

Pneumatic conveying installation file: dkf400

INPUT

Pressure pneumatic conveying calculation Input screen

Client: Mike Kaufman File path: c:\Vdk400.txt Product: Cement

Gas medium
 Air
 Nitrogen

Gas pump
 Screwcompressor
 Predefined screwcompressor
 Blower data
 Predefined blower
 Constant mas pump (sonic choke/turbo)
 Centrifugal fan
 Gas mass: 1.184 kg/sec

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 deg C Altitude: 0 m
 Ambient pressure: 1000 mbar Altitude pressure: 1013 mbar

Temperatures
 Cement temperature: 105 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 distance horizontal: 370 m
 Convey distance vertical: 30 m-up 0 m-down
 Convey distance slope: 0 m-up 0 m-down
 Total conveying length: 400 m
 Number of Bends: 7
 Pipe diameter begin: 200 mm
 Pipe diameter end: 200 mm

Calculation settings
 Predicted capacity: 88 tons/hr at 2.5 bar
 Set capacity: 110.3 tons/hr
 Pressure: 25000 mmWC
 Back pressure: 0 mmWC
 Set pressure drop: 25000 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

Filter area: 50 m2

Buttons: Back to start menu, Calculate

Calculation Table Pressure Conveying

Client: Mike Kaufman Filepath: c:\Vdk400.txt Product: Cement

Convey distance horizontal: 370 m
 Convey distance vertical: 30 m
 Total conveying length: 400 m
 Number of Bends: 7
 Pump displacement at 2.5 bar(p): 0.9995 m3/sec
 Volumetric efficiency: 100 %
 Booster displacement: 0 m3/sec
 Rotarylock leakage: 0 m3/sec
 Gas displacement at end: 1.0079 m3/sec
 Capacity: 110.3 tons/hr
 Pressure: 25000 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 25000 mmWC
 Loading ratio: 25.8
 Pipeline energy consumption: 2.17 kWh/ton
 Compressor power: 239 kW
 Conveying energy: 128.5 kW
 Pneumatic conveying efficiency: 53.6 %
 Bend losses: 25.1 kW
 Material intake loss: 0.34 kW
 Re-number * 10⁻⁵: 3.918
 Empty pipeline pressure drop: 5722 mmWC
 Empty pipeline filter press. drop: 479 mmWC
 Material loss factor: 0.012
 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	11.69	9.26	717	4.04	0.116	3	2.4	1.9		
2	Pipe	2	11.85	11.61	1355	4.98	0.292	5	2.2	1.7		
3	Bend		14.34	6.87	1356		0.3397	1	0		1.3	1
4	Pipe	150	11.27	11.39	6056	4.82	13.7217	444	16.2	12.6		
5	Bend		14.14	6.73	6057		13.7701	1	0		1.2	1
6	Pipe	168.0	15.15	14.87	13088	5.58	26.6012	421	28	21.8		
7	Bend		17.36	8.78	13089		26.6384	1	0		2.2	1.7
8	Pipe	22.01	16.33	15.9	14665	5.77	28.0614	46	7.4	5.8		
9	Bend		18.54	9.1	14666		28.0966	1	0		2.6	2
10	Pipe	27.01	22.37	20.56	20119	6.67	29.6096	48	31.3	24.4		
11	Bend		24.35	12.13	20120		29.6366	0	0		4.2	3.2
12	Pipe	10.01	25	23.23	21679	7.01	30.0896	14	11.1	8.6		
13	Bend		26.8	13.71	21680		30.1134	0	0		5.3	4.1
14	Pipe	20.01	31.81	28.57	24513	7.85	30.8844	24	24	18.7		
15	Bend		33.37	16.97	24515		30.9038	0	0		8	6.2
16										0.5		
17										3.6		
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
16	Outlet		33.37	16.97	24515		30.9038		0.6709	0.5		
17	Filter 50	m2	1.1	m/min	25000		30.9038		4.6610	3.6	dp = 484	mmWC

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

Double tank installation

Calculation results pressure conveying

Client: Mike Kaufman
 Filepath: c:\Valk400.txt
 Product: Cement

Installation

Convey distance horizontal: 370 m
 Convey distance vertical: 30 m
 Total conveying length: 400 m
 Number of Bends: 7
 Pipe diameter(s): 200 mm
 Compressor displacement: 0.999 m3/sec
 Booster displacement: 0 m3/sec

Calculation results

Capacity: 110.3 tons/hr
 Pressure: 25000 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 25000 mmWc
 Loading ratio: 25.8
 Empty pipeline pressure: 3777 mmWc
 Residence time: 30.9 seconds
 Re-number * 10⁻⁵: 3.918
 Mixture density: 31.9 kg/m³
 Mass of material in pipeline: 1018 kg
 Exit dynamic force: 5.58 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 717 mmWC
 Acceleration excl product resistance: 5329 mmWC
 Product resistance: 13984 mmWC
 Elevation: 1688 mmWC
 Suspension: 1838 mmWC
 Gas: 1644 mmWC
 Filter: 484 mmWC

Energy

(Screwcompressor)
 Compressor power: 239 kW
 No booster
 Pipeline energy consumption/Ton: 2.171 kWh/Ton

Temperatures

Ambient temperature: 25 deg C
 Outlet temperature compressor: -273 deg C
 No booster
 Material temperature: 105 deg C
 Mixture temperature begin: 88 deg C
 Mixture temperature end: 27 deg C

Table calculation

Begin capacity: 110.3 tons/hr
 Begin pressure: 25000 mmWc
 lowest pressure: 5000 mmWc
 pressure decrement: 1000 mmWc

Feeder system

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

Vessel factor: 1000 tons/hr/bar(s) vessel capacity: 285.7 tons/hr
 Nominal capacity: 110 tons/hr Vessel content: 5.5 tons
 Vessel volume: 6.3 m³ Vessel product volume: 5 m³
 pipevolume: 12.71 m³ pipe content: 1018 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: 110.3 tons/hr
 System capacity at pressure: 92 tons/hr
 Pipeline energy consumption: 2.17 kWh/Ton
 System energy consumption: 2.37 kWh/Ton
 Total energy consumption: 2.37 kWh/Ton

pressurizing time: 10 seconds
 Discharging time: 179.4 seconds
 purging time: 23.1 seconds
 valve time: 2 seconds
 overlap time: seconds
 cycle time: 214.6 seconds
 Number of kettles/hr: 16.7

Kettle capacity > capacity Calculate system capacity

Back to start menu Print calculation result New Calculation

Table calculation

Pressure conveying

Client: Mike Kaufman
 Filepath: c:\Valk400.txt
 Product: Cement

Convey distance horizontal: 370 m
 Convey distance vertical: 30 m-up 0 m-down
 Total conveying length: 400 m
 Number of Bends: 7
 Pipe diameter begin: 200 mm
 Pipe diameter end: 200 mm

Mass displ. pump: 1,184 kg/sec (Sonoc choke/Turbo)
 Booster displacement: 0 m3/sec
 Gas volume end: 1,0008 m3/sec

Two vessel installation

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
2.5	110.3	92	16.7	25.8	11.6	33.3	2.37	30.9	No sedimentation
2.4	108	90	16.5	25.3	11.9	33.2	2.43	30.26	No sedimentation
2.3	105.6	89	16.2	24.7	12.3	33.2	2.47	29.62	No sedimentation
2.2	103.1	87	15.9	24.2	12.6	33.1	2.53	28.97	No sedimentation
2.1	100.6	86	15.6	23.6	12.9	33	2.57	28.31	No sedimentation
2	97.9	84	15.3	22.9	13.3	32.9	2.64	27.65	No sedimentation
1.9	95.2	82	14.9	22.3	13.7	32.8	2.71	26.98	No sedimentation
1.8	92.3	80	14.6	21.6	14.2	32.7	2.78	26.31	No sedimentation
1.7	89.3	78	14.2	20.9	14.6	32.6	2.86	25.63	No sedimentation
1.6	86.1	76	13.8	20.2	15.1	32.5	2.95	24.94	No sedimentation
1.5	82.8	73	13.3	19.4	15.6	32.4	3.08	24.25	No sedimentation
1.4	79.3	70	12.8	18.6	16.2	32.3	3.22	23.54	No sedimentation
1.3	75.5	67	12.3	17.7	16.8	32.2	3.38	22.83	No sedimentation
1.2	71.3	64	11.7	16.7	17.5	32.1	3.55	22.12	No sedimentation
1.1	66.8	61	11.1	15.6	18.2	32	3.74	21.4	No sedimentation
1	61.8	56	10.3	14.5	18.9	31.8	4.09	20.67	No sedimentation
0.9	56.1	52	9.4	13.1	19.6	31.7	4.43	19.93	No sedimentation
0.8	49.5	46	8.4	11.6	20.4	31.5	5.03	19.18	No sedimentation
0.7	41.4	39	7.1	9.7	21	31.3	5.97	18.43	No sedimentation
0.6	31.4	30	5.4	7.3	21.1	31	7.81	17.68	No sedimentation
0.5	18.8	18	3.3	4.4	19.7	30.8	13.14	16.94	No sedimentation

Empty pipeline system pressure drop: 3771 mmWC

Back to start menu Print table New Calculation

Screwfeeder

Pressure pneumatic conveying calculation Input screen

Client: Mike Kaufman | File path: c:\Vdkf400.txt | Product: Cement

Gas medium
 Air
 Nitrogen

Gas pump
 Screwcompressor
 Predefined screwcompressor
 Blower data
 Predefined blower
 Constant mas pump (sonic choke/turbo)
 Centrifugal fan
 Gas mass: 1,184 kg/sec

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
 Accept

Temperatures
 Cement temperature: 105 degr C
 Screwcompressor air cooling: degr C
 Booster air cooling: degr 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: n
 Change product

Filter
 Filter area: 50 m2

Convey pipeline
 Convey distance horizontal: 370 m
 Convey distance vertical: 30 m-up 0 m-down
 Convey distance slope: 0 m-up 0 m-down
 Total conveying length: 400 m
 Number of Bends: 7
 Pipe diameter begin: 200 mm
 Pipe diameter end: 200 mm

Calculation settings
 Predicted capacity: 88 tons/hr at 2.5 bar
 Set capacity: 110,3 tons/hr
 Pressure: 25000 mmWC
 Back pressure: 0 mmWC
 Set pressure drop: 25000 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

Back to start menu

Calculation Table Pressure Conveying

Client: Mike Kaufman | Filepath: c:\Vdkf400.txt | Product: Cement

Convey distance horizontal: 370 m
 Convey distance vertical: 30 m
 Total conveying length: 400 m
 Number of Bends: 7
 Pump displacement at 2.5 bar(p): 0,9995 m3/sec
 Volumetric efficiency: 100 %
 Booster displacement: 0 m3/sec
 Rotarylock leakage: 0 m3/sec
 Gas displacement at end: 1,0079 m3/sec
 Capacity: 110,3 tons/hr
 Pressure: 25000 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 25000 mmWC
 Loading ratio: 25,8
 Pipeline energy consumption: 2,17 kWh/Ton
 Compressor power: 239 kW
 Conveying energy: 128,5 kW
 Pneumatic conveying efficiency: 53,6 %
 Bend losses: 25,1 kW
 Material intake loss: 0,34 kW
 Re-number * 10⁵: 3,918
 Empty pipeline pressure drop: 8777 mmWC
 Empty pipeline filter press. drop: 479 mmWC
 Material loss factor: 0,012
 Lossfactor at end: 1,4866E-12
 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	Bend loss kW	Sediment % kW
1	Intake	1	11,69	9,26	717	4,04	0,116	3	2,4	1,9		
2	Pipe	2	11,85	11,61	1355	4,98	0,292	5	2,2	1,7		
3	Bend		14,34	6,87	1356		0,3397	1	0		1,3	1
4	Pipe	150	11,27	11,39	6056	4,82	13,7217	444	16,2	12,6		
5	Bend		14,14	6,73	6057		13,7701	1	0		1,2	1
6	Pipe	168,0	15,15	14,87	13088	5,58	26,6012	421	28	21,8		
7	Bend		17,36	8,78	13089		26,6384	1	0		2,2	1,7
8	Pipe	22,01	16,33	15,9	14665	5,77	28,0614	46	7,4	5,8		
9	Bend		18,54	9,1	14666		28,0966	1	0		2,6	2
10	Pipe	27,01	22,37	20,56	20119	6,67	29,6096	48	31,3	24,4		
11	Bend		24,35	12,13	20120		29,6366	0	0		4,2	3,2
12	Pipe	10,01	25	23,23	21679	7,01	30,0896	14	11,1	8,6		
13	Bend		26,8	13,71	21680		30,1134	0	0		5,3	4,1
14	Pipe	20,01	31,81	28,57	24513	7,85	30,8844	24	24	18,7		
15	Bend		33,37	16,97	24515		30,9038	0	0		8	6,2
16											0,5	
17											3,6	
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
16	Outlet		33,37	16,97	24515		30,9038		0,6709	0,5		
17	Filter	50 m2	1,1	m/min	25000		30,9038		4,6610	3,6	dp = 484	mmWC

Back to start menu | Print calculation | Change product | New Calculation | Calculation results

Calculation results pressure conveying

Client: Mike Kaufman
 Filepath: c:\V\d\k400.txt
 Product: Cement

Installation

Convey distance horizontal: 370 m
 Convey distance vertical: 30 m
 Total conveying length: 400 m
 Number of Bends: 7
 Pipe diameter(s): 200 mm
 Compressor displacement: 0.999 m3/sec
 Booster displacement: 0 m3/sec

Calculation results

Capacity: 110.3 tons/hr
 Pressure: 25000 mmWC
 Booster pressure: 0 mmWC
 Back pressure: 0 mmWC
 Pressure drop: 25000 mmWC
 Loading ratio: 25.8
 Empty pipeline pressure: 3777 mmWC
 Residence time: 30.9 seconds
 Re-number * 10⁵: 3.918
 Mixture density: 31.9 kg/m³
 Mass of material in pipeline: 1018 kg
 Exit dynamic force: 5.58 kN

Pressure drops

Product intake: 100 mmWC
 Nozzle: 717 mmWC
 Acceleration excl product resistance: 5329 mmWC
 Product resistance: 13984 mmWC
 Elevation: 1688 mmWC
 Suspension: 1838 mmWC
 Gas: 1644 mmWC
 Filter: 484 mmWC

Energy

(Screwcompressor)
 Compressor power: 239 kW
 No booster
 Pipeline energy consumption/ton: 2.171 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: -273 degr C
 No booster
 Material temperature: 105 degr C
 Mixture temperature begin: 88 degr C
 Mixture temperature end: 27 degr C

Table calculation

Begin capacity: 110.3 tons/hr
 Begin pressure: 25000 mmWC
 lowest pressure: 5000 mmWC
 pressure decrement: 1000 mmWC

Calculate system capacity Calculate table

Back to start menu Print calculation result New Calculation

Table calculation

Client: Mike Kaufman
 Filepath: c:\V\d\k400.txt
 Product: Cement

Convey distance horizontal: 370 m
 Convey distance vertical: 30 m-up 0 m-down
 Total conveying length: 400 m
 Number of Bends: 7
 Pipe diameter begin: 200 mm
 Pipe diameter end: 200 mm

Mass displ. pump: 1.184 kg/sec (Sonoc choke/turbo)
 Booster displacement: 0 m3/sec
 Gas volume end: 1.0008 m3/sec

Screwfeeder installation

Pressure bar	pipe line capacity tons/hr	system capacity tons/hr	Silo 1100 tons hrs	Solid Loading Ratio SLR	gas velocity begin m/sec	gas velocity end m/sec	System energy consumption kWh/ton	residence time seconds	Sediment
2.5	110.3	110	9.96	25.8	11.6	33.3	3.14	30.9	No sedimentation
2.4	108	108	10.18	25.3	11.9	33.2	3.15	30.26	No sedimentation
2.3	105.6	105	10.41	24.7	12.3	33.2	3.16	29.62	No sedimentation
2.2	103.1	103	10.66	24.2	12.6	33.1	3.17	28.97	No sedimentation
2.1	100.6	100	10.93	23.6	12.9	33	3.19	28.31	No sedimentation
2	97.9	97	11.22	22.9	13.3	32.9	3.22	27.65	No sedimentation
1.9	95.2	95	11.55	22.3	13.7	32.8	3.25	26.98	No sedimentation
1.8	92.3	92	11.91	21.6	14.2	32.7	3.29	26.31	No sedimentation
1.7	89.3	89	12.31	20.9	14.6	32.6	3.34	25.63	No sedimentation
1.6	86.1	86	12.76	20.2	15.1	32.5	3.4	24.94	No sedimentation
1.5	82.8	82	13.27	19.4	15.6	32.4	3.47	24.25	No sedimentation
1.4	79.3	79	13.87	18.6	16.2	32.3	3.56	23.54	No sedimentation
1.3	75.5	75	14.56	17.7	16.8	32.2	3.67	22.83	No sedimentation
1.2	71.3	71	15.4	16.7	17.5	32.1	3.82	22.12	No sedimentation
1.1	66.8	66	16.44	15.6	18.2	32	4.01	21.4	No sedimentation
1	61.8	61	17.77	14.5	18.9	31.8	4.26	20.67	No sedimentation
0.9	56.1	56	19.57	13.1	19.6	31.7	4.62	19.93	No sedimentation
0.8	49.5	49	22.2	11.6	20.4	31.5	5.15	19.18	No sedimentation
0.7	41.4	41	26.51	9.7	21	31.3	6.05	18.43	No sedimentation
0.6	31.4	31	34.99	7.3	21.1	31	7.86	17.68	No sedimentation
0.5	18.8	18	58.26	4.4	19.7	30.8	12.93	16.94	No sedimentation

Empty pipeline system pressure drop: 3771 mmWC

Back to start menu Print table New Calculation