar

Temperatures  
 LLDPE pellets temp. 40 degr C Pressure dewpoint  
 Compressor gas cooling degr C  Dryer degr C  
 Booster gas cooling degr C  Dryer degr C  
 Heat transmission factor pipewall 0.1 kCal/sec/degC/m2  
 \_\_\_\_\_ degr F -> \_\_\_\_\_ degr C

Material properties  
 LLDPE pellets particle density 920 kg/m3  
 Bulk density 550 kg/m3  
 Part. size 9 mesh acc.> 2000 susp.> 2000 micron  
 Susp. vel. 5.68 m/sec acc.> 5.68 susp.> 5.68 m/sec  
 Product loss constant 0.585  
 Product loss factor  
 Wall friction factor 0.5  
 Mat. intake press.drop 0 mmWC  
 v-wall / v-susp 1.4  
 Filter resistance factor 350000  
 Specific heat content 0.4 kCal/kg/C  
 product loss factor constant y/n y  
 Change product No particle size distribution

Filter  
 Filter area 28.8 m2  No filter exhaust fan/filter calculated  
 Fixed filtersize

Convey pipeline

Convey distance horizontal 10 m  
 Convey distance vertical 20 m-up 0 m-down  
 Convey distance slope 0 m-up 0 m-down Pipe diameter  
 Total conveying length 30 m begin 102 mm  
 Number of Bends 5 - end 102 mm

Guessed air only pressure drop \_\_\_\_\_ mmWC  
 Calculate empty pipeline pressure \_\_\_\_\_ mmWC  
 Air only compr. press. with filter \_\_\_\_\_ bar  
 Volumetric eff. \_\_\_\_\_ Gas displacement \_\_\_\_\_ m3/sec

Gas supply/vent piping

Gas supply Vent  
 Length 0 0 m Guessed press. drop \_\_\_\_\_ mmWC  
 Nu of bends 0 0 - Air press. drop \_\_\_\_\_ mmWC  
 Diameter 0 0 mm Air press. drop \_\_\_\_\_ bar  
 End pressure 3641 mmWC Re-/Calculate pressure drop  
 Gas supply piping 0 mmWC 0 bar  
 Vent piping 0 mmWC 0 bar  
 Calculate Gas supply piping  Calculate Vent piping

Calculation settings

Set capacity 11023 lbs/hr -> 5 tons/hr  
 Compressor pressure 0.36 bar 3641 mmWC Press. 5.178 psi  
 Back pressure 0 bar 0 mmWC 3640 mmWC  
 Set pressure drop 0.36 bar 3641 mmWC <- Accept  
 Calc. intake gas press. drop  No Time domain dt 0.001 sec  Default

Calculation selection

Pressure fixed -> capacity calculated  
 Capacity fixed -> pressure calculated  
 Pressure and capacity fixed -> intake pressure drop calculated  
 Pressure and capacity fixed -> constant loss factor calculated

product loss factor (cwp) kept constant Calculate

Venturi\_educator calculation

**Nozzle dimensions**

D\_throat: 30 mm

D\_out: 30 mm

**Venturi\_educator gas feeding**

Compressor air flow: 0,2399 m3/sec

Compressor mass flow: 0,2749 kg/sec

Compressor pressure: 0,8 bar

Temperature compressor: 73,8 degrC

**Pressure at outlet nozzle**

p\_nozzle out: 0 bar

**Solid Loading Ratio**

Solid Loading Ratio: 4,677 -

**Gas medium**

Air

Nitrogen (generator)

Oxygen

**Ambient conditions**

Ambient pressure: 1000 mbar

Air intake temperature: 35 degrC

**Critical conditions**

pressure\_ratio\_critical: 0,5282 -

p\_critical: -0,05 bar

velocity\_critical: 335,32 m/sec

specific volume\_critical: 0,8609 m3/kg

specific density\_critical: 1,1614 kg/m3

massflow\_critical: 0,275 kg/sec

Compr. gasflow\_critical: 0,2402 m3/sec

Temp\_critical: 16 degrC

**Calculate venturi\_educator**

**Sub critical pressure ratio**

**Sub critical gas flow**

Calculation results venturi\_educator and difusor

pressure ratio	0,5553	-	velocity nozzle_out	323	m/sec	pressure_ratio_critical	0,528	-
Compressor pressure	0,8	bar	specific volume nozzle_out	0,8305	m3/kg	p_compressor_critical	0,892	bar
p_nozzle_out	0	bar	specific density nozzle_out	1,204	kg/m3	p_critical	-0,05	bar
Eductor mass flow	0,2749	kg/sec	Temperature nozzle_out	20,1	degrC	velocity_critical	335,32	m/sec
Eductor air flow	0,2398	m3/sec	dynamic pressure nozzle_out	0,6282	bar	specific volume_critical	0,8609	m3/kg
velocity_difusor in	56,9	m/sec	available conveying pressure	0,6282	bar	specific density_critical	1,1614	kg/m3
pressure difusor in	0,02	bar	impulse nozzle_out	88,81	kg.m/sec	massflow_critical	0,275	kg/sec
Difusor diameter	70,9	mm	entrapped air volume	0,001	m3/sec	Compr. gasflow_critical	0,2402	m3/sec
velocity_difusor out	21,76	m/sec			Temp_critical	16	degrC	
Temperature difusor_out	40,1	degrC						

OK  
 Material velocity from eductor is accounted for in conveying calculation

Calculation Table Pressure Conveying

**Client**

Filepath: Quick modeling

Product: LLDPE pellets

Conveying distance

Horizontal: 10 m Total: 30 m

Vertical: 20 m Bends: 5

Conveying gas: Air

Compr. displ at 0.36 bar: 0,2582 m3/s 0,291 kg/s

Volumetric efficiency: 93,74 %

Booster displacement: 0 m3/sec

Rotarylock leakage: 0 m3/sec

Gas displacement at end: 0,2631 m3/sec

New set capacity: 5 tons/hr

Capacity: 5 tons/hr at 3641 mmWC 0,364 bar

Pressure drop: 3641 mmWC 0,364 bar

Booster pressure: mmWC bar

Back pressure: 0 mmWC 0 bar

Empty pipeline pressure drop: 927 mmWC

Empty pipeline filter press. drop: 28 mmWC

Loading ratio: 4,76

Pipeline energy consumption: 6,81 kWh/Ton

Compressor power: 34 kW

Conveying power: 8,3 kW

Pneumatic conveying efficiency: 24,4 %

Bend losses: 0 kW Material intake loss: 0 kW

Re-number: 2,027 \* 10<sup>5</sup>

Material loss factor constant: 0,585

Material loss factor

Mat. int. press. drop: 0 mmWC

Filter receiver diameter => 0,48 m

Progress: 5

Filter: 5

Iteration: 5

**Table calculation**

Part	Part description	Length(l) m	v-gas m/sec	v-product m/sec	Pressure drop mmWC	Pressure bar	v-wall/ v-susp	residence time	mass kg	temperature degrC	% kW	Bend loss kW	Sediment % kW	RH%
1	Intake 102 hor	1	23,95	6,19	107	0,3533	1,96	0,1846	0	39	0,2	2,5		84
2	Pipe 102 hor	0	25,21	6,21	108	0,3532	2,06	0,1856	0	39	0	0		84
3	Bend		29,07	3,18	109	0,3531		0,2379	0	39	0	0	0,2	
4	Pipe 102 hor	0	26,48	3,34	110	0,3531	2,17	0,2389	0	39	0	0		84
5	Bend		34,3	1,71	111	0,3529		0,3357	0	39	0	0		
6	Pipe 102 hor	0	28,85	1,97	112	0,3529	2,36	0,3367	0	39	0	0		84
7	Diameter Transfer		28,85	1,97	112	0,3529		0,3367	0	39	0	0		
8	Pipe 102 hor	0	28,16	2,21	112	0,3528	2,3	0,3377	0	39	0	0		84
9	Bend		66,54	0,65	113	0,3527		0,4244	0	39	0	0		
10	Pipe 102 up	20	29,99	7,02	2425	0,1215	2,24	3,4334	1	36	4,9	59		83
11	Diameter Transfer		29,99	7,02	2425	0,1215		3,4334	0	36	0	0		
12	Pipe 102 up	0	29,99	7,02	2426	0,1214	2,24	3,4344	0	36	0	0		83
13	Bend		34,1	3,61	2428	0,1213		3,481	0	36	0	0	0,3	
14	Pipe 102 hor	10	33,46	7,68	3613	0,0028	2,37	4,822	0	36	2,9	35,1		73
15	Bend		37,46	4,28	3614	0,0026		4,8626	0	36	0	0,3		
16	Outlet		34,65	4,28	3614	0,0026		4,8626	0	36	0,177	2,1		73
17	After Filter	28,8	m2	0,5	m/min	3641	0	4,8626						

To page 2 0,069 0,8 dp = 26 mmWC 73

No condensation