Calculation Table Pressure Conveying

Client: Kalmykov Andrey
Filepath: c:\f\dandr.txt   5 of 5
Product: Cement

Convey Length horizontal: 90 m
Convey Length vertical: 20 m
Total Length: 110 m
Number of Bends: 10
Pump displacement at 2.5 bar(o): 0,3 m3/sec
Booster displacement: 0 m3/sec
Rotarylock leakage: 0 m3/sec
Gas displacement at end: 0,3043 m3/sec

Capacity: 74,1 tons/hr
Pressure: 25000 mmWC
Back pressure: 0 mmWC
Pressure drop: 25000 mmWc
Loading ratio: 57,9

Pipeline energy consumption: 0,99 kWh/ton
Compressor + (booster) power: 73 kW
Conveying energy: 38,6 kW
Pneumatic conveying efficiency: 52,5 %
Bend losses: 5,3 kW
Material intake loss: 0,1 kW

Re-number * 10^5: 1,583
Empty pipeline pressure drop: 814 mmWc
Empty pipeline filter press. drop: 107 mmWc

Material loss factor: 1,4866E-12
Lossfactor at end: 0,0368
Intake pressure drop: 100 mmWc

Progress
Filter
Iteration

Table calculation

Part	Part description	Length(t)	v-gas	v-product	Pressure drop	v-wall/ v-susp	residence time	mass kg	kW	% kW	Bend loss kW	% kW	Sediment
1	Intake	1	5,91	5,46	582	2,33	0,195	4	0,5	1,4			
2	Pipe	2	5,92	5,65	860	2,4	0,551	8	0,2	0,6			
3	Bend		5,92	3,34	860		0,6241	1	0		0,2	0,5	
4	Pipe	5	6,04	5,76	1738	2,42	1,5041	19	0,8	2,1			
5	Bend		6,04	2,74	1738		1,5829	1	0		0,2	0,6	
6	Pipe	5	6,63	5,92	4871	2,53	2,4659	19	3,1	8			
7	Bend		6,63	3,52	4871		2,5365	1	0		0,2	0,6	
8	Pipe	20	7,1	6,7	7554	2,61	5,6236	68	2,9	7,5			
9	Bend		7,1	5,14	7554		5,6506	0	0		0,1	0,4	
10	Pipe	25	7,87	7,37	10719	2,74	9,2096	78	3,7	9,8			
11	Bend		7,87	5,66	10719		9,234	0	0		0,2	0,5	
12	Pipe	5	8,11	7,57	11514	2,78	9,9079	14	1	2,6			
13	Bend		8,11	3,99	11514		9,9653	1	0		0,4	1,1	
14	Pipe	15	11,2	9,64	18295	3,24	11,7743	39	10,4	27			
15	Bend		11,2	5,7	18295		11,8175	0	0		0,6	1,6	
16	Pipe	2	11,65	10,45	19005	3,3	12,0225	4	1,3	3,4			
17	Bend		11,65	8,03	19005		12,0397	0	0		0,4	1,1	
18	Pipe	25	15,73	13,49	23328	3,81	14,1607	45	9,6	24,8			
19	Bend		15,73	7,96	23328		14,1915	0	0		1,2	3,1	
20	Pipe	5	18,12	15,07	24911	4,08	14,5515	7	4,4	11,4			
21	Bend		18,12	9,12	24911		14,5787	0	0		1,4	3,8	
22													
23													
24													
25													
26													
27													
28													
29													
30													
22	Outlet		18,12	9,12	24911		14,5787		0,0593				
23	Filter	36 m2	0,5	m/min	25000		14,5787		0,2657				88 mmWC

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Calculation results pressure conveying

Client: Kalmykov Andrey
Filepath: c:\f\dandr.txt
Product: Cement

Convey distance horizontal: 90,000000 m
Convey distance vertical: 20 m
Total conveying length: 110 m
Number of Bends: 10
Compressor displacement: 0,3 m3/sec
Booster displacement: 0 m3/sec

Calculation results
Capacity: 74,1 tons/hr
Pressure: 25000 mmWC
Booster pressure: 0 mmWC
Back pressure: 0 mmWC
Pressure drop: 25000 mmWc
Loading ratio: 57,9
Empty pipeline pressure: 814 mmWc
Residence time: 14,57 seconds
Re-number * 10^5: 1,583
Mixture density: 69,2 kg/m^3
Mass of material in pipeline: 321 kg

Pressure drops
Poduct intake: 100 mmWC
Nozzle: 582 mmWC
Acceleration excl product resistance: 3902 mmWC
Poduct resistance: 10053 mmWC
Elevation: 3034 mmWC
Suspension: 7582 mmWC
Gas: 251 mmWC
Filter: 88 mmWC

Energy
Compressor power: 73 kW
Booster power: 0 kW
Pipeline energy consumption/ton: 0,99 kW/ton

Temperatures
Ambient temperature: 25 degr C
Outlet temperature compressor: 208 degr C
Outlet temperature booster: 0 degr C
Mixture temperature begin: 43 degr C
Mixture temperature end: 29 degr C

Vessel system
Installation system:
- ● 2-vessel system ○ Rotary lock feeder ○ silo unloading airslides
- ○ 3-vessel system ○ screw feeder

Vessel factor: 1000 tons/hr/bar(a)
Nominal capacity: 70 tons/hr
vessel volume: 0,7 m^3
Vessel product volume: 0,3 m^3
pipevolume: 1,89 m^3
pressure begin pressurizing: -0,05 bar
pressure valve open: 2,5 bar
temperature begin pressurizing: 35 C
temperature after pressurizing: 60 C

pressurizing time: 4,3 seconds
Discharging time: 16 seconds
purging time: 10,9 seconds
valve time: 2 seconds
overlaptime: seconds
cycletime: 33,3 seconds
Number of kettles/hr: 108 --

vessel capacity: 285,7 tons/hr
Vessel content: 0,33 tons
pipe content: 321,8 kgs
Pipeline capacity: 74,1 tons/hr
System capacity: 35 tons/hr
at pressure: 2,5 bar
Energy consumption/ton: 2,06 kW/ton

Kettle capacity>capacity

Calculate system capacity

Table calculation
Begin capacity: 74,1 tons/hr
Begin pressure: 25000 mmWc
pressure decrement: 1125 mmWc
lowest pressure: 2500 mmWc

Calculate table

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Table calculation

Client Kalmykov Andrey
Filepath c:\f\dandr.txt
Product Cement

Convey distance horizontal	90	m
Convey distance vertical	20	m
Total conveying length	110	m
Number of Bends	10	
Pipe diameter begin	148	mm
Pipe diameter end	148	mm

Pump displacement	0,3	m3/sec
Booster displacement	0	m3/sec at 2.5 bar
Gas volume end	0,3264	m3/sec

Pressure conveying

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	energy consumption kWh/ton	residence time seconds	sediment
2,5	74,1	35	108	>capacity	57,9	5,9	18,1	2,09	14,57	No sedimentation
2,3875	72,4	35	107,6	>capacity	56,4	6	18,1	2,02	14,24	No sedimentation
2,275	70,7	35	107,1	>capacity	54,9	6,2	18,1	1,96	13,9	No sedimentation
2,1625	68,9	35	106,5	>capacity	53,3	6,4	18,2	1,89	13,55	No sedimentation
2,05	67	34	105,9	>capacity	51,8	6,6	18,2	1,87	13,2	No sedimentation
1,9375	65,1	34	105,1	>capacity	50,1	6,8	18,2	1,8	12,84	No sedimentation
1,825	63,1	34	104,2	>capacity	48,4	7,1	18,2	1,73	12,48	No sedimentation
1,7125	61,1	34	103,1	>capacity	46,7	7,3	18,3	1,66	12,11	No sedimentation
1,6	59	33	101,9	>capacity	45	7,6	18,4	1,64	11,73	No sedimentation
1,4875	56,7	33	100,4	>capacity	43	7,9	18,3	1,57	11,36	No sedimentation
1,375	54,3	32	98,7	>capacity	41,1	8,3	18,4	1,54	10,98	No sedimentation
1,2625	51,9	31	96,7	>capacity	39,1	8,6	18,4	1,52	10,59	No sedimentation
1,15	49,2	31	94,3	>capacity	36,9	9,1	18,4	1,44	10,2	No sedimentation
1,0375	46,4	30	91,5	>capacity	34,7	9,5	18,5	1,41	9,81	No sedimentation
0,925	43,3	29	88,1	>capacity	32,2	10,1	18,5	1,38	9,41	No sedimentation
0,8125	39,9	27	84	>capacity	29,6	10,7	18,5	1,39	9,01	No sedimentation
0,7	36,1	26	78,8	>capacity	26,6	11,3	18,6	1,35	8,61	No sedimentation
0,5875	31,8	23	72,2	>capacity	23,3	12,1	18,6	1,42	8,21	No sedimentation
0,475	26,7	20	63,6	>capacity	19,5	13	18,7	1,52	7,81	No sedimentation
0,3625	20,6	17	51,8	>capacity	14,9	14	18,8	1,65	7,43	No sedimentation
0,25	13,2	11	35,6	>capacity	9,5	15,2	18,9	2,33	7,07	No sedimentation

Empty pipeline system pressure drop 815 mmWC

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