

# Resin PVC powder Line 2 – Blower 1475 rpm

Pressure pneumatic conveying calculation input screen

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

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

**Temperatures**  
 PVC Powder temperature: 40 deg C  
 Compressor gas cooling: [ ] deg C  
 Booster gas cooling: [ ] deg C  
 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

**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: 11,7 tons/hr  
 Pressure: 10000 mmWC  
 Back pressure: 0 mmWC  
 Set pressure drop: 10000 mmWC

**Calculation selection**  
 Pressure fixed -> capacity calculated  
 Capacity fixed -> pressure calculated  
 Pressure and capacity fixed -> intake pressure drop calculated  
 Pressure and capacity fixed -> material loss factor calculated  
 Pressure and capacity fixed -> constant loss factor calculated  
 product loss factor (cwp) kept constant

**Filter**  
 Filter area: 30 m2

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  
 Blower displ at 3.5 bar: 0,296 m3/sec  
 Volumetric efficiency: 60,37 %  
 Booster displacement: 0 m3/sec  
 Rotarylock leakage: 0 m3/sec  
 Gas displacement at end: 0,179 m3/sec  
 Capacity: 11,7 tons/hr  
 Pressure: 10000 mmWC  
 Back pressure: 0 mmWC  
 Pressure drop: 10000 mmWC  
 Loading ratio: 15,4  
 Pipeline energy consumption: 3,57 kWh/ton  
 Compressor power: 42 kW  
 Conveying energy: 12,5 kW  
 Pneumatic conveying efficiency: 29,7 %  
 Bend losses: 1,8 kW  
 Material intake loss: 0,1 kW  
 Re-number \* 10<sup>5</sup>: 1,107  
 Empty pipeline pressure drop: 2883 mmWC  
 Empty pipeline filter press. drop: 40 mmWC  
 Material loss factor: 0,0209  
 Lossfactor at end: 3,2318E-11  
 Intake pressure drop: 100 mmWC

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	12,24	10,39	397	3,64	0,109	0	0,3	3,1		
2	Pipe 102 hor	8,5	12,19	11,67	891	3,74	0,839	2	0,4	3,8		
3	Bend		14,69	6,89	892		0,8685	0	0		0,1	1,1
4	Pipe 102 hor	9	12,43	11,84	1540	3,77	1,6405	2	0,6	5		
5	Bend		14,92	6,99	1540		1,6697	0	0		0,1	1,1
6	Pipe 102 hor	9	12,8	12,12	2208	3,82	2,4267	2	0,6	5,3		
7	Bend		15,36	6,91	2209		2,4557	0	0		0,1	1,2
8	Pipe 102 up	5	13,38	12,2	3012	3,91	2,8787	1	0,8	6,6		
9	Bend		15,95	7,21	3013		2,9071	0	0		0,1	1,2
10	Pipe 102 hor	9	13,94	13	3734	3,97	3,6171	2	0,7	6,2		
11	Diameter Transfer		13,94	13	3741		3,6171		0	0		
12	Pipe 114 hor	12	11,29	10,74	4068	3,17	4,7291	3	0,3	2,9		
13	Bend		13,27	6,34	4068		4,7677	0	0		0,1	0,9
14	Pipe 114 hor	12	11,66	11,03	4578	3,21	5,8788	3	0,5	4,6		
15	Bend		13,63	6,51	4578		5,9164	0	0		0,1	1
16	Pipe 114 hor	12	12,06	11,35	5098	3,26	6,9974	3	0,6	4,9		
17	Bend		14,02	6,71	5099		7,0338	0	0		0,1	1
18	Pipe 114 hor	12	12,51	11,7	5631	3,32	8,0838	3	0,6	5,2		
19	Bend		14,46	6,91	5632		8,1192	0	0		0,1	1,1
20	Pipe 114 hor	12	13,01	12,09	6179	3,38	9,1372	3	0,6	5,5		
21	Bend		15,02	6,84	6179		9,1722	0	0		0,1	1,2
22	Pipe 114 up	28	16,15	13,85	8850	3,73	11,3931	7	3,8	30,7		
23	Bend		18,14	8,18	8851		11,4231	0	0		0,2	1,6
24	Pipe 114 hor	11,5	17,16	15,14	9514	3,83	12,2131	2	1	8,7		
25	Diameter Transfer		17,16	15,14	9520		12,2131		0	0		
26	Pipe 127 hor	2,5	13,79	13,12	9538	3,05	12,3951	0	0	0,2		
27	Bend		15,26	7,49	9538		12,4271	0	0		0,1	1,5
28	Pipe 127 up	2,5	14,13	11,95	9792	3,1	12,6521	0	0,4	3,5		
29	Bend		15,8	7,06	9792		12,6869	0	0		0,1	1,2
30	Pipe 127 hor	2,51	14,36	12,74	9959	3,12	12,9029	0	0,2	2,3		
31	Outlet		14,36	12,74	9959		12,9029		0,0222	0		
32	Filter	30 m2	0,3 m/min		70000				0,0728	0,1		dp = 40 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 mm / 127 mm  
 Compressor displacement: 0.296 m3/sec  
 Booster displacement: 0 m3/sec

**Calculation results**

Capacity: 11.7 tons/hr  
 Pressure: 10000 mmWC  
 Booster pressure: 0 mmWC  
 Back pressure: 0 mmWC  
 Pressure drop: 10000 mmWc  
 Loading ratio: 15.4  
 Empty pipeline pressure: 2883 mmWc  
 Residence time: 12.9 seconds  
 Re-number \* 10<sup>-5</sup>: 1.107  
 Mixture density: 19.4 kg/m<sup>3</sup>  
 Mass of material in pipeline: 45.1 kg  
 Exit dynamic force: 0.25 kN

**Pressure drops**

Product intake: 100 mmWC  
 Nozzle: 397 mmWC  
 Acceleration excl product resistance: 1803 mmWC  
 Product resistance: 4855 mmWC  
 Elevation: 838 mmWC  
 Suspension: 1624 mmWC  
 Gas: 750 mmWC  
 Filter: 40 mmWC

**Energy**

(Blower)  
 Compressor power: 42 kW  
 No booster  
 Pipeline energy consumption/ton: 3.577 kWh/ton

**Temperatures**

Ambient temperature: 25 degr C  
 Outlet temperature compressor: 90 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: 11.7 tons/hr  
 Begin pressure: 10000 mmWc  
 lowest pressure: 2500 mmWc  
 pressure decrement: 375 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) vessel capacity: 499.9 tons/hr  
 Nominal capacity: 10 tons/hr  
 Vessel volume: 1.2 m<sup>3</sup> Vessel content: 0.35 tons  
 Vessel product volume: 0.75 m<sup>3</sup>  
 pipe volume: 1.45 m<sup>3</sup> pipe content: 45.1 kgs  
 pressure begin pressurizing: -0.05 bar  
 pressure valve open: 2.5 bar  
 temperature begin pressurizing: 35 C  
 temperature after pressurizing: 60 C  
 Pipeline capacity: 11.7 tons/hr  
 System capacity at pressure: 8 tons/hr  
 pressurizing time: 7 seconds  
 Discharging time: 107.9 seconds  
 purging time: 9.6 seconds  
 valve time: 2 seconds  
 Pipeline energy consumption: 3.57 kWh/ton  
 System energy consumption: 3.85 kWh/ton  
 overaptime: seconds  
 filling time: 15 seconds  
 cycle time: 141.6 seconds  
 Total energy consumption: 3.85 kWh/ton  
 Number of kettles/hr: 25.4

**Kettle capacity > capacity** Calculate system capacity

Back to start menu Print calculation result New Calculation

**Table calculation**

**Pressure conveying**

Convey distance horizontal: 113 m  
 Convey distance vertical: 35.5 m  
 Total conveying length: 148.5 m  
 Number of Bends: 12  
 Pipe diameter begin: 102 mm  
 Pipe diameter end: 127 mm  
 Pump displacement: 0.296 m3/sec (Blower)  
 Booster displacement: 0 m3/sec  
 Gas volume end: 0.2219 m3/sec

Client: Forum  
 Filepath: c:\Vdyuryl2.txt  
 Product: PVC Powder  
 Altitude: 0 m  
 One vessel installation 07-02-2009

**Table**

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
1	11.7	10	28.4	15.4	12.2	14.3	3.86	12.9	No sedimentation
0.97	11.5	9.9	28.1	15	12.5	14.4	3.79	12.66	No sedimentation
0.94	11.4	9.7	27.7	14.6	12.8	14.6	3.77	12.42	No sedimentation
0.91	11.2	9.6	27.4	14.3	13.1	14.7	3.7	12.18	No sedimentation
0.88	11	9.5	27	13.9	13.4	14.9	3.63	11.94	No sedimentation
0.85	10.8	9.4	26.7	13.5	13.8	15	3.56	11.71	No sedimentation
0.82	10.6	9.2	26.3	13.1	14.1	15.1	3.53	11.48	No sedimentation
0.79	10.4	9.1	25.8	12.7	14.5	15.3	3.46	11.25	No sedimentation
0.76	10.2	8.9	25.4	12.3	14.9	15.4	3.42	11.02	No sedimentation
0.73	9.9	8.7	24.9	11.9	15.3	15.6	3.38	10.79	No sedimentation
0.7	9.7	8.6	24.4	11.5	15.7	15.7	3.3	10.56	No sedimentation
0.67	9.4	8.4	23.8	11.1	16.2	15.9	3.25	10.33	No sedimentation
0.64	9.1	8.1	23.2	10.6	16.6	16	3.25	10.11	No sedimentation
0.61	8.8	7.9	22.5	10.1	17.1	16.2	3.2	9.89	No sedimentation
0.58	8.5	7.7	21.8	9.7	17.6	16.4	3.14	9.66	No sedimentation
0.55	8.2	7.4	21	9.2	18.1	16.6	3.13	9.44	No sedimentation
0.52	7.8	7.1	20.2	8.6	18.7	16.7	3.11	9.22	No sedimentation
0.49	7.4	6.7	19.2	8.1	19.2	16.9	3.14	9	No sedimentation
0.46	6.9	6.3	18.1	7.5	19.8	17.1	3.18	8.79	No sedimentation
0.43	6.4	5.9	16.8	6.8	20.5	17.3	3.22	8.57	No sedimentation
0.4	5.8	5.4	15.4	6.1	21.1	17.5	3.32	8.36	No sedimentation

Empty pipeline system pressure drop: 2873 mmWC

Back to start menu Print table New Calculation