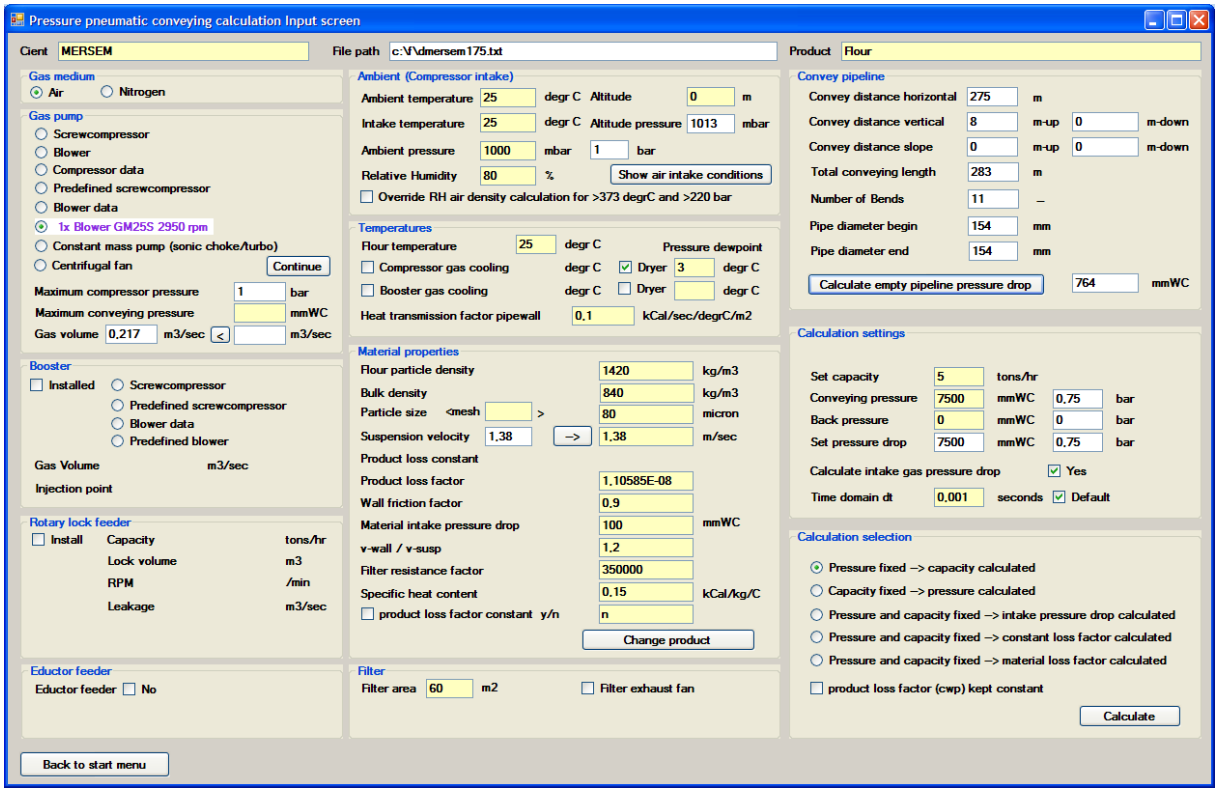
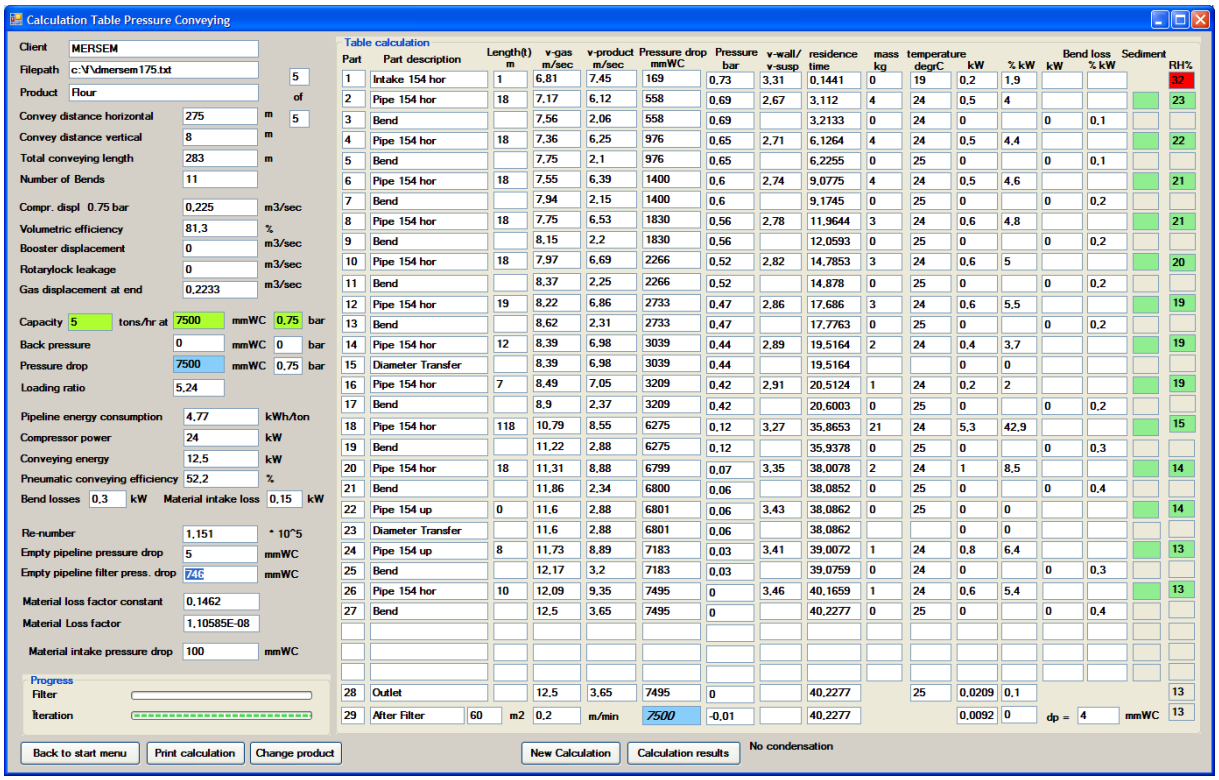
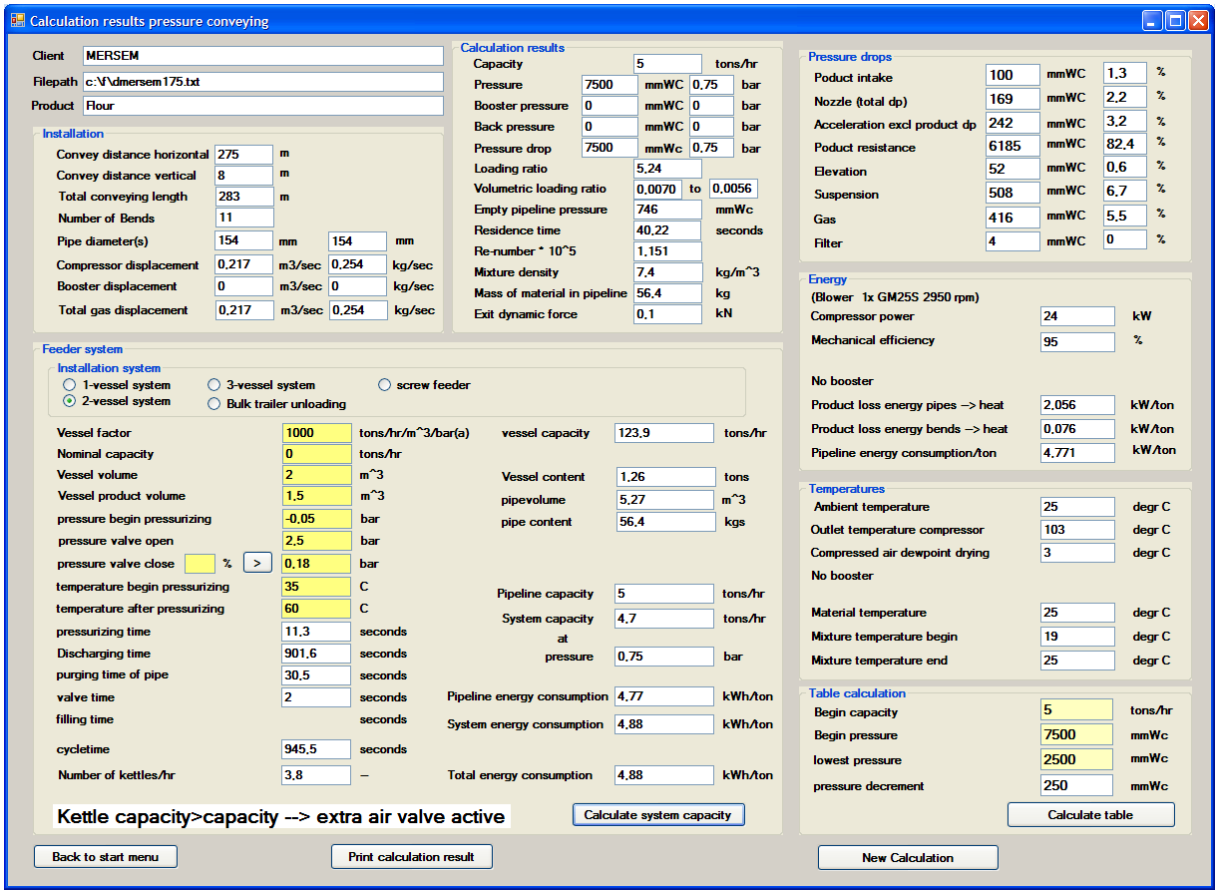
Flour preliminary pneumatic conveying calculation.

Pipe length:
- 175 m horizontal
- 8 m vertical
- 11 bends
- pipe diameter 6” (154 mm)




Calculation Table Pressure Conveying
Client MERSEM
Filepath c:\f\dmersem175.txt
Product Flour
Convey distance horizontal 275 m
Convey distance vertical 8 m
Total conveying length 283 m
Number of Bends 11
Compr. displ 0.75 bar 0,225 m3/sec
Volumetric efficiency 81,3 %
Booster displacement 0 m3/sec
Rotarylock leakage 0 m3/sec
Gas displacement at end 0,2233 m3/sec
Capacity 5 tons/hr at 7500 mmWC 0,75 bar
Back pressure 0 mmWC 0 bar
Pressure drop 7500 mmWC 0,75 bar
Loading ratio 5,24
Pipeline energy consumption 4,77 kWh/ton
Compressor power 24 kW
Conveying energy 12,5 kW
Pneumatic conveying efficiency 52,2 %
Bend losses 0,3 kW Material intake loss 0,15 kW
Re-number 1,151 * 10^5
Empty pipeline pressure drop 5 mmWC
Empty pipeline filter press. drop 746 mmWC
Material loss factor constant 0,1462
Material Loss factor 1,10585E-08
Material intake pressure drop 100 mmWC
Progress
Filter
Iteration
Table calculation
Part | Part description | Length(l) m | v-gas m/sec | v-product m/sec | Pressure drop mmWC | Pressure bar | v-wall/ v-susp | residence time | mass kg | temperature degrC | Bend loss kW | Bend loss % kW | Sediment | RH%
1 | Intake 154 hor | 1 | 6,81 | 7,45 | 169 | 0,73 | 3,31 | 0,1441 | 0 | 19 | 0,2 | 1,9 | | 32
2 | Pipe 154 hor | 18 | 7,17 | 6,12 | 558 | 0,69 | 2,67 | 3,112 | 4 | 24 | 0,5 | 4 | | 23
3 | Bend | | 7,56 | 2,06 | 558 | 0,69 | | 3,2133 | 0 | 24 | 0 | 0 | 0,1 | |
4 | Pipe 154 hor | 18 | 7,36 | 6,25 | 976 | 0,65 | 2,71 | 6,1264 | 4 | 24 | 0,5 | 4,4 | | 22
5 | Bend | | 7,75 | 2,1 | 976 | 0,65 | | 6,2255 | 0 | 25 | 0 | 0 | 0,1 | |
6 | Pipe 154 hor | 18 | 7,55 | 6,39 | 1400 | 0,6 | 2,74 | 9,0775 | 4 | 24 | 0,5 | 4,6 | | 21
7 | Bend | | 7,94 | 2,15 | 1400 | 0,6 | | 9,1745 | 0 | 25 | 0 | 0 | 0,2 | |
8 | Pipe 154 hor | 18 | 7,75 | 6,53 | 1830 | 0,56 | 2,78 | 11,9644 | 3 | 24 | 0,6 | 4,8 | | 21
9 | Bend | | 8,15 | 2,2 | 1830 | 0,56 | | 12,0593 | 0 | 25 | 0 | 0 | 0,2 | |
10 | Pipe 154 hor | 18 | 7,97 | 6,69 | 2266 | 0,52 | 2,82 | 14,7853 | 3 | 24 | 0,6 | 5 | | 20
11 | Bend | | 8,37 | 2,25 | 2266 | 0,52 | | 14,878 | 0 | 25 | 0 | 0 | 0,2 | |
12 | Pipe 154 hor | 19 | 8,22 | 6,86 | 2733 | 0,47 | 2,86 | 17,686 | 3 | 24 | 0,6 | 5,5 | | 19
13 | Bend | | 8,62 | 2,31 | 2733 | 0,47 | | 17,7763 | 0 | 25 | 0 | 0 | 0,2 | |
14 | Pipe 154 hor | 12 | 8,39 | 6,98 | 3039 | 0,44 | 2,89 | 19,5164 | 2 | 24 | 0,4 | 3,7 | | 19
15 | Diameter Transfer | | 8,39 | 6,98 | 3039 | 0,44 | | 19,5164 | | | 0 | 0 | | |
16 | Pipe 154 hor | 7 | 8,49 | 7,05 | 3209 | 0,42 | 2,91 | 20,5124 | 1 | 24 | 0,2 | 2 | | 19
17 | Bend | | 8,9 | 2,37 | 3209 | 0,42 | | 20,6003 | 0 | 25 | 0 | 0 | 0,2 | |
18 | Pipe 154 hor | 118 | 10,79 | 8,55 | 6275 | 0,12 | 3,27 | 35,8653 | 21 | 24 | 5,3 | 42,9 | | 15
19 | Bend | | 11,22 | 2,88 | 6275 | 0,12 | | 35,9378 | 0 | 25 | 0 | 0 | 0,3 | |
20 | Pipe 154 hor | 18 | 11,31 | 8,88 | 6799 | 0,07 | 3,35 | 38,0078 | 2 | 24 | 1 | 8,5 | | 14
21 | Bend | | 11,86 | 2,34 | 6800 | 0,06 | | 38,0852 | 0 | 25 | 0 | 0 | 0,4 | |
22 | Pipe 154 up | 0 | 11,6 | 2,88 | 6801 | 0,06 | 3,43 | 38,0862 | 0 | 25 | 0 | 0 | | 14
23 | Diameter Transfer | | 11,6 | 2,88 | 6801 | 0,06 | | 38,0862 | | | 0 | 0 | | |
24 | Pipe 154 up | 8 | 11,73 | 8,89 | 7183 | 0,03 | 3,41 | 39,0072 | 1 | 24 | 0,8 | 6,4 | | 13
25 | Bend | | 12,17 | 3,2 | 7183 | 0,03 | | 39,0759 | 0 | 24 | 0 | 0 | 0,3 | |
26 | Pipe 154 hor | 10 | 12,09 | 9,35 | 7495 | 0 | 3,46 | 40,1659 | 1 | 24 | 0,6 | 5,4 | | 13
27 | Bend | | 12,5 | 3,65 | 7495 | 0 | | 40,2277 | 0 | 25 | 0 | 0 | 0,4 | |
28 | Outlet | | 12,5 | 3,65 | 7495 | 0 | | 40,2277 | | 25 | 0,0209 | 0,1 | | 13
29 | After Filter | 60 m2 | 0,2 | m/min | 7500 | -0,01 | | 40,2277 | | | 0,0092 | 0 | dp = 4 mmWC | 13
Back to start menu
Print calculation
Change product
New Calculation
Calculation results
No condensation


Calculation results pressure conveying
Client MERSEM
Filepath c:\f\dmersem175.txt
Product Flour
Installation
Convey distance horizontal 275 m
Convey distance vertical 8 m
Total conveying length 283 m
Number of Bends 11
Pipe diameter(s) 154 mm 154 mm
Compressor displacement 0,217 m3/sec 0,254 kg/sec
Booster displacement 0 m3/sec 0 kg/sec
Total gas displacement 0,217 m3/sec 0,254 kg/sec
Calculation results
Capacity 5 tons/hr
Pressure 7500 mmWC 0,75 bar
Booster pressure 0 mmWC 0 bar
Back pressure 0 mmWC 0 bar
Pressure drop 7500 mmWc 0,75 bar
Loading ratio 5,24
Volumetric loading ratio 0,0070 to 0,0056
Empty pipeline pressure 746 mmWc
Residence time 40,22 seconds
Re-number * 10^5 1,151
Mixture density 7,4 kg/m^3
Mass of material in pipeline 56,4 kg
Exit dynamic force 0,1 kN
Pressure drops
Poduct intake 100 mmWC 1,3 %
Nozzle (total dp) 169 mmWC 2,2 %
Acceleration excl product dp 242 mmWC 3,2 %
Poduct resistance 6185 mmWC 82,4 %
Elevation 52 mmWC 0,6 %
Suspension 508 mmWC 6,7 %
Gas 416 mmWC 5,5 %
Filter 4 mmWC 0 %
Energy
(Blower 1x GM25S 2950 rpm)
Compressor power 24 kW
Mechanical efficiency 95 %
No booster
Product loss energy pipes --> heat 2,056 kW/ton
Product loss energy bends --> heat 0,076 kW/ton
Pipeline energy consumption/ton 4,771 kW/ton
Temperatures
Ambient temperature 25 degr C
Outlet temperature compressor 103 degr C
Compressed air dewpoint drying 3 degr C
No booster
Material temperature 25 degr C
Mixture temperature begin 19 degr C
Mixture temperature end 25 degr C
Feeder system
Installation system
1-vessel system
2-vessel system
3-vessel system
Bulk trailer unloading
screw feeder
Vessel factor 1000 tons/hr/m^3/bar(a)
Nominal capacity 0 tons/hr
Vessel volume 2 m^3
Vessel product volume 1,5 m^3
pressure begin pressurizing -0,05 bar
pressure valve open 2,5 bar
pressure valve close % > 0,18 bar
temperature begin pressurizing 35 C
temperature after pressurizing 60 C
pressurizing time 11,3 seconds
Discharging time 901,6 seconds
purging time of pipe 30,5 seconds
valve time 2 seconds
filling time seconds
cycletime 945,5 seconds
Number of kettles/hr 3,8 –
vessel capacity 123,9 tons/hr
Vessel content 1,26 tons
pipevolume 5,27 m^3
pipe content 56,4 kgs
Pipeline capacity 5 tons/hr
System capacity at pressure 4,7 tons/hr
0,75 bar
Pipeline energy consumption 4,77 kWh/ton
System energy consumption 4,88 kWh/ton
Total energy consumption 4,88 kWh/ton
Kettle capacity>capacity --> extra air valve active
Calculate system capacity
Table calculation
Begin capacity 5 tons/hr
Begin pressure 7500 mmWc
lowest pressure 2500 mmWc
pressure decrement 250 mmWc
Calculate table
Back to start menu
Print calculation result
New Calculation

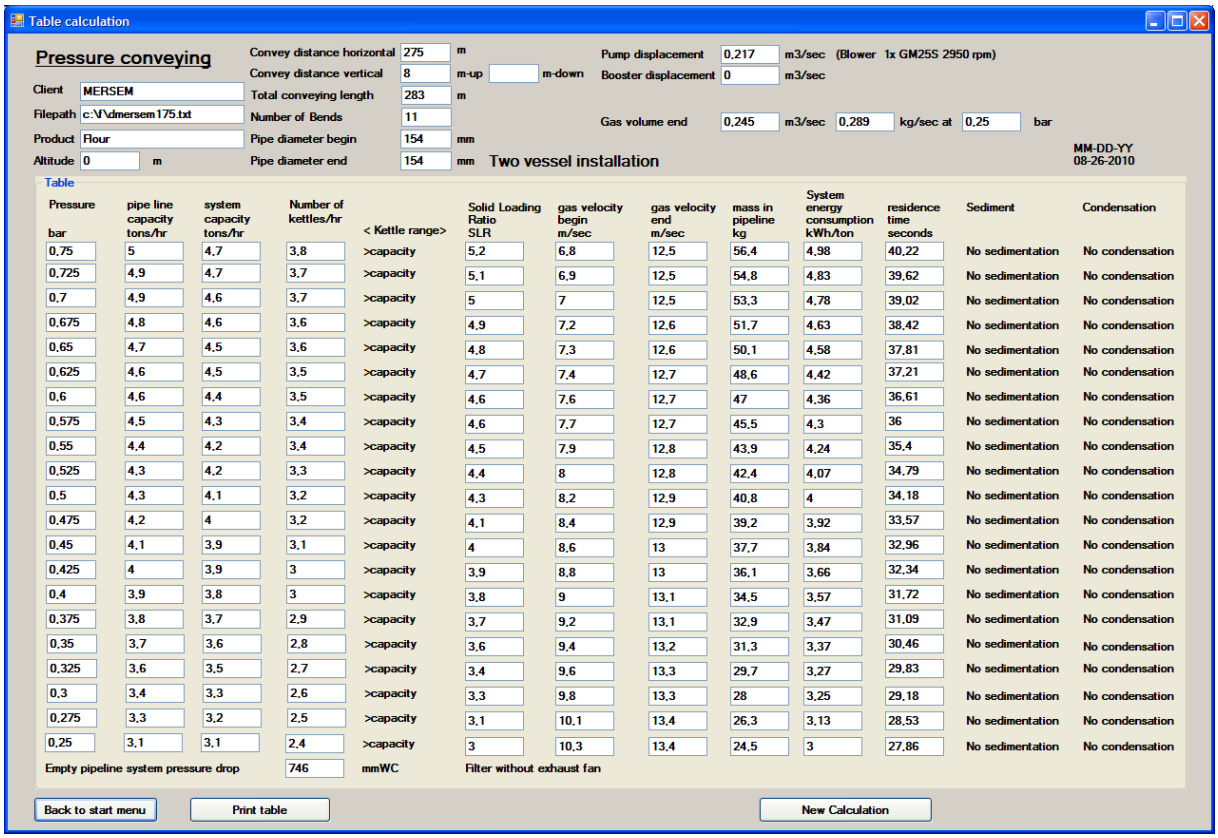


Table calculation
Pressure conveying
Client MERSEM
Filepath c:\f\dmersem175.txt
Product Flour
Altitude 0 m
Convey distance horizontal 275 m
Convey distance vertical 8 m-up m-down
Total conveying length 283 m
Number of Bends 11
Pipe diameter begin 154 mm
Pipe diameter end 154 mm
Two vessel installation
Pump displacement 0,217 m3/sec (Blower 1x GM25S 2950 rpm)
Booster displacement 0 m3/sec
Gas volume end 0,245 m3/sec 0,289 kg/sec at 0,25 bar
MM-DD-YY
08-26-2010
Table
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
0,75 5 4,7 3,8 >capacity 5,2 6,8 12,5 56,4 4,98 40,22 No sedimentation No condensation
0,725 4,9 4,7 3,7 >capacity 5,1 6,9 12,5 54,8 4,83 39,62 No sedimentation No condensation
0,7 4,9 4,6 3,7 >capacity 5 7 12,5 53,3 4,78 39,02 No sedimentation No condensation
0,675 4,8 4,6 3,6 >capacity 4,9 7,2 12,6 51,7 4,63 38,42 No sedimentation No condensation
0,65 4,7 4,5 3,6 >capacity 4,8 7,3 12,6 50,1 4,58 37,81 No sedimentation No condensation
0,625 4,6 4,5 3,5 >capacity 4,7 7,4 12,7 48,6 4,42 37,21 No sedimentation No condensation
0,6 4,6 4,4 3,5 >capacity 4,6 7,6 12,7 47 4,36 36,61 No sedimentation No condensation
0,575 4,5 4,3 3,4 >capacity 4,6 7,7 12,7 45,5 4,3 36 No sedimentation No condensation
0,55 4,4 4,2 3,4 >capacity 4,5 7,9 12,8 43,9 4,24 35,4 No sedimentation No condensation
0,525 4,3 4,2 3,3 >capacity 4,4 8 12,8 42,4 4,07 34,79 No sedimentation No condensation
0,5 4,3 4,1 3,2 >capacity 4,3 8,2 12,9 40,8 4 34,18 No sedimentation No condensation
0,475 4,2 4 3,2 >capacity 4,1 8,4 12,9 39,2 3,92 33,57 No sedimentation No condensation
0,45 4,1 3,9 3,1 >capacity 4 8,6 13 37,7 3,84 32,96 No sedimentation No condensation
0,425 4 3,9 3 >capacity 3,9 8,8 13 36,1 3,66 32,34 No sedimentation No condensation
0,4 3,9 3,8 3 >capacity 3,8 9 13,1 34,5 3,57 31,72 No sedimentation No condensation
0,375 3,8 3,7 2,9 >capacity 3,7 9,2 13,1 32,9 3,47 31,09 No sedimentation No condensation
0,35 3,7 3,6 2,8 >capacity 3,6 9,4 13,2 31,3 3,37 30,46 No sedimentation No condensation
0,325 3,6 3,5 2,7 >capacity 3,4 9,6 13,3 29,7 3,27 29,83 No sedimentation No condensation
0,3 3,4 3,3 2,6 >capacity 3,3 9,8 13,3 28 3,25 29,18 No sedimentation No condensation
0,275 3,3 3,2 2,5 >capacity 3,1 10,1 13,4 26,3 3,13 28,53 No sedimentation No condensation
0,25 3,1 3,1 2,4 >capacity 3 10,3 13,4 24,5 3 27,86 No sedimentation No condensation
Empty pipeline system pressure drop 746 mmWC
Filter without exhaust fan
Back to start menu
Print table
New Calculation