

# Corn conveying over 800 m horizontal

Pressure pneumatic conveying calculation Input screen

Client:  File path: Quick modeling Product: Corn

Gas medium:  Air  Nitrogen

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

Gas volume: 12 m3/sec Maximum pressure: 3.5 bar

Booster:  Installed  Screwcompressor  Predefined screwcompressor  Blower data  Predefined blower

Gas Volume: m3/sec Injection point

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

Ambient (Compressor intake): Ambient temperature: 25 degr C Ambient pressure: 1000 mbar

Temperatures: Corn temperature: 40 degr C  Screwcompressor air cooling  Booster air cooling Heat transmission factor pipewall: 0,18 kCal/degC/m

Material properties: **Corn** Product density: 1400 kg/m3 Bulk density: 760 kg/m3 Particle size: 7600 micron Suspension velocity: 11,5 m/sec Product loss constant: 0,01 Product loss factor: 0 Wall friction factor: 0,9 Intake pressure drop pressure discharge: 100 mmWC v-wall / v-susp: 1,5 Filter resistance factor: 350000 Specific heat content: 0,15 kCal/Kg/C product loss factor constant y/n: y

Filter: Filter area: 1148,256 m2

Convey pipeline: Convey distance horizontal: 800 m Convey distance vertical: 5 m-up 0 m-down Convey distance slope: 0 m-up 0 m-down Total conveying length: 805 m Number of Bends: 3 Pipe diameter begin: 438 mm Pipe diameter end: 590 mm

Calculation settings: Set capacity: 70 tons/hr Pressure: 13584 mmWC Back pressure: 0 mmWC Set pressure drop: 13584 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

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Calculation Table Pressure Conveying

Client:  Filepath: Quick modeling 5 of 5 Product: Corn

Convey distance horizontal: 800 m Convey distance vertical: 5 m Total conveying length: 805 m Number of Bends: 3 Pump displacement at 2.5 bar(o): 12 m3/sec Volumetric efficiency: 0,84 % Booster displacement: 0 m3/sec Rotarylock leakage: 0 m3/sec Gas displacement at end: 12,8737 m3/sec Capacity: 70 tons/hr Pressure: 13586 mmWC Back pressure: 0 mmWC Pressure drop: 13586 mmWc Loading ratio: 1,2 Pipeline energy consumption: 28,16 kWh/ton Compressor power: 1971 kW Conveying energy: 1204,2 kW Pneumatic conveying efficiency: 61 % Bend losses: 25,5 kW Material intake loss: 6,61 kW Re-number \* 10<sup>5</sup>: 17,141 Empty pipeline pressure drop: 11926 mmWc Empty pipeline filter press. drop: 35 mmWc Material loss factor: 0,01 Material loss factor Intake pressure drop: 100 mmWc

Progress: Filter Iteration

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	% kW	Sediment
1	Intake	1	44,95	18,76	411	2,26	0,087	0	25,1	2			
2	Pipe	535,7	69,97	52,72	11276	3,37	13,7839	267	821,3	68,2			
3	Diameter Transfer		69,97	52,72	11527		13,7839		26,3	2,1			
4	Pipe	253,3	46,63	34,46	13290	2,02	21,25	1199	203,6	16,9			
5	Bend		105,31	0,16	13296		21,7042	9	0,7		11,5	0,9	
6	Pipe	0	45,73	1,08	13296	2,32	21,7052	0	0	0			
7	Diameter Transfer		45,73	1,08	13296		21,7052		0	0			
8	Pipe	5,02	46,21	23,86	13392	1,99	22,0232	3	11,9	0,9			
9	Bend		106,94	0,16	13407		24,2609	47	2		5,5	0,4	
10	Pipe	10,02	46,91	29,5	13542	2,01	24,7499	6	17,1	1,4			
11	Bend		107,89	0,16	13554		25,8763	24	1,4		8,4	0,7	
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12	Outlet		107,89	0,16	13554		25,8763		90,105				
13	Filter	1148, m2	0,6	m/min	13586		25,8763		4,1199	32			mmWc

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Calculation results pressure conveying

Client:

Filepath: Quick modeling

Product: Corn

**Installation**

Convey distance horizontal: 800 m

Convey distance vertical: 5 m

Total conveying length: 805 m

Number of Bends: 3

Pipe diameter(s): 438 590 mm

Compressor displacement: 12 m<sup>3</sup>/sec

Booster displacement: 0 m<sup>3</sup>/sec

**Feeder system**

Installation system

2-vessel system  Rotary lock feeder  silo unloading airslides

3-vessel system  screw feeder  Bulk trailer unloading

Vessel factor	tons/hr/bar(a)	vessel capacity	tons/hr
Nominal capacity			
Silo volume		Silo content	760 tons
Silo product volume	1000 m <sup>3</sup>	pipe content	1559,2 kgs
pipe volume	152,87 m <sup>3</sup>		
pressure begin pressurizing	bar	Pipeline capacity	70 tons/hr
pressure valve open	bar	System capacity at pressure	
temperature begin pressurizing	C		
temperature after pressurizing	C		
pressurizing time	seconds	Pipeline energy consumption	28,16 kW/ton
Silo discharge time	10,8 hrs	System energy consumption	28,16 kW/ton
purging time	seconds	Total energy consumption	28,16 kW/ton
valve time	seconds		
overlap time	seconds		
cycle time	seconds		
Number of kettles/hr	-		

**Calculation results**

Capacity: 70 tons/hr

Pressure: 13586 mmWC

Booster pressure: 0 mmWC

Back pressure: 0 mmWC

Pressure drop: 13586 mmWC

Loading ratio: 1,2

Empty pipeline pressure: 16273 mmWc

Residence time: 25,87 seconds

Re-number \* 10<sup>-5</sup>: 17,141

Mixture density: 2,7 kg/m<sup>3</sup>

Mass of material in pipeline: 1559,2 kg

Exit dynamic force: 43,44 kN

**Pressure drops**

Product intake: 100 mmWC

Nozzle: 411 mmWC

Acceleration excl product resistance: 335 mmWC

Product resistance: 3159 mmWC

Elevation: 6 mmWC

Suspension: 609 mmWC

Gas: 10045 mmWC

Filter: 32 mmWC

**Energy**

(Screwcompressor)

Compressor power: 1971 kW

Booster power: 0 kW

Pipeline energy consumption/ton: 28,165 kW/ton

**Temperatures**

Ambient temperature: 25 degr C

Outlet temperature compressor: 130 degr C

Outlet temperature booster: 0 degr C

Mixture temperature begin: 90 degr C

Mixture temperature end: 25 degr C

**Table calculation**

Begin capacity: 70 tons/hr

Begin pressure: 13586 mmWc

lowest pressure: 2500 mmWc

pressure decrement: 554 mmWc

Calculate system capacity

Calculate table

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Print calculation result

New Calculation