

Pneumatic conveying PET 2

Pressure pneumatic conveying calculation input screen

Client: FORUM File path: c:\Vdyurypet.txt Product: PET

Gas medium
 Air
 Nitrogen

Gas pump
 Screwcompressor
 Predefined screwcompressor
 Blower data
 1x Blower GM35S 3020 rpm
 Constant mas pump (sonic choke/turbo)
 Centrifugal fan

Gas volume: 0,483 m³/sec
 Maximum pressure: 1 bar

Booster
 Installed
 Screwcompressor
 Predefined screwcompressor
 Blower data
 Predefined blower

Gas Volume: m³/sec
 Injection point

Rotary lock feeder
 Installed (De-install)
 Capacity: 17,2 tons/hr
 Lock volume: 0,038 m³
 RPM: 20 /min
 Leakage: 0,011 m³/sec
 Calculate capacity rotary lock

Ambient (Compressor intake)
 Ambient temperature: 25 degr C
 Ambient pressure: 1000 mbar
 Altitude: 0 m
 Altitude pressure: 1013 mbar

Temperatures
 PVC Powder temperature: 25 degr C
 Compressor gas cooling: 35 degr C
 Booster gas cooling: degr C
 Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties
PET
 Product density: 910 kg/m³
 Bulk density: 540 kg/m³
 Particle size: 4000 micron
 Suspension velocity: 8 m/sec
 Product loss constant: 0,025
 Product loss factor:
 Wall friction factor: 0,5
 Intake pressure drop pressure discharge: 100 mmWC
 v-wall / v-susp: 1,2
 Filter resistance factor: 500000
 Specific heat content: 0,2 kCal/kg/C
 product loss factor constant y/n: y
 Change product

Filter
 Filter area: 40 m²

Convey pipeline
 Convey distance horizontal: 80 m
 Convey distance vertical: 20 m-up 0 m-down
 Convey distance slope: 0 m-up 0 m-down
 Total conveying length: 100 m
 Number of Bends: 5 -
 Pipe diameter begin: 154 mm
 Pipe diameter end: 154 mm

Calculation settings
 Set capacity: 12 tons/hr
 Pressure: 5020 mmWC
 Back pressure: 0 mmWC
 Set pressure drop: 5020 mmWC

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
 Pressure and capacity fixed -> material loss factor calculated
 product loss factor (cwp) kept constant

Calculate

Back to start menu

Calculation Table Pressure Conveying

Client: FORUM Filepath: c:\Vdyurypet.txt Product: PET

Convey distance horizontal: 80 m
 Convey distance vertical: 20 m
 Total conveying length: 100 m
 Number of Bends: 5
 Blower displ at 1 bar: 0,483 m³/sec
 Volumetric efficiency: 87,66 %
 Booster displacement: 0 m³/sec
 Rotarylock leakage: 0,011 m³/sec
 Gas displacement at end: 0,4332 m³/sec
 Capacity: 12 tons/hr
 Pressure: 5020 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 5020 mmWC
 Loading ratio: 6,5
 Pipeline energy consumption: 2,71 kWh/ton
 Compressor power: 32 kW
 Conveying energy: 17,8 kW
 Pneumatic conveying efficiency: 54,7 %
 Bend losses: 1,1 kW
 Material intake loss: 0,35 kW
 Re-number * 10⁵: 2,426
 Empty pipeline pressure drop: 1013 mmWC
 Empty pipeline filter press. drop: 64 mmWC
 Material loss factor: 0,025
 Material loss factor:
 Intake pressure drop: 100 mmWC

Table calculation

Part	Part description	Length(θ) m	v-gas m/sec	v-product m/sec	Pressure drop mmWC	v-wall/ v-susp	residence time 0,189	mass kg	kW	% kW	Bend loss kW	Sediment % kW
1	Intake 154 hor	1	15,81	8,27	195	1,05	0,189	0	0,6	3,5		
2	Pipe 154 hor	23,01	24,04	15,05	1329	1,52	1,7739	71	3,4	19,3		
3	Bend		18,08	8,86	1329		1,7927	0	0		0,2	1,3
4	Pipe 154 hor	23	24,46	15,24	2395	1,48	3,3527	65	3,5	19,6		
5	Bend		19,58	8,97	2396		3,3713	0	0		0,2	1,4
6	Pipe 154 hor	19,67	26,17	15,46	3265	1,53	4,6983	50	3	17,3		
7	Diameter Transfer		26,17	15,46	3265		4,6983	0	0			
8	Pipe 154 hor	3,34	25,65	15,44	3398	1,49	4,9153	7	0,4	2,7		
9	Bend		21,25	8,95	3399		4,9338	0	0		0,2	1,4
10	Pipe 154 up	0	20,52	8,97	3400	1,19	4,9348	0	0	0		
11	Diameter Transfer		20,52	8,97	3400		4,9348	0	0			
12	Pipe 154 up	20	22,75	11,81	4538	1,24	6,7078	8	4,4	25		
13	Bend		24,01	6,96	4539		6,7318	0	0		0,1	0,8
14	Pipe 154 hor	10,01	28,14	15,73	4958	1,51	7,4378	18	1,7	9,8		
15	Bend		24,49	9,42	4959		7,4556	0	0		0,2	1,4
16												
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29												
30												
16	Outlet		24,49	9,42	4959		7,4556		0,1560	0		
17	Filter 40	m2	0,6	m/min	5020		7,4556		0,2631	0,8	dp = 61	mmWC

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Client FORUM
Filepath c:\Vdyurypet.bt
Product PET

Installation

Convey distance horizontal	80	m
Convey distance vertical	20	m
Total conveying length	100	m
Number of Bends	5	
Pipe diameter(s)	154	154 mm
Compressor displacement	0,483	m3/sec
Booster displacement	0	m3/sec

Calculation results

Capacity	12	tons/hr
Pressure	5020	mmWC
Booster pressure	0	mmWC
Back pressure	0	mmWC
Pressure drop	5020	mmWc
Loading ratio	6,5	
Empty pipeline pressure	1819	mmWc
Residence time	7,45	seconds
Re-number * 10 ⁻⁵	2,426	
Mixture density	8,9	kg/m ³
Mass of material in pipeline	222,7	kg
Exit dynamic force	0,49	kN

Pressure drops

Product intake	100	mmWC
Nozzle	195	mmWC
Acceleration excl product resistance	398	mmWC
Product resistance	2172	mmWC
Elevation	169	mmWC
Suspension	1034	mmWC
Gas	1120	mmWC
Filter	61	mmWC

Feeder system

Installation system

Rotary lock feeder

Vessel factor	tons/hr/bar(a)	vessel capacity	tons/hr
Nominal capacity	tons/hr	Silo content	540 tons
Silo volume	m ³	pipe content	222,7 kgs
Silo product volume	1000 m ³		
pipevolume	1,49 m ³		
pressure begin pressurizing	bar		
pressure valve open	bar		
temperature begin pressurizing	C	Pipeline capacity	12 tons/hr
temperature after pressurizing	C	System capacity at pressure	tons/hr
pressurizing time	seconds		
Silo discharge time	45 hrs	Pipeline energy consumption	2,71 kWh/ton
purging time	seconds	System energy consumption	2,71 kWh/ton
valve time	seconds	Total energy consumption	2,71 kWh/ton
overlap time	seconds		
filling time	seconds		
cycle time	seconds		

Energy

(Blower 1x GM35S 3020 rpm)

Compressor power 32 kW

No booster

Pipeline energy consumption/ton 2,716 kW/ton

Temperatures

Ambient temperature 25 degr C

Outlet temperature compressor 35 degr C

No booster

Material temperature 25 degr C

Mixture temperature begin 26 degr C

Mixture temperature end 25 degr C

Table calculation

Begin capacity	12	tons/hr
Begin pressure	5020	mmWc
lowest pressure	2500	mmWc
pressure decrement	126	mmWc