

Sand conveying

Pressure pneumatic conveying calculation Input screen

Client: Forum File path: c:\Vdjs.txt Product: Sand

Gas medium: Air Nitrogen Oxygen

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

Maximum compressor pressure: 3,5 bar
Maximum conveying pressure: mmWC
Compr. displ.: 0,1 m3/sec

Booster: Installed Screwcompressor Predefined screwcompressor Blower data Predefined blower
Compr. displ.: m3/sec

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

Eductor feeder: No

Ambient (Compressor intake):
Ambient temperature: 25 degr C Altitude: 0 m
Intake temperature: 25 degr C Altitude pressure: 1013 mbar
Ambient pressure: 1000 mbar 1 bar
Relative Humidity: 80 %
 Override RH air density calculation for >373 degrC and >220 bar

Temperatures:
Sand temperature: 40 degr C Pressure dewpoint:
 Compressor gas cooling degr C Dryer degr C
 Booster gas cooling degr C Dryer degr C
Heat transmission factor pipewall: 0,1 kCal/sec/degC/m2

Material properties:
Sand particle density: 2400 kg/m3
Bulk density: 610 kg/m3
Particle size <mesh >: 250 micron
Suspension velocity: 3,52 m/sec
Product loss constant: 1,6962567E-09
Wall friction factor: 0,5
Material intake pressure drop: 100 mmWC
v-wall / v-susp: 1,2
Filter resistance factor: 1500000
Specific heat content: 0,2 kCal/kg/C
 product loss factor constant y/n

Filter:
Filter area: 15 m2 Filter exhaust fan

Convey pipeline:
Convey distance horizontal: 4 m
Convey distance vertical: 26 m-up 0 m-down
Convey distance slope: 0 m-up 0 m-down
Total conveying length: 30 m
Number of Bends: 2
Pipe diameter: begin 102 mm end 102 mm
Guessed air only pressure drop: mmWC
Re-/Calculate empty pipeline pressure: mmWC

Calculation settings:
Set capacity: 12 tons/hr
Conveying pressure: 20000 mmWC 2 bar
Back pressure: 0 mmWC 0 bar
Set pressure drop: 20000 mmWC 2 bar
Calculate intake gas pressure drop: Yes
Time domain dt: 0,001 seconds Default

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:\Vdjs.txt Product: Sand

Convey distance horizontal: 4 m
Convey distance vertical: 26 m
Total conveying length: 30 m
Number of Bends: 2
Compr. displ. 2 bar: 0,101 m3/sec
Volumetric efficiency: 91,6 %
Booster displacement: 0 m3/sec
Rotarylock leakage: 0 m3/sec
Gas displacement at end: 0,102 m3/sec

Capacity: 12 tons/hr at 20000 mmWC 2 bar
Back pressure: 0 mmWC 0 bar
Pressure drop: 20000 mmWC 2 bar
Loading ratio: 27,8

Pipeline energy consumption: 1,87 kWh/ton
Compressor power: 22 kW
Conveying energy: 11,4 kW
Pneumatic conveying efficiency: 50,8 %
Bend losses: 0 kW Material intake loss: 0,04 kW

Re-number: 0,776 * 10⁵
Empty pipeline pressure drop: 215 mmWC
Empty pipeline filter press. drop: 66 mmWC
Material loss factor constant: 1,2153
Material Loss factor: 1,6962567E-0
Material intake pressure drop: 100 mmWC

Progress: Filter Iteration

Part	Part description	Length(m)	v-gas m/sec	v-product m/sec	Pressure drop mmWC	Pressure bar	v-wall/v-susp	residence time	mass kg	temperature degC	kW	% kW	Bend loss kW	% kW	Sediment	RH%
1	Intake 102 hor	1	4,58	1,71	388	1,96	0,82	0,6056	1	45	0,1	1,2				75
2	Pipe 102 hor	1	8,25	2,62	1064	1,47	0,9886	1	44	0,2	2,1					78
3	Bend		13,93	1,58	1064	1,89	1,017	0	44	0	0	0	0			
4	Pipe 102 up	26	14,79	3,43	19267		1,64	10,94	21	28	10,2	90,1				70
5	Bend		26,97	1,78	19268	0,07		11,0305	0	28	0	0	0	0,1		
6	Pipe 102 hor	2	15	3,82	19942	0	1,61	11,5615	0	27	0,6	5,7				67
7	Outlet		15	3,82	19942	0		11,5615		27	0,0135	0,1				67
8	After Filter	15	0,4	m/min	20000	-0,01		11,5615			0,0583	0,5	dp = 57			67

Buttons: Back to start menu, Print calculation, Change product, New Calculation, Calculation results, No condensation

Calculation results pressure conveying

Client: Forum
 Filepath: c:\vdjs.txt
 Product: Sand

Installation

Convey distance horizontal: 4 m
 Convey distance vertical: 26 m
 Total conveying length: 30 m
 Number of Bends: 2
 Pipe diameter(s): 102 mm

Compressor displacement: 0.1 m³/sec
 Booster displacement: 0 m³/sec
 Total gas displacement: 0.1 m³/sec

Calculation results

Capacity: 12 tons/hr
 Pressure: 20000 mmWC 2 bar
 Booster pressure: 0 mmWC 0 bar
 Back pressure: 0 mmWC 0 bar
 Pressure drop: 20000 mmWC 2 bar
 Loading ratio: 27.8
 Volumetric loading ratio: 0.1019 to 0.0536
 Empty pipeline pressure: 215 mmWc
 Residence time: 11.56 seconds
 Re-number * 10⁻⁵: 0.776
 Mixture density: 34.1 kg/m³
 Mass of material in pipeline: 26.5 kg
 Exit dynamic force: 0.31 kN

Pressure drops

Product intake: 100 mmWC 0.4 %
 Nozzle (total dp): 388 mmWC 1.9 %
 Acceleration excl product dp: 80 mmWC 0.4 %
 Product resistance: 9155 mmWC 45.7 %
 Elevation: 1588 mmWC 7.9 %
 Suspension: 8947 mmWC 44.7 %
 Gas: 83 mmWC 0.4 %
 Filter: 57 mmWC 0.2 %

Energy (Screwcompressor)

Compressor power: 22 kW
 Mechanical efficiency: 90 %

No booster
 Product loss energy pipes -> heat: 0.435 kW/ton
 Product loss energy bends -> heat: 0.001 kW/ton
 Pipeline energy consumption/ton: 1.872 kW/ton

Temperatures

Ambient temperature: 25 degr C
 Outlet temperature compressor: 175 degr C
 Outlet temperature eductor: degr C

No booster
 Material temperature: 40 degr C
 Mixture temperature begin: 45 degr C
 Mixture temperature end: 27 degr C

Table calculation

Begin capacity: 12 tons/hr
 Begin pressure: 20000 mmWc
 lowest pressure: 2500 mmWc
 pressure decrement: 875 mmWc

Feeder system
 Installation system:
 1-vessel system
 2-vessel system
 3-vessel system
 Bulk trailer unloading

Vessel factor: 1000 tons/hr/m³/bar(a)
 Nominal capacity: 10 tons/hr
 Bulktruck volume: 45 m³
 Bulktruck product volume: 28 m³
 pressure begin pressurizing: -0.05 bar
 pressure valve open: 2.5 bar
 pressure valve close: 0.49 bar
 temperature begin pressurizing: 35 C
 temperature after pressurizing: 60 C
 pressurizing time: 838.3 seconds
 Discharging time: 1.42
 purging time of pipe: 8.7
 valve time: 2 seconds
 filling time: seconds
 cycletime: 1.65 hrs
 Number of bulktrucks/hr: 0.6

vessel capacity: 33.3 tons/hr
 Bulktruck content: 17.07 tons
 pipe volume: 0.23 m³
 pipe content: 26.5 kgs
 Pipeline capacity: 12 tons/hr
 System capacity: 10 tons/hr
 at pressure: 2 bar
 Pipeline energy consumption: 1.87 kWh/ton
 System energy consumption: 2.02 kWh/ton
 Total energy consumption: 2.02 kWh/ton

Calculate system capacity

Back to start menu | Print calculation result | New Calculation

Capacity	12	t/hr
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Air displ	pressure
0,1	20000
0,12	15791
0,15	15047
0,175	14843
0,3	14292
0,4	14335
0,5	14719

