

Cement pneumatic conveying pipeline 1000m (Double tank system)

Pressure pneumatic conveying calculation Input screen

Client: Kaufman | File path: c:\Vdkf1000.txt | Product: Cement

Gas medium: Air (selected)

Gas pump: Screwcompressor (selected)

Gas Volume: 0,967 m³/sec | Maximum pressure: 3.5 bar

Ambient (Compressor intake): Ambient temperature: 25 deg C | Ambient pressure: 1000 mbar

Temperatures: Cement temperature: 40 deg C | Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties (Cement): Product density: 3100 kg/m³ | Bulk density: 1100 kg/m³ | Particle size: 50 micron | Suspension velocity: 1,8 m/sec | Product loss constant: 0,095 | Product loss factor: 1,4866E-12 | Wall friction factor: 0,5 | Intake pressure drop pressure discharge: 100 mmWC | v-wall / v-susp: 1,75 | Filter resistance factor: 1500000 | Specific heat content: 0,2 kCal/kg/C | product loss factor constant y/n: n

Convey pipeline: Convey length horizontal: 1000 m | Convey length vertical: 50 m-up 0 m-down | Total length: 1050 m | Number of Bends: 8 | Pipe diameter begin: 200 mm | Pipe diameter end: 200 mm

Calculation settings: Predicted capacity: 62,1 tons/hr at 2.5 bar | Set capacity: 84,6 tons/hr | Pressure: 40000 mmWC | Back pressure: 0 mmWC | Set pressure drop: 40000 mmWC

Calculation selection: Pressure fixed -> capacity calculated (selected)

Filter: Filter area: 116,04 m²

Buttons: Back to start menu, Calculate

Calculation Table Pressure Conveying

Client: Kaufman | Filepath: c:\Vdkf1000.txt | Product: Cement

Convey Length horizontal: 1000 m | Convey Length vertical: 50 m | Total Length: 1049 m | Number of Bends: 8

Pump displacement at 2.5 bar(o): 0,967 m³/sec | Volumetric efficiency: 0,82 % | Booster displacement: 0 m³/sec | Rotarylock leakage: 0 m³/sec | Gas displacement at end: 0,9311 m³/sec

Capacity: 84,6 tons/hr | Pressure: 40000 mmWC | Back pressure: 0 mmWC | Pressure drop: 40000 mmWC | Loading ratio: 21,4

Pipeline energy consumption: 3,98 kWh/ton | Compressor power: 337 kW | Conveying energy: 150,4 kW | Pneumatic conveying efficiency: 44,6 %

Bend losses: 16,7 kW | Material intake loss: 0,22 kW | Re-number * 10⁻⁵: 3,632 | Empty pipeline pressure drop: 8046 mmWC | Empty pipeline filter press. drop: 99 mmWC | Material loss factor: 0,0063 | Lossfactor at end: 1,4866E-12 | Intake pressure drop: 100 mmWC

Progress: Filter area: 116,04 m² | Iteration: 100%

Part	Part description	Length(θ) 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	1	7,01	6,37	387	3,29	0,164	3	0,8	0,5		
2	Pipe	164,8	7,16	7,42	6748	3,78	23,167	597	13,1	8,7		
3	Bend		9,08	4,39	6749		23,2412	2	0		0,4	0,2
4	Pipe	164,8	8,26	8,43	12609	4,02	44,0681	535	13,5	8,9		
5	Bend		10,07	4,98	12609		44,1335	1	0		0,5	0,3
6	Pipe	164,8	9,6	9,66	17823	4,28	62,3695	463	13,9	9,2		
7	Bend		11,3	5,71	17823		62,4265	1	0		0,7	0,4
8	Pipe	164,8	11,29	11,21	22650	4,6	78,2426	397	15	10		
9	Bend		12,89	6,62	22651		78,2918	1	0		0,9	0,6
10	Pipe	39,67	11,89	11,74	24013	4,7	81,7388	86	4,7	3,1		
11	Diameter Transfer		11,89	11,74	24013	0	81,7388		0			
12	Pipe	125,1	13,65	13,33	27356	5	91,7608	249	12,7	8,4		
13	Bend		15,1	7,88	27356		91,8022	1	0		1,3	0,9
14	Pipe	164,8	17,48	16,74	32311	5,6	102,8472	272	22,9	15,2		
15	Bend		18,78	9,61	32312		102,8806	0	0		2,2	1,4
16	Pipe	0	17,51	10,31	32345	5,77	102,8816	0	0,1	0,1		
17	Diameter Transfer		17,51	10,31	32345		102,8816		0	0		
18	Pipe	50,01	27,47	24,5	38700	6,93	105,4106	61	41,4	27,5		
19	Bend		28,35	14,46	38701		105,4332	0	0		4,5	3
20	Pipe	10,01	30,77	27,89	39911	7,3	105,8162	9	10,5	7		
21	Bend		31,43	16,6	39912		105,836	0	0		5,9	3,9
22	Outlet		31,43	16,6	39912		105,836		0,5509			
23	Filter	116,0	0,4	m/min	40000		105,836		0,8065	87	mmWC	

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

Calculation results pressure conveying

Client: Kaufman
 Filepath: c:\Vdkf 1000.txt
 Product: Cement

Installation

Convey distance horizontal: 1000 m
 Convey distance vertical: 50 m
 Total conveying length: 1049.9 m
 Number of Bends: 8
 Pipe diameter(s): 200 mm
 Compressor displacement: 0.967 m³/sec
 Booster displacement: 0 m³/sec

Calculation results

Capacity: 84.6 tons/hr
 Pressure: 40000 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 40000 mmWC
 Loading ratio: 21.4
 Empty pipeline pressure: 8046 mmWc
 Residence time: 105.83 seconds
 Re-number * 10⁻⁵: 3.632
 Mixture density: 26.7 kg/m³
 Mass of material in pipeline: 2686.9 kg
 Exit dynamic force: 4.14 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 387 mmWC
 Acceleration excl product resistance: 4119 mmWC
 Product resistance: 12602 mmWC
 Elevation: 1800 mmWC
 Suspension: 18285 mmWC
 Gas: 3065 mmWC
 Filter: 87 mmWC

Feeder system

Installation system:
 2-vessel system
 3-vessel system
 Rotary lock feeder
 silo unloading airlifts
 screw feeder
 Bulk trailer unloading

Vessel factor: 1000 tons/hr/bar(a)
 Nominal capacity: 80 tons/hr
 Vessel volume: 6.3 m³
 Vessel product volume: 5 m³
 pipevolume: 32.98 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: 10.3 seconds
 Discharging time: 233.9 seconds
 purging time: 79.3 seconds
 valve time: 2 seconds
 overuptime: seconds
 cyclertime: 325.7 seconds
 Number of kettles/hr: 11

Vessel capacity: 199.9 tons/hr
 Vessel content: 5.5 tons
 pipe content: 2686.9 kgs
 Pipeline capacity: 84.6 tons/hr
 System capacity at pressure: 60 tons/hr
 Pipeline energy consumption: 3.98 kW/ton
 System energy consumption: 4.75 kW/ton
 Total energy consumption: 4.75 kW/ton

Energy

(Screwcompressor)
 Compressor power: 337 kW
 Booster power: 0 kW
 Pipeline energy consumption/ton: 3.985 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 472 degr C
 Outlet temperature booster: 0 degr C
 Mixture temperature begin: 62 degr C
 Mixture temperature end: 26 degr C

Table calculation

Begin capacity: 84.6 tons/hr
 Begin pressure: 40000 mmWc
 pressure decrement: 1500 mmWc
 lowest pressure: 10000 mmWc

Kettle capacity > capacity

Calculate system capacity

Calculate table

Back to start menu | Print calculation result | New Calculation

Table calculation

Client: Kaufman
 Filepath: c:\Vdkf 1000.txt
 Product: Cement

Convey distance horizontal: 1000 m
 Convey distance vertical: 50 m-up, 0 m-down
 Total conveying length: 1049.9 m
 Number of Bends: 8
 Pipe diameter begin: 200 mm
 Pipe diameter end: 200 mm

Pump displacement: 0.967 m³/sec (Screwcompressor)
 Booster displacement: 0 m³/sec
 Gas volume end: 1.0265 m³/sec

Two vessel installation

Table

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
4	84.6	60	11	>capacity	21.4	7	31.4	4.81	105.83	No sedimentation
3.85	83.5	60	11	>capacity	21	7.2	31.5	4.67	103.49	No sedimentation
3.7	82.3	60	10.9	>capacity	20.7	7.4	31.6	4.54	101.12	No sedimentation
3.55	81.1	59	10.8	>capacity	20.3	7.6	31.6	4.48	98.71	No sedimentation
3.4	79.8	59	10.8	>capacity	19.8	7.9	31.7	4.35	96.26	No sedimentation
3.25	78.3	59	10.7	>capacity	19.4	8.2	31.8	4.21	93.77	No sedimentation
3.1	76.8	58	10.6	>capacity	18.9	8.4	31.9	4.14	91.23	No sedimentation
2.95	75.2	57	10.5	>capacity	18.5	8.8	32	4.07	88.67	No sedimentation
2.8	73.4	57	10.3	>capacity	17.9	9.1	32.1	3.93	86.06	No sedimentation
2.65	71.5	56	10.2	>capacity	17.4	9.5	32.2	3.85	83.4	No sedimentation
2.5	69.5	55	10	>capacity	16.8	9.9	32.2	3.77	80.7	No sedimentation
2.35	67.2	54	9.8	>capacity	16.2	10.4	32.3	3.68	77.96	No sedimentation
2.2	64.7	52	9.6	>capacity	15.5	10.9	32.4	3.66	75.17	No sedimentation
2.05	62	51	9.3	>capacity	14.8	11.4	32.5	3.57	72.33	No sedimentation
1.9	58.9	49	8.9	>capacity	13.9	12	32.6	3.54	69.44	No sedimentation
1.75	55.3	47	8.5	>capacity	13	12.7	32.7	3.51	66.5	No sedimentation
1.6	51.2	44	8	>capacity	12	13.5	32.7	3.56	63.51	No sedimentation
1.45	46.3	40	7.4	>capacity	10.8	14.3	32.8	3.7	60.44	No sedimentation
1.3	40.2	36	6.5	>capacity	9.3	15.3	32.8	3.87	57.31	No sedimentation
1.15	32.3	29	5.4	>capacity	7.4	16.5	32.9	4.51	54.09	No sedimentation
1	21.7	20	3.7	>capacity	4.9	17.8	32.8	6.13	50.79	No sedimentation

Empty pipeline system pressure drop: 8041 mmWC

Back to start menu | Print table | New Calculation

Cement conveying pipeline 800 m (Double tank system)

Pressure pneumatic conveying calculation Input screen

Client: Kaufman | File path: c:\Vdkf800.txt | Product: Cement

Gas medium: Air (selected), Nitrogen

Gas pump: Screwcompressor (selected), Predefined screwcompressor, Blower data, Predefined blower

Gas Volume: 0,683 m³/sec | Maximum pressure: 3.5 bar

Booster: Screwcompressor (selected), Predefined screwcompressor, Blower data, Predefined blower

Gas Volume: m³/sec | Injection point

Rotary lock: Install (unchecked), Capacity: tons/hr, Lock volume: m³, RPM: /min, Leakage: m³/sec

Ambient (Compressor intake): Ambient temperature: 25 deg C, Ambient pressure: 1000 mbar

Temperatures: Cement temperature: 40 deg C, Screwcompressor air cooling: deg C, Booster air cooling: deg C, Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties (Cement): Product density: 3100 kg/m³, Bulk density: 1100 kg/m³, Particle size: 50 micron, Suspension velocity: 1,8 m/sec, Product loss constant: 0,095, Product loss factor: 1,4866E-12, Wall friction factor: 0,5, Intake pressure drop pressure discharge: 100 mmWC, v-wall / v-susp: 1,75, Filter resistance factor: 1500000, Specific heat content: 0,2 kCal/kg/C, product loss factor constant y/n: n

Convey pipeline: Convey length horizontal: 800 m, Convey length vertical: 50 m-up, 0 m-down, Total length: 830 m, Number of Bends: 7, Pipe diameter begin: 203 mm, Pipe diameter end: 203 mm

Calculation settings: Predicted capacity: 68,5 tons/hr at 2.5 bar, Set capacity: 81 tons/hr, Pressure: 40000 mmWC, Back pressure: 0 mmWC, Set pressure drop: 40000 mmWC

Calculation selection: Pressure fixed -> capacity calculated (selected), 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 (unchecked)

Filter area: 81,96 m²

Buttons: Back to start menu, Calculate

Calculation Table Pressure Conveying

Client: Kaufman | Filepath: c:\Vdkf800.txt | Product: Cement

Convey Length horizontal: 800 m | Convey Length vertical: 30 m | Total Length: 830 m | Number of Bends: 7

Pump displacement at 2.5 bar(o): 0,683 m³/sec | Volumetric efficiency: 0,83 % | Booster displacement: 0 m³/sec | Rotarylock leakage: 0 m³/sec | Gas displacement at end: 0,6585 m³/sec

Capacity: 80,9 tons/hr | Pressure: 40000 mmWC | Back pressure: 0 mmWC | Pressure drop: 40000 mmWc | Loading ratio: 28,9

Pipeline energy consumption: 2,93 kWh/ton | Compressor power: 237 kW | Conveying energy: 107,1 kW | Pneumatic conveying efficiency: 45 %

Bend losses: 11,8 kW | Material intake loss: 0,15 kW | Re-number * 10⁻⁵: 2,538 | Empty pipeline pressure drop: 5372 mmWc | Empty pipeline filter press. drop: 101 mmWc | Material loss factor: 0,01 | Lossfactor at end: 1,4866E-12 | Intake pressure drop: 100 mmWc

Progress: Filter (100%), Iteration (100%)

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	1	4,81	4,45	335	2,26	0,235	5	0,5	0,4		
2	Pipe	157,8	5,41	5,61	9947	2,69	30,443	773	14,5	13,5		
3	Bend		13,09	1,26	9948		30,9398	26	0		0,3	0,3
4	Pipe	157,8	6,67	6,74	17635	2,92	56,5677	642	14	13		
5	Bend		15,81	1,23	17637		57,1025	27	0		0,4	0,4
6	Pipe	157,8	8,26	8,15	23848	3,19	78,3516	522	13,9	13		
7	Bend		19,22	1,21	23849		78,9188	28	0		0,7	0,6
8	Pipe	78,93	9,3	9,06	26780	3,36	88,0658	221	7,8	7,2		
9	Diameter Transfer			9,06	26780		88,0658	0	0	0		
10	Pipe	78,86	10,43	10,04	29281	3,53	96,3378	199	7,4	6,9		9,3
11	Bend		23,89	1,19	29283		96,9342	28	0		1,1	1
12	Pipe	157,8	14,01	13,09	34572	4,03	110,7142	328	19,3	18		
13	Bend		31,61	1,17	34573		110,9942	10	0		1,9	1,7
14	Pipe	0	14,13	6,92	34699	4,55	110,9952	0	0,5	0,5		
15	Diameter Transfer		14,13	6,92	34699		110,9952	0	0	0		
16	Pipe	30	19,41	16,76	38835	4,69	113,0632	48	20,7	19,3		
17	Bend		43,32	1,16	38840		113,763	25	0		3,1	2,9
18	Pipe	10,01	21,47	19,07	39910	4,92	114,321	12	6,6	6,1		
19	Bend		47,7	1,16	39913		114,751	15	0		4	3,8
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
20	Outlet		47,7	1,16	39913		114,751		0,8987			
21	Filter	81,96 m ²	0,4	m/min	40000		114,751		0,5693	87	mmWC	

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

Calculation results pressure conveying

Client: Kaufman
 Filepath: c:\vdkf800.txt
 Product: Cement

Installation

Convey distance horizontal: 800 m
 Convey distance vertical: 30 m
 Total conveying length: 830 m
 Number of Bends: 7
 Pipe diameter(s): 203 mm
 Compressor displacement: 0,683 m³/sec
 Booster displacement: 0 m³/sec

Calculation results

Capacity: 80,9 tons/hr
 Pressure: 40000 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 40000 mmWC
 Loading ratio: 28,9
 Empty pipeline pressure: 5377 mmWc
 Residence time: 114,75 seconds
 Re-number * 10⁻⁵: 2,538
 Mixture density: 35,5 kg/m³
 Mass of material in pipeline: 2915,9 kg
 Exit dynamic force: 13,09 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 335 mmWC
 Acceleration excl product resistance: 3272 mmWC
 Product resistance: 10866 mmWC
 Elevation: 1196 mmWC
 Suspension: 23248 mmWC
 Gas: 1367 mmWC
 Filter: 87 mmWC

Feeder system

Installation system:
 2-vessel system
 3-vessel system
 Rotary lock feeder
 silo unloading airslides
 screw feeder
 Bulk trailer unloading

Vessel factor: 1000 tons/hr/bar(a)
 Nominal capacity: 80 tons/hr
 Vessel volume: 6,3 m³
 Vessel product volume: 5 m³
 pipevolume: 26,86 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: 14,6 seconds
 Discharging time: 244,5 seconds
 purging time: 86 seconds
 valve time: 2 seconds
 overaptime: seconds
 cyclertime: 347,2 seconds
 Number of kettles/hr: 10,3

Vessel capacity: 199,9 tons/hr
 Vessel content: 5,5 tons
 pipe content: 2915,9 kgs
 Pipeline capacity: 80,9 tons/hr
 System capacity at pressure: 57 tons/hr
 Pipeline energy consumption: 2,93 kW/ton
 System energy consumption: 3,53 kW/ton
 Total energy consumption: 3,53 kW/ton

Booster power: 0 kW
 Compressor power: 237 kW
 Pipeline energy consumption/ton: 2,934 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 466 degr C
 Outlet temperature booster: 0 degr C
 Mixture temperature begin: 56 degr C
 Mixture temperature end: 26 degr C

Table calculation

Begin capacity: 80,9 tons/hr
 Begin pressure: 40000 mmWC
 pressure decrement: 1500 mmWC
 lowest pressure: 10000 mmWC

Kettle capacity > capacity

Calculate system capacity

Calculate table

Back to start menu | Print calculation result | New Calculation

Table calculation

Pressure conveying

Convey distance horizontal: 800 m
 Convey distance vertical: 50 m-up 0 m-down
 Total conveying length: 830 m
 Number of Bends: 7
 Pipe diameter begin: 203 mm
 Pipe diameter end: 203 mm

Pump displacement: 0,683 m³/sec (Screwcompressor)
 Booster displacement: 0 m³/sec
 Gas volume end: 0,7221 m³/sec

Client: Kaufman
 Filepath: c:\vdkf800.txt
 Product: Cement

Two vessel installation

Table

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
4	80,9	57	10,3	>capacity	28,9	4,8	47,6	3,53	114,75	No sedimentation
3,85	80,1	56	10,3	>capacity	28,5	4,9	47,8	3,5	112,64	No sedimentation
3,7	79,3	56	10,3	>capacity	28,1	5,1	48	3,4	110,5	No sedimentation
3,55	78,3	56	10,2	>capacity	27,7	5,2	48,1	3,29	108,33	No sedimentation
3,4	77,4	56	10,2	>capacity	27,2	5,4	48,3	3,19	106,11	No sedimentation
3,25	76,3	55	10,1	>capacity	26,7	5,6	48,5	3,15	103,84	No sedimentation
3,1	75,2	55	10,1	>capacity	26,2	5,8	48,6	3,04	101,54	No sedimentation
2,95	74	55	10	>capacity	25,7	6	48,7	2,94	99,19	No sedimentation
2,8	72,7	54	9,9	>capacity	25,1	6,2	49	2,88	96,79	No sedimentation
2,65	71,3	54	9,8	>capacity	24,6	6,5	49,1	2,78	94,35	No sedimentation
2,5	69,8	53	9,7	>capacity	23,9	6,8	49,3	2,72	91,87	No sedimentation
2,35	68,2	52	9,6	>capacity	23,3	7,1	49,6	2,66	89,34	No sedimentation
2,2	66,4	52	9,4	>capacity	22,6	7,4	49,7	2,54	86,77	No sedimentation
2,05	64,4	51	9,3	>capacity	21,8	7,8	49,8	2,48	84,15	No sedimentation
1,9	62,3	50	9,1	>capacity	21	8,2	50,1	2,41	81,49	No sedimentation
1,75	59,9	48	8,8	>capacity	20,1	8,7	50,3	2,38	78,79	No sedimentation
1,6	57,3	47	8,5	>capacity	19,1	9,2	50,5	2,31	76,06	No sedimentation
1,45	54,3	45	8,2	>capacity	18	9,8	50,7	2,27	73,31	No sedimentation
1,3	50,9	43	7,8	>capacity	16,7	10,4	50,9	2,24	70,57	No sedimentation
1,15	46,9	40	7,3	>capacity	15,3	11,2	51,1	2,25	68,85	No sedimentation
1	42,1	36	6,7	>capacity	13,7	12,1	51,5	2,33	66,11	No sedimentation

Empty pipeline system pressure drop: 5223 mmWC

Back to start menu | Print table | New Calculation

Cement pneumatic conveying pipeline 1000m (Screwfeeder)

Pressure pneumatic conveying calculation Input screen

Client: Kaufman | File path: c:\Vdki 1000.txt | Product: Cement

Gas medium: Air (selected)

Gas pump: Screwcompressor (selected)

Gas Volume: 0,967 m³/sec | Maximum pressure: 3.5 bar

Ambient (Compressor intake): Ambient temperature: 25 deg C | Ambient pressure: 1000 mbar

Temperatures: Cement temperature: 40 deg C | Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties: Cement

Product density: 3100 kg/m³ | Bulk density: 1100 kg/m³ | Particle size: 50 micron | Suspension velocity: 1,8 m/sec | Product loss constant: 0,095 | Product loss factor: 1,4866E-12 | Wall friction factor: 0,5 | Intake pressure drop pressure discharge: 100 mmWC | v-wall / v-susp: 1,75 | Filter resistance factor: 1500000 | Specific heat content: 0,2 kCal/kg/C | product loss factor constant y/n: n

Convey pipeline: Convey length horizontal: 1000 m | Convey length vertical: 50 m-up 0 m-down | Total length: 1050 m | Number of Bends: 8 | Pipe diameter begin: 200 mm | Pipe diameter end: 200 mm

Calculation settings: Predicted capacity: 62,1 tons/hr at 2.5 bar | Set capacity: 56,6 tons/hr | Pressure: 18000 mmWC | Back pressure: 0 mmWC | Set pressure drop: 18000 mmWC

Calculation selection: Pressure fixed -> capacity calculated (selected)

Filter: Filter area: 116,04 m²

Buttons: Back to start menu, Calculate

Calculation Table Pressure Conveying

Client: Kaufman | Filepath: c:\Vdki 1000.txt | Product: Cement

Convey Length horizontal: 1000 m | Convey Length vertical: 50 m | Total Length: 1049 m | Number of Bends: 8

Pump displacement at 2.5 bar(o): 0,967 m³/sec | Volumetric efficiency: 0,88 % | Booster displacement: 0 m³/sec | Rotarylock leakage: 0 m³/sec | Gas displacement at end: 0,9942 m³/sec

Capacity: 56,6 tons/hr | Pressure: 18000 mmWC | Back pressure: 0 mmWC | Pressure drop: 18000 mmWc | Loading ratio: 13,4

Pipeline energy consumption: 3,22 kWh/ton | Compressor power: 182 kW | Conveying energy: 103 kW | Pneumatic conveying efficiency: 56,5 % | Bend losses: 17,4 kW | Material intake loss: 0,42 kW

Re-number * 10⁻⁵: 3,895 | Empty pipeline pressure drop: 8043 mmWc | Empty pipeline filter press. drop: 99 mmWc | Material loss factor: 0,0016 | Lossfactor at end: 1,4866E-12 | Intake pressure drop: 100 mmWc

Table calculation:

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	1	12,52	11,59	420	4,67	0,095	1	1,6	1,6		
2	Pipe	164,8	12,55	12,63	2447	4,99	13,4479	218	7,6	7,4		
3	Bend		13,68	7,47	2448		13,4915	0	0		0,8	0,7
4	Pipe	164,8	13,72	13,75	4639	5,2	25,9586	203	8,8	8,6		
5	Bend		14,83	8,12	4639		25,9988	0	0		0,9	0,9
6	Pipe	164,8	15,14	15,1	6816	5,45	37,3968	185	9,6	9,4		
7	Bend		16,21	8,92	6817		37,4334	0	0		1,1	1,1
8	Pipe	164,8	16,9	16,77	9024	5,74	47,7523	167	10,9	10,5		
9	Bend		17,94	9,9	9024		47,7853	0	0		1,4	1,3
10	Pipe	39,68	17,61	17,44	9792	5,85	50,1003	37	4	3,9		
11	Diameter Transfer		17,61	17,44	9792	0	50,1003	0	0			
12	Pipe	125,1	19,23	18,97	11323	6,1	56,9883	111	8,7	8,4		
13	Bend		20,24	11,19	11324		57,0175	0	0		1,8	1,7
14	Pipe	164,8	22,62	22,13	13816	6,59	65,0255	128	16	15,5		
15	Bend		23,58	12,84	13817		65,0507	0	0		2,5	2,4
16	Pipe	0,01	22,66	13,52	13839	6,69	65,0517	0	0,1	0,1		
17	Diameter Transfer		22,66	13,52	13839		65,0517	0	0			
18	Pipe	50,01	29,76	27,65	17189	7,53	67,1067	32	26,8	26		
19	Bend		30,65	16,32	17190		67,1267	0	0		3,9	3,8
20	Pipe	10,01	31,87	30,41	17911	7,78	67,4767	5	6,8	6,6		
21	Bend		32,68	18,05	17912		67,4949	0	0		4,7	4,5
22												
23												
24												
25												
26												
27												
28												
29												
30												
22	Outlet		32,68	18,05	17912		67,4949		0,6378			
23	Filter	116,0 m ²	0,5	m/min	18000		67,4949		0,8589	87	mmWC	

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

Calculation results pressure conveying

Client: Kaufman
 Filepath: c:\valkd\1000.txt
 Product: Cement

Installation

Convey distance horizontal: 1000 m
 Convey distance vertical: 50 m
 Total conveying length: 1049.9 m
 Number of Bends: 8
 Pipe diameter(s): 200 mm
 Compressor displacement: 0.967 m³/sec
 Booster displacement: 0 m³/sec

Calculation results

Capacity: 56.6 tons/hr
 Pressure: 18000 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 18000 mmWC
 Loading ratio: 13.4
 Empty pipeline pressure: 8043 mmWc
 Residence time: 67.49 seconds
 Re-number * 10⁻⁵: 3.895
 Mixture density: 17.1 kg/m³
 Mass of material in pipeline: 1094.7 kg
 Exit dynamic force: 2.88 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 420 mmWC
 Acceleration excl product resistance: 3295 mmWC
 Product resistance: 3474 mmWC
 Elevation: 973 mmWC
 Suspension: 5128 mmWC
 Gas: 5005 mmWC
 Filter: 87 mmWC

Feeder system

Installation system:
 2-vessel system
 3-vessel system
 Rotary lock feeder
 silo unloading airslides
 Bulk trailer unloading

Vessel factor: tons/hr/bar(a)
 Nominal capacity: tons/hr
 Silo volume: m³
 Silo product volume: 1000 m³
 pipe volume: 32.99 m³
 pressure begin pressurizing: bar
 pressure valve open: bar
 temperature begin pressurizing: C
 temperature after pressurizing: C
 pressurizing time: seconds
 Silo discharge time: 19.4 hrs
 purging time: seconds
 valve time: seconds
 overlaptime: seconds
 cyclertime: seconds
 Number of kettles/hr: -

vessel capacity: tons/hr
 Silo content: 1100 tons
 pipe content: 1094.7 kgs
 Pipeline capacity: 56.6 tons/hr
 System capacity at pressure: 56 tons/hr
 pressure: 1.8 bar
 Pipeline energy consumption: 3.22 kW/ton
 System energy consumption: 3.22 kW/ton
 Feeder energy consumption: 0.7 kW/ton
 Total energy consumption: 3.92 kW/ton

Energy

(Screwcompressor)
 Compressor power: 182 kW
 Booster power: 0 kW
 Pipeline energy consumption/ton: 3.222 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 140 degr C
 Outlet temperature booster: 0 degr C
 Mixture temperature begin: 48 degr C
 Mixture temperature end: 26 degr C

Table calculation

Begin capacity: 56.6 tons/hr
 Begin pressure: 18000 mmWC
 pressure decrement: 400 mmWC
 lowest pressure: 10000 mmWC

Calculate system capacity
 Calculate table

Back to start menu Print calculation result New Calculation

Table calculation

Pressure conveying

Convey distance horizontal: 1000 m
 Convey distance vertical: 50 m-up 0 m-down
 Total conveying length: 1049.9 m
 Number of Bends: 8
 Pipe diameter begin: 200 mm
 Pipe diameter end: 200 mm

Pump displacement: 0.967 m³/sec (Screwcompressor)
 Booster displacement: 0 m³/sec
 Gas volume end: 1.0265 m³/sec

Client: Kaufman
 Filepath: c:\valkd\1000.txt
 Product: Cement

Screwfeeder installation

Table

Pressure bar	pipe line capacity tons/hr	system capacity tons/hr	Silo disch time hrs	Solid Loading Ratio SLR	gas velocity begin m/sec	gas velocity end m/sec	System energy consumption kWh/ton	residence time seconds	Sediment
1.8	56.6	56	19.42	13.4	12.5	32.6	3.92	67.49	No sedimentation
1.76	55.6	55	19.77	13.1	12.7	32.7	3.91	66.7	No sedimentation
1.72	54.6	54	20.14	12.8	12.9	32.7	3.9	65.91	No sedimentation
1.68	53.5	53	20.54	12.6	13.1	32.7	3.9	65.11	No sedimentation
1.64	52.4	52	20.98	12.3	13.3	32.7	3.9	64.31	No sedimentation
1.6	51.2	51	21.45	12	13.5	32.7	3.91	63.51	No sedimentation
1.56	50	50	21.97	11.7	13.7	32.8	3.91	62.69	No sedimentation
1.52	48.7	48	22.55	11.4	13.9	32.8	3.93	61.88	No sedimentation
1.48	47.4	47	23.19	11	14.2	32.8	3.94	61.06	No sedimentation
1.44	46	46	23.91	10.7	14.4	32.8	3.97	60.23	No sedimentation
1.4	44.4	44	24.72	10.3	14.7	32.8	4.02	59.4	No sedimentation
1.36	42.8	42	25.64	9.9	14.9	32.8	4.06	58.57	No sedimentation
1.32	41.1	41	26.7	9.5	15.2	32.8	4.13	57.73	No sedimentation
1.28	39.3	39	27.94	9.1	15.5	32.9	4.2	56.88	No sedimentation
1.24	37.4	37	29.4	8.6	15.8	32.9	4.3	56.03	No sedimentation
1.2	35.2	35	31.16	8.1	16.1	32.9	4.45	55.17	No sedimentation
1.16	33	33	33.32	7.6	16.4	32.9	4.61	54.3	No sedimentation
1.12	30.5	30	36.03	7	16.7	32.9	4.84	53.43	No sedimentation
1.08	27.8	27	39.51	6.3	17.1	32.9	5.16	52.55	No sedimentation
1.04	24.9	24	44.16	5.7	17.4	32.8	5.58	51.67	No sedimentation
1	21.7	21	50.58	4.9	17.8	32.8	6.2	50.79	No sedimentation

Empty pipeline system pressure drop: 8041 mmWC

Back to start menu Print table New Calculation

Cement pneumatic conveying pipeline 800m (Screwfeeder)

Pressure pneumatic conveying calculation Input screen

Client: Kaufman | File path: c:\Vdkf800.txt | Product: Cement

Gas medium: Air (selected)

Gas pump: Screwcompressor (selected)

Gas Volume: 0,683 m³/sec | **Maximum pressure:** 3.5 bar

Ambient (Compressor intake): Ambient temperature: 25 deg C | Ambient pressure: 1000 mbar

Temperatures: Cement temperature: 40 deg C | Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties (Cement): Product density: 3100 kg/m³ | Bulk density: 1100 kg/m³ | Particle size: 50 micron | Suspension velocity: 1,8 m/sec | Product loss constant: 0,095 | Product loss factor: 1,4866E-12 | Wall friction factor: 0,5 | Intake pressure drop pressure discharge: 100 mmWC | v-wall / v-susp: 1,75 | Filter resistance factor: 1500000 | Specific heat content: 0,2 kCal/kg/C | product loss factor constant y/n: n

Convey pipeline: Convey length horizontal: 800 m | Convey length vertical: 50 m-up 0 m-down | Total length: 830 m | Number of Bends: 7 | Pipe diameter begin: 203 mm | Pipe diameter end: 203 mm

Calculation settings: Predicted capacity: 68,5 tons/hr at 2.5 bar | Set capacity: 61 tons/hr | Pressure: 18000 mmWC | Back pressure: 0 mmWC | Set pressure drop: 18000 mmWC

Calculation selection: Pressure fixed -> capacity calculated (selected)

Filter: Filter area: 81,96 m²

Buttons: Back to start menu, Calculate

Calculation Table Pressure Conveying

Client: Kaufman | Filepath: c:\Vdkf800.txt | Product: Cement

Convey Length horizontal: 800 m | Convey Length vertical: 30 m | Total Length: 830 m | Number of Bends: 7

Pump displacement at 2.5 bar(o): 0,683 m³/sec | Capacity: 60,8 tons/hr | Pressure: 18000 mmWC | Back pressure: 0 mmWC | Pressure drop: 18000 mmWC | Loading ratio: 20,4

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	mass kg	kW	% kW	Bend loss kW	Sediment % kW
1	Intake	1	8,54	7,99	339	3,15	0,138	2	0,9	1,2		
2	Pipe	157,8	8,98	9,05	3342	3,43	18,3069	324	8,1	11,1		
3	Bend		21,15	0,89	3344		19,1291	28	0		0,6	0,9
4	Pipe	157,8	10,2	10,19	6310	3,64	35,4982	290	8,9	12,2		
5	Bend		23,88	0,88	6312		36,336	29	0		0,8	1,1
6	Pipe	157,8	11,7	11,58	9085	3,87	50,7979	255	9,5	13		
7	Bend		27,23	0,87	9088		51,6507	29	0		1,1	1,5
8	Pipe	78,93	12,72	12,51	10602	4,02	58,1717	114	5,8	7,9		
9	Diameter Transfer			12,51	10602		58,1717	0	0			
10	Pipe	78,87	13,65	13,36	11781	4,16	64,2737	107	4,9	6,6		12,72
11	Bend		31,58	0,87	11784		65,1409	29	0		1,5	2
12	Pipe	157,8	16,44	15,88	14533	4,54	75,91	188	12,9	17,7		
13	Bend		37,83	0,86	14535		76,2572	9	0		2,1	2,8
14	Pipe	0	16,57	7,93	14638	4,93	76,2582	0	0,5	0,7		
15	Diameter Transfer		16,57	7,93	14638		76,2582	0	0			
16	Pipe	30	20,51	18,58	17182	5,04	78,0412	30	14,7	20,1		
17	Bend		47,04	0,86	17186		78,74	17	0		2,9	3,9
18	Pipe	10,01	21,98	20,7	17909	5,21	79,254	8	4,8	6,6		
19	Bend		50,28	0,86	17912		79,6992	10	0		3,6	4,9
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
20	Outlet		50,28	0,86	17912		79,6992		1,0644			
21	Filter	81,96 m ²	0,5	m/min	18000		79,6992		0,6046	87	mmWC	

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

Calculation results pressure conveying

Client: Kaufman
 Filepath: c:\valkf800.txt
 Product: Cement

Installation

Convey distance horizontal: 800 m
 Convey distance vertical: 30 m
 Total conveying length: 830 m
 Number of Bends: 7
 Pipe diameter(s): 203 mm
 Compressor displacement: 0,683 m³/sec
 Booster displacement: 0 m³/sec

Calculation results

Capacity: 60,8 tons/hr
 Pressure: 18000 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 18000 mmWC
 Loading ratio: 20,4
 Empty pipeline pressure: 5272 mmWc
 Residence time: 79,69 seconds
 Re-number * 10⁻⁵: 2,708
 Mixture density: 25,4 kg/m³
 Mass of material in pipeline: 1477,1 kg
 Exit dynamic force: 10,42 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 339 mmWC
 Acceleration excl product resistance: 2899 mmWC
 Product resistance: 4666 mmWC
 Elevation: 772 mmWC
 Suspension: 7578 mmWC
 Gas: 2049 mmWC
 Filter: 87 mmWC

Feeder system

Installation system:
 2-vessel system
 3-vessel system
 Rotary lock feeder
 silo unloading airslides
 screw feeder
 Bulk trailer unloading

Vessel factor: tons/hr/bar(a)
 Nominal capacity: tons/hr
 Silo volume: m³
 Silo product volume: 1000 m³
 pipe volume: 26,86 m³
 pressure begin pressurizing: bar
 pressure valve open: bar
 temperature begin pressurizing: C
 temperature after pressurizing: C
 pressurizing time: seconds
 Silo discharge time: 18 hrs
 purging time: seconds
 valve time: seconds
 overlap time: seconds
 cycletime: seconds
 Number of kettles/hr: -

vessel capacity: tons/hr
 Silo content: 1100 tons
 pipe content: 1477,1 kgs
 Pipeline capacity: 60,8 tons/hr
 System capacity at pressure: 60 tons/hr
 pressure: 1,8 bar
 Pipeline energy consumption: 2,12 kW/ton
 System energy consumption: 2,12 kW/ton
 Feeder energy consumption: 0,7 kW/ton
 Total energy consumption: 2,82 kW/ton

Energy

(Screwcompressor)
 Compressor power: 129 kW
 Booster power: 0 kW
 Pipeline energy consumption/ton: 2,125 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 136 degr C
 Outlet temperature booster: 0 degr C
 Mixture temperature begin: 45 degr C
 Mixture temperature end: 25 degr C

Table calculation

Begin capacity: 60,8 tons/hr
 Begin pressure: 18000 mmWC
 pressure decrement: 500 mmWC
 lowest pressure: 8000 mmWC

Calculate system capacity
 Calculate table

Back to start menu Print calculation result New Calculation

Table calculation

Pressure conveying

Convey distance horizontal: 800 m
 Convey distance vertical: 50 m-up 0 m-down
 Total conveying length: 830 m
 Number of Bends: 7
 Pipe diameter begin: 203 mm
 Pipe diameter end: 203 mm

Pump displacement: 0,683 m³/sec (Screwcompressor)
 Booster displacement: 0 m³/sec
 Gas volume end: 0,7288 m³/sec

Client: Kaufman
 Filepath: c:\valkf800.txt
 Product: Cement

Screwfeeder installation

Pressure bar	pipe line capacity tons/hr	system capacity tons/hr	Silo disch time hrs	Solid Loading Ratio SLR	gas velocity begin m/sec	gas velocity end m/sec	System energy consumption kWh/ton	residence time seconds	Sediment
1,8	60,8	60	18,08	20,4	8,5	50,2	2,82	79,69	No sedimentation
1,75	59,9	59	18,33	20,1	8,7	50,3	2,79	78,79	No sedimentation
1,7	59,1	59	18,59	19,7	8,8	50,4	2,76	77,89	No sedimentation
1,65	58,2	58	18,87	19,4	9	50,5	2,73	76,97	No sedimentation
1,6	57,3	57	19,17	19,1	9,2	50,5	2,7	76,06	No sedimentation
1,55	56,4	56	19,5	18,7	9,4	50,6	2,67	75,15	No sedimentation
1,5	55,4	55	19,85	18,3	9,6	50,7	2,65	74,23	No sedimentation
1,45	54,3	54	20,23	18	9,8	50,7	2,62	73,31	No sedimentation
1,4	53,2	53	20,64	17,6	10	50,7	2,6	72,4	No sedimentation
1,35	52,1	52	21,09	17,2	10,2	50,8	2,58	71,48	No sedimentation
1,3	50,9	50	21,58	16,7	10,4	50,9	2,56	70,57	No sedimentation
1,25	49,6	49	22,13	16,3	10,7	51,1	2,54	69,67	No sedimentation
1,2	48,3	48	22,74	15,8	10,9	51,1	2,53	68,79	No sedimentation
1,15	46,9	46	23,43	15,3	11,2	51,1	2,52	68,85	No sedimentation
1,1	45,4	45	24,2	14,8	11,5	51,2	2,51	67,92	No sedimentation
1,05	43,8	43	25,08	14,2	11,8	51,3	2,51	67	No sedimentation
1	42,1	42	26,1	13,7	12,1	51,5	2,52	66,11	No sedimentation
0,95	40,2	40	27,29	13	12,4	51,5	2,54	65,24	No sedimentation
0,9	38,3	38	28,71	12,4	12,8	51,5	2,56	64,4	No sedimentation
0,85	36,1	36	30,43	11,6	13,1	51,6	2,61	63,63	No sedimentation
0,8	33,7	33	32,56	10,8	13,5	51,7	2,68	62,93	No sedimentation

Empty pipeline system pressure drop: 5207 mmWC

Back to start menu Print table New Calculation