

# Resin PVC powder Line 1 – Blower 1475 rpm

Pressure pneumatic conveying calculation input screen

Client: Yury | File path: c:\Vdyury.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: 570 kg/m3  
 Particle size: 250 micron  
 Suspension velocity: 2,68 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: 110 m  
 Convey distance vertical: 41 m-up 0 m-down  
 Convey distance slope: 0 m-up 0 m-down  
 Total conveying length: 151 m  
 Number of Bends: 9  
 Pipe diameter begin: 102 mm  
 Pipe diameter end: 127 mm

**Calculation settings**  
 Set capacity: 12 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 -> 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

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	Bend loss kW	Sediment % kW
1	Intake 102 hor	1	12,13	9,41	383	2,5	0,126	0	0,3	3		
2	Pipe 102 hor	19	12,37	11,18	1626	2,6	1,8469	6	1,2	9,6		
3	Bend		14,69	6,34	1626		1,8783	0	0		0,1	1,1
4	Pipe 102 up	5	12,93	11,03	2484	2,66	2,3493	1	0,8	6,9		
5	Bend		15,31	6,52	2484		2,3807	0	0		0,1	1
6	Pipe 102 hor	7,5	13,39	11,86	3157	2,7	3,0337	2	0,7	5,6		
7	Diameter Transfer		13,39	11,86	3164		3,0337	0	0			
8	Pipe 114 hor	20	11,07	10,03	3856	2,17	5,0368	7	0,7	6		
9	Bend		12,85	5,93	3856		5,078	0	0		0,1	0,8
10	Pipe 114 hor	10	11,42	10,27	4349	2,2	6,081	3	0,5	4,4		
11	Bend		13,28	5,72	4349		6,1224	0	0		0,1	0,9
12	Pipe 114 up	28	14,19	11,34	7386	2,44	8,8244	9	3,8	30,8		
13	Bend		16,11	6,71	7387		8,861	0	0		0,1	1,1
14	Pipe 114 hor	8,5	14,79	12,49	7908	2,48	9,574	2	0,7	6		
15	Diameter Transfer		14,79	12,49	7914		9,574	0	0			
16	Pipe 127 hor	10	12,06	10,55	8106	1,99	10,4929	3	0,2	2,2		
17	Bend		13,47	6,24	8107		10,5321	0	0		0,1	0,9
18	Pipe 127 hor	10	12,41	10,78	8449	2,02	11,5011	3	0,5	4,1		
19	Bend		13,82	6,37	8450		11,5395	0	0		0,1	1
20	Pipe 127 hor	10	12,8	11,03	8798	2,04	12,4875	3	0,5	4,3		
21	Bend		14,27	6,19	8798		12,5259	0	0		0,1	1,1
22	Pipe 127 up	8	13,65	10,48	9488	2,12	13,3289	2	1,1	9		
23	Bend		15,25	6,21	9488		13,3685	0	0		0,1	0,9
24	Pipe 127 hor	14	14,31	11,98	9976	2,15	14,5915	4	0,8	6,8		
25	Outlet		14,31	11,98	9976		14,5915		0,0220	0		
26	Filter	40	0,2	m/min	10000		14,5915		0,0410	0,1		dp = 23 mmWC

Summary:  
 Capacity: 12 tons/hr  
 Pressure: 10000 mmWC  
 Back pressure: 0 mmWC  
 Pressure drop: 10000 mmWC  
 Loading ratio: 15,8  
 Pipeline energy consumption: 3,49 kWh/ton  
 Compressor power: 42 kW  
 Conveying energy: 12,5 kW  
 Pneumatic conveying efficiency: 29,7 %  
 Bend losses: 1,1 kW  
 Material intake loss: 0,1 kW  
 Re-number \* 10<sup>-5</sup>: 1,108  
 Empty pipeline pressure drop: 2517 mmWC  
 Empty pipeline filter press. drop: 22 mmWC  
 Material loss factor: 0,0266  
 Lossfactor at end: 3,2318E-11  
 Intake pressure drop: 100 mmWC

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

**Calculation results pressure conveying**

Client: Yury  
 Filepath: c:\Vdyury.txt  
 Product: PVC Powder

**Installation**

Convey distance horizontal: 110 m  
 Convey distance vertical: 41 m  
 Total conveying length: 151 m  
 Number of Bends: 9  
 Pipe diameter(s): 102, 127 mm  
 Compressor displacement: 0,296 m3/sec  
 Booster displacement: 0 m3/sec

**Calculation results**

Capacity: 12 tons/hr  
 Pressure: 10000 mmWC  
 Booster pressure: 0 mmWC  
 Back pressure: 0 mmWC  
 Pressure drop: 10000 mmWc  
 Loading ratio: 15,8  
 Empty pipeline pressure: 2517 mmWc  
 Residence time: 14,59 seconds  
 Re-number \* 10<sup>-5</sup>: 1,108  
 Mixture density: 19,9 kg/m<sup>3</sup>  
 Mass of material in pipeline: 51,6 kg  
 Exit dynamic force: 0,25 kN

**Pressure drops**

Product intake: 100 mmWC  
 Nozzle: 383 mmWC  
 Acceleration excl product resistance: 1138 mmWC  
 Product resistance: 4645 mmWC  
 Elevation: 1063 mmWC  
 Suspension: 2383 mmWC  
 Gas: 659 mmWC  
 Filter: 23 mmWC

**Energy**

(Blower)  
 Compressor power: 42 kW  
 No booster  
 Pipeline energy consumption/ton: 3,492 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: 12 tons/hr  
 Begin pressure: 10000 mmWc  
 lowest pressure: 4000 mmWc  
 pressure decrement: 300 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: 0,43 tons  
 Vessel product volume: 0,77 m<sup>3</sup>  
 pipe volume: 1,6 m<sup>3</sup> pipe content: 51,6 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: 12 tons/hr  
 System capacity at pressure: 9 tons/hr  
 pressurizing time: 6,6 seconds  
 Discharging time: 131,1 seconds  
 purging time: 10,9 seconds  
 valve time: 2 seconds  
 Pipeline energy consumption: 3,49 kWh/ton  
 System energy consumption: 3,72 kWh/ton  
 overaptime: seconds  
 filling time: 15 seconds  
 cycle time: 165,7 seconds  
 Total energy consumption: 3,72 kWh/ton  
 Number of kettles/hr: 21,7

**Kettle capacity > capacity** Calculate system capacity

Back to start menu Print calculation result New Calculation

**Table calculation**

Pressure conveying

Client: Yury  
 Filepath: c:\Vdyury.txt  
 Product: PVC Powder  
 Altitude: 0 m

Convey distance horizontal: 110 m  
 Convey distance vertical: 41 m  
 Total conveying length: 151 m  
 Number of Bends: 9  
 Pipe diameter begin: 102 mm  
 Pipe diameter end: 127 mm

Pump displacement: 0,296 m3/sec (Blower)  
 m-up: 0 m-down  
 Booster displacement: 0 m3/sec  
 Gas volume end: 0,2219 m3/sec

One vessel installation 07-02-2009

Pressure bar	pipe line capacity tons/hr	system capacity tons/hr	Number of kettles/hr	< Kettle range >	Solid Loading Ratio SLR	gas velocity begin m/sec	gas velocity end m/sec	System energy consumption kWh/ton	residence time seconds	Sediment
1	12	10,4	23,8	>capacity	15,8	12,1	14,3	3,75	14,59	No sedimentation
0,97	11,8	10,3	23,6	>capacity	15,4	12,4	14,4	3,69	14,32	No sedimentation
0,94	11,7	10,2	23,4	>capacity	15	12,7	14,5	3,62	14,05	No sedimentation
0,91	11,5	10,1	23,1	>capacity	14,7	13	14,7	3,56	13,78	No sedimentation
0,88	11,4	10	22,8	>capacity	14,3	13,3	14,8	3,49	13,52	No sedimentation
0,85	11,2	9,9	22,5	>capacity	14	13,7	15	3,42	13,25	No sedimentation
0,82	11	9,7	22,2	>capacity	13,6	14	15,1	3,38	12,99	No sedimentation
0,79	10,8	9,6	21,9	>capacity	13,2	14,4	15,2	3,31	12,73	No sedimentation
0,76	10,6	9,4	21,6	>capacity	12,8	14,8	15,4	3,27	12,47	No sedimentation
0,73	10,4	9,3	21,2	>capacity	12,4	15,2	15,5	3,19	12,2	No sedimentation
0,7	10,2	9,1	20,8	>capacity	12	15,6	15,7	3,14	11,95	No sedimentation
0,67	9,9	8,9	20,4	>capacity	11,6	16,1	15,9	3,09	11,69	No sedimentation
0,64	9,7	8,7	20	>capacity	11,2	16,5	16	3,04	11,44	No sedimentation
0,61	9,4	8,5	19,5	>capacity	10,8	17	16,2	2,99	11,18	No sedimentation
0,58	9,1	8,3	19	>capacity	10,3	17,5	16,4	2,93	10,93	No sedimentation
0,55	8,8	8	18,4	>capacity	9,9	18	16,5	2,91	10,67	No sedimentation
0,52	8,5	7,8	17,7	>capacity	9,4	18,6	16,7	2,85	10,42	No sedimentation
0,49	8,1	7,5	17	>capacity	8,9	19,2	16,9	2,82	10,17	No sedimentation
0,46	7,7	7,1	16,3	>capacity	8,3	19,8	17,1	2,83	9,92	No sedimentation
0,43	7,2	6,7	15,4	>capacity	7,7	20,4	17,3	2,84	9,67	No sedimentation
0,4	6,7	6,3	14,3	>capacity	7,1	21,1	17,5	2,85	9,42	No sedimentation

Empty pipeline system pressure drop: 2512 mmWC

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