

Calculation pneumatic conveying PET

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 2800 rpm
 Constant mas pump (sonic choke/turbo)
 Centrifugal fan
 Gas volume: 0.442 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: 0.015 m3/sec
 Calculate capacity rotary lock

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

Temperatures
 PET temperature: 20 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: 15 m-up 0 m-down
 Convey distance slope: 0 m-up 0 m-down
 Total conveying length: 95 m
 Number of Bends: 5 -
 Pipe diameter begin: 114 mm
 Pipe diameter end: 114 mm

Calculation settings
 Set capacity: 12 tons/hr
 Pressure: 7357 mmWC
 Back pressure: 0 mmWC
 Set pressure drop: 7357 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

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Calculation Table Pressure Conveying

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

Convey distance horizontal: 80 m
 Convey distance vertical: 15 m
 Total conveying length: 95 m
 Number of Bends: 5
 Blower displ at 1 bar: 0.442 m3/sec
 Volumetric efficiency: 83,75 %
 Booster displacement: 0 m3/sec
 Rotarylock leakage: 0.015 m3/sec
 Gas displacement at end: 0,3765 m3/sec
 Capacity: 12 tons/hr
 Pressure: 7357 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 7357 mmWC
 Loading ratio: 7,5
 Pipeline energy consumption: 3.55 kWh/Ton
 Compressor power: 42 kW
 Conveying energy: 21,1 kW
 Pneumatic conveying efficiency: 49,5 %
 Bend losses: 1,8 kW
 Material intake loss: 0,26 kW
 Re-number * 10⁵: 2,573
 Empty pipeline pressure drop: 3590 mmWC
 Empty pipeline filter press. drop: 52 mmWC
 Material loss factor: 0,025
 Intake pressure drop: 100 mmWC

Table calculation

Part	Part description	Length(m)	v-gas m/sec	v-product m/sec	Pressure drop mmWC	v-wall/v-susp	residence time	mass kg	kW	% kW	kW	Bend loss % kW	Sediment
1	Intake 114 hor	1	21,45	12,32	327	1,58	0,123	0	0,7	3,6			
2	Pipe 114 hor	23	23,81	16,05	1824	1,62	1,6169	5	3,4	16,2			
3	Bend		26,31	9,46	1825		1,6345	0	0		0,2	1,3	
4	Pipe 114 hor	23	26,56	17,17	3407	1,7	3,0515	4	4	19			
5	Bend		29,13	10,13	3408		3,0679	0	0		0,3	1,5	
6	Pipe 114 hor	19,67	29,56	18,28	4812	1,79	4,2109	3	3,9	18,8			
7	Diameter Transfer		29,56	18,28	4812		4,2109	0	0				
8	Pipe 114 hor	3,34	30,11	18,48	5039	1,81	4,3929	0	0,6	3,2			
9	Bend		32,81	10,75	5041		4,4083	0	0		0,3	1,7	
10	Pipe 114 up	0,01	30,12	10,83	5043	1,85	4,4093	0	0	0			
11	Diameter Transfer		30,12	10,83	5043		4,4093	0	0				
12	Pipe 114 up	15	34,2	18,89	6495	1,93	5,2644	2	4,7	22,3			
13	Bend		37,17	11,12	6497		5,2794	0	0		0,3	1,8	
14	Pipe 114 hor	10,01	36,95	20,65	7304	2	5,8114	1	2,9	13,7			
15	Bend		39,82	12,28	7306		5,825	0	0		0,4	2,1	
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29													
30													
16	Outlet		39,82	12,28	7306		5,825		0,3572	0			
17	Filter 40 m2		0,5	m/min	7357		5,825		0,1927	1,6			dp = 51 mmWC

Progress
 Filter: 
 Iteration: 

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Calculation results pressure conveying

Client: FORUM
 Filepath: c:\Ndyurypet.bt
 Product: PET

Installation

Convey distance horizontal: 80 m
 Convey distance vertical: 15 m
 Total conveying length: 95 m
 Number of Bends: 5
 Pipe diameter(s): 114 mm
 Compressor displacement: 0.442 m3/sec
 Booster displacement: 0 m3/sec

Calculation results

Capacity: 12 tons/hr
 Pressure: 7357 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 7357 mmWc
 Loading ratio: 7,5
 Empty pipeline pressure: 3590 mmWc
 Residence time: 5,82 seconds
 Re-number * 10⁻⁵: 2,573
 Mixture density: 10,1 kg/m³
 Mass of material in pipeline: 18,1 kg
 Exit dynamic force: 0,81 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 327 mmWC
 Acceleration excl product resistance: 766 mmWC
 Product resistance: 3630 mmWC
 Elevation: 153 mmWC
 Suspension: 801 mmWC
 Gas: 1950 mmWC
 Filter: 51 mmWC

Energy

(Blower 1x GM35S 2800 rpm)
 Compressor power: 42 kW
 No booster
 Pipeline energy consumption/ton: 3,551 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 35 degr C
 No booster
 Material temperature: 20 degr C
 Mixture temperature begin: 22 degr C
 Mixture temperature end: 27 degr C

Table calculation

Begin capacity: 12 tons/hr
 Begin pressure: 7357 mmWc
 lowest pressure: 2500 mmWc
 pressure decrement: 242 mmWc

Feeder system

Installation system:
 1-vessel system
 Rotary lock feeder

Vessel factor	tons/hr/bar(a)	vessel capacity	tons/hr
Nominal capacity	tons/hr		
Silo volume	m ³	Silo content	540 tons
Silo product volume	1000 m ³	pipe content	18,1 kgs
pipevolume	0,97 m ³		
pressure begin pressurizing	bar	Pipeline capacity	12 tons/hr
pressure valve open	bar	System capacity at pressure	tons/hr
temperature begin pressurizing	C		
temperature after pressurizing	C	Pipeline energy consumption	3,55 kWh/ton
pressurizing time	seconds	System energy consumption	kWh/ton
Silo discharge time	hrs	Total energy consumption	kWh/ton
purging time	seconds		
valve time	seconds		
overlap time	seconds		
filling time	seconds		
cycle time	seconds		

Kettle capacity < capacity

Calculate system capacity

Calculate table

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