DEUTSCHES INSTITUT FÜR BAUTECHNIK
[German Institute for Structural Engineering]

Institution under German Public Law

D-10829 Berlin, 31 January 2007
Kolonnenstraße 30 L
Tel: +49-(0)30-7 87 30 - 298
Fax: +49-(0)30-7 87 30 - 320
Reference: III 31-1.55.3-24/06

National General Technical Approval

(This translation of the German original version has not been approved by the Deutsches Institut für Bautechnik.)

Approval number **Z-55.3-144**

Manufacturer ATB Umwelttechnologien GmbH
Südstraße 2
D-32457 Porta-Westfalica
Germany

Object of the approval Small wastewater treatment plants with wastewater aeration, made from poly ethylene; activated sludge plants in impoundage operation for 4 to 16 PT; Effluent Class D

Validity to: 01 June 2011

The above mentioned object of approval is now approved. This National General Technical Approval consists of ten pages and eight annexes

I. GENERAL PROVISIONS

1. With the National General Technical Approval the suitability and applicability of the object to be approved is verified within the meaning of the building regulations of the German Federal States.

2. The National General Technical Approval does not replace the approvals, agreements and certifications prescribed by law for the realisation of building projects.

3. The National General Technical Approval is granted irrespective of third party rights, in particular private property rights.

4. Irrespective of further regulations in the “Special Provisions”, manufacturer and seller of the object of the approval have to place at the disposal of the user of the object of the approval, copies of the National General Technical Approval, and are to point out that the National General Technical Approval must be available at the place of use. Copies of the National General Technical Approval are, on demand, to be placed at the disposal of the authorities involved.

5. The National General Technical Approval may be reproduced in its entirety only. Publication in part requires the consent of the Deutsches Institut für Bautechnik. Texts and drawings of promotional documents may not contradict the National General Technical Approval. Translations of the National General Technical Approval must contain the note "This translation of the German original version has not been approved by the Deutsches Institut für Bautechnik.”

6. The National General Technical Approval is granted until further notice. The provisions of the National General Technical Approval can be supplemented and amended at a later date, in particular if this is required due to new technical findings.

II. SPECIAL PROVISIONS

1 Object of the approval and field of application

1.1 Object of the approval are small wastewater treatment plants with wastewater aeration, made from polyethylene, for installation in the ground, outside traffic areas, which are operated as activated sludge plants in impoundage operation in various sizes from 4 to 16 PT in accordance with Annex 1.

Small wastewater treatment plants serve for the aerobic biological treatment of domestic wastewater and commercial wastewater in so far as it is comparable with domestic wastewater, collected using the separate system.

The small wastewater treatment plants, including all components, are basically manufactured as new plants. They can, however, also be produced through appropriate retrofitting of existing facilities. In these cases the existing facility (multichamber pit made from concrete in accordance with DIN 4261-1[1)]) serve for coarse material separation and sludge storage, the additionally installed PE tank constitutes the activated sludge plant in impoundage operation.

The approval of the essential modification of an existing wastewater facility (retrofitting of existing multichamber pit) takes place according to [German] Federal State provisions within the framework of the licensing process under water law.

1.2 The following may not be discharged into the small wastewater treatment plant:

- commercial wastewater so far as it is not comparable with domestic wastewater
- infiltration water (e.g. drainage water)
- cooling water and discharged water from swimming pools
- precipitation water

1.3 With this National General Technical Approval, in addition to general construction supervision requirements, those requirements under water law within the sense of the Federal State regulations for the determination of the suitability of construction products and designs are also fulfilled through verification in accordance with the Federal State Construction Regulations (WasBauPVO).

1.4 The National General Technical Approval is granted irrespective of test or authorisation reservations of other legal areas (First Ordinance on Equipment and Products Safety Law (Ordinance on the Bringing on to the Open Market of Electrical Equipment for Utilisation within Certain Voltage Limits – 1st GPSGV), Law on the Electromagnetic Compatibility of Equipment – (EMVG), Eleventh Ordinance to the Equipment and Product Safety Law (Explosion Protection Ordinance – 11th GPSGV), Ninth Ordinance on the Equipment and Product Safety Law (Machine Ordinance – 9. GPSGV).

2 Provisions for the construction product

2.1 Characteristics and requirements

2.1.1 Characteristics

The small wastewater treatment plants with wastewater aeration (activated sludge plant in impoundage operation) in accordance with the functional description in Annexes 8 to 10 have been tested in accordance with EN 12566-3[2)] on a test field and assessed according to the approval principles for small wastewater treatment plants of the Deutsches Institut für Bautechnik (as at: February 2006).

---

1) DIN 4261-1: "Small sewage treatment plants; Plants without wastewater aeration"

2) EN 12566-3:2005-10 "Small wastewater treatment systems for up to 50 PT, Part 3: Packaged and/or site assembled domestic wastewater treatment plants"

Small wastewater treatment plants of this type are in a position to maintain the following requirements in on-site operation:

Requirements, determined at the outlet of the small wastewater treatment plant:

- BOD_5: ≤ 15 mg/l from a 24 h composite sample, homogenised
  ≤ 20 mg/l from a qualified random sample, homogenised
- COD: ≤ 75 mg/l from a 24 h composite sample, homogenised
  ≤ 90 mg/l from a qualified random sample, homogenised
- NH_4-N: ≤ 10 mg/l from a 24 h composite sample, filtered
- N_{inorg}: ≤ 25 mg/l from a 24 h composite sample, filtered
- filterable solids: ≤ 50 mg/l from a qualified random sample

Thus the requirements on Effluent Class D are observed.

2.1.2 Requirements

2.1.2.1 Technical clarification dimensioning

Technical clarification dimensioning for each design capacity is to be found in Annexes 5 to 6.

2.1.2.2 Design of the small wastewater treatment plants

With regard to configuration, size of the components and functional dimensions, small wastewater treatment plants with wastewater aeration must comply with the specifications in Annexes 1 to 4.

With regard to the materials used, attention is drawn to the product documentation lodged with the Deutsches Institut für Bautechnik.

2.1.2.3 Verification of structural safety

Verification of the structural safety has been furnished for the installation conditions given in this National General Technical Approval. The information on installation under Section 3 as well as the manufacturer's details in Annex 8 of this National General Technical Approval are to be observed.

2.2 Production, marking

2.2.1 Production

For the production of the tanks, only moulding material made of PE, more precisely designated with the trade name and manufacturer, which comply with the characteristic values in accordance with EN 1778[3)] and the DVS Directive 2205-1[4)] and which are lodged with the Deutsches Institut für Bautechnik, may be employed.

Small wastewater treatment plants are produced either completely in the factory or by retrofitting of existing plants.

The existing multi-chamber pits must have a

2.2.2 Marking

Small wastewater treatment plants with wastewater aeration (activated sludge plants in impoundage operation) must be marked by the manufacturer with the conformity symbol in accordance with the [German] Conformity Symbol Ordnance according to the respective German Federal State. Marking may only take place if the prerequisites in accordance with

---

3) EN 1778:1999-12: "Characteristic values for welded thermoplastics constructions. Determination of allowable stresses and moduli for design of thermoplastics equipment"

4) Directive DVS 2205, Part 1:1987-06 - Characteristic values - "Berechniung von Behältern und Apparaten aus Thermoplasten" [Calculation of tanks and apparatus made from thermoplastics]

Section 2.3are met. In addition, small wastewater treatment plants with wastewater aeration are to be marked clearly and permanently with the following details:

- Type designation
- Max. PT
- Electrical connected load
- Usable volumes of the primary settling stage/sludge storage tank
  of the buffer
  of the activated sludge reactor

Effluent Class D

2.3 Certificate of conformity

2.3.1 New construction

2.3.1.1 General information

The confirmation of the conformity of small sewage treatment plants with wastewater aeration with the provisions of this National General Technical Approval must take place for each manufacturing plant by means of a declaration of conformity by the manufacturer based on a factory production control (see Section 2.3.1.2).

The confirmation of the conformity of the installed plant with the provisions of the National General Technical Approval must take place using a declaration of conformity of the installation firm on the basis of the tests and examinations listed in Section 2.3.2.

2.3.2 Factory production control

In each manufacturing plant a factory production control is to be established and carried out. “Factory production control” is understood to mean the continuous production monitoring carried out by the manufacturer, by means of which he ensures that the construction products he has manufactured conform to the provisions of this National General Technical Approval.

The factory production controls consist of:

- Description and examination of the original materials and the components:

  The manufacturer of the tank has to verify that the moulding material corresponds with the laiddown requirements by means of certificates 2.3/3.1.B, in accordance with EN 10204[5)], of the manufacturer of the original material.

  The melt-flow index and the density of the moulding material (tank) are to be checked for compliance with the requirements below, at incidental sections (e.g. supports, openings) following start up of operations, change of batches, however, at least once in the month of manufacture.

Characteristic	Unit	Test basis	Requirement
Melt-flow index	g/10 min)	EN ISO 1133[6)] MFR 190/2,16	Max. MFR = MFR 190/2, $16_{(a)}$ + 15 %
Density	g/cm^3	EN ISO 1183-1[7)]	$D_{(e)} = D_{(a)} \pm 15$ %

  Index a = measured value before processing (moulding materials)

  Index e = measured value after processing (on the tank)

- Checks and tests which are to be carried out on finished products are:

5) EN 10204:1995-08 “Metallic materials; Types of inspection documents”.

6) EN ISO 1133:2000-02 “Plastics. Determination of the melt mass-flow rate MFR and the melt volume-flow rate (MVR) of thermoplastics”.

7) EN ISO 1183-1:2000-07 “Plastics. Methods for the determining the density of non-cellular plastics. Immersion method, liquid pyknometer method and titration method”.

Here
- the relevant dimensions of the tank,
- the diameter and the arrangement of inlet and outlet by height
- the cross-sections and the arrangement of possible flow passages by height
- installation depth and height above the water level of the submerged tube and scum board

are to be established, and the conformity with the statements in the Annexes of this National General Technical Approval is to be checked.

- Control of watertightness:

  The watertightness test from inside (the tank) is to be carried out by authorised technical experts of the manufacturer of the tank taking into consideration the requirements in accordance with Point 7 of DIN 4261-101[8)].

The results of the factory production control are to be recorded and evaluated. The documents must contain at least the following information:

- designation of the construction product and/or of the original material and its constituents
- type of control or examination
- date of production and of the examination of the construction product and/or the original material or the constituents
- result of controls and examinations and, as far as applicable, comparison with the requirements
- signature of the person responsible for the factory production control.

With inadequate test results the required measures for the remedy of faults are to be taken without delay by the manufacturer. Construction products, which do not meet the requirements are to be handled in such a manner that they cannot be confused with those which conform. After rectification of the fault the respective testing is to be repeated without delay – as far as it is technically possible and necessary for the verification of the correction of the fault.

The records are to be kept for least five years. They are to be submitted, on demand, to the Deutsches Institut für Bautechnik, the responsible highest building supervisory authority or the responsible water authority.

2.3.3 Retrofitting

The confirmation of the conformity of the retrofitted plant with the provisions of the National General Technical Approval must take place using a declaration of conformity of the firm carrying out the retrofit on the basis of the following checks of the plant installed ready on site in accordance with Section 3:

The completeness of the assembled plant and the arrangement of the components including the installation components are to be checked.

The results of the checks and tests are to be recorded and evaluated. The records must contain at least the following details:

- Designation of the construction product and initial materials and the components
- Type of check or test
- Date of manufacture and the testing of the construction product and the initial materials or the components
- Results of the checks and tests and, as far as relevant, comparison with requirements
- Signature of those responsible for the checks.

---

8) DIN 4261-101:1998-02 "Kleinkläranlagen, Anlagen ohne Abwasserbelüftung, Grundsätze zur werkseigenen Produktionskontrolle und Fremd Überwachung"
(Not available in English – Courtesy translation of title: "Small wastewater treatment plants without wastewater aeration, principles for factory production monitoring l and outside surveillance")

With inadequate test results the required measures for the remedy of faults are to be taken without delay by the manufacturer. Construction products, which do not meet the requirements are to be handled in such a manner that they cannot be confused with those which conform. After rectification of the fault the respective testing is to be repeated without delay – as far as it is technically possible and necessary for the verification of the correction of the fault.

Results of checks and tests as well as the declaration of conformity are to be kept by the applicant or the installation firm for at least five years. They are to be submitted, on demand, to the Deutsches Institut für Bautechnik, the responsible highest building supervisory authority or the responsible water authority.

3 Provisions for installation

3.1 Point of installation

With the selection of the installation point attention is to be paid that the small wastewater treatment plant is accessible at all times and the removal of sludge is ensured at all times. The separation of the plant from existing and planned facilities for the procurement of water must be so large that there are no fears about interference. In water protective zones the respective regulations under Federal State law are to be observed.

The installation of small wastewater treatment plants may only take place outside traffic areas. The point of installation is to be secured through appropriate measures (enclosure, warning signs) against being driven over accidentally.

With installation in the area of groundwater, safety measures against buoyancy are to be planned. In this case a verification of stability matched locally is required.

3.2 General conditions

Installation is to be carried only by such firms as have specialist experience, suitable equipment and facilities as well as sufficiently trained personnel. Relevant accident prevention regulations are to be observed in order to avoid hazards for employees and third parties.

The applicant has to produce an installation instruction each for both the case where the small wastewater treatment plant is manufactured completely in the factory and also for the case where it is produced by the retrofitting of an existing facility. With this, the provisions of Annex 8 are to be observed.

3.3 Plants manufactured completely in the factory

Installation is to be carried out in accordance with the manufacturer's installation instructions taking into account the constraints which are based on the verification of stability.

3.4 Plant manufactured through retrofitting and existing facility

Installation is to be carried out in accordance with the manufacturer's installation instructions.

Following emptying, the correct condition of the existing multi-chamber pit is to be assessed and documented through individual inspection under the responsibility of the firm carrying out retrofitting. Possible overhaul is to be carried and documented in writing by this firm, taking into account items already installed and items to be retrofitted. A record of this is to be handed to the operator together with the operator's log.

The structural modifications may not impair the static concept of the existing facilities.

The thus retrofitted plant must at least correspond with the details of this National General Technical Approval.

3.5 Testing of the watertightness following installation

Outside walls and bottoms of plant components as well as pipe connections must be sealed. The plant is to be filled with water for testing after installation up to the upper edge of the tank (upper edge of cone or cover plate). With concrete tanks the water loss of 0.1 l/m^2 wetted inner surface of the outer walls in accordance with EN 1610[9)] may not be exceeded. With tanks made from other materials water loss is not permitted.

Test procedures of equal status in accordance with EN 1610 are authorised.

4 Provisions for usage, operation and maintenance

4.1 General

The characteristics confirmed under Section 2.1.1 are only achievable in on-site installation if operation and maintenance are carried out according to the following provisions.

Small wastewater treatment plants must always be ready for operation. faults with technical facilities must be indicated using acoustically and/or optically.

Small wastewater treatment plants must be equipped with a mains-independent power failure monitoring facility with acoustic and/or optical alarm signalling

Only such wastewater may be discharged into small wastewater treatment plants that neither damages these nor disrupts their function (see DIN 1986-3[10)]).

The manufacturer of the plant is to draw up an instruction for operation and maintenance, including sludge removal, which at least must contain the provisions of this National General Technical Approval, and is to hand this to the operator of the plant.

All plant components, which require regular maintenance, must be accessible at all times.

Operation and maintenance are to be arranged in such a way that

- hazards for the environment are not to be expected, which applies in particular for the removal, transport and disposal of sludge and floating sludge from the small wastewater treatment plants;
- the durability and the function of the small wastewater treatment plants are not impaired or endangered;
- the body of water intended for the discharge of the treated wastewater is not loaded beyond the permitted degree or otherwise changed in a detrimental way;
- no persistent annoying odours occur.

Particular care is to be taken if it is necessary to enter the small wastewater treatment plant for repair or maintenance purposes. The appropriate accident prevention regulations are to be observed.

4.2 Usage

The number of inhabitants as a respective maximum whose wastewater may be fed to small wastewater treatment plants (max. PT) is based on the details in Annexes 6 to 7 of this National General Technical Approval.

4.3 Operation

4.3.1 General

The operator must have work carried out by a qualified[11)] person tasked by him if he does not possess the required specialist knowledge.

The operator is to carry out all tasks at regular intervals, which essentially have the functional checking as well as, if required, the measurement of the most important operating parameters as content; here, the operating instructions are to be observed.

---

9) EN 1010: "Construction and testing of drains and sewers"

10) DIN 1986-3 "Drainage and sewerage systems for buildings and plots. Rules for service and operation"

11) As "qualified" are operator's personnel or tasked third parties who, due to their training, their knowledge and their experience gained through practical activity, guarantee that they carry out self-monitoring in small wastewater treatment plants correctly.

4.3.2 Daily checks

It is to be checked whether the plant is in operation.

4.3.3 Monthly checks

The following checks are to be carried out:

- Visual examination for sludge drifting
- Check of the inlet and outlets for blockages (visual examination)
- Determination of formation of scum and, if required, removal of the floating sludge (into the sludge storage)
- Reading of the operating hours counter of blowers and pumps and entry into t operator's log

Faults or problems detected are to be remedied immediately by the operator or by a tasked specialist and are to be recorded in the operator's log.

4.4 Maintenance

Maintenance is to be carried out at least three times a year (at intervals of ca. four months) by the applicant or a specialist firm (specialist)[12)].

Maintenance comprises the following:

- Inspection of the operator's log with determination of regular operation (variance comparison).
- Functional check of the mechanical, electrical and other plant components which are essential for operation, such as blowers and pumps.
- Maintenance of blowers and pumps in accordance with details of the manufacturer.
- Maintenance of the UV facility in accordance with the details of the manufacturer.
- Functional check of the control system and alarm function.
- Setting of optimum operating values such as oxygen supply and sludge volume fraction.
- Examination of the sludge height in the primary settling stage/sludge storage. If required, arrange for sludge removal by the operator. For a correct operation of the small wastewater treatment plant a disposal of sludge meeting the requirement is necessary. Sludge disposal is to be carried out at the latest with the following filling of the sludge storage with sludge.
- Plants with primary settling stage (425 l/PT): with 50 % filling
- Plants with sludge storage (250 l/PT): with 70 % filling
- Carrying out of general cleaning tasks, e.g. removal of deposits.
- Examination of the structural condition of the plant.
- Check for sufficient aeration and ventilation.
- The maintenance carried out is to be recorded in the operating manual.

Inspections in the aeration tank:

- oxygen concentration
- sludge volume fraction

A random sample of the effluent is to be taken within the scope of the maintenance. With this, the following values are to be examined:

- Temperature
- pH value
- Settleable solids

---

12) Specialist firms are firms independent of the operator whose staff (specialists), due to their professional training and the participation in relevant qualifying measures, have the required qualification for operation and maintenance of small wastewater treatment plants.

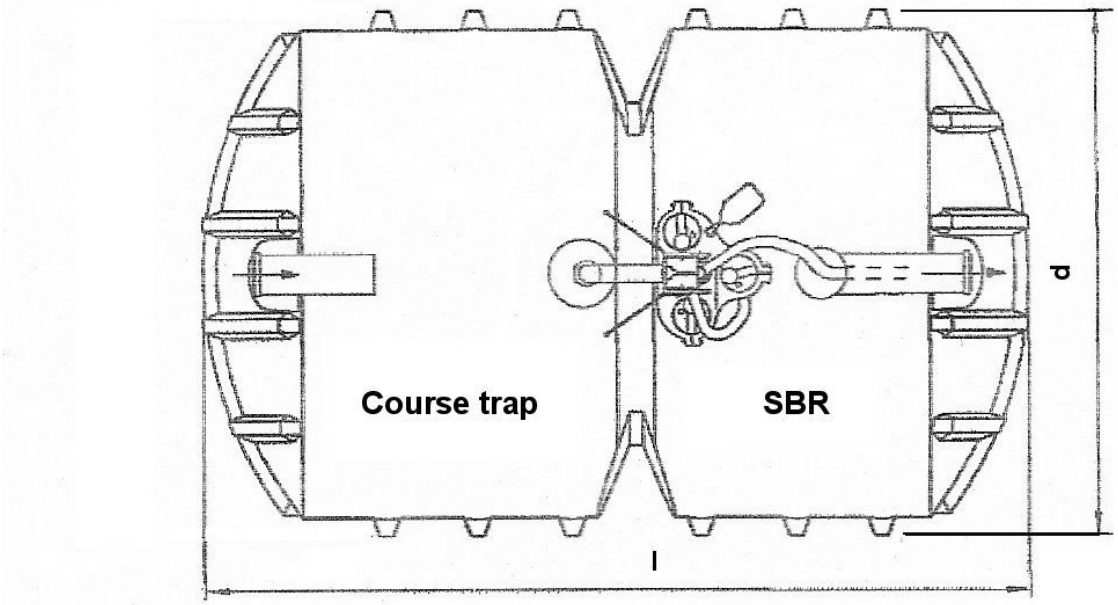
- COD
- NH_4-N (filtered)
- N_{inorg}

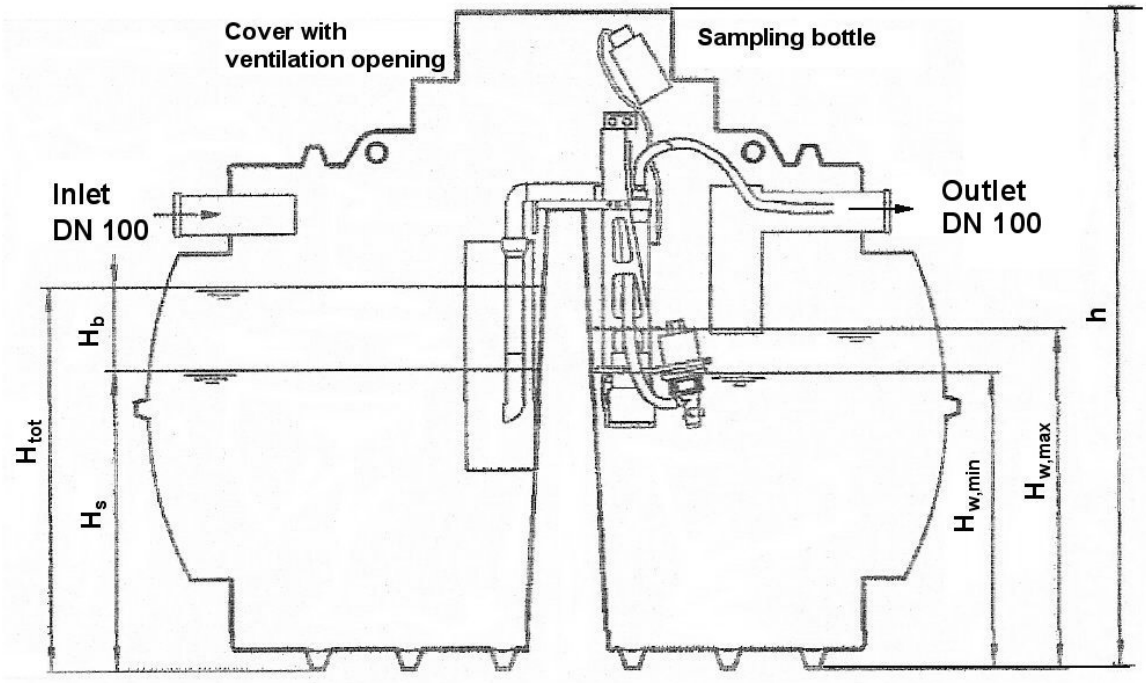
Findings and tasks carried out are to be recorded in a maintenance report. The maintenance report is to be given to the operator. The operator is to include the maintenance report in the operating manual and to submit the latter on demand to the responsible supervisory building authority or the responsible water authority.

Herold

Certified

German Institute
for Structural Engineering
(signed)





Manufacture: Rotation sinter process; Material: PE
Average wall thickness: 10 mm

ATB

Umwelttechnologien GmbH
Suedstr.2
D-32457 Porta Westfalica
Tel.: +49 (0)5731/30230-0
Fax: +49 (0)573130230-30

Small wastewater treatment plant with wastewater aeration - activation sludge plant in impoundage operation

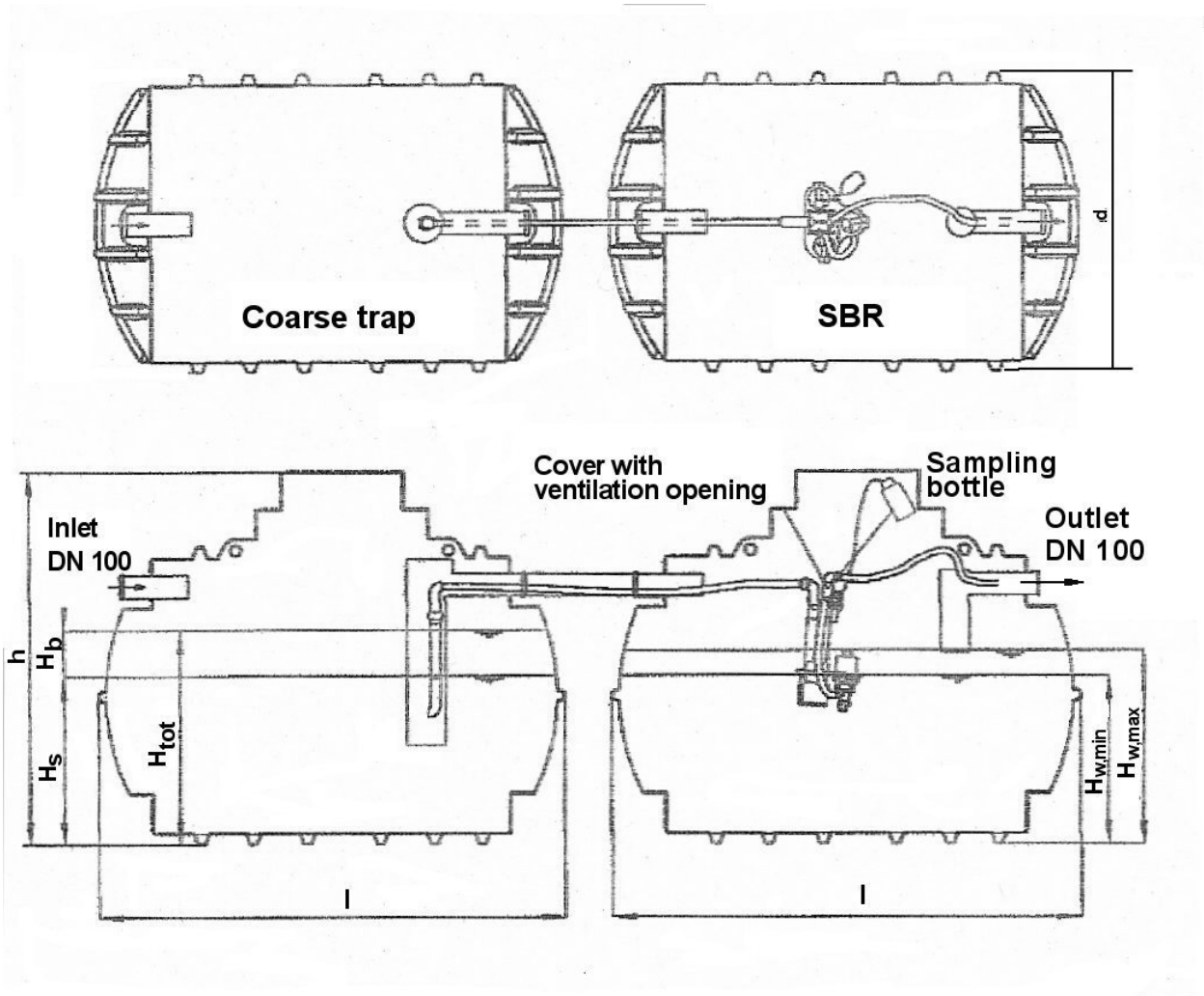
AQUA*max*® MC*

* MC = multi-chamber

Annex 1

to the National General Technical Approval
No.: Z-55.3-144

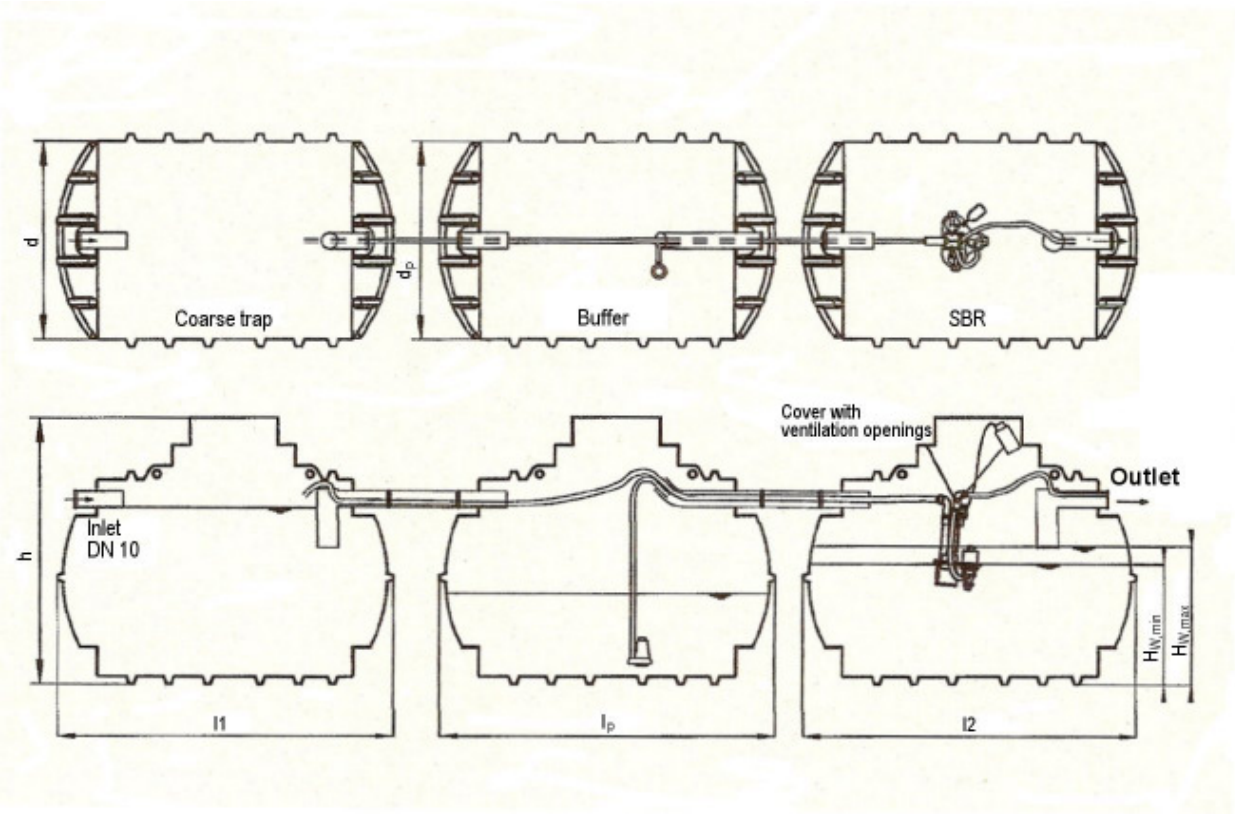
dated 02.06.2006



Manufacture: Rotation sinter process; Material: PE
Average wall thickness: 10 mm

Tank for coarse trap can be designed as single or twin-chamber tank

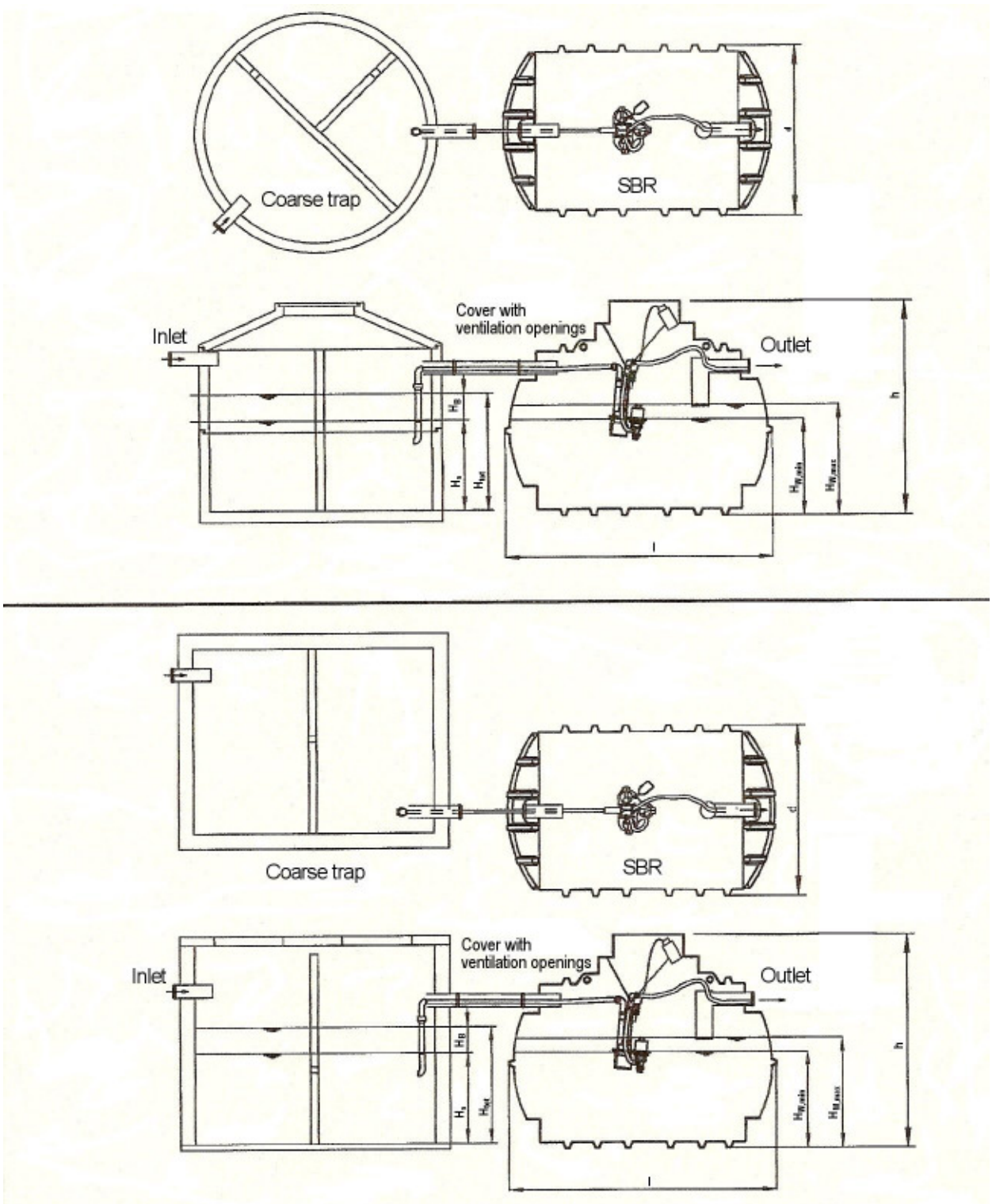
ATB **Umwelttechnologien GmbH** **Suedstr.2** **D-32457 Porta Westfalica** **Tel.: +49 (0)5731/30230-0** **Fax: +49 (0)573130230-30**	**Small wastewater treatment plant with wastewater aeration - activation sludge plant in impoundage operation** **AQUA*max*® TC*** * TC = twin-chamber	**Annex 2** **to the National General Technical Approval** **No.: Z-55.3-144** **dated 02.06.2006**



Manufacture: Rotation sinter process; Material: PE
Average wall thickness: 10 mm

Tank for coarse trap can be designed as single or twin-chamber tank

ATB **Umwelttechnologien GmbH** **Suedstr.2** **D-32457 Porta Westfalica** **Tel.: +49 (0)5731/30230-0** **Fax: +49 (0)573130230-30**	**Small wastewater treatment plant with wastewater aeration -** **activation sludge plant in impoundage operation** **AQUA*max*® MC*** **Gastro** * MC = multi-chamber	**Annex 3** **to the National General Technical Approval** **No.: Z-55.3-144** **dated 02.06.2006**



Tank for coarse trap/sludge storage can – independent of each other - can be designed as one, two, three or four-chamber tank

ATB

Umwelttechnologien GmbH
Suedstr.2
D-32457 Porta Westfalica
Tel.: +49 (0)5731/30230-0
Fax: +49 (0)573130230-30

Small wastewater treatment plant with wastewater aeration -
activation sludge plant in impoundage operation

AQUA*max*® TC*
Retrofitting

* TC = twin-chamber

Annex 4

to the National General Technical Approval
No.: Z-55.3-144

dated 02.06.2006

AQUAmax MC — Plastic tanks, single-tank structure

PT	Inlet				Dimensions			Volumes						Heights				
	Q_d	Q_{dc}	B_d	Q_{10}	d	l	h	$V_{R,mean}$	$V_{R,max}$	$V_{R,min}$	V_S	V_B	$V_{S,tot}$	$H_{W,max}$	$H_{W,min}$	H_S	H_B	H_{tot}
	[m^3/d]	[m^3]	[kg/d]	[m^3/h]	[m]			[m^3]						[m]				
4	0.60	0.20	0.24	0.06	1.63	2.40	2.04	1.20	1.30	1.10	1.10	0.44	1.54	1.13	0.98	0.98	0.35	1.33
6	0.90	0.30	0.36	0.09	1.96	3.04	2.35	1.80	1.95	1.65	1.65	0.56	2.21	1.15	1.02	1.02	0.25	1.27
8	*1.20*	*0.40*	*0.48*	*0.12*	1.96	3.04	2.35	*2.40*	*2.60*	*2.20*	*2.20*	*0.68*	*2.88*	*1.46*	*1.27*	*1.27*	*0.35*	*1.62*

AQUAmax TC — Plastic tanks, twin-tank structure

PT	Inlet				Dimensions			Volumes						Heights				
	Q_d	Q_{dc}	B_d	Q_{10}	d	l	h	$V_{R,mean}$	$V_{R,max}$	$V_{R,min}$	V_S	V_B	$V_{S,tot}$	$H_{W,max}$	$H_{W,min}$	H_S	H_B	H_{tot}
	[m^3/d]	[m^3]	[kg/d]	[m^3/h]	[m]			[m^3]						[m]				
6	0.90	0.30	0.36	0.09	1.63	2.40	2.04	1.80	2.40	2.10	2.10	0.56	2.66	1.00	0.90	0.90	0.18	1.08
8	1.20	0.40	0.48	0.12	1.63	2.40	2.04	2.40	2.60	2.20	2.20	0.68	2.88	1.07	0.93	0.93	0.25	1.18
10	1.50	0.50	0.60.	0.15	1.63	2.40	2.04	3.00	3.25	2.75	2.75	0.60	3.35	1.32	1.12	1.12	0.26	1.38
12	1.80	0.60	0.72	0.18	1.96	3.04	2.35	3.60	3.90	3.30	3.30	0.72	4.02	1.10	0.98	0.98	0.14	1.12
16	*2.40*	*0.80*	*0.96*	*0.24*	1.96	3.04	2.35	*4.80*	*5.20*	*4.40*	*4.40*	*0.96*	*5.36*	*1.39*	*1.21*	*1.21*	*0.22*	*1.43*

AQUAmax TC – Gastro — Plastic tank

PT	Inlet				Dimension						Volumes					Heights			
	Q_d	Q_{dc}	B_d	Q_{10}	d1	l2	d2	l2	d_B	d_B	$V_{R,mean}$	$V_{R,max}$	$V_{R,min}$	V_S	V_B*	$H_{W,max}$	$H_{W,min}$	H_S	H_B*
	[m^3/d]	[m^3]	[kg/d]	[m^3/h]	[m]						[m^3]					[m]			
8	1.20	0.40	0.48	0.12	1.63	2.40	1.63	2.40	**	**	2.40	2.60	2.20	2.00	0.68	1.07	0.93	0.87	**
10	1.50	0.50	0.60	0.15	1.63	2.40	1.63	2.40	**	**	3.00	3.25	2.75	2.50	0.60	1.32	0.93	1.03	**
12	1.80	0.60	0.72	0.18	1.63	2.40	1.96	3.04	**	**	3.60	3.90	3.30	3.00	0.72	1.10	0.98	1.22	**
16	*2.40*	*0.80*	*0.96*	*0.24*	*1.96*	*3.04*	*1.96*	*3.04*	**	**	*4.80*	*5.20*	*4.40*	*4.00*	*0.96*	*1.39*	*1.21*	*1.12*	**

* Minimum volumes or heights. dependent on application case these can be considerably bigger

* Dependent on application case and the amount of wastewater produced. The required buffer volume can be considerably bigger than the minimum volume listed under VB. It requires a separate wastewater engineering calculation and is to be verified in reach individual case

Symbols and units (German symbols, where different, are shown in brackets, underlined):

B_d	kg/d	BOD_5 load / day *[= 0.06 kg BOD_5 / (PT x d)]*
d	m	Diameter
PT (EW)		Total number of inhabitants and population equivalents
$H_{W,max}$	m	Maximum water level in SB reactor *[> 1.0 m]*
$H_{W,min}$	m	Minimum water level in SB reactor
H_S	m	Minimum water level in coarse trap/sludge storage *[> 0.8 m, as a rule $H_{W,min}$]*
H_B (H_P)	m	Height of buffer in sludge storage
H_{tot} (H_{ges})	m	Minimum water level from lower edge inlet pipe to upper edge tank floor *[= H_S + H_B]*
Q_d	m^3/d	Wastewater inflow / day
Q_{10}	m^3/h	Maximum wastewater inflow / hour
V_{dC} (V_{dZ})	m^3	Amount of wastewater / cycle *[= 3 cycles / day]*
$V_{R,mean}$ ($V_{R,mittel}$)	m^3	Mean reactor volume *[= B_d /B_R, with a volumetric loading [B_R] of 0.2 kg/(m^3xd)]*
$V_{R,max}$	m^3	Maximum reactor volume [= $V_{R,mean}$ + $V_{dC/2}$. If this volume represents a $H_{W,max}$ > 1.0 m, then the volume is to be adjusted in order to achieve a $h_{W,max}$ > 1.0 m]
$V_{R,min}$	m^3	Minimum reactor volume *[= $V_{R,max}$ – V_{dC}]*
V_S	m^3	Volume of sludge storage *[> 0.25 m^3 / PT]*
$V_{S,tot}$ ($V_{S,ges}$)	m^3	Minimum useful volume of sludge storage *[= V_S + V_B]*
V_B (V_P)	m^3	Volume of the buffer [= 4h* x Q_{10}]**
		[maximum time free of charging ** + 0.2 m^3 bathtub surge with 4,6,8 PT]*

ATB

Umwelttechnologien GmbH
Suedstr.2
D-32457 Porta Westfalica
Tel.: +49 (0)5731/30230-0
Fax: +49 (0)573130230-30
E-mail: info@aquamax.net
www.aquamax.net

Small wastewater treatment plant with wastewater aeration - activation sludge plant in impoundage operation

Characteristic values

Annex 5

to the National General Technical Approval No.: Z-55.3-144

dated 02.06.2006

AQUA*max*® MC and TC, Retrofitting

I	4	*6*	8	*10*	12	*16*	
Q_d=0.15xI [m^3/d]	0.60	*0.90*	1.20	*1.50*	1.80	*2.40*	
$Q_{cC}=Q_d$/ [m^3]	0.20	*0.30*	0.40	*0.50*	0.60	*080*	
Q_{10}	0.06	*0.09*	0.12	*0.15*	0.18	*0.24*	
B_d=0.06xI [kg BOD_5d]	0.24	*0.36*	0.48	*0.60*	0.72	*0.96*	
$V_{R,mean}=B_d/0.2$ [m^3]	1.20	*1.80*	2.40	*3.00*	3.60	*4.80*	
$V_{R,max}= V_{R,mean}+Q_{SC}/2$ [m^3]	1.30	*1.95*	2.60	*3.25*	3.90	*5.20*	
$V_{R,min}= V_{R,max}-Q_{SC}$ [m^3]	1.10	*1.65*	2.20	*2.75*	3.30	*4.40*	
V_S=0.25 x PT	1.00	*1.50*	2.00	*2.50*	3.00	*4.00*	
V_B= 4 x Q_{10}	0.44	*0.56*	0.68	*0.60*	0.72	*0.96*	
$V_{S,tot}=V_S + V_B$	1.44	*2.06*	2.68	*3.10*	3.72	*4.96*	
AS = 1 m^2							
$H_{W,max}$	1.04	*1.00*					
$H_{W,min}$	0.91	*0.89*					
$H_B=V_B/A_S$	0.44	*0.56*					
$H_S=V_S/A_S$*	1.00	*1.50*					
$H_{tot}=H_S + H_B$	*1.44*	*2.06*					
AS = 1.5 m^2							
$H_{W,max}$	1.04	*1.00*	1.05	*1.37*			
$H_{W,min}$	0.91	*0.89*	0.91	*1.12*			
$H_B=V_B/A_S$	0.29	*0.37*	0.45	*0.40*			
$H_S=V_S/A_S$*	0.80	*1.00*	1.33	*1.67*			
$H_{tot}=H_S + H_B$	1.09	*1.37*	1.79	*2.07*			
AS = 2 m^2							
$H_{W,max}$		*1.00*	1.05	*1.37*	1.07		
$H_{W,min}$		*0.89*	0.91	*1.12*	0.87		
$H_B=V_B/A_S$		*0.28*	0.34	*0.30*	0.36		
$H_S=V_S/A_S$*		*0.80*	1.00	*1.25*	1.50		
$H_{tot}=H_S + H_B$		*1.08*	1.34	*1.55*	1.86		
AS = 2,5 m^2							
$H_{W,max}$			1.05	*1.37*	1.07	*1.36*	
$H_{W,min}$			0.91	*1.12*	0.87	*1.18*	
$H_B=V_B/A_S$			0.27	*0.24*	0.29	*0.38*	
$H_S=V_S/A_S$*			0.80	*1.00*	1.20	*1.60*	
$H_{tot}=H_S + H_B$			1.07	*1.24*	1.49	*1.98*	
AS = 3 m^2							
$H_{W,max}$			1.05	*1.37*	1.07	*1.36*	
$H_{W,min}$			0.91	*1.12*	0.87	*1.18*	
$H_B=V_B/A_S$			0.23	*0.20*	0.24	*0.32*	
$H_S=V_S/A_S$*			0.80	*0.83*	1.00	*1.33*	
$H_{tot}=H_S + H_B$			1.03	*1.03*	1.24	*1.65*	
AS = 3.5 m^2							
$H_{W,max}$				*1.37*	1.07	*1.36*	
$H_{W,min}$				*1.12*	0.87	*1.18*	
$H_B=V_B/A_S$				*0.17*	0.21	*0.27*	
$H_S=V_S/A_S$*				*0.80*	0.86	*1.14*	
$H_{tot}=H_S + H_B$				*0.97*	1.06	*1.42*	
AS = 4 m^2							
$H_{W,max}$					1.07	*1.36*	
$H_{W,min}$					0.87	*1.18*	
$H_B=V_B/A_S$					0.18	*0.24*	
$H_S=V_S/A_S$*					0.80	*1.00*	
$H_{tot}=H_S + H_B$					0.98	*1.24*	

I	12	*16*	
Q_d=0.15xI [m^3/d]	1.80	*2.40*	
$Q_{cC}=Q_d$/ [m^3]	0.60	*0.80*	
Q_{10}	0.18	*0.24*	
B_d=0.06xI [kg BOD_5d]	0.72	*0.96*	
$V_{R,mean}=B_d/0.2$ [m^3]	3.60	*4.80*	
$V_{R,max}= V_{R,mean}+Q_{SC}/2$ [m^3]	3.90	*5.20*	
$V_{R,min}= V_{R,max}-Q_{SC}$ [m^3]	3.30	*4.40*	
V_S=0.25 x PT	3.00	*4.00*	
V_B= 4 x Q_{10}	0.72	*0.96*	
$V_{S,tot}=V_S + V_B$	3.72	*4.96*	
AS 4.5 m^2			
$H_{W,max}$	1.07	*1.36*	
$H_{W,min}$	0.87	*1.18*	
$H_B=V_B/A_S$	0.16	*0.21*	
$H_S=V_S/A_S$*	0.80	*0.89*	
$H_{tot}=H_S + H_B$	*0.96*	*1.10*	
AS = 5 m^2			
$H_{W,max}$		*1.36*	
$H_{W,min}$		*1.18*	
$H_B=V_B/A_S$		*0.19*	
$H_S=V_S/A_S$*		*0.80*	
$H_{tot}=H_S + H_B$		*0.99*	
AS = 6 m^2			
$H_{W,max}$		*1.36*	
$H_{W,min}$		*1.18*	
$H_B=V_B/A_S$		*0.16*	
$H_S=V_S/A_S$*		*0.90*	
$H_{tot}=H_S + H_B$		*0.96*	

With deviating m^2 figures the values are to be interpolated!

The values for $H_{W,max}$ and $H_{W,min}$ result from the heights for the AQUA*max*® TC.
(for 4 PT the plastic tank the values d = 1.03 m, l = 2.23 m are to be set.)
If the volume of the primary settling stage (V_S) > 425 l/PT one can reckon with a pollutant load of 40 g [multi-chamber primary settling stage] or 50 g BOD_5/(PTxd) [single-chamber primary settling stage] in the influent.

ATB
Umwelttechnologien GmbH
Suedstr.2
D-32457 Porta Westfalica
Tel.: +49 (0)5731/30230-0
Fax: +49 (0)573130230-30
E-mail: info@aquamax.net
www.aquamax.net

Small wastewater treatment plant with wastewater aeration - activation sludge plant in impoundage operation

Retrofitting

Annex 6

to the National General Technical Approval No.: Z-55.3-144

dated 02.06.2006

Functional description AQUA*max*®

The wastewater treatment plant operates with a cycle time of ca. eight hours. Of these two hours are for the settling phase. During the six hour aeration phase oxygen is fed intermittently via a submerged aerator into the activated sludge tank.

The plant has an upstream coarse trap, which serves for the storage of the primary and secondary sludge and to buffer the inflowing water.
The buffer can accept at least the maximum amount of wastewater (Q_{10}) flowing in in four hours. Four hours are the maximum time in which the SBR activated sludge phase may have no wastewater fed to it (2 hours before settling phase + 2 hours settling phase).
The theoretical daily inflow quantity is calculated for an impoundage up to the lower edge of the inflow pipe. In case of emergency the inflow pipe is available as storage space. With a back-up above the upper edge of the inflow pipe the inflowing water is fed away via an emergency overflow.

Charging of the activated sludge tank from the buffer takes place via a communicating pipe. This, during the aeration phase, is filled every two hours by a short stroke of the excess sludge pump. Following this the higher water level in the buffer balances itself with the activated sludge tank. The final charging takes place two hours before the settling phase. In order that, no untreated wastewater can flow in in the final clarification phase, during aeration air is fed into this communicating pipe. Through this the water flow from the buffering tank into the aeration tank is interrupted. Once per cycle excess sludge is pumped into the coarse trap.

The AQUA*max*® Gastro has a separate buffer. If larger quantities of wastewater are produced with a short period, these can be retained in a separate storage and, using the charging pump, fed evenly and according to the technical wastewater calculation to the SBR activated sludge stage.

The activated sludge stage is also charged every two hours using a separate pump. The duration of charging is dependent on the plant size and is set at the control. The last charging takes place two hours before the settling phase. With an exceeding of the maximum permitted charging amount ($H_{W,max}$) an alarm is activated via a float switch.

Once per cycle excess sludge is pumped into the coarse trap.

After the settling phase the treated wastewater is pumped out down to the switching point of the float (LEV1) into the outlet. A possibility for sampling is to be planned!.

The plant changes automatically into holiday operation if, four hours after the start of the cycle, the switch-on point of the float (LEV1) is still not reached. During holiday operation the aeration times are reduced to ca. 30 % of the normal aeration time. Charging continues to take place regularly.
As soon as the switch-on point of the float is reached the plant changes into normal operation. After two hours the settling stage starts.

The plant is controlled by a PLC whose settings of which can be changed via a code number. Fault alarms are indicated optically and acoustically. Operating hours, interventions and reports are automatically stored with date and time.

AQUA*max*® PLUS Paket
The AQUA*max*® is an expansion possibility fr the improvement of the treatment performance. The plant is equipped with an improved programme module. Through an additional anaerobic clarification stage the total nitrogen (Ntot) can be reduced to a value of < 25 mg/l (> 12 °C).

ATB

Umwelttechnologien GmbH
Suedstr.2
D-32457 Porta Westfalica
Tel.: +49 (0)5731/30230-0
Fax: +49 (0)573130230-30
E-mail: info@aquamax.net
www.aquamax.net

**Small wastewater treatment plant with wastewater aeration -
activation sludge plant in impoundage operation**

Functional description

Annex 7

**to the National General Technical Approval
No.: Z-55.3-144**

dated 02.06.2006

Installation instructions AQUA*max*®

Constructional prerequisites

- The tank, must be installed ready in accordance with our specifications
- In accordance with DIN 4261, Part2, a watertightness test must be carried out.
- At the start of assembly the aeration tank must be free of wastewater and be clean.
- Inlets and outlets must be made from standard grey plastic pipe of at least DN 100 and internally must project by ca. 15 cm.
- The cover of the tank must have ventilation openings. An air vent must be installed in the inlet pipe immediately before the coarse trap if ventilation is not possible via the roof.
- The control unit must be must be mounted at an appropriate point and be provided with electricity (230 V).
- A protected (residual current circuit beaker) cable 3 x 1.5 mm^2 is to be laid. Between the control unit and the tank (AQUAmax) 4 earthing cables (3 x 1.5 m2) are required. The Cable ends should reach 1.5 m into the chamber.

Installation of the AQUA*max*® (carried out by our service personnel on instruction):

The cable branch box must be secured in the plant so that it easily accessible.

The connection cable of the AQUA*max*® and the float switch must be clamped in the cable branch box with the earthing cables. The float cable is to be connected to a separate branch box as floats and main plant may not be connected together in one cable branch box. (Seal/encapsulate only after functional test!)

Assemble inlet and outlet packets with sampling option according to the drawing.
Suspend AQUA*max*® M on the separating wall. Secure AQUA*max*® Z with the chains on the cover mounting ring or cone.

The charging pipe must be led into the coarse trap (M).
The riser of the excess sludge / charging pump must be connected to the hose and fed into the coarse trap.
There it must be secured with submerged pipe (Z).
With the AQUA*max*® GASTRO the charging pump is to be installed ca. 5 – 10 cm above the floor and the charging pipeline is to be led into the SBR chamber (free runout).

The outlet hose is secured to the sampling vessel using a pipe clamp,
With this the hose may not be submerged in the water to be found there.
The hose must be secured using a clip in the area of the manhole cover.

The plant must now be filled with water at least to the switch-off point of the float. Now a functional test should be carried out using the manual switch on the control unit. Following successful test the cable branch box must be encapsulated into the plant.

For the setting of the control unit, please refer to the separate operating instruction.

The plant can first be commissioned when the coarse trap is filled.

With all connection tasks please observe that all cables and hoses are long enough so that the AQUA*max*® can be removed from the plant without problem.

ATB
Umwelttechnologien GmbH
Suedstr.2
D-32457 Porta Westfalica
Tel.: +49 (0)5731/30230-0
Fax: +49 (0)573130230-30
E-mail: info@aquamax.net
www.aquamax.net

Small wastewater treatment plant with wastewater aeration - activation sludge plant in impoundage operation

Installation instructions

Annex 8
to the National General Technical Approval
No.: Z-55.3-144

dated 02.06.2006