

Pressure pneumatic conveying calculation Input screen

Client: Forum | File path: c:\Vdyuryl2.txt | Product: PVC Powder

Gas medium: Air | Nitrogen

Gas pump: Screwcompressor | Predefined screwcompressor | Blower data | Predefined blower | Constant mas pump (sonic choke/turbo) | Centrifugal fan

Gas volume: 0,297 m³/sec | Maximum pressure: 3.5 bar

Booster: Installed | Screwcompressor | Predefined screwcompressor | Blower data | Predefined blower

Gas Volume: m³/sec | Injection point:

Rotary lock feeder: Install | Capacity: tons/hr | Lock volume: m³ | RPM: /min | Leakage: m³/sec

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

Temperatures: PVC Powder temperature: 40 degr C | Compressor gas cooling | Booster gas cooling | Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties: PVC Powder | Product density: 1400 kg/m³ | Bulk density: 470 kg/m³ | Particle size: 120 micron | Suspension velocity: 1,86 m/sec | Product loss constant: 0 | Product loss factor: 3,2318E-11 | Wall friction factor: 0,5 | Intake pressure drop pressure discharge: 100 mmWC | v-wall / v-susp: 1,5 | Filter resistance factor: 500000 | Specific heat content: 0,2 kCal/kg/C | product loss factor constant y/n: n

Filter: Filter area: 30 m²

Convey pipeline: Convey distance horizontal: 113 m | Convey distance vertical: 35,5 m-up 0 m-down | Convey distance slope: 0 m-up 0 m-down | Total conveying length: 148,5 m | Number of Bends: 12 | Pipe diameter begin: 102 mm | Pipe diameter end: 127 mm

Calculation settings: Set capacity: 11,1 tons/hr | Pressure: 9500 mmWC | Back pressure: 0 mmWC | Set pressure drop: 9500 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

Buttons: Back to start menu, Calculate

Calculation Table Pressure Conveying

Client: Forum | Filepath: c:\Vdyuryl2.txt | Product: PVC Powder

Convey distance horizontal: 113 m | Convey distance vertical: 35 m | Total conveying length: 148 m | Number of Bends: 12 | Pump displacement at 2.5 bar(p): 0,297 m³/sec | Volumetric efficiency: 92,99 % | Booster displacement: 0 m³/sec | Rotarylock leakage: 0 m³/sec | Gas displacement at end: 0,3124 m³/sec | Capacity: 11,1 tons/hr | Pressure: 9500 mmWC | Back pressure: 0 mmWC | Pressure drop: 9500 mmWC | Loading ratio: 8,4 | Pipeline energy consumption: 3,6 kWh/ton | Compressor power: 40 kW | Conveying energy: 21,1 kW | Pneumatic conveying efficiency: 52,5 % | Bend losses: 5,7 kW | Material intake loss: 0,19 kW | Re-number * 10⁻⁵: 1,93 | Empty pipeline pressure drop: 834 mmWC | Empty pipeline filter press. drop: 47 mmWC | Material loss factor: 0,0057 | Lossfactor at end: 3,2318E-11 | Intake pressure drop: 100 mmWC

Progress: Filter: [Progress Bar] | Iteration: [Progress Bar]

Part	Part description	Length(l) m	v-gas m/sec	v-product m/sec	Pressure drop mmWC	v-wall/v-susp	residence time	mass kg	kW	% kW	Bend loss kW	Sediment % kW
1	Intake 102 hor	1	21,7	19,26	541	6,32	0,06	0	0,9	4,5		
2	Pipe 102 hor	8,51	21,54	20,92	959	6,69	0,468	1	0,7	3,4		
3	Bend		23,64	12,31	960		0,4845	0	0		0,4	2
4	Pipe 102 hor	9	22,01	21,3	1621	6,76	0,9155	1	1,1	5,4		
5	Bend		24,1	12,57	1622		0,9317	0	0		0,4	2,1
6	Pipe 102 hor	9	22,73	21,91	2306	6,87	1,3527	1	1,2	5,8		
7	Bend		24,84	12,73	2307		1,3687	0	0		0,4	2,3
8	Pipe 102 up	5	23,66	22,31	3002	7	1,6017	0	1,2	6,1		
9	Bend		25,78	13,12	3004		1,6173	0	0		0,5	2,3
10	Pipe 102 hor	9	24,73	23,63	3751	7,15	2,0103	1	1,4	6,8		
11	Diameter Transfer		24,73	23,63	3772		2,0103		0	0,1		
12	Pipe 114 hor	12	20	19,29	3992	5,7	2,6243	2	0,4	2		
13	Bend		21,69	11,36	3993		2,6459	0	0		0,3	1,7
14	Pipe 114 hor	12	20,7	19,9	4528	5,79	3,2649	1	1	5,1		
15	Bend		22,38	11,75	4529		3,2857	0	0		0,4	1,8
16	Pipe 114 hor	12,01	21,5	20,59	5083	5,9	3,8857	1	1,1	5,5		
17	Bend		23,17	12,13	5084		3,9059	0	0		0,4	2
18	Pipe 114 hor	12,01	22,39	21,36	5659	6,01	4,4859	1	1,2	6		
19	Bend		24,05	12,6	5660		4,5053	0	0		0,4	2,1
20	Pipe 114 hor	12	23,41	22,22	6257	6,14	5,0634	1	1,3	6,5		
21	Bend		25,07	12,94	6258		5,0822	0	0		0,5	2,3
22	Pipe 114 up	28,01	27,51	25,08	8215	6,63	6,2862	3	4,9	23,6		
23	Bend		29,17	14,77	8216		6,3028	0	0		0,6	3
24	Pipe 114 hor	11,5	29,39	27,18	8940	6,84	6,7468	1	2	9,8		
25	Diameter Transfer		29,39	27,18	8959		6,7468		0	0,2		
26	Pipe 127 hor	2,51	23,67	23,66	8964	5,46	6,8478	0	0	0		
27	Bend		24,91	13,81	8965		6,8654	0	0		0,5	2,7
28	Pipe 127 up	2,51	24,27	21,57	9225	5,54	6,9924	0	0,7	3,6		
29	Bend		25,68	12,74	9226		7,0116	0	0		0,4	2,2
30	Pipe 127 hor	2,51	24,82	22,4	9459	5,6	7,1356	0	0,7	3,3		
31	Outlet		24,82	22,4	9459		7,1356		0,1157	0		
32	Filter 30 m ²		0,6	m/min	9500		7,1356		0,1280	0,5	dp = 41	mmWC

Buttons: Back to start menu, Print calculation, Change product, New Calculation, Calculation results

Calculation results pressure conveying

Client: Forum
 Filepath: c:\Vdyuryl2.txt
 Product: PVC Powder

Installation

Convey distance horizontal: 113 m
 Convey distance vertical: 35.5 m
 Total conveying length: 148.5 m
 Number of Bends: 12
 Pipe diameter(s): 102, 127 mm
 Compressor displacement: 0.297 m3/sec
 Booster displacement: 0 m3/sec

Calculation results

Capacity: 11.1 tons/hr
 Pressure: 9500 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 9500 mmWC
 Loading ratio: 8.4
 Empty pipeline pressure: 3344 mmWC
 Residence time: 7.13 seconds
 Re-number * 10⁻⁵: 1.93
 Mixture density: 11.1 kg/m³
 Mass of material in pipeline: 23.1 kg
 Exit dynamic force: 0.43 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 541 mmWC
 Acceleration excl product resistance: 3104 mmWC
 Product resistance: 2851 mmWC
 Elevation: 446 mmWC
 Suspension: 684 mmWC
 Gas: 2309 mmWC
 Filter: 41 mmWC

Energy

(Screwcompressor)
 Compressor power: 40 kW
 No booster
 Pipeline energy consumption/ton: 3,601 kW/Ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 65 degr C
 No booster
 Material temperature: 40 degr C
 Mixture temperature begin: 43 degr C
 Mixture temperature end: 25 degr C

Table calculation

Begin capacity: 11.1 tons/hr
 Begin pressure: 9500 mmWC
 lowest pressure: 2500 mmWC
 pressure decrement: 350 mmWC

Feeder system

Installation system:
 1-vessel system
 2-vessel system
 3-vessel system
 Bulk trailer unloading
 screw feeder

Vessel factor: 1000 tons/hr/bar(a)
 Nominal capacity: 10 tons/hr
 Vessel volume: 1.2 m³
 Vessel product volume: 0.75 m³
 pipe volume: 1.45 m³
 pressure begin pressurizing: -0.05 bar
 pressure valve open: 2.5 bar
 temperature begin pressurizing: 35 C
 temperature after pressurizing: 60 C
 pressurizing time: 19.7 seconds
 Discharging time: 113.6 seconds
 purging time: 5.3 seconds
 valve time: 2 seconds
 overlap time: seconds
 filling time: 15 seconds
 cycle time: 155.7 seconds
 Number of kettles/hr: 23.1

Vessel capacity: 512.8 tons/hr
 Vessel content: 0.35 tons
 pipe content: 23.1 kgs
 Pipeline capacity: 11.1 tons/hr
 System capacity at pressure: 8 tons/hr
 Pipeline energy consumption: 3.6 kWh/ton
 System energy consumption: 3.99 kWh/ton
 Total energy consumption: 3.99 kWh/ton

Kettle capacity > capacity Calculate system capacity

Back to start menu Print calculation result New Calculation

Table calculation

Client: Forum
 Filepath: c:\Vdyuryl2.txt
 Product: PVC Powder
 Altitude: 0 m

Convey distance horizontal: 113 m
 Convey distance vertical: 35.5 m-up 0 m-down
 Total conveying length: 148.5 m
 Number of Bends: 12
 Pipe diameter begin: 102 mm
 Pipe diameter end: 127 mm

Pump displacement: 0.297 m3/sec (Screwcompressor)
 Booster displacement: 0 m3/sec
 Gas volume end: 0.3191 m3/sec

Two vessel installation 07-01-2009

Pressure bar	pipe line capacity tons/hr	system capacity tons/hr	Number of kettles/hr	Solid Loading Ratio SLR	gas velocity begin m/sec	gas velocity end m/sec	System energy consumption kWh/ton	residence time seconds	Sediment
0.95	11.1	9	25.5	>capacity	8.4	21.7	4	7.13	No sedimentation
0.925	10.9	8	25.1	>capacity	8.2	21.9	4.45	7.06	No sedimentation
0.9	10.7	8	24.7	>capacity	8	22.2	4.4	7	No sedimentation
0.875	10.4	8	24.2	>capacity	7.8	22.5	4.35	6.93	No sedimentation
0.85	10.2	8	23.8	>capacity	7.6	22.8	4.3	6.87	No sedimentation
0.825	9.9	8	23.3	>capacity	7.4	23.2	4.25	6.8	No sedimentation
0.8	9.6	8	22.7	>capacity	7.2	23.5	4.21	6.73	No sedimentation
0.775	9.3	7	22.2	>capacity	7	23.8	4.75	6.67	No sedimentation
0.75	9	7	21.6	>capacity	6.7	24.2	4.7	6.6	No sedimentation
0.725	8.7	7	20.9	>capacity	6.5	24.5	4.64	6.54	No sedimentation
0.7	8.4	7	20.2	>capacity	6.2	24.9	4.59	6.47	No sedimentation
0.675	8	6	19.5	>capacity	5.9	25.3	5.29	6.4	No sedimentation
0.65	7.6	6	18.7	>capacity	5.6	25.7	5.23	6.34	No sedimentation
0.625	7.2	6	17.8	>capacity	5.3	26.1	5.17	6.27	No sedimentation
0.6	6.8	5	16.9	>capacity	5	26.5	6.13	6.21	No sedimentation
0.575	6.3	5	15.8	>capacity	4.6	26.9	6.06	6.14	No sedimentation
0.55	5.8	5	14.7	>capacity	4.3	27.3	5.99	6.08	No sedimentation
0.525	5.2	4	13.5	>capacity	3.9	27.8	7.4	6.02	No sedimentation
0.5	4.7	4	12.2	>capacity	3.4	28.2	7.32	5.96	No sedimentation
0.475	4.1	3	10.7	>capacity	3	28.7	9.65	5.91	No sedimentation
0.45	3.4	3	9.2	>capacity	2.5	29.2	9.54	5.85	No sedimentation

Empty pipeline system pressure drop: 3339 mmWC

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