

Update info AQUA DESIGNER Version 9.1

Document: Update info AQUA DESIGNER Version 9.1
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	1 Summary	Version: 0

1 Summary

AQUA DESIGNER is one of the standard design programs for activated sludge plants in Germany and worldwide. The range of tools has been extended over the last few years to all important procedures and procedural stages.

- Sand trap as ventilated sand and fat catcher or round sand trap.
- Primary clarifier as rectangular or round basin.
- Aeration as continuous flow or SBR with common container shapes.
- Sludge treatment as anaerobic treatment or aerobic stabilization.

Many guidelines have been incorporated into the software:

- DWA-A 131, May 2016
- ATV-DVWK-A 198, April 2003
- DWA-A 202, May 2011
- DWA-M 210, July 2009
- DWA-A 226, August 2009
- DWA-M 229-1, September 2017
- DWA-M 368, June 2014
- DWA-M 260, October 2017
- DWA-M 227, October 2014; **NEW**

2 New in AQUA DESIGNER version 9.1

- New Standard M 227, Membrane Bioreactor

Since AQUA DESIGNER 9.0 very detailed ways of design for Membrane Bioreactor Plants is implemented. **In AD 9.1 this part has been refined because of further demands and technical discussions.**

The two common kinds of arrangement are available, modules in the activated chamber or modules in separate chambers.

The design is supported by standard values according to the M 227 and by data banks, containing membranes of suppliers, blowers for cross flow and pumps for permeate pumping.

Membrane Module
MBR-System

Integrated MBR system Separate MBR system

Multiline
Number of Module Tanks: 4
Wall Thickness: 0,30 m

Selection Membrane Module

Manufacturer	Kind of	Type	Length m	Width m	Height m	Membrane Surface m ²	basic area m ²	Volume m ³	Specific Membrane Surface / basic m ² /m ²	Packing density m ² /m ³	
Database	Modell 3	Hohfasemodul	M3 600	2,50	0,95	2,20	600,00	2,38	5,23	252,63	114,83

Average daily inflow (QT,aM): 390,62 m³/h

Parameter membrane design

- Water level above the membranes: 0,10 m
- Water distance under the membranes: 1,00 m
- Distance between modules: 0,20 m
- Distance to Wall: 0,20 m
- Transmembrane Pressure: 250 mbar
- Design permeation flux at the end of the usage period: 7,5 l/(m²h)
- Max. Suspended Solids: 12,0 g/l

Parameter Cross-Flow Aeration

- raw bubbles
- Spec. Oxygen supply: 2,5 gO₂/(Nm³m)
- Spec. Air demand (0,2 - 0,7): 0,2 m³/(m²h)
- Aeration System-Pressure Loss: 40 mbar

Blowers

- Number of Blowers: 4
- Efficiency: 100 %

Database

Motor Power	37,0	kW
Power Consumption	32,0	KW
Air Volume of each Blower	2610	m ³ /h
Pressure Height	300	mbar
Motor Power, total	148,0	KW
Power Consumption, total	128,0	KW
Air Volume, total	10440	Nm ³ /h
Oxygen Transfer, total	26,10	kgO ₂ /h
Energy demand of the Cross-Flow aeration	2,5	Wh/m ²

Result Membrane

	total	per Tank	
Required membrane surface	52.083,31	13.020,83	m ²
Number of membrane units	88	22	
Required basic area	209,00	52,25	m ²
Required Volume	459,80	114,95	m ³
Required Water Level	3,30	3,30	m

Results Cross-Flow Aeration

	total	per Tank	
Required Air Volume	10.416,66	2.604,17	Nm ³ /h
Oxygen Transfer	26,04	6,51	kgO ₂ /h
Min. Pressure Height	270	270	mbar

Membrane Pump

- Min. Transportation Height: 2,5 m
- Output: 1296,87 m³/h
- Number of Pumps: 8
- Transportation Height: 4,0 m

Database

Output	197,00	m ³ /h
Transportation Height	4,0	m WS
Motor Power	5,5	kW
Motor Power, total	44,00	kW
Output, total	1576,00	Nm ³ /h

OK Cancel

Figure 1: Selecting Modules and designing cross flow and permeate pumping

A 131 Activated Sludge Parameters

Basis of Calculation
 A 131 Sludge Stabilization

Outflow Requirements
 Denitrification

Organic Load

MLSS (Aeration Tank) kg/m3
 Sludge Age t_sg Min d
 Sludge Age t_sg d
 f_i
 f_{B,Stab}
 Acid Capacity in the Inflow mmol/l
 NTK in the Inflow mg/l
 Ammonia-N in the Outflow mg/l
 Nitrate-N in the Outflow mg/l

Phosphate Elimination
 chemical biological
 Factor XPBM
 Basic Data
 Discharge Limit mg/l
 β-Value
 Precipitant
 Iron Salt FeCl3 Aluminium Salt AlCl3
 Iron Salt FeSO4

External Carbon Dosage
 External Carbon Dosage
 Primärschlamm
 Density kg/m³
 COD-Concentration kg/m³
 Denitrification Capacity kgN/kgCSB
 Denitrification Rate g/(kg³h)
 Additional ES-Production kg/kgCSB
 Max. Denitrification Relation

Denitrification process
 Separate Stage Simultaneous
 Intermittend Combined

Parameter

Inert part of particular COD	fA	<input type="text" value="0,30"/>
Proportion of inorganic matter of filterable	fB	<input type="text" value="0,30"/>
Part of easily degradable COD	fCOD	<input type="text" value="0,20"/>
Yield coefficient	Y	<input type="text" value="0,67"/>
Decomposition Coefficient	b	<input type="text" value="0,17"/>
Part of dissolved inert COD	fS	<input type="text" value="0,05"/>

Process factor PF

fN	1,4	1,6	1,8	2,0	2,2	2,4
SNH ₄ , Control						
5 mg/l	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 mg/l	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Process factor
 Process factor chosen

Fractions COD

Particular COD	XCOD,ZB	418,13 mg/l
Dissolved COD	SCOD,ZB	221,87 mg/l
Dissolved inert COD	SCOD,inert,ZB	32,00 mg/l
Particular inert COD	XCOD,inert,ZB	125,44 mg/l
degradable COD	CCOD,abb,ZB	482,56 mg/l
easily degradable COD	CCOD,la,ZB	96,51 mg/l
filterable inorganic COD	Xanorg,TS,ZB	112,00 mg/l

Result

Required Volume VBBmin	632,08	m3
Sludge Age, total	25,00	d
Denitrification Ratio	0,236	
Spec. Surplus Sludge Production	0,506	kg/kg

Result Phosphate Elimination

Waste Sludge Production	21,86	kg/d
Part of SS-Biological	11,75	kg/m3
Precipitant Consumption for	44,32	l/d

x = OVC,D / SNO₃,D / 2,86

Calculate Interim Result

OK Cancel

Figure 2: Biological Volume and Treatment Parameters

Aqua Designer - [Aeration ATV A131]

File Report Selection Sludge Treatment Extras Drawings Verify Options Infos ?

Oxygen Transfer
 Minimum Volume VBB 632 m3
 Chosen Volume VBBjst 634 m3

Water Depth hBB 5 m
 Aeration Depth hD 4,7 m
 Factor depth fD 1,23
 Oxygen saturation at 20°C cS.20 9,10 mg/l
 Deduction oxygen input of cross-flow aeration 7,22 kgO2/h

Factors Membrane 5 m
 Factors Surface Aeration 5 m

height over NN 380 m
 Spec. Oxygen Transfer SSOTR 19,0 gO2/(m3*m)
 relative humidity J 0,60
 Pressure loss suction side DP 20 mbar
 Temperature Suction Side 30 °C
 salidity factor B 1,0 salidity factor Bc 1,0
 salidity factor fSt.St 1,0 salidity factor fS.c 1,0

Load Variation
 Load Case: 0 Dimensioning Medium Maximum Minimum Prognosis Winter

Load	%	100,0	80,0	100,0	80,0	100,0	100,0
Wastewater Temperature T	°C	12,0	15,0	20,0	15,0	15,0	10,0
Suspended Solids MLSS(AC)	kg/m3	12,00	12,00	12,00	12,00	12,00	12,00
Nutrient in the inflow CTKN.ZB	mg/l	58,7	58,7	58,7	58,7	58,7	58,7
Nitrate-N in the Inflow SNO3.ZB	mg/l	0,0	0,0	0,0	0,0	0,0	0,0
Effluent Concentration Ammonia SNH4-N.ES	mg/l	0,0	0,0	0,0	0,0	0,0	0,0
Effluent Concentration organic SorgN.LES	mg/l	2,0	2,0	2,0	2,0	2,0	2,0
Nitrate-N (Outlet) SNO3.ES	mg/l	6,0	6,0	6,0	6,0	6,0	6,0
Total Sludge Age tTS	d	25,0	32,8	26,5	32,8	25,7	0,0
Required Aerobic Sludge Age tTSa	d	7,30	5,44	3,33	5,44	5,44	0,00

Peak Factors
 Peak Factor for Carbon Respiration fC 1,00 1,00 1,10 1,00 1,00 1,00
 Peak factor for nutrient fN 1,00 1,00 1,50 1,00 1,00 1,00

Aeration Time
 Denitrification Ratio VD/VACmax 0,236 0,230 0,230 0,230 0,232 0,000
 x 1,006 1,001 1,001 1,001 1,001 0,000
 Aeration Time tL h/d 24,00 24,00 24,00 24,00 24,00 24,00

	kgO2/h	4,53	3,74	4,71	3,74	4,60	0,00
Oxygen Demand OVC.D							
O2-Consumption for Nitrification OVd.N	kgO2/h	7,78	6,43	8,09	6,43	7,91	1,01
O2-Consumption for Denitrification OVd.D	kgO2/h	4,50	3,74	4,71	3,74	4,60	0,00
Oxygen Demand OVh	kgO2/h	17,33	14,51	23,40	14,51	17,76	1,01
Oxygen Demand OVhmin	kgO2/h				6,65		
Operation Oxygen Concentrations cx	mg/l	1,50	1,50	1,50	1,50	1,50	1,50

Suppressed Air Aeration
 Interfacial factor α 0,60 0,60 0,40 0,60 0,40 0,40
 Oxygen Transfer SOTR kgO2/h 27,76 22,20 64,01 22,20 46,78 0,00
air demand QL m3/h 310,81 248,64 716,83 248,64 523,82 0,00

Surface Aeration
 Interfacial factor α 0,95 0,95 0,95 1,00 0,95 0,95
 Oxygen Transfer SOTR kgO2/h

Blower
 air volume at design cond., Load **716.83** m3/h
 Blowers 1
 Number of Blowers 2
 Database 100 %
 Motor Power kW
 Air Volume of each Blower m3/h
 Pressure Height mbar
 Air Flow for Dimensioning the Membrane Aerator m3/h
 Total (1 Chamber) m3/h
 Blowers 2
 Standby Blower
 Number of Blowers 0
 Database 0 %
 Motor Power kW
 Air Volume of each Blower m3/h
 Pressure Height mbar
 Air Flow for Dimensioning the Membrane Aerator m3/h
 Total (1 Chamber) m3/h
 Air Volume, total, Norm Cond. (per Chamber) QL.N m3/h m3/h
 Air Volume, total, Suction Cond. (per Chamber) Q1 m3/h m3/h
 Mixers
 Number of Mixers 1
 Spec. Energy Input (1-5 W/m³) 3,0 W/m3
 Database
 Motor Power kW
 Spec. Energy Input W/m3
 Membrane Aerator Cancel

Figure 3: Evaluating the oxygen demand and designing the aeration equipment

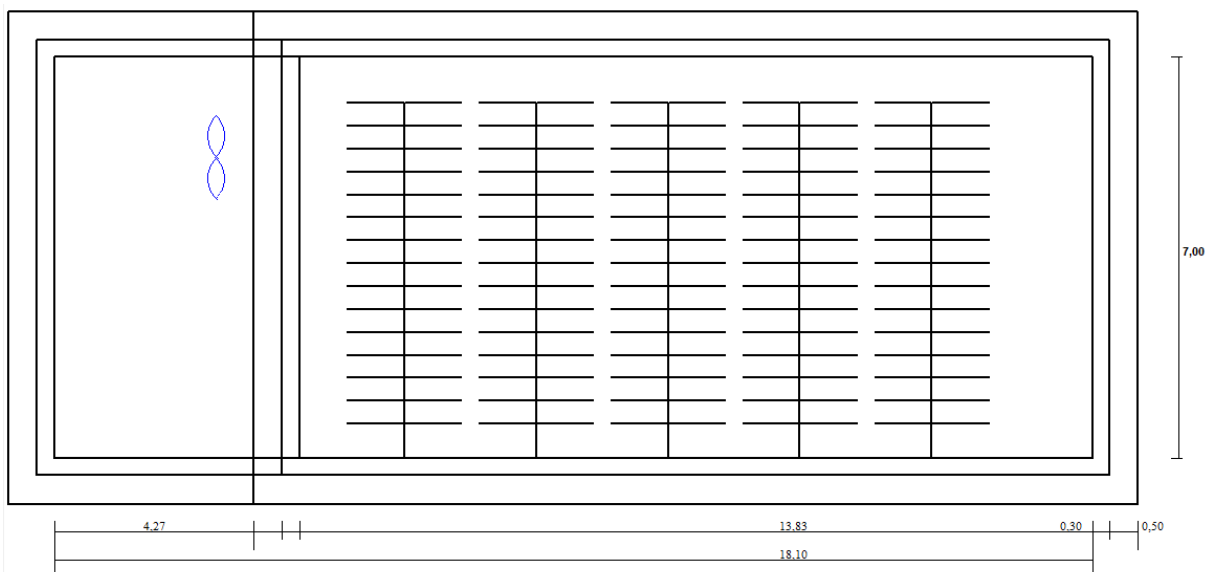


Figure 4: True scaled drawing of the activated chamber with equipment

After completing the design of a Membrane Bioreactor the additional tools are available.

Also for MBR you can add

- anaerobic or aerobic sludge treatment
- operational cost
- Oxygen efficiency
- Machine list
- And the other engineering tools of AQUA DESIGNER

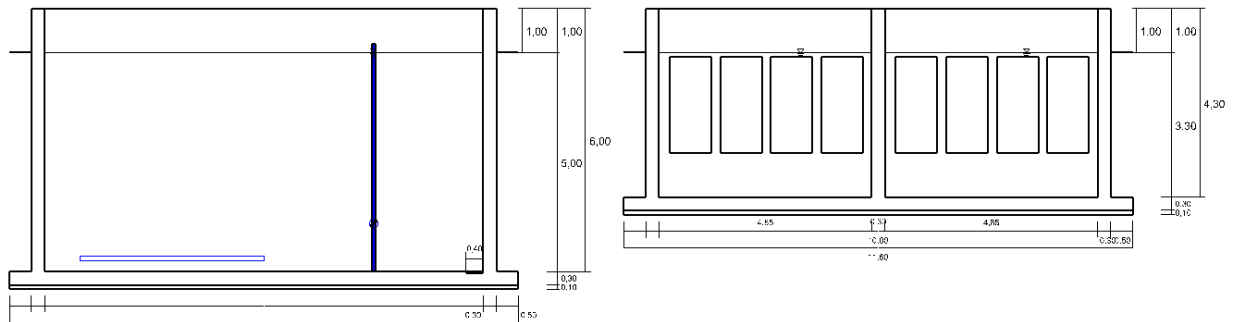


Figure 5: True scaled drawing, MBR side view

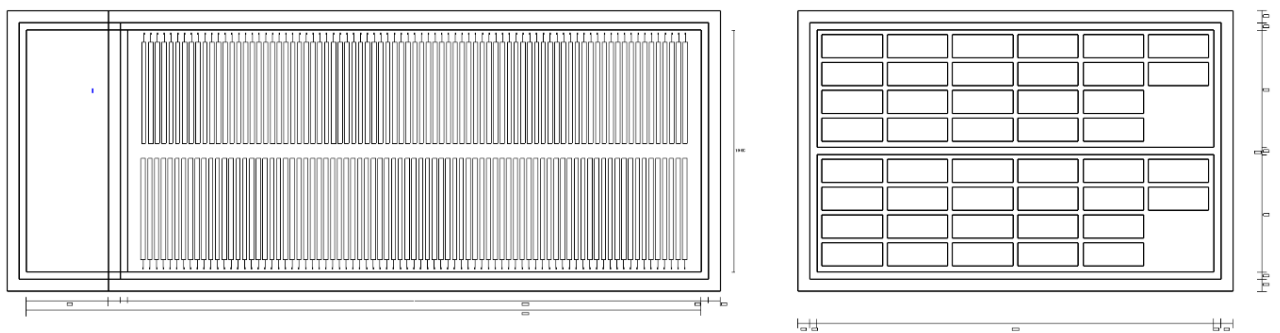


Figure 6: True scaled drawing, MBR top view

3 New in AD 8.3

- New Standard MSIG, Malaysian Sewerage Industry Guidelines
- New Standard Metcalf & Eddy for load, primary sedimentation and clarifiers
- Automatically generated machine and measuring list
- Automatically generated flow diagram
- Excel Export for the documentations

In the current update version 8.3, we added a [Machine List](#) and a [Flow Diagram](#).

After completing a project design including sand- and grease chamber, primary sedimentation, activated chamber, clarifier and return sludge pumping you can add other process steps via the component selection.

The selected steps with a typical set of machines and all the machine data chosen during the design process are listed in the machine list. Also for the measuring equipment a list can be generated. Part of this is also a plant identification system. By this index every machine can be identified in the lists and in the flow diagram.

Based on the design and the selections a flow diagram is generated suitable to the way of calculation.

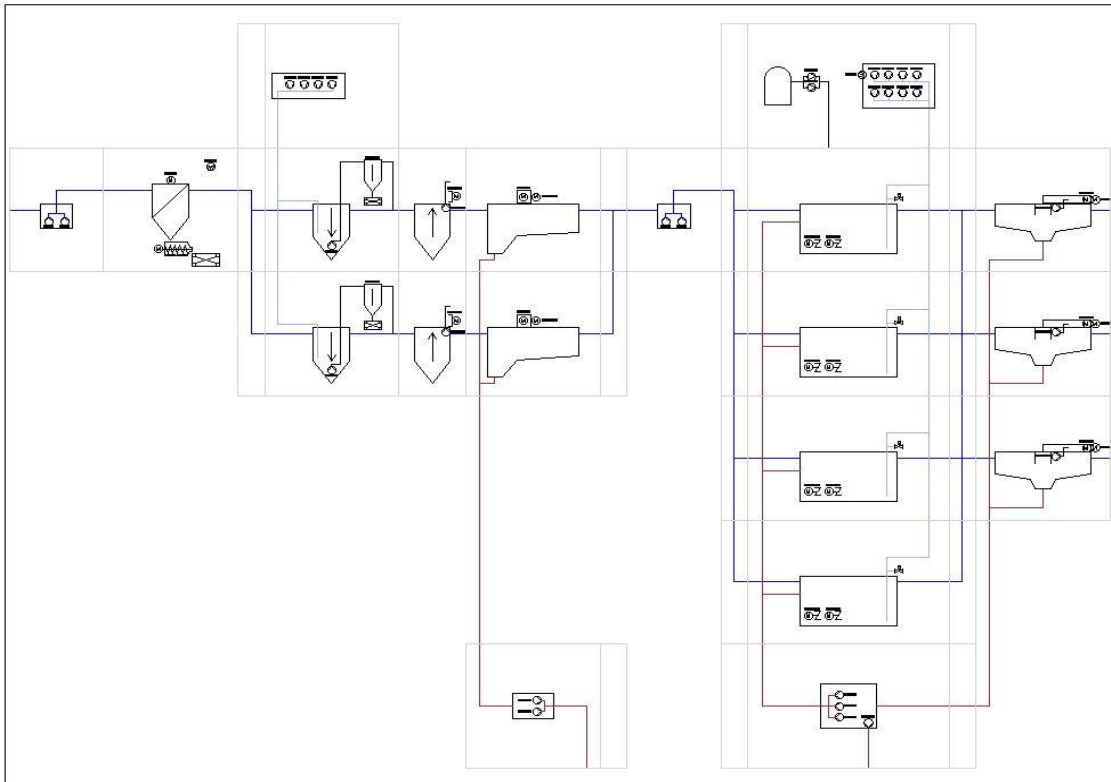


Figure 7: Flow Diagram Water Line

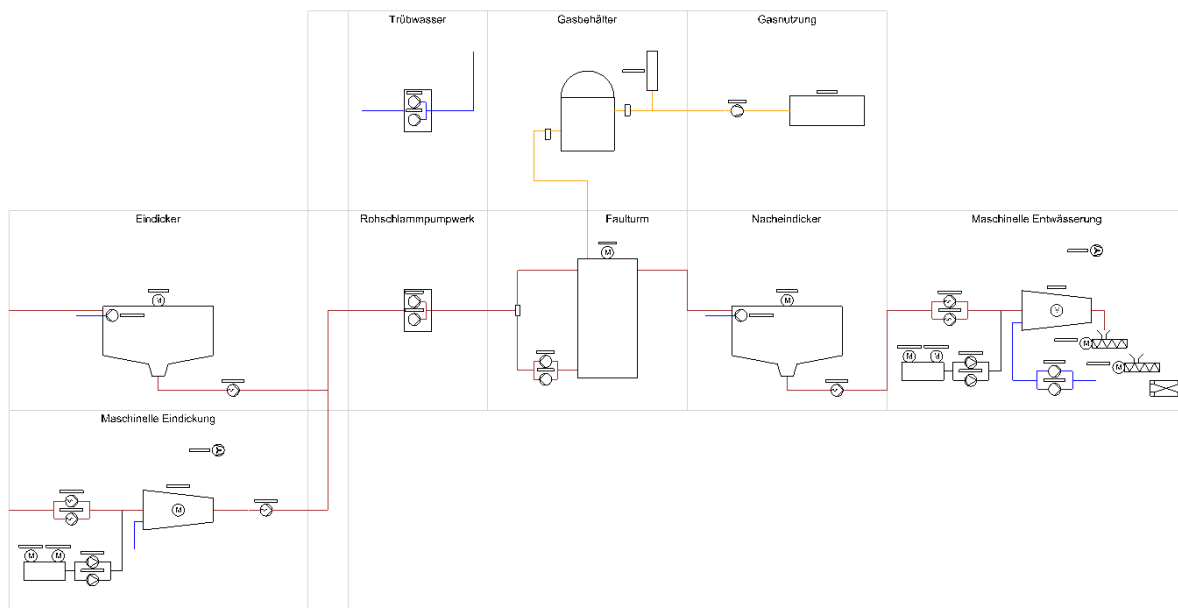


Figure 8: Flow Diagram Sludge Treatment

See also on youtube at <https://www.youtube.com/watch?v=-uhVsin2rDM>

4 New in AD 8.2

Continuous adaptation and improvement of the Design and SBR systems through the standard DWA-M 229-1. The following changes have been introduced into leaflet DWA-M 229-1:

- Case 3: The minimum air volume is calculated using a different approach.
- SOTR: The necessary oxygen supply SOTR was modified in particular with regard to the salt content.
- Operating air quantity Q1: The formula for the operating air quantity Q has not been changed.
- This applies to the design of SBR systems.

The modified formulas are listed in detail in the manual for the current version.

5 Examples

5.1 Machine List

Nr	Process stage	Order Number	Name	Type	Motor Power [kW]	Power Consumption [kW]	Capacity	Capacity Unit
1	Inflow Pumping Station	M-IN-P.1	Inlet Pump.1	Centrifugal Pump			3.255,21	m³/h
2	Inflow Pumping Station	M-IN-P.2	Inlet Pump.2	Centrifugal Pump			3.255,21	m³/h
3	Screen	M-SCR-SCR.1	Screen.1	Step Screen with Press			6.510,42	m³/h
4	Screen	M-SCR-VE.1	Screen Ventilator.1	Ventilator				
5	Grit and Grease Chamber	M-GC-B.1	Grit Blower.1	GM 4 S	7,5	5,4	273,6	m3/h
6	Grit and Grease Chamber	M-GC-B.2	Grit Blower.2	GM 4 S	7,5	5,4	273,6	m3/h
							
17	Pre Sedimentation	M-PS-PSP.1	Primary Sludge Pump.1	Centrifugal Pump				
18	Pre Sedimentation	M-PS-PSP.2	Primary Sludge Pump.2	Centrifugal Pump				
19	Pre Sedimentation	M-PS-SR.1.1	Sludge Removal Device.1.1	Sludge Removal Device				
20	Pre Sedimentation	M-PS-SR.2.1	Sludge Removal Device.2.1	Sludge Removal Device				
							
25	Intermediate Pumping Station	M-INT-P.1	Intermediate Pump.1	Centrifugal Pump			3.255,21	m³/h
26	Intermediate Pumping Station	M-INT-P.2	Intermediate Pump.2	Centrifugal Pump			3.255,21	m³/h
27	Anaerobic Mix Tank	M-AMT-MR.1.1	Anaerobic Mix Tank Mixer.1.1	Mixers				kW
28	Anaerobic Mix Tank	M-AMT-MR.1.2	Anaerobic Mix Tank Mixer.1.2	Mixers				kW
							
36	Activated Chamber	M-AC-B.1	Blower.1	GM 50 L	75	63,7	3.048,00	m³/h
37	Activated Chamber	M-AC-B.2	Blower.2	GM 50 L	75	63,7	3.048,00	m³/h
38	Activated Chamber	M-AC-B.3	Blower.3	GM 50 L	75	63,7	3.048,00	m³/h
39	Activated Chamber	M-AC-B.4	Blower.4	GM 50 L	75	63,7	3.048,00	m³/h

48	Activated Chamber	M-AC-VE.1	Activated Chamber Ventilator.1	Ventilator				
49	Activated Chamber	M-AC-MR.1.1	Activated Chamber Mixer.1.1	EMU TR 325	4,5	14,86	1,72	W/m ³
50	Activated Chamber	M-AC-MR.1.2	Activated Chamber Mixer.1.2	EMU TR 325	4,5	14,86	1,72	W/m ³
61	Precipitant dosage	M-PD-MNP.1	Precipitant Dosage Pump.1	Membrane Pump				
62	Precipitant dosage	M-PD-MNP.2	Precipitant Dosage Pump.2	Membrane Pump				
63	Secondary Settling Tank	M-SS-SR.1.1	Secondary Sedimentation Scraper.1.1	Remover Motor			1	kW
64	Secondary Settling Tank	M-SS-SR.2.1	Secondary Sedimentation Scraper.2.1	Remover Motor			1	kW
67	Secondary Settling Tank	M-SS-SCP.1.1	Scum Pump.1.1	Scum Pump			20	m ³ /h
68	Secondary Settling Tank	M-SS-SCP.2.1	Scum Pump.2.1	Scum Pump			20	m ³ /h
71	Secondary Settling Tank	M-SS-CC.1.1	Channel Cleaning.1.1	Channel Cleaning				
72	Secondary Settling Tank	M-SS-CC.2.1	Channel Cleaning.2.1	Channel Cleaning				
75	Return Sludge Pump Station	M-RAS-P.1	Return Sludge Pump.1	Centrifugal Pump	25	20	650	m ³ /h
76	Return Sludge Pump Station	M-RAS-P.2	Return Sludge Pump.2	Centrifugal Pump	25	20	650	m ³ /h
85	Waste Sludge Pumps	M-ES-P.1	Excess Sludge Pump.1	Centrifugal Pump				
86	Activated Chamber	M-AC-RCP.1	Recirculation Pump.1	Recirculation				m ³ /h
87	Activated Chamber	M-AC-RCP.2	Recirculation Pump.2	Recirculation				m ³ /h
92	Thickener	M-PTH-MR.1	Thickener Mixer.1	Mixer				
93	Thickener	M-PTH-PCP.1	Thickener progressing cavity pump.1	progr. cav. Pump				
94	Thickener	M-PTH-SN-P.1	Thickener Supernatant Pump.1	Centrifugal Pump				
95	Mechanical Thickening	M-MTH-DSP.1	Thin sludge Pump.1	Thin sludge Pump				

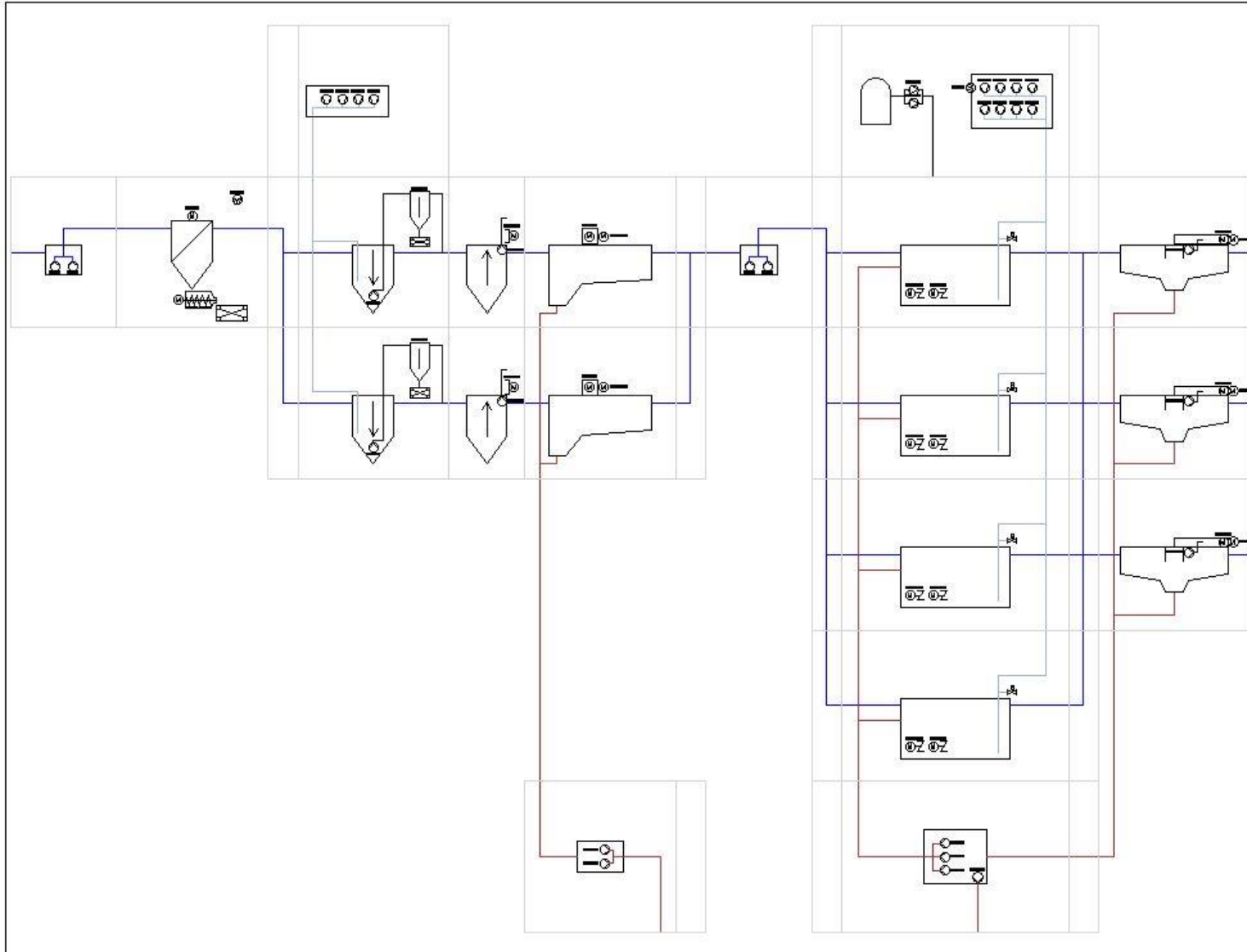
96	Mechanical Thickening	M-MTH-DSP.2	Thin sludge Pump.2	Thin sludge Pump				
97	Mechanical Thickening	M-MTH-TM.1	Thickening Machine.1	Thickening Machine				
98	Mechanical Thickening	M-MTH-TSP.1	Thick Sludge Pump.1	Thick Sludge Pump				
99	Mechanical Thickening	M-MTH-POM.1	Mixer Polymer.1	Polymer				
100	Mechanical Thickening	M-MTH-POM.2	Mixer Polymer.2	Polymer				
101	Mechanical Thickening	M-MTH-PDP.1	Polymer Dosage Pump.1	Polymer Dosage Pump				
102	Mechanical Thickening	M-MTH-PDP.2	Polymer Dosage Pump.2	Polymer Dosage Pump				
103	Mechanical Thickening	M-MTH-VE.1	Mechanical Thickening Ventilator.1	Ventilator				
104	Raw Sludge	M-RMS-P.1	Raw Sludge Pump.1	Raw Sludge Pump				
105	Raw Sludge	M-RMS-P.2	Raw Sludge Pump.2	Raw Sludge Pump				
106	Digester	M-DP-PC.1	Digester Circulating Pump.1	Circulating Pump				
107	Digester	M-DP-PC.2	Digester Circulating Pump.2	Circulating Pump				
108	Digester	M-DP-MR.1	Digester Mixer.1	Mixer				
109	Secondary Thickener	M-STH-MR.1	Secondary Thickener Mixer.1	Mixer				
110	Secondary Thickener	M-STH-PCP.1	Secondary Thickener progressing cavity pump.1	progr. cav. Pump				
111	Secondary Thickener	M-STH-SN-P.1	Secondary Thickener Supernatant Pump.1	Centrifugal Pump				
112	Dewatering	M-DW-PFE.1	Feed Pump.1	progr. cav. Pump				
113	Dewatering	M-DW-PFE.2	Feed Pump.2	progr. cav. Pump				
114	Dewatering	M-DW-M.1	Dewatering Machine.1	Dewatering Machine				
115	Dewatering	M-DW-SSC.1	Screw Conveyor.1	Screw Conveyor				
116	Dewatering	M-DW-SSC.2	Screw Conveyor.2	Screw Conveyor				
117	Dewatering	M-DW-FIP.1	Filtrate Pump.1	Filtrate Pump				
118	Dewatering	M-DW-FIP.2	Filtrate Pump.2	Filtrate Pump				
119	Dewatering	M-DW-VE.1	Dewatering Ventilator.1	Ventilator				
120	Dewatering	M-DW-POM.1	Dewatering Mixer Polymer.1	Polymer				
121	Dewatering	M-DW-POM.2	Dewatering Mixer Polymer.2	Polymer				
							
124	Supernatant	M-SN-P.1	Supernatant Pump.1	Centrifugal Pump				
125	Supernatant	M-SN-P.2	Supernatant Pump.2	Centrifugal Pump				

5.2 Measuring List

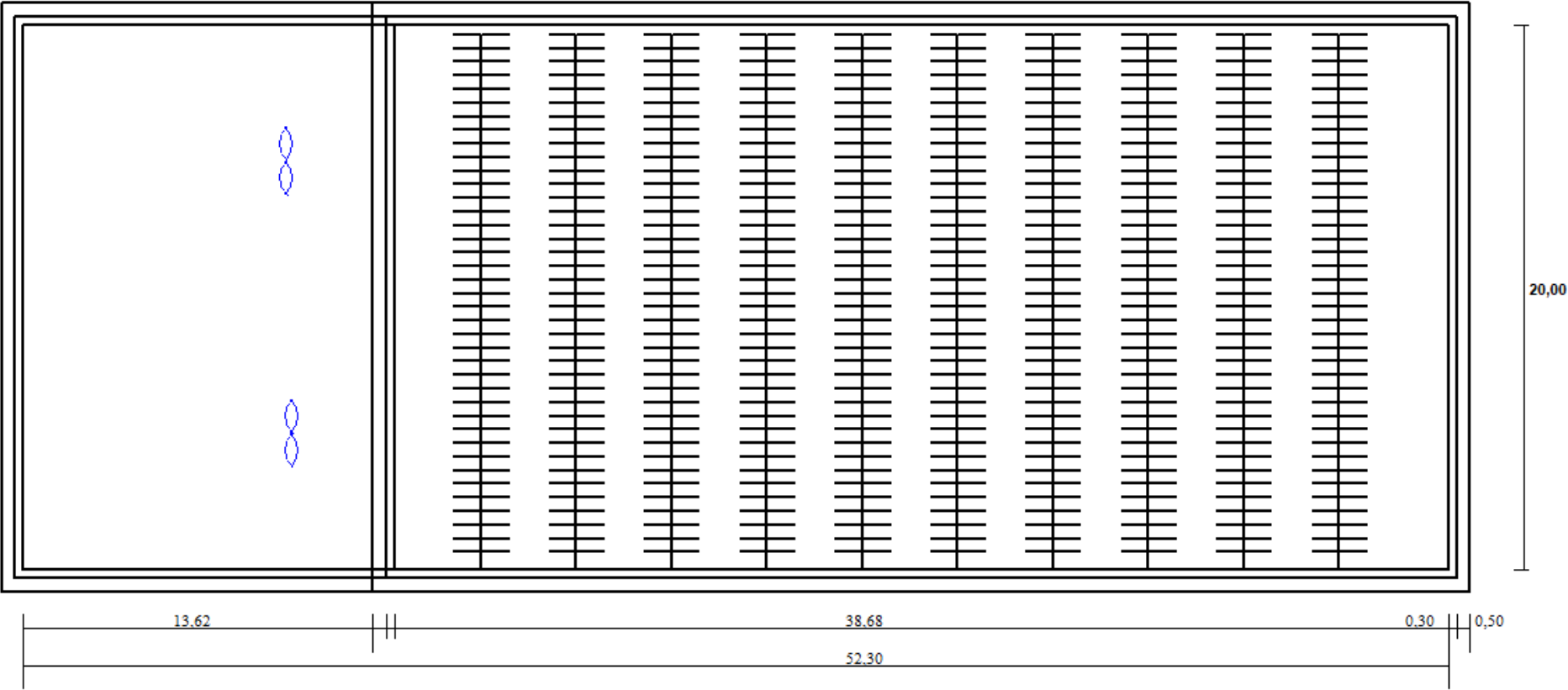
Nr	Process stage	Process stage	Order Number	Measuring Point (*)
1		Inflow Measuring	MES-IN.1	Flow
2		Inflow Measuring	MES-IN.2	Conductivity
3		Inflow Measuring	MES-IN.3	PH
4		Inflow Measuring	MES-IN.4	NH4
5		Inflow Pumping Station	MES-IN-PS.1	Flow
6		Inflow Pumping Station	MES-IN-PS.2	Level
7		Screen	MES-SCR.1	Level
8		Activated Chamber	MES-AC.1.1	PH
9		Activated Chamber	MES-AC.1.2	Temperature
10		Activated Chamber	MES-AC.1.3	O2
11		Activated Chamber	MES-AC.1.4	NH4
12		Activated Chamber	MES-AC.1.5	NO3
13		Activated Chamber	MES-AC.1.6	MLSS
14		Activated Chamber	MES-AC.1.7	Pressure
15		Activated Chamber	MES-AC.2.1	PH
16		Activated Chamber	MES-AC.2.2	Temperature
17		Activated Chamber	MES-AC.2.3	O2
18		Activated Chamber	MES-AC.2.4	NH4
19		Activated Chamber	MES-AC.2.5	NO3
20		Activated Chamber	MES-AC.2.6	MLSS
21		Activated Chamber	MES-AC.2.7	Pressure
22		Activated Chamber	MES-AC.3.1	PH
23		Activated Chamber	MES-AC.3.2	Temperature
24		Activated Chamber	MES-AC.3.3	O2
25		Activated Chamber	MES-AC.3.4	NH4
26		Activated Chamber	MES-AC.3.5	NO3
27		Activated Chamber	MES-AC.3.6	MLSS
28		Activated Chamber	MES-AC.3.7	Pressure
29		Activated Chamber	MES-AC.4.1	PH
30		Activated Chamber	MES-AC.4.2	Temperature
31		Activated Chamber	MES-AC.4.3	O2
32		Activated Chamber	MES-AC.4.4	NH4
33		Activated Chamber	MES-AC.4.5	NO3

34	Activated Chamber	MES-AC.4.6	MLSS
35	Activated Chamber	MES-AC.4.7	Pressure
36	Activated Chamber	MES-AC.5.1	PH
37	Activated Chamber	MES-AC.5.2	Temperature
38	Activated Chamber	MES-AC.5.3	O2
39	Activated Chamber	MES-AC.5.4	NH4
40	Activated Chamber	MES-AC.5.5	NO3
41	Activated Chamber	MES-AC.5.6	MLSS
42	Activated Chamber	MES-AC.5.7	Pressure
43	Activated Chamber	MES-AC.6.1	PH
44	Activated Chamber	MES-AC.6.2	Temperature
45	Activated Chamber	MES-AC.6.3	O2
46	Activated Chamber	MES-AC.6.4	NH4
47	Activated Chamber	MES-AC.6.5	NO3
48	Activated Chamber	MES-AC.6.6	MLSS
49	Activated Chamber	MES-AC.6.7	Pressure
50	Secondary Sedimentation	MES-SS.1	Flow
51	Return Sludge Pump Station	MES-RAS-PS.1.1	Level
52	Return Sludge Pump Station	MES-RAS-PS.2.1	Level
53	Return Sludge Pump Station	MES-RAS-PS.3.1	Level
54	Return Sludge Pump Station	MES-RAS-PS.4.1	Level
55	Thickener	MES-PTH.1	Level
56	Excess Sludge Thickening	MES-MTH.1	Flow
57	Excess Sludge Thickening	MES-MTH.2	MLSS
58	Raw Sludge	MES-RMS-PS.1	Flow
59	Raw Sludge	MES-RMS-PS.2	Level
60	Raw Sludge	MES-RMS-PS.3	Phosphate
61	Raw Sludge	MES-RMS-PS.4	MLSS
62	Digester	MES-DP.1	Level
63	Digester	MES-DP.2	PH
64	Digester	MES-DP.3	Temperature
65	Sludge Dewatering	MES-DW.1	Flow
66	Sludge Dewatering	MES-DW.2	Level
67	Sludge Dewatering	MES-DW.3	MLSS
68	Supernatant	MES-SN.1	Level

5.3 Flow Diagram



5.4 Drawing combined denitrification



5.5 Drawing clarifier

