

Pressure pneumatic conveying calculation Input screen

Client: _____ File path: Quick modeling Product: Fly ash Date: 04-08-2011

Gas medium
 Air Nitrogen Oxygen

Gas pump
 Screwcompressor
 Blower
 Compressor data
 Predefined screwcompressor
 Blower data
 1x Blower GM 0255 4800 rpm
 Const. mass pump (sonic choke/Turbo)
 Centrifugal fan Predefined Hybrid blower

Maximum compressor pressure: 1 bar
 Maximum conveying pressure: 10000 mmWC
 Compr. displ.: 0,39 m3/sec < 0,3219 m3/sec
 Compr. displ.: _____ CFM = _____ m3/sec

Boosters
 Installed Screwcompressor
 Predefined screwcompressor
 Blower data
 Predefined blower
 Booster displ.: _____ m3/sec
 Injection point: _____

Rotary lock feeder (RLF) / screw-feeder (SF)
 Rotary Lock Feeder Screw Feeder

Eductor feeder
 Eductor feeder: No

Ambient (Compressor intake)
 Ambient temperature: 25 deg C Altitude: 0 m
 Inlet temperature: 25 deg C Altitude pressure: 1013 mbar
 Inlet pressure drop: 15 mbar 0,015 bar
 Ambient pressure: 1000 mbar 1 bar
 Relative Humidity: 80 %
 Override RH air density calculation for >373 degC and >220 bar

Temperatures
 Fly ash temp.: 40 deg C Pressure dewpoint: _____
 Compressor gas cooling deg C Dryer deg C
 Booster gas cooling deg C Dryer deg C
 Heat transmission factor pipewall: 0,1 kCal/sec/degC/m2

Material properties
 Fly ash particle density: 2270 kg/m3
 Bulk density: 970 kg/m3
 Particle size -mesh: _____ > 100 micron
 Suspension velocity: 2,35 m/sec
 Product loss constant: _____
 Product loss factor: 4,58E-12
 Wall friction factor: 0,5
 Material intake/screwfeeder pressure drop: 0 mmWC
 v-wall / v-susp: 2,1
 Filter resistance factor: 1500000
 Specific heat content: 0,25 kCal/kg/C
 product loss factor constant y/n

Filter
 Filter area: 40 m2 No filter exhaust fan/Filter calculated

Convey pipeline
 Convey distance horizontal: 80 m
 Convey distance vertical: 15 m-up 0 m-down
 Convey distance slope: 0 m-up 0 m-down
 Total conveying length: 95 m
 Number of Bends: 5
 Pipe diameter: begin 154 mm end 154 mm

Guesses
 Guesseed air only pressure drop: _____ mmWC

 Air only pressure with filter: _____ bar
 Volumetric eff.: _____ Gas displacement: _____ m3/sec

Gas supply/vent piping
 Gas supply: Length 0 m, Nu of bends 0, Diameter 0 mm, End pressure 1500 mmWC
 Vent: Length 0 m, Nu of bends 0, Diameter 0 mm, End pressure 1500 mmWC
 Guesseed press. drop: _____ mmWC
 Air press. drop: _____ mmWC
 Air press. drop: _____ bar

 Gas supply piping
 Vent piping
 Calculate Gas supply piping Calculate Vent piping

Calculation settings
 Pressure: _____ psi
 Set capacity: 7,6 tons/hr
 Conveying pressure: 1500 mmWC 0,15 bar
 Back pressure: 0 mmWC 0 bar
 Set pressure drop: 1500 mmWC 0,15 bar Default
 Calc. intake gas press. drop: Yes Time domain dt: 0,001 sec

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

Calculation Table Pressure Conveying

Client: _____ Filepath: Quick modeling Product: Fly ash

Convey distance horizontal: 80 m
 Convey distance vertical: 15 m
 Total conveying length: 95 m
 Number of Bends: 5
 Compr. displ.: 0,15 bar 0,4272 m3/sec
 Volumetric efficiency: 94,86 %
 Booster displacement: 0 m3/sec
 Rotarylock leakage: 0 m3/sec
 Gas displacement at end: 0,4339 m3/sec

Capacity: 7,6 tons/hr at 1500 mmWC 0,15 bar
 Pressure drop: 1500 mmWC 0,15 bar
 Booster pressure: 0 mmWC 0 bar
 Back pressure: 0 mmWC 0 bar
 Empty pipeline pressure drop: 851 mmWC
 Empty pipeline filter press. drop: 148 mmWC
 Loading ratio: 4,28
 Pipeline energy consumption: 1,43 kWh/ton
 Compressor power: 11 kW
 Conveying energy: 6,2 kW
 Pneumatic conveying efficiency: 56,2 %
 Bend losses: 1,7 kW Material intake loss: 0 kW
 Re-number: 2,187 * 10⁵
 Material loss factor constant: 0
 Material Loss factor: 4,58E-12
 Material intake pressure drop: 0 mmWC

Progress: Filter _____ Iteration _____

No condensation

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	kW	% kW	Bend loss kW	Sediment RH%
1	Intake 154 hor	1	21,4	16,23	115	0,1384	3,91	0,085	0	39	0,4	7,3				37
2	Pipe 154 hor	23,01	21,04	20,62	318	0,1181	3,9	1,2329	2	26	0,7	12,7				80
3	Bend		21,28	10,55	319	0,118		1,2567	0	26	0		0,3	5,3		
4	Pipe 154 hor	23	21,41	20,81	567	0,0932	3,93	2,4247	2	25	0,9	15,6				85
5	Bend		21,66	10,64	568	0,0931		2,4483	0	25	0		0,3	5,4		
6	Pipe 154 hor	16,34	21,81	21,03	772	0,0727	3,97	3,2793	1	25	0,8	13,1				84
7	Diameter Transfer		21,81	21,03	772	0,0727		3,2793			0					
8	Pipe 154 hor	6,68	21,91	21,26	822	0,0677	3,98	3,5953	0	25	0,2	3,2				84
9	Bend		22,16	10,67	823	0,0676		3,6186	0	25	0		0,3	5,8		
10	Pipe 154 up	0,01	22,05	10,88	824	0,0675	4	3,6196	0	25	0	0				83
11	Diameter Transfer		22,05	10,88	824	0,0675		3,6196			0					
12	Pipe 154 up	15	22,69	20,13	1184	0,0315	4,05	4,4056	1	24	1,4	23,8				81
13	Bend		22,96	10,31	1185	0,0314		4,43	0	25	0		0,3	5,1		
14	Pipe 154 hor	10,01	23,07	21,85	1355	0,0144	4,08	4,9321	1	24	0,7	11,5				80
15	Bend		23,32	11,36	1355	0,0144		4,9543	0	25	0		0,3	5,9		
16	Outlet		23,2	11,36	1355	0,0144		4,9543		25	0,1373	2,2				79
17	After Filter	40	0,6	m/min	1500	0		4,9543			0,6160	9,8			dp = 144	mmWC 78

Table calculation MM-DD-YY
04-08-2011

Client: Filepath: Quick modeling Product: Fly ash

Convey distance horizontal: 80 m
 Convey distance vertical: 15 m-up m-down
 Total conveying length: 95 m
 Number of Bends: 5
 Altitude: 0 m
 Pipe diameter begin: 154 mm
 Pipe diameter end: 154 mm

Pressure conveying
 Pump displacement: 0,39 m3/sec (Blower 1x GM 025S 4800 rpm)
 Booster displacement: 0 m3/sec
 Gas volume end: 0,4275 m3/sec 0,493 kg/sec at 0,25 bar

Two vessel installation

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	mass in pipeline kg	System energy consumption kWh/ton	residence time seconds	Sediment	Condensation
1	48,3	42,6	21,9	>capacity	29,4	11,3	23,1	112,5	1,1	7,84	No sedimentation	No condensation
0,9625	47,3	41,9	21,5	>capacity	28,7	11,6	23,1	108,2	1,08	7,71	No sedimentation	No condensation
0,925	46,4	41,1	21,2	>capacity	28,1	11,8	23,1	104,1	1,06	7,59	No sedimentation	No condensation
0,8875	45,4	40,4	20,8	>capacity	27,4	12,1	23,1	99,9	1,04	7,46	No sedimentation	No condensation
0,85	44,4	39,6	20,4	>capacity	26,7	12,4	23,1	95,8	1,02	7,33	No sedimentation	No condensation
0,8125	43,3	38,7	19,9	>capacity	26	12,7	23,2	91,6	1,01	7,21	No sedimentation	No condensation
0,775	42,2	37,9	19,5	>capacity	25,2	13	23,2	87,5	0,99	7,08	No sedimentation	No condensation
0,7375	41,1	37	19	>capacity	24,5	13,3	23,2	83,4	0,97	6,95	No sedimentation	No condensation
0,7	39,9	36,1	18,6	>capacity	23,7	13,7	23,2	79,3	0,95	6,82	No sedimentation	No condensation
0,6625	38,7	35,1	18	>capacity	22,9	14	23,2	75,2	0,93	6,69	No sedimentation	No condensation
0,625	37,4	34	17,5	>capacity	22,1	14,4	23,2	71,2	0,91	6,56	No sedimentation	No condensation
0,5875	36	32,9	16,9	>capacity	21,2	14,8	23,2	67	0,9	6,43	No sedimentation	No condensation
0,55	34,6	31,7	16,3	>capacity	20,3	15,2	23,2	62,9	0,88	6,3	No sedimentation	No condensation
0,5125	33,1	30,4	15,7	>capacity	19,3	15,7	23,2	58,7	0,87	6,17	No sedimentation	No condensation
0,475	31,4	29	14,9	>capacity	18,3	16,1	23,2	54,5	0,85	6,04	No sedimentation	No condensation
0,4375	29,6	27,5	14,2	>capacity	17,2	16,6	23,2	50,2	0,84	5,91	No sedimentation	No condensation
0,4	27,7	25,9	13,3	>capacity	16	17,1	23,2	45,7	0,83	5,77	No sedimentation	No condensation
0,3625	25,6	24	12,4	>capacity	14,7	17,7	23,2	41,2	0,83	5,64	No sedimentation	No condensation
0,325	23,2	21,9	11,3	>capacity	13,3	18,2	23,2	36,4	0,84	5,51	No sedimentation	No condensation
0,2875	20,6	19,6	10,1	>capacity	11,7	18,8	23,2	31,4	0,86	5,38	No sedimentation	No condensation
0,25	17,6	16,8	8,7	>capacity	9,9	19,5	23,2	26,1	0,91	5,25	No sedimentation	No condensation

Empty pipeline system pressure drop: 862 mmWC Filter without exhaust fan