

Start menu

Pneumatic conveying calculations

YARCA
Pneumatic Conveying Software

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End	<p><u>Use comma "*,*" as decimal sign</u></p> <p><u>Enter "0,*" as decimal sign</u></p>	Continue
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MM-DD-YY
09-11-2016

Version 2015-9 **Visual Basic 12**

Calculation for a 4" pipeline

Modeling geometry of a pneumatic conveying installation

Installation description
 Client *
 Drive * c
 Directory * f
 Installation name * Quick modeling
 Version s/d * d
 Full Path c:\vd\Quick modeling.bat

Bend orientation
 (1) Vertical ascending to horizontal
 (2) Horizontal to vertical descending
 (3) Vertical descending to horizontal
 (4) Horizontal to vertical ascending
 (5) Horizontal to horizontal
 Compressor type

Pipe sizes

2"	54 mm	6s	146 mm	18"	438 mm	32"	793 mm
3"	78 mm	8"	203 mm	20"	489 mm	34"	843 mm
4"	102 mm	10"	254 mm	24"	590 mm		
5"	128 mm	12"	304 mm	26"	643 mm		
5s	122 mm	14"	336 mm	28"	693 mm		
6"	154 mm	16"	387 mm	30"	743 mm		

Part	Description	Diam mm	Length m	Angle degrees	R mm	Bend degrees	Start angle degrees	Bend Type
1	Intake	102	1	0				
2	Pipe	102	4,5	0				
3	Bend	102			204	90	36,869	5
4	Pipe	102	4,5	0				
5	Bend	102			204	90	36,869	5
6	Pipe	102	4,5	0				
7	Bend	102			204	90	36,869	5
8	Pipe	102	4,5	0				
9	Bend	102			204	90	36,869	5
10	Pipe	102	4,5	0				
11	Bend	102			204	90	36,869	5
12	Pipe	102	4,5	0				
13	Bend	102			204	90	36,869	5
14	Pipe	102	4,5	0				
15	Bend	102			204	90	36,869	5
16	Pipe	102	4,5	0				
17	Diameter Tra							
18	Pipe	102	0	0				
19	Bend	102			204	90	36,869	4
20	Pipe	102	16,3333	90				
21	Diameter Tra							

Geometry table (right)
 Part 22 Pipe 102 16,6666 90
 Part 23 Bend 102 204 90 36,869 1
 Part 24 Pipe 102 10 0
 Part 25 Bend 102 204 90 36,869 2
 Part 26 Outlet 102

Geometry table (bottom right)
 Part 27 Filter 13,8 m2 Total length 80 m
 Part 28 Pump 0,115 m3/sec Number of bends 10

Calculate filter
 Bend radius 1,5 *D
 Page 1
 Page 2

Air supply/vent piping
 Air supply piping length 10 m Vent piping length 0 m
 Air supply Nu of bends 5 - Vent Nu of bends 0 -
 Air supply piping Diam 102 mm Vent piping Diam 0 mm

Buttons: Back to menu, Accept / Back to input screen, Change diameters

Pressure pneumatic conveying calculation Input screen

Client: Gent File path: Quick modeling Product: Bentonite Date: 09-11-2016 Time: 13:45:03

Gas medium compressor
 Air Nitrogen (generator) Oxygen Data

Gas pump
 Screw compressor 2-stage
 Blower
 Compressor data
 Predefined screw compressor
 Blower data
 Predefined blower
 Predefined Hybrid blower
 Const. mass pump (sonic choke/Turbo/oil filled)
 Blower data curve operating points
 Centrifugal fan

Max. compr. press. 3,5 bar
 Maximum conveying pressure 35000 mmWC
 Compr. displ. 0,18 m3/sec < 0,1892 m3/sec
 Compr. displ. CFM =>

Tank/continuous system
 Tank system (Tank air from compressor air)
 Continuous system (No tank air)

Gas medium booster
 Air Nitrogen (generator) Data

Booster
 Installed

Rotary lock feeder (RLF) / screw-feeder (SF)
 Rotary Lock Feeder Screw Feeder
 Capacity 33,6 tons/hr
 Lock vol. 0,0517 m3
 RPM 15 /min Diam 0,403 m Calculate
 Vol. eff. 0,85 - Feeder RL p-in +/-
 Leakage 0,044 m3/sec

Eductor feeder
 Eductor feeder No

Ambient (Compressor intake)
 Ambient temperature 35 degr C Altitude 1750 m
 Inlet temperature 35 degr C Altitude pressure 819 mbar
 Inlet dp (or vacuum) 15 mbar 0,015 bar
 Ambient pressure 1000 mbar 1 bar <- Accept
 Ambient RH 80 % Show air intake conditions
 Override RH air density calculation for >373 degC and >220 bar

Temperatures
 Bentonite temp. 40 degr C
 Compressor gas cooling degr C
 Dryer degr C

Booster gas cooling degr C Dryer degr C

Non insulated gas supply pipe
 Non insulated convey pipe
 degr F -> degr C

Material properties
 Bentonite particle density 2600 kg/m3
 Bulk density 850 kg/m3
 Part. size 197 mesh -> acc > 75 susp > 75 micron
 Susp. vel. 2 m/sec -> acc > 2 susp > 2 m/sec

Product loss constant
 Product loss factor 8,6963E-12
 Wall friction factor 0,5
 Mat. intake press. drop 150 mmWC
 v-wall / v-susp 1,35
 Filter resistance factor 1500000
 Specific heat content 0,2 kCal/kg/C
 product loss factor constant y/n
 No particle size distribution

Filter
 Filter area 13,8 m2 No filter exhaust fan/Filter calculated
 Fixed filter size

Convey pipeline
 Convey distance horizontal 47 m
 Convey distance vertical 33 m-up 0 m-down
 Convey distance slope 0 m-up 0 m-down Pipe diameter
 Total conveying length 80 m begin 102 mm
 Number of Bends 10 - Radius bends end 102 mm
 T-bends

Guessed air only pressure drop mmWC
 Calculate empty pipeline pressure mmWC
 Air only compr. press. with filter bar
 Volumetric eff. Gas displacement m3/sec

Gas supply/vent piping

Gas supply	Vent	Length	Guessed press. drop
10	0	m	mmWC
5	0	-	mmWC
102	0	mm	mmWC
25000		mmWC	mmWC

 Gas supply piping 0 mmWC 0 bar
 Vent piping 0 mmWC 0 bar
 Additional press. drop gas supply 0 mmWC
 Calculate Gas supply piping Calculate Vent piping

Calculation settings
 Set capacity 67880 lbs/hr -> 30,79 tons/hr
 Compressor pressure 2,5 bar 25000 mmWC Press. 35,558 psi
 Back pressure 0 bar 0 mmWC 24999 mmWC
 Set pressure drop 2,5 bar 25000 mmWC <- Accept
 Calc. intake gas press. drop Yes Time domain dt 0,001 sec Default

Calculation selection
 Pressure fixed -> capacity calculated
 Capacity fixed -> pressure calculated (Manual calculation Zenz diagram)
 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, Modify installation, Save file

Calculation Table Pressure Conveying

Client: []
 Filepath: c:\V\default.txt
 Product: Bentonite

Table calculation

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	temp degC	Energy loss kW	% kW	Heat loss kW	Diam fill <deg>/L/C	Sediment	RHC
1	Intake 102 hor	1	5,23	4,1	469	2,453	1,83	0,3361	2	43	0,2	1,1	0			85
2	Pipe 102 hor	4,5	7,1	5,19	1702	2,3297	2,04	1,2301	10	43	0,5	2,8	0,1			
3	Bend 90		10,31	2,62	1723	2,3276		1,3087	0	43	0	0,4				
4	Pipe 102 hor	4,5	7,33	5,33	3032	2,1967	2,09	2,2027	9	43	0,5	3,2	0,1			92
5	Bend 90		10,46	2,7	3052	2,1947		2,2789	0	43	0	0,4				
6	Pipe 102 hor	4,5	7,58	5,49	4355	2,0644	2,14	3,1489	9	43	0,6	3,3	0			88
7	Bend 90		10,63	2,78	4374	2,0625		3,223	0	43	0	0,5				
8	Pipe 102 hor	4,5	7,85	5,67	5671	1,9328	2,19	4,069	9	43	0,6	3,4	0			84
9	Bend 90		10,83	2,88	5689	1,931		4,1407	0	43	0,1	0,5				
10	Pipe 102 hor	4,5	8,15	5,85	6981	1,8018	2,24	4,9617	8	43	0,6	3,6	0			81
11	Bend 90		11,06	2,97	6999	1,8		5,0312	0	43	0,1	0,5				
12	Pipe 102 hor	4,5	8,47	6,05	8286	1,6713	2,29	5,8272	8	43	0,6	3,7	0			77
13	Bend 90		11,32	3,08	8303	1,6696		5,8943	0	43	0,1	0,6				
14	Pipe 102 hor	4,5	8,83	6,27	9588	1,5411	2,37	6,6653	7	43	0,7	3,9	0			73
15	Bend 90		11,62	3,19	9605	1,5394		6,7301	0	43	0,1	0,6				
16	Pipe 102 hor	4,5	9,22	6,5	10888	1,4111	2,44	7,4751	7	43	0,7	4,1	0			70
17	Diameter Transfer		9,22	6,5	10888	1,4111		7,4751	0	43	0	0				
18	Pipe 102 hor	0	9,23	6,5	10901	1,4098	2,44	7,4761	0	43	0	0				70
19	Bend 90		13,61	2,76	10928	1,4071		7,5436	0	43	0,1	0,8				
20	Pipe 102 up	16,33	11,87	6,98	16555	0,8444	2,93	10,1946	24	43	3,9	21,2	0,2			54
21	Diameter Transfer		11,87	6,98	16555	0,8444		10,1946	0	43	0	0				
22	Pipe 102 up	16,66	15,82	9,12	21817	0,3182	3,57	12,2976	18	42	4,9	26,7	0,2			38
23	Bend 90		18,64	4,69	21832	0,3167		12,3423	0	42	0,2	1,4				
24	Pipe 102 hor	10	19,62	11,85	24721	0,0278	4,13	13,3053	8	42	3,6	19,7	0			29
25	Bend 90		21,88	6,36	24732	0,0267		13,3388	0	42	0,4	2,3				
26	Outlet		21,88	6,36	24759	0,024		13,3388		42	0,039	0,2				29
27	After Filter	13,8	0,6	m/min	25000	0		13,3388			0,346	1,8		dp = 240	mmWC	28

Progress: Filter 5, Iteration 5

RH kettle intake = 0 % - temp. kettle intake = 218 degC

Condensation intake: 7.44 ltrs/hr @ 0.102 % bonded cement of conveying rate

Calculation results pressure conveying

Client: []
 Filepath: c:\V\default.txt
 Product: Bentonite

Calculation results

Capacity: 30,7 tons/hr

Pressure: 25000 mmWC 2,5 bar
 Booster pressure: 0 mmWC 0 bar
 Back pressure: 0 mmWC 0 bar
 Pressure drop: 25000 mmWC 2,5 bar

Loading ratio: 53
 Volumetric loading ratio: 0,0996 to 0,0382
 Empty pipeline pressure: 1389 mmWC
 Residence time: 13,33 seconds
 Re-number * 10⁵: 1,156

Mixture dens. at int.: 190,1 at end: 59,2 kg/m³
 Mixture dens. at booster inj.: kg/m³
 Material in pipeline: 127,7 kg Sedim: 0 kg
 Exit dynamic force: 1,16 kN

Pressure drops

Product intake	150 mmWC	0,6 %	4,8 mmWC/ton
Nozzle (total dp)	469 mmWC	1,8 %	15,2 mmWC/ton
Acceleration excl product dp	2716 mmWC	10,8 %	88,2 mmWC/ton
Product resistance	15332 mmWC	61,3 %	497,9 mmWC/ton
Bend extra product resistance	0 mmWC	0 %	0 mmWC/ton
Elevation	3543 mmWC	14,1 %	115 mmWC/ton
Suspension	2472 mmWC	9,8 %	80,2 mmWC/ton
Gas Air	475 mmWC	1,9 %	15,4 mmWC/ton
Filter	240 mmWC	0,9 %	7,8 mmWC/ton
Gas supply piping	mmWC	%	mmWC/ton
Vent piping	mmWC	%	mmWC/ton
Sum dp Total	24689,8 mmWC	98,7 %	801,8 mmWC/ton

Energy (Screwcompressor)

Compressor power 1* 1 x 42 kW = 42 kW
 Mechanical efficiency: 90 %

No booster

Product loss energy pipes -> heat: 0,367 kW/ton
 Product loss energy bends -> heat: 0,05 kW/ton
 Heat loss pipeline: 1,3 kW

Temperatures

Ambient temperature: 35 deg C
 Outlet temperature compressor: 218 deg C

Intake temperature kettle: 218 deg C

No booster

Material temperature: 40 deg C
 Mixture temperature begin: 43 deg C
 Mixture temperature end: 42 deg C

Table calculation

Begin capacity: 30,7 tons/hr
 Begin pressure: 25000 mmWC
 lowest pressure: 1900 mmWC
 pressure decrement: 1155 mmWC

Table 20 steps
 Table 40 steps
 Table steps

Calculate table

Table calculation pressure discharge

Client: _____ Filepath: V:\Videofa4.txt Product: Bentonite MM-DD-YY: 09-11-2016

Pressure conveying

Conveying gas: Air Rotary lock feeder installation (Screwcompressor)

Convey distance horizontal: 47 m
 Convey distance vertical: 33 m-up 0 m-down
 Convey distance slope: 0 m-up 0 m-down
 Total conveying length: 80 m 10 bends
 Pipe diameter begin: 102 mm end 102 mm
 Back pressure: 0 mmWC _____ bar

Pump displacement: 0,18 m3/sec
 Booster displacement: 0 m3/sec
 Gas volume end: 0,2062 m3/sec 0,219 kg/sec at 0,2 bar
 Altitude: 1750 m

Pipeline energy consumption
 System energy consumption

Pressure bar	pipe line capacity tons/hr	system capacity tons/hr	Silo/Cargo 850 tons	disch time hrs	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	Choking
2,5	30,7	30,7	27,6		53	5,2	21,8	127,7	1,38	13,33	No sedimentation	Condensation	No choking
2,4	30,2	30,2	28,07		51,4	5,4	22	121	1,37	12,96	No sedimentation	Condensation	No choking
2,3	29,7	29,7	28,59		49,8	5,6	22,1	114,4	1,36	12,58	No sedimentation	Condensation	No choking
2,2	29,1	29,1	29,15		48,2	5,9	22,2	108	1,36	12,19	No sedimentation	Condensation	No choking
2,1	28,5	28,5	29,77		46,5	6,2	22,3	101,7	1,36	11,81	No sedimentation	Condensation	No choking
2	27,9	27,9	30,45		44,9	6,5	22,4	95,5	1,35	11,42	No sedimentation	Condensation	No choking
1,9	27,2	27,2	31,2		43,3	6,8	22,5	89,5	1,35	11,03	No sedimentation	Condensation	No choking
1,8	26,5	26,5	32,04		41,6	7,1	22,6	83,6	1,35	10,63	No sedimentation	Condensation	No choking
1,7	25,7	25,7	32,97		39,9	7,5	22,7	77,8	1,36	10,23	No sedimentation	Condensation	No choking
1,6	24,9	24,9	34,02		38,2	7,9	22,8	72,1	1,37	9,83	No sedimentation	Condensation	No choking
1,5	24,1	24,1	35,2		36,4	8,3	22,9	66,5	1,37	9,43	No sedimentation	Condensation	No choking
1,4	23,2	23,2	36,54		34,6	8,8	23	60,8	1,39	9,03	No sedimentation	Condensation	No choking
1,3	22,3	22,3	38,11		32,8	9,3	23,1	55,2	1,4	8,63	No sedimentation	Condensation	No choking
1,2	21,2	21,2	39,93		30,9	9,9	23,2	49,7	1,43	8,22	No sedimentation	Condensation	No choking
1,1	20,1	20,1	42,1		28,9	10,5	23,3	44,5	1,46	7,82	No sedimentation	Condensation	No choking
1	18,9	18,9	44,73		26,8	11,2	23,4	39,4	1,51	7,42	No sedimentation	Condensation	No choking
0,9	17,7	17,7	48		24,7	12	23,5	34,4	1,56	7,02	No sedimentation	No condensation	No choking
0,8	16,2	16,2	52,15		22,6	12,7	23,4	29,9	1,64	6,69	No sedimentation	No condensation	No choking
0,7	14,6	14,6	57,83		20,1	13,7	23,5	25,2	1,76	6,3	No sedimentation	No condensation	No choking
0,6	12,8	12,8	66,09		17,3	14,7	23,6	20,6	1,94	5,93	No sedimentation	No condensation	No choking
0,5	10,7	10,7	79,39		14,2	16	23,7	16	2,23	5,58	No sedimentation	No condensation	No choking

Empty pipeline system pressure drop: 1412 mmWC Filter without exhaust fan

Buttons: Back to start menu, Print table, New Calculation, Data Table, Next page

Calculation for a 6" pipeline

Modeling geometry of a pneumatic conveying installation

Installation description
 Client * []
 Drive * c
 Directory * f
 Installation name * Quick modeling
 Version s/d * d
 Full Path c:\Vd\Quick modeling.bat

Bend orientation
 (1) Vertical ascending to horizontal
 (2) Horizontal to vertical descending
 (3) Vertical descending to horizontal
 (4) Horizontal to vertical ascending
 (5) Horizontal to horizontal
 Compressor type

Pipe sizes

2"	54 mm	6s	146 mm	18"	438 mm	32"	793 mm
3"	78 mm	8"	203 mm	20"	489 mm	34"	843 mm
4"	102 mm	10"	254 mm	24"	590 mm		
5"	128 mm	12"	304 mm	26"	643 mm		
6"	154 mm	14"	336 mm	28"	693 mm		
		16"	387 mm	30"	743 mm		

Part	Description	Diam mm	Length m	Angle degrees	R mm	Bend degrees	Start angle degrees	Bend Type
1	Intake	154	1	0				
2	Pipe	154	4,5	0				
3	Bend	154			308	90	36,869	5
4	Pipe	154	4,5	0				
5	Bend	154			308	90	36,869	5
6	Pipe	154	4,5	0				
7	Bend	154			308	90	36,869	5
8	Pipe	154	4,5	0				
9	Bend	154			308	90	36,869	5
10	Pipe	154	4,5	0				
11	Bend	154			308	90	36,869	5
12	Pipe	154	4,5	0				
13	Bend	154			308	90	36,869	5
14	Pipe	154	4,5	0				
15	Bend	154			308	90	36,869	5
16	Pipe	154	4,5	0				
17	Diameter Tra							
18	Pipe	154	0	0				
19	Bend	154			308	90	36,869	4
20	Pipe	154	16,3333	90				
21	Diameter Tra							

Calculate filter
 Bend radius 1,5 *D
 Page 1
 Page 2

Back to menu Accept / Back to input screen Change diameters

Pressure pneumatic conveying calculation Input screen

Client [] File path Quick modeling Product Bentonite Date: 09-11-2016 Time: 13:50:30

Gas medium compressor
 Air Nitrogen (generator) Oxygen Data

Gas pump
 Screw compressor 2-stage
 Blower
 Compressor data
 Predefined screw compressor
 Blower data
 Predefined blower
 Predefined Hybrid blower
 Const. mass pump (sonic choke/Turbo/oil filled)
 Blower data curve operating points
 Centrifugal fan

Max. compr. press. 3,5 bar
 Maximum conveying pressure 35000 mmWC
 Compr. displ. 0,25 m3/sec < 0,4313 m3/sec
 Compr. displ. CFM =>

Tank/continuous system
 Tank system (Tank air from compressor air)
 Continuous system (No tank air)

Gas medium booster
 Air Nitrogen (generator) Data

Booster
 Installed

Rotary lock feeder (RLF) / screw-feeder (SF)
 Rotary Lock Feeder Screw Feeder
 Capacity 44,9 tons/hr
 Lock vol. 0,069 m3
 RPM 15 /min Diam 0,444 m Calculate
 Vol. eff. 0,85
 Leakage 0,026 m3/sec Feeder RL p-in +/- mmWC

Eductor feeder
 Eductor feeder No

Ambient (Compressor intake)
 Ambient temperature 40 degr C Altitude 1750 m
 Inlet temperature 40 degr C Altitude pressure 819 mbar
 Inlet dp (or vacuum) 15 mbar 0,015 bar
 Ambient pressure 1000 mbar 1 bar <- Accept
 Ambient RH 80 % Show air intake conditions
 Override RH air density calculation for >373 degC and >220 bar

Temperatures
 Bentonite temp. 40 degr C
 Compressor gas cooling degr C
 Dryer

Booster gas cooling degr C Dryer degr C

Non insulated gas supply pipe
 Non insulated convey pipe Heat properties pipelines
 degr F -> degr C

Material properties
 Bentonite particle density 2600 kg/m3
 Bulk density 850 kg/m3
 Part. size 197 mesh -> acc > 75 susp > 75 micron
 Susp. vel. 2 m/sec -> acc > 2 susp > 2 m/sec

Product loss constant
 Product loss factor 8,6963E-12
 Wall friction factor 0,5
 Mat. intake press.drop 150 mmWC
 y-wall / y-susp 1,35
 Filter resistance factor 1500000
 Specific heat content 0,2 kCal/kg/C
 product loss factor constant y/n
 No particle size distribution

Filter
 Filter area 43,1 m2 No filter exhaust fan/Filter calculated
 Fixed filtersize

Convey pipeline
 Convey distance horizontal 47 m
 Convey distance vertical 33 m-up 0 m-down
 Convey distance slope 0 m-up 0 m-down Pipe diameter
 Total conveying length 80 m begin 154 mm
 Number of Bends 10 Radius bends end 154 mm
 T-bends

Guessed air only pressure drop mmWC
 Calculate empty pipeline pressure mmWC
 Air only compr. press. with filter bar
 Volumetric eff. Gas displacement m3/sec

Gas supply/vent piping

Gas supply	Vent	Length	Guessed press. drop
10	0	0 m	mmWC
5	0	0 m	mmWC
102	0	0 mm	mmWC
10000			mmWC

 Gas supply piping 173 mmWC 0,017 bar
 Vent piping 0 mmWC 0 bar
 Additional press. drop gas supply 0 mmWC
 Calculate Gas supply piping Calculate Vent piping

Calculation settings
 Set capacity 89639 lbs/hr -> 40,66 tons/hr
 Compressor pressure 1 bar 10000 mmWC Press. 14,223 psi
 Back pressure 0 bar 0 mmWC 9999 mmWC
 Set pressure drop 1 bar 10000 mmWC <- Accept
 Calc. intake gas press. drop Yes Time domain dt 0,001 sec Default

Calculation selection
 Pressure fixed -> capacity calculated
 Capacity fixed -> pressure calculated (Manual calculation Zenz diagram)
 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 Modify installation Save file

Calculation Table Pressure Conveying

Client: []
 Filepath: c:\V\default.txt
 Product: Bentonite

Conv. dist.: Horizontal 47 m Bends 10
 Vertical 33 m-up 0 m-down
 Slope 0 m-up 0 m-down Total 80 m

Conveying gas: Air
 Pump displ. at 3.5 bar 0.25 m³/s 0.27166 kg/s
 Booster displacement
 Total displacement 0.25 m³/s 0.27166 kg/s
 Rotarylock leakage 0.0241 m³/sec RL press. 9677 mmWC
 Compr. displ. at 1 bar 0.2878 m³/s
 Tank displ. compr. (respl. gas) 0.0071 m³/s 0.008 kg/s
 Compr. displ. for pipe 0.2636 m³/s Dryer 0 m³/s
 Actual gas flow at end 0.2475 m³/sec 0.2702 kg/s
 New set capacity 40.669 tons/hr at
 Capacity 40.669 tons/hr at 10000 mmWC 1 bar
 Pressure drop 10000 mmWC 1 bar
 Booster pressure mmWC
 Back pressure 0 mmWC 0 bar
 Empty pipeline pressure 537 mmWC
 Empty pipeline filter press. drop 65 mmWC
 SLR begin 41.8 SLR end 41.8
 Pipeline energy consumption 0.93 kWh/Ton
 Compressor power 38 kW
 Conveying power 16.9 kW
 Conveying energy consumption 0.416 kWh/Ton
 Press. conv. eff. 44.5 % Vol. eff. compr. 92.91 %
 Bend losses 2.5 kW Material intake loss 0.21 kW
 Re-number 1.233 * 10⁵ End vel. air supply
 Mat. loss fact. const. 0.0406 17.3 m/s
 Mat. Loss fact. 8.6969E-12
 Mat. int./add. press. drop 150 0 mmWC
 Filter receiver diameter -> 0.79 m 0.505 m/s

Table calculation

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	temp degC	Energy loss kW	% kW	Heat loss kW	Diam fill c/dogr./L/C	Sediment	RH%
1	Intake 154 hor	1	6,8	5,19	517	0,9482	1,8	0,2854	2	41	0,4	2,7	0			86
2	Pipe 154 hor	4,5	7,79	6,61	936	0,9063	1,94	0,9954	9	41	0,5	3,1	0			
3	Bend 90		8,86	3,35	940	0,9059		1,0883	0	41	0,1	1	0			
4	Pipe 154 hor	4,5	7,98	6,75	1424	0,8575	1,97	1,8203	9	41	0,6	3,7	0			94
5	Bend 90		9,04	3,42	1428	0,8571		1,9114	0	41	0,1	1,1	0			
6	Pipe 154 hor	4,5	8,18	6,89	1913	0,8086	2	2,6294	8	41	0,6	3,8	0			91
7	Bend 90		9,23	3,5	1917	0,8082		2,7184	0	41	0,1	1,1	0			
8	Pipe 154 hor	4,5	8,38	7,05	2404	0,7595	2,04	3,4214	8	41	0,6	3,9	0			89
9	Bend 90		9,43	3,58	2408	0,7591		3,5085	0	41	0,2	1,2	0			
10	Pipe 154 hor	4,5	8,61	7,21	2897	0,7102	2,08	4,1975	8	41	0,6	4,1	0			86
11	Bend 90		9,65	3,66	2900	0,7099		4,2826	0	41	0,2	1,2	0			
12	Pipe 154 hor	4,5	8,84	7,38	3391	0,6608	2,12	4,9566	8	41	0,7	4,2	0			84
13	Bend 90		9,88	3,73	3395	0,6604		5,0397	0	41	0,2	1,3	0			
14	Pipe 154 hor	4,5	9,09	7,56	3889	0,611	2,16	5,6997	8	41	0,7	4,4	0			81
15	Bend 90		10,13	3,85	3893	0,6106		5,7808	0	41	0,2	1,4	0			
16	Pipe 154 hor	4,5	9,36	7,75	4390	0,5609	2,21	6,4258	7	41	0,7	4,5	0			78
17	Diameter Transfer		9,36	7,75	4390	0,5609		6,4258			0	0	0			
18	Pipe 154 hor	0	9,36	7,76	4398	0,5601	2,21	6,4268	0	41	0	0	0			78
19	Bend 90		10,33	3,25	4404	0,5595		6,5128	0	41	0,2	1,6	0			
20	Pipe 154 up	16,33	11,02	7,64	6719	0,328	2,5	8,8738	29	41	3,9	23,4	0			67
21	Diameter Transfer		11,02	7,64	6719	0,328		8,8738			0	0	0			
22	Pipe 154 up	16,66	12,97	9,01	8873	0,1126	2,81	10,8848	24	41	4,3	25,7	0			56
23	Bend 90		14,14	4,64	8878	0,1121		10,9533	0	41	0,3	1,9	0			
24	Pipe 154 hor	10	14,12	11,03	9935	0,0064	2,98	11,9563	11	41	2,4	14,5	0			50
25	Bend 90		14,98	6,1	9938	0,0061		12,0098	0	41	0,4	2,8	0			
26	Outlet		14,98	6,1	9950	0,0049		12,0098		41	0,03	0,1	0			50
27	After Filter	43,1	0,3	m/min	70000	0		12,0098			0,12	0,7	0	dp = 49	mmWC	50

Progress: Filter 5, Iteration 5

Condensation intake = 5 % - temp. kettle intake = 101 degC

Condensation intake = 24.67 lbs/hr @ 0.256 % bonded cement of conveying rate

Calculation results pressure conveying

Client: []
 Filepath: c:\V\default.txt
 Product: Bentonite

Installation
 Convey dist. horizontal 47 m
 Convey dist. vertical 33 m-up 0 m-down
 Convey dist. slope 0 m-up 0 m-down
 Total conv. length 80 m
 Nu of Bends 10
 Pipe diameter(s) 154 mm 154 mm
 Compressor displacement 0.25 m³/sec 0.277 kg/sec
 Booster. displ. Air 0 m³/sec 0 kg/sec
 Total gas displacement 0.25 m³/sec 0.277 kg/sec

Feeder system
 Installation system
 Rotary lock feeder Continuous system

Vessel factor
 Nominal capacity tons/hr
 Silo volume m³
 Silo product volume 1000 m³ pipevol. 1,49
 pressure begin pressurizing bar
 pressure valve open (>= pressure) bar
 temperature begin pressurizing C
 temperature after pressurizing C
 pressurizing time seconds
 Silo discharge time 20.9 hrs
 purging time of pipe seconds
 valve time seconds
 cyclotime seconds

Calculation results
 Capacity 40.6 tons/hr
 Pressure 10000 mmWC 1 bar
 Booster pressure 0 mmWC 0 bar
 Back pressure 0 mmWC 0 bar
 Pressure drop 10000 mmWC 1 bar
 Loading ratio 41.8
 Volumetric loading ratio 0.0456 to 0.0229
 Empty pipeline pressure 537 mmWC
 Residence time 12 seconds
 Re-number * 10⁵ 1.233
 Mixture dens. at int. 88.3 at end 46.2 kg/m³
 Mixture dens. at booster inj. kg/m³
 Material in pipeline 141.2 kg Sedim. 0 kg
 Exit dynamic force 0.96 kN

Pressure drops
 Product intake 150 mmWC 1.5 % 3.6 mmWC/Ton
 Nozzle (total dp) 517 mmWC 5.1 % 12.7 mmWC/Ton
 Acceleration excl product dp 1803 mmWC 18 % 44.3 mmWC/Ton
 Product resistance 4228 mmWC 42.2 % 103.9 mmWC/Ton
 Bend extra product resistance 0 mmWC 0 % 0 mmWC/Ton
 Elevation 2003 mmWC 20 % 49.2 mmWC/Ton
 Suspension 1375 mmWC 13.7 % 33.8 mmWC/Ton
 Gas Air 176 mmWC 1.7 % 4.3 mmWC/Ton
 Filter 49 mmWC 0.4 % 1.2 mmWC/Ton
 Gas supply piping 173 mmWC 1.7 % 4.2 mmWC/Ton
 Vent piping mmWC % mmWC/Ton
 Sum dp Total 9736.3 mmWC 97.3 % 239.4 mmWC/Ton

Energy (Screwcompressor)
 Compressor power 1* 1 x 38 kW = 38 kW
 Mechanical efficiency 90 %
 No booster
 Product loss energy pipes -> heat 0.176 kW/Ton
 Product loss energy bends -> heat 0.063 kW/Ton
 Heat loss pipeline 0.2 kW

Temperatures
 Ambient temperature 40 deg C
 Outlet temperature compressor 118 deg C
 Pipe surface temp. before kettle 64 deg C
 Intake temperature kettle 101 deg C
 No booster
 Material temperature 40 deg C
 Mixture temperature begin 41 deg C
 Mixture temperature end 41 deg C

Table calculation
 Begin capacity 40.6 tons/hr
 Begin pressure 10000 mmWC
 lowest pressure 1000 mmWC
 pressure decrement 1000 mmWC
 Table 20 steps
 Table 40 steps
 Table 9 steps
 Calculate table

