Content

The 3P Hydrosystem 1000 heavy traffic

with approval DIBt for construction

The problem

Rain water treatment plants in front of infiltration systems, especially infiltration boxes are only able to protect the soil and groundwater if they properly work and are safe to operate. Heavy metals such as zinc, lead, copper or cadmium and hydrocarbons in the form of mineral oil and polycyclic aromatic hydrocarbons doubt in too high concentrations in rain runoff and should be retained in front of infiltration. This is particularly important if there no "Soil zone" is used.

Currently there appears on the market a whole Number of decentralized treatment systems which should retain all the relevant substances from rain runoffs. This technology is an contraption and sometimes not sufficiently tested, so water authorities and planners rarely assess whether a system is really reliable achieve its goals of treatment and can especially durable and reliable work.
That for an application is always with subject to certain risks.

Building approval

A general building approval (abZ) of the German Institute for Building Technology (DIBt) in Berlin provides a remedy.

As known from water-permeable surface coatings, now also decentralized rain water treatment plants can get abZ when you according to approval guidelines for stormwater treatment facilities.

Technical Approvals be of such construction products and types within the scope of state building codes granted , for which there is no generally recognized rules of technology, especially DIN standards , or those of the differ materially.

The ultimate goal is the permanent protection of soil and groundwater according to the applicable German regulations and guidelines. Since this among other things in the context of the forthcoming implementation of Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (GWD), on 16 of January 2007 entered into force, change is a abZ issued for a period of five years and can always be adapted to changes in the law. As the first approved equipment with the number Z-84.2-4 is consistent. With the 3P Hydrosystem heavy traffic now a system is available that has passed all test conditions.

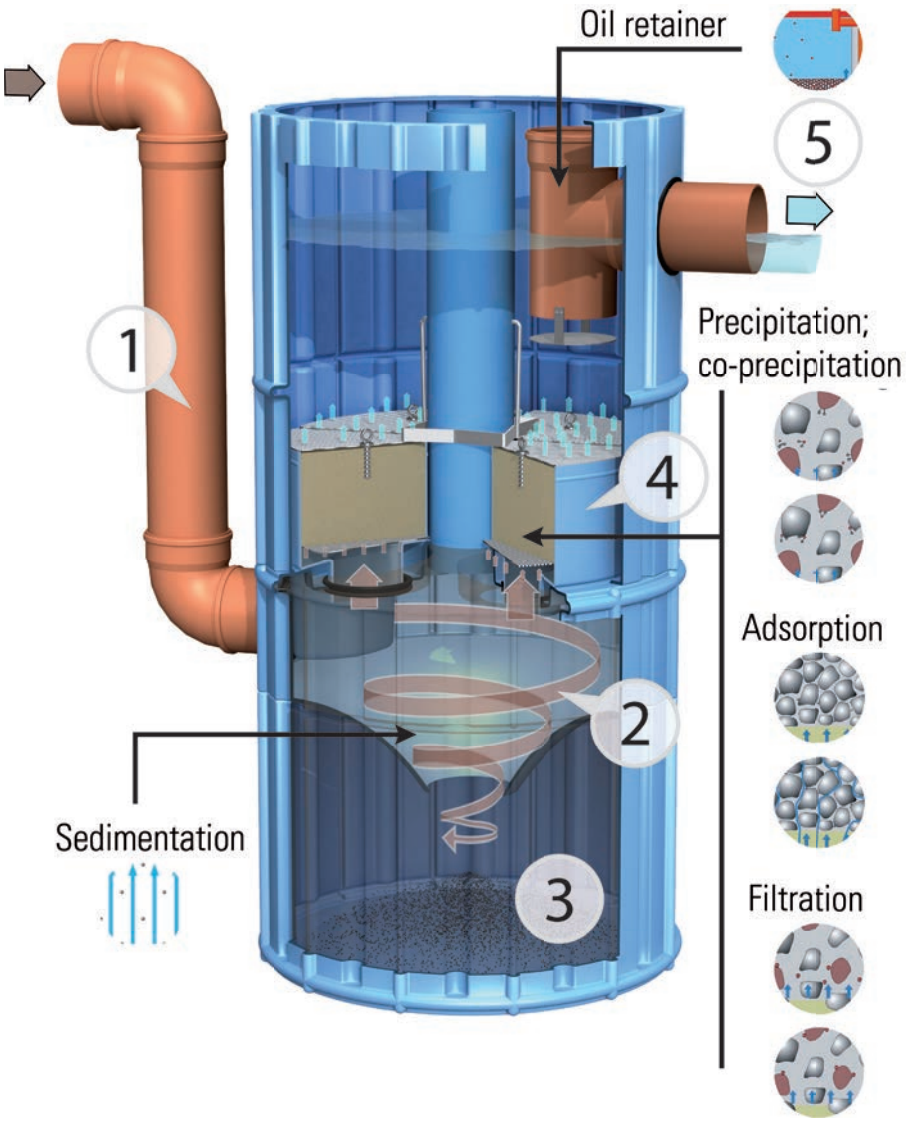
Factory production control and external quality control safeguard the properties of the product.

Principle of function

The treatment plant consists of a polyethylene insert and is installed in an outer shaft, which must comply with the traffic-related load. In addition to concrete shafts to DIN V 4034-1 and EN 1917 plastic ducts with their own abZ can also be used. The rainwater from the area to be drained is introduced radially in the lower part of the treatment unit. Here is a hydrodynamic separator which converts turbulent secondary flows in a radial laminar flow regime, sedimentation of particles, especially the sand fraction by gravity instead. These are collected through an opening in the lower section of the cleaning shaft in a flow-stabilized sludge collection space at the bottom of the shaft, which can be emptied via a tube while the maintenance.

In the middle of the treatment plant, there are four filter elements. With these filters fines are filtered in the upflow and a large part of the dissolved contaminants will be precipitated and adsorbed.

The filter is rinseable and in case of completely siltation they are also interchangeable. As the slot narrows upwardly from the filter insert consists of several parts, so that the filter can be lifted easily from the shaft and be replaced. The service life of the filter is usually in three years. The sludge trap with 320 ltr must be drawn at intervals of between one and five years. Inside the filter elements the processes filtration, adsorption and precipitation, the chemical purification of the water from solid matter, heavy metals, hydrocarbons and nutrients occure. It is of particular meaning that once retained heavy metals are not dissolved jerk de-icing salt in winter. The processes are shown in Figure 1 (bottom left) graphically.



3P Hydrosystem 1000 heavy traffic

Applications

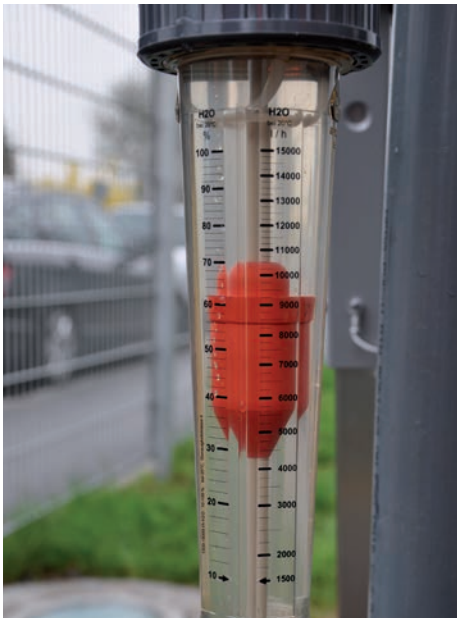
The abZ for the „3P hydro system heavy traffic“ applies to the connection of motor vehicle traffic areas without limitation, the average daily traffic Strong (DTV) to a size of 500 m2. Except surfaces, on which is dealt with substances hazardous to water. The outflowing water is provided for infiltration. It is considered safe according to the DWA-A 138 so that it can be drained almost all infiltration systems, in particular underground facilities such as trenches or infiltration Boxes. The use of the plant for the treatment of surfaces with heavy contamination (eg by trucking companies, markets,…) is possible, but requires a permit / approval of the competent water authority and possibly subject to additional installation, operation or maintenance requirements.

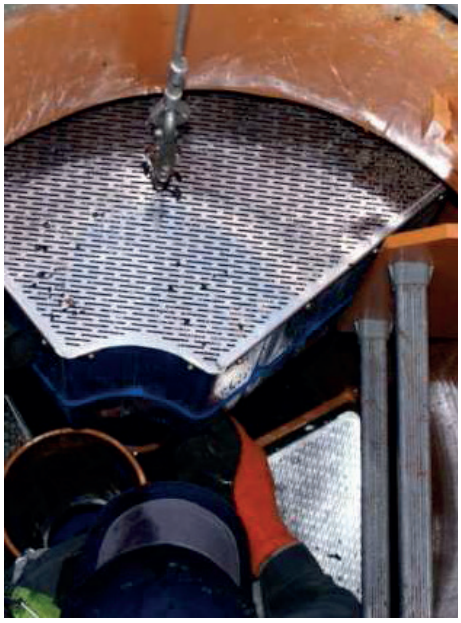
Operation and maintenance

As the rainwater runoff from traffic areas a number of undesirable substances are included, which are retained in the filter system, the units must be serviced and cleaned at regular intervals. A maintenance manual should be handed over to the operator. Maintenance must be performed by a qualified trainer. There must be a maintenance contract with the specialist. At intervals not exceeding 12 months, a control of the permeability of the filter inserts is necessary. This happens when installed (Figure 2). In addition, the sludge level (Figure 3) has to be measured in the sludge collection chamber. If necessary, it must be pumped out and disposed of properly. The filter cartridges are to be replaced at a term of no more than three years (Figure 4). The used filter cartridges are placed in a tight tank and sent back to the manufacturer. All work must be documented in a log book.

Summary

With the general type approval of the German Institute for Building Technology (DIBt) in Berlin is a reliable proof of applicability of equipment for cleaning stormwater runoff from road surfaces available. Systems with abZ are tested independently on the fabric jerk maintenance, environmental compatibility and functionality. The outflowing water is considered safe according to the DWA A 138, so it can be drained through almost all infiltration systems, in particular underground facilities such as trenches. The „3P Hydrosystem heavy traffic“ has the abZ as first the shaft system, which also regulates the operation and maintenance. To the system 500 m2 traffic area can be connected independent of the traffic load. Once a year, the plant is maintained, the filter elements must be replaced after three years. The used filter elements are returned to the manufacturer in exchange procedure to ensure proper disposal.





The Hydrosystem 1000 heavy traffic

For traffic areas, without limitation of the traffic volume

DIBt approval Z-84.2-4 since 11/05/2010

„The water is considered safe in the sense of DWA A-138“, that means, it may be introduced for example in, underground infiltration systems (trenches, hollow bodies, seepage pits).

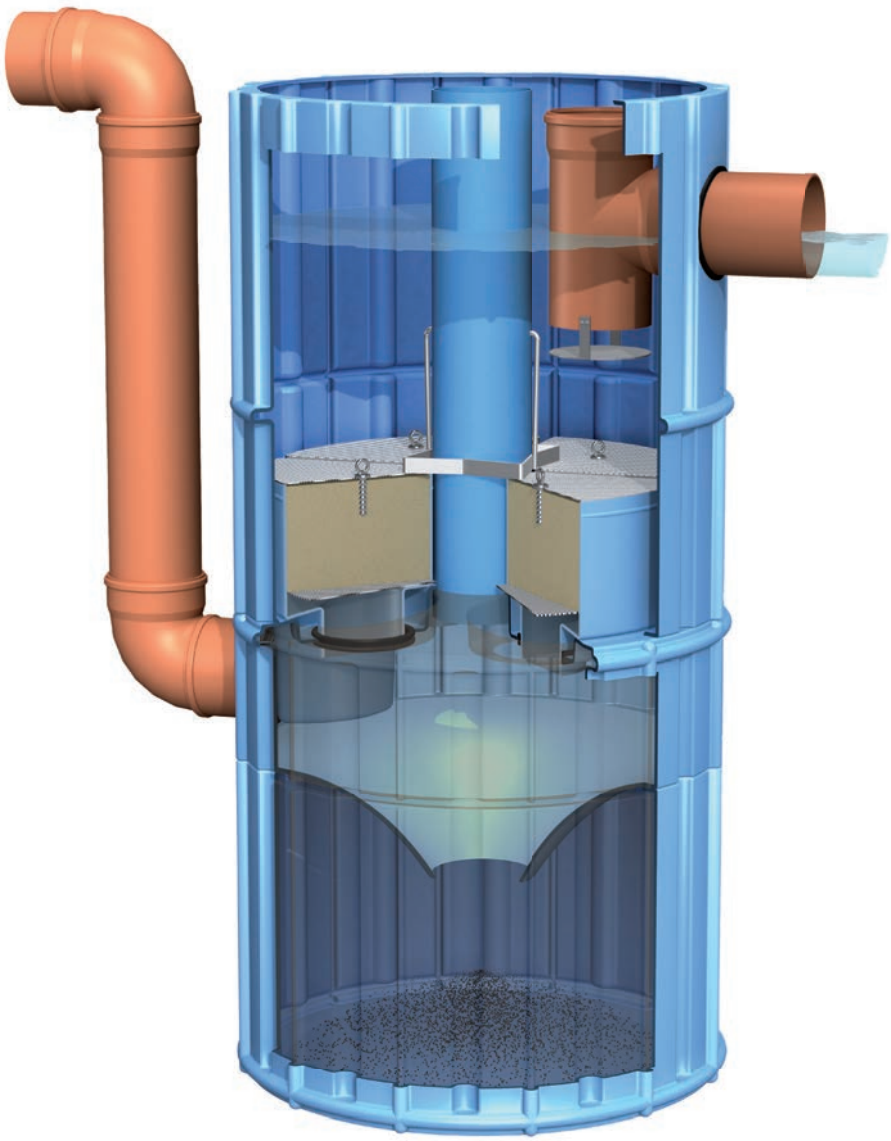
Retention of solids (AFS):	≥ 92%
Retention of mineral oil (TPH):	≥ 80%
Retention of dissolved copper:	≥ 80%
Retention of dissolved zinc:	≥ 70%

The water meets the requirements of German BBodSchV already at the end of the installation.

By further underground passage additional collateral available.

The approval also provides for the monitoring of the production and maintenance of the systems.

The filters are returned to the manufacturer, proper disposal is assured.



DIBt

Deutsches Institut für Bautechnik
INSTITUTION INCORPORATED UNDER PUBLIC LAW

General Technical Approval

Registration centre for building projects and design
Technical examination authority
Member of the European Organization for
Technical Approval E O T A and the European Union

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Date: 12 May 2010

Reference: II 32-1.84.2-1/07

Approval no.
Z-84.2-4

Validity period:
11 May 2010

Applicant:

3P Technik Filtersysteme GmbH
Oeschstrasse 14, 73072 Donzdorf

Approval subject:
Plant for treatment of mineral oil containing rainwater runoff for infiltration
3P Hydrosystem heavy traffic

The above mentioned approval subject is herewith generally technical approved. This technical approval includes eleven pages and ten appendices.

Translation of the German original issue, not verified by the Deutsches Institut für Bautechnik (DIBt).

I. GENERAL PROVISIONS

1 With the general technical approval the usability or applicability, respectively, is proven according to the federal states building regulations.

2 Insofar as special requirements for expert knowledge and experience are needed in the general technical approval, from people involved in performing building construction and designs according to § 17, section 5 of the prototype building regulations, it has to be observed, that this expert knowledge and experience can also be proven by equivalent certificates from other member states of the European Economic Area (EWR) or other bilateral certificates.

3 The general technical approval does not replace the approvals, agreements and certifications required for building projects.

4 The general technical approval will be awarded regardless of any rights of third parties, especially of private protective rights.

5 Manufacturers and distributors of the approval subject must, regardless of more far-reaching regulations in the "Special Regulations", provide copies of the general technical approval to the owner or user, respectively, and must point at the fact, that the general technical approval must be available at site of usage. Copies of the general technical approval must be made available for the responsible authorities on request.

6 The general technical approval may only be duplicated completely. An extracted publication needs the approval of the Deutsches Institut für Bautechnik. Texts and drawings of advertisement material may not be in contradiction to the general technical approval. Translations of the general technical approval must contain the note "Translation of the German original issue, not verified by the Deutsches Institut für Bautechnik ".

7 The awarded general technical approval is revocable. The provisions of the general technical approval can be supplemented and changed later, especially in case this is required because of new technical findings.

II. SPECIAL PROVISIONS

1 Approval subject and scope of application

1.1 Approval subject are plants for treatment of mineral oil containing rainwater runoff from vehicle traffic areas type 3P Hydrosystem heavy traffic, according to information in Appendix 1, further referred to as waste water treatment plants. The waste water treatment plants can permanently treat rainwater runoff under specified conditions, supplied from vehicle traffic areas of up to 500 m^2, in a way that the water can be infiltrated into the ground and groundwater.

1.2 The waste water treatment plants are provided with an additional outer shaft for installation in accessible and not accessible areas.

1.3 Usage of the waste water treatment plants in different applications and/or under different conditions than it is specified in the approval, is individually possible after clarification of their admissibility of such an input or as the case may be, after clarification of additional requirements with the responsible water authorities.

1.4 The waste water treatment plants may not be used for treatment of rainwater runoff

- from residual pollutions and suspected residual pollution areas and
- from areas on which water hazardous substances are being handled.

1.5 With this general technical approval both requirements will be fulfilled, the building supervisory requirements and also the permissions according to the law on water according to the "Regulations of the federal states for determination of suitability according to the law on water of building projects and designs by proof according to the federal state building regulations" (WasBauPVO) .

2 Provisions for building projects and design

2.1 General

The waste water treatment plant consists of a shaft insert made of plastic with inlet and outlet, 4 filter inserts type ht and further components according to the information given in appendices 1 and 2. The filter inserts consist of filter housings filled with substrate according to the specifications in appendix 3.The substrate causes retarding of hydrocarbon and heavy metals,

2.2 Design and characteristics

2.2.1 Design and characteristics of the waste water treatment plant

The layout of the waste water treatment plant corresponds with the information given the appendices 1 and 2.

The waste water treatment plant has been tested and evaluated according to the "Approval basics for rainwater runoff treatment plants" - draft February 2010 - of the DIBt.

During the tests the waste water treatment plant has reached the required flows. Hydrocarbonate and heavy metals (conductive parameters of copper and zinc) were retained according to specifications of the approval basics. Thus the legal requirements of soil and water protection have been fulfilled.

2.2.2 Characteristics of the shaft elements

The shaft inserts consist of polyethylene with manufacturer declaration and characteristics provided to DIBt. They meet the information given in appendices 1 and 2 in regards to shape and dimensions.

2.2.3 Characteristics of the filter inserts

The filter inserts type ht correspond with the information given in appendix 3. They consist essentially of layers in the filter housing consisting of the components zeolite and activated carbon (substrate). Information about design and composition of the substrate filling has been provided to DIBt.

The substrate meets the requirements of the "Basics for evaluating the effects of building projects on soil and ground water" in the applying version each[1] under application of insignificance threshold values of the federal state cooperative water board (see appendix I-D.1).

2.3 Manufacturing and identification of the products

2.3.1 Manufacturing of the shaft elements

The shaft elements shall be made according to the information given in appendices 1 and 2 in the factory, based on rotation sinter processes. For manufacturing only the moulding compounds may be used provided to DIBt, with detailed identification of trade name, manufacturer and specification parameters.

2.3.2 Manufacturing and identification of the filter inserts

The filter inserts have to be produced in the factory.

The substrate must correspond with the recipe provided to DIBt in regards to design and composition. The filter inserts may only be produced in companies denominated by the applicant.

The filter inserts must be identified by the manufacturer based on these general technical approval with the certificate of conformity mark (C-mark) according to certificate of conformity regulations of the federal states and be marked with the type identification ht. Identification with the C-mark may only be made if the provisions of section 2.4 are met.

2.3.3 Manufactering and identification of the waste water treatment plant

The waste water treatment plant has to be manufactered by installing the filter inserts and the other components in the shaft insert according to the information given in appendices 1 and 2.

The waste water treatment plant must be identified by the manufacturer based on these general technical approval with the certificate of conformity mark (C-mark) according to certificate of conformity regulations of the federal states and be marked with the type identification 3P Hydrosystem heavy traffic. Identification with the C-mark may only be made if the provisions of section 2.4 are met.

2.4 Certificate of conformity

2.4.1 Certificate of conformity for the filter inserts

2.4.1.1 General

Confirmation about complying of the filter inserts with the provisions of this general technical approval must be given for any production plant by a certificate of conformity based on a factory production inspection and a regular external monitoring including initial tests according to the following provisions.

For awarding the certificate of conformity and external monitoring including product tests to be conducted, the manufacturer has to involve an appropriately authorized certification agency and an appropriately authorized monitoring agency.

The declaration, that a certificate of conformity has been awarded must be indicated by the manufacturer on the building projects with the conformity mark (C-mark) and provided with information about the intended use. The Deutsches Institut für Bautechnik has to be provided with a copy of the certificate of conformity awarded by certification agency for information.
The Deutsches Institut für Bautechnik has to be provided with a copy of the initial test report for information.

2.4.1.2 Factory production inspection

An in-house production inspection has to be initiated in each factory and to be conducted. The in-house production inspection is to be understood as continuously monitoring the production, to be performed by the manufacturer, which ensures, that manufactured products by him will correspond with the provisions of this general technical approval.
The in-house production inspection shall include following measures as a minimum.

- description and inspection of the filter housings and the components of the substrate: compliance of the filter housings and the components of the substrate with the composition provided to DIBt, have to be demonstrated by works certificate from the supplier of the filter housing and the components of the substrate. Delivery documents must be checked on compliance with the order at each delivery item.
- Inspections and tests to be conducted during manufacturing:

  Mixing of the components corresponding to the design of the substrate provided to DIBt, must be recorded.
  Samples of the components must be taken from running production once per batch and be mixed according to the mixing ratio in the filter insert and to be checked regarding following specifications:
  - bulk density
  - particle-size distribution
  - pH value
  - annealing loss

  Once per quarter samples of the components must be taken from the running production and be mixed according to the mixing ratio in the filter insert and the sorption capacity has to be determined.
  The tests must be conducted according to the test method specified in the inspection plan. Test values must comply with the requirements specified in the inspection plan. The inspection plan is filed at DIBt.
- Inspections and tests to be conducted on the finish filter insert:

  At each 25th filter insert weight, filling grade and layer composition of the substrate have to be checked. For this test a filter insert must be taken from the running production. The weight must be determined by weighing the filter insert. The filling grade and the layer composition must be checked by removing the individual layers of the substrate from a filter element. Layer thicknesses must be determined.

Results of the in-house production inspections must be recorded and be evaluated. Records must include following information as a minimum:

- name of filter insert or the components, respectively:
- type of inspection or test
- date of fabrication and test of substrate or components, respectively

- result of the inspections and tests and, if applying, comparison with the requirements
- signature of the responsible person for the factory production inspection

Recordings must be filed for at least five years. They must be presented to the Deutsches Institut für Bautechnik, the responsible supreme Building Supervisory Board or the responsible water authority on request.

At insufficient test results the manufacturer has to take immediate actions. After correcting the defects the corresponding test has to be repeated immediately - as far as technically possible and necessary for demonstrating correction of the defect. Substrate or components not complying with the requirements must be handled in a way that they cannot be confused with complying components.

2.4.1.3 External monitoring of production of the filter inserts

In any factory the production inspection by external monitoring has to be checked twice a year. If there are no complaints about two consecutive external monitoring the external monitoring can be reduced to once a year. If defects will be detected during the annual external monitoring, the monitoring twice a year has to be resumed. In the scope of external monitoring an initial inspection of the substrate has to be conducted.

- Initial inspection

For the factory designated for being awarding this approval, the initial inspection of the substrate can be dropped, since tests on samples from the running production have been conducted as basis for the general technical approval.

At designation of other factories or at changes of the production conditions the initial inspection of the filter inserts has to be conducted.

In the scope of the initial inspection of the components of the substrate and a finish filter insert sample from the running production have to be taken.

The components of the substrate must be mixed according to the mixing ratio in the filter insert and to be inspected with regards to following characteristics:

- particle-size distribution
- bulk density
- pH value
- annealing loss
- sorption capacity

On the filter insert weight, filling grade and layer design of the substrate must be checked. The weight must be determined by weighing the filter insert. The filling grade and the layer composition must be checked by removing the individual layers of the substrate from a filter element. The layer thicknesses must be determined.

Test methods and the requirements corresponding to the inspection plan for in-house production inspections provided to DIBt will apply.

- External monitoring

In the scope of the external monitoring the results of the in-house production inspections must be checked and samples of the components of the substrate and a finish filter insert must be taken from the running production.

The components of the substrate must be mixed according to the mixing ratio in the filter insert and to be inspected with regards to following characteristics:

- particle-size distribution
- bulk density
- pH value

- annealing loss
- sorption capacity

On the filter insert weight, filling grade and layer design of the substrate must be checked. The weight must be determined by weighing the filter insert. The filling grade and the layer composition must be checked by removing the individual layers of the substrate from a filter element. Layer thicknesses must be determined.

The test methods and the requirements corresponding to the inspection plan for in-house production inspections provided to DIBt, will apply.

Sample taking is performed by the respective authorized test agency.

Results of certification and external monitoring must be filed for at least five years. They must be presented to the Deutsches Institut für Bautechnik, the responsible supreme Building Supervisory Board or the responsible water authority, on request.

2.4.2 Certification of conformity for the waste water treatment plant

2.4.2.1 General

Certification of conformity of the waste water treatment plant with the provisions of this general technical approval must be made for each factory by a declaration of conformity of the manufacturer, based on an in-house production inspection. The declaration of conformity must be provided by identification of the building projects with the conformity mark (C-mark) with indication of the intended use.

In each factory an in-house production inspection has to be installed and conducted. The in-house production inspection is to be understood as continuously monitoring the production, to be performed by the manufacturer, which ensures, that erected building projects by him will correspond with the provisions of this general technical approval.

2.4.2.2 Factory production inspection

The factory production inspection shall include following listed measures as a minimum:

- Description and checking of the original materials
  Manufacturer of the shaft inserts has to demonstrate, according to certification 3.1 B based on DIN EN 10204[2] manufacturing of the original materials, that the moulding compound for manufacturing the shaft inserts meets the specified requirements. As far as this moulding compound has a General technical approval the building supervisory approval mark replaces the certification 3.1 B according to DIN EN 10204. Delivery documents of the manufacturer of the waste water treatment plant must be checked on conformity with the order at each delivery.
- Inspections to be conducted on the shaft element:
  The given dimensions in appendices 2 to 4 must be checked on one element per delivery as a minimum.

  As far as the relevant DIN standards do not specify any tolerances the accuracy degree B according to DIN EN ISO 13920[3] applies. For the outer wall thickness elements a tolerance of ± 1.0 mm has to be kept.

  Any shaft element has to be checked on tightness by filling it with water up to the upper edge over a period of minimum 20 minutes. No leakages are permissible.
- Inspections to be conducted on the filter insert:

DIN EN 10204:2005-01 "Metallic products -Types of test certificates"
DIN EB ISO 13920:1996-11 "General tolerances for welding engineering: length and angle dimensions and position"

The filter inserts must be inspected on proper identification with the C-mark according to section 2.3.2 and the type-code.

- Inspections to be conducted on the finish waste water treatment plant:
  Each plant has to be checked on proper installation of filter inserts.

The results of the in-house production inspection must be recorded and evaluated. Records must contain following information as a minimum:

- Name of the product
- Inspection method
- Date of installation and inspection
- Result of inspections and as far as applying comparison with requirements
- Signature of the responsible person for the in-house production inspection

At insufficient test result the manufacturer has to take immediate actions. After correcting the defects the concerned test has to be repeated immediately - as far as technically possible and necessary for demonstrating correction of the defect. Substrate or components not complying with the requirements must be handled in a way that they cannot be confused with complying components.

Recordings must be filed for at least five years. They must be presented to the Deutsches Institut für Bautechnik, the responsible supreme Building Supervisory Board or the responsible water authority on request.

3 Provisions for planning and design

3.1 General

For planning and design the provisions specified in the technical regulations according to appendix 4 for planning and waste water technically design of plants for rainwater infiltration apply, unless nothing different is provided following.

3.2 Planning

The waste water treatment plants may be used under following preconditions:

- The waste water treatment plants may only be installed in/on vehicle traffic areas (roads, parking lots etc.). Drainage water is intended for infiltration.
- Drainage water is considered to be harmless according to DWA-A-138. For planning the following plant for infiltration, DWA-A 138 applies.
- Thickness of the seepage space must be minimum 1 m according to DWA-A 138. If below the drainage there is a blind drain the necessary distance between drainage of the plant and the relevant ground water level increases by the height of the blind drain.
- Installation in areas of protection of water may only be performed according to relevant regulations in individual cases, in agreement with the responsible water authority.
- Usage of the waste water treatment plant for treatment of rainwater runoff from areas, roads, places and yards with heavy pollution (e.g. by agriculture, hauling companies, weekly markets and horse stables) is only possible with permission/approval of the responsible water authority under complying with additional provisions about installation, operation and maintenance provisions, as the case may be.

3.3 Waste water technical design *

To a waste water treatment plant up to 500 m^2 vehicle traffic area space may be connected.

Otherwise the worksheet DWA-A 138 applies for the technical design of the waste water treatment plant, in connection with the enclosed appendix for rainwater infiltration and the existing ground.

In the scope of flooding proof for the area the maximum flow of the waste water treatment plant has to be considered. This has to be stated by the applicant.

3.4 Technical dimensioning

The waste water treatment plants can be installed in passable and not passable areas.

They must be installed in a way, that loads (traffic, soil pressure etc.) cannot affect the shaft inserts of the waste water treatment plant. For this purpose shafts must be installed made of concrete, type 2 according to DIN EN 1917[4] in connection with DIN V 4034-1[5] (example see appendix 5) or generally building supervisory approved plastic shafts (example see appendix 6).

External shafts must be selected according to traffic loads to be expected. They must meet the relevant technical regulations.

Structural evidence for external shafts made of plastic has to be provided according to the provisions of the applying general technical approvals for shaft systems made of plastic.

4 Provisions for installation

4.1 General

For installation of the plant the technical regulations according to appendix 4 must be observed, unless nothing different is provided following.

4.2 Installation instructions

Manufacturer of the plant must provide installation instructions together with the plant (see appendices 7 and 8). Installation must be performed according to installation instructions and following provisions.

4.3 Requirements for installer of the plant

Installation of the plant has to be made by persons having the necessary professional skills.

4.4 Installation

Installation has to be performed based on the planning according to section 3.2. The plant must be installed in external shafts according to section 3.4, based on the information given in appendices 5 and 6. Flow-in to the waste water treatment plant must have a plunge of 250 mm to 500 mm.

The installer has to confirm the correct installation.

5 Provisions for maintenance

5.1 General

The throughput and treatment efficiency can only be ensured permanently if maintenance works are conducted according to following provisions.

4 DIN EN 1917:2003-04 "Manhole and inspection shafts made of concrete, steel fibre concrete reinforced concrete "

5 DIN V 4034-1:2004-08 " Shafts made of concrete, steel fibre concrete, reinforced concrete for sewages and ducts, type 1 and type 2 - part 1: Requirements, tests and evaluation of conformity.

Maintenance instructions must be provided by any contractor to the customer to be handed over to the operator. Maintenance instructions must comply at least with the provisions according to section 5.2, and the appendices 9 and 10.

Maintenance has to be performed by professionally skilled persons [6]. The operator of the plant has to sign an appropriate maintenance contract with the responsible person.

Federal state regulations for inspections, maintenance and checking of the plants (method and scope of activities, required qualification for performing the works) remain unchanged.

The responsible person has to record the respective times and results of conducted inspections and maintenance works, as well as removing possibly detected defects. The maintenance contract and documentation about performed inspections and maintenance works must be filed by the operator and be presented to the responsible local authorities on request.

5.2 Maintenance

In minimum time intervals of 12 months or in case the plant is flooded more frequently than provided in the dimensioning, the plant has to be inspected on proper condition. For doing this following activities must be performed:

- check on permeability of the filter inserts, cleaning and replacing if required
- measurement of position of solids level, emptying if required
- re-filling of the plant with water

Filter inserts must be replaced every 3 years as a minimum. As spare filter inserts only items with conformity mark according to section 2.3.2 are permissible.

Prior to first operation and thereafter in regular intervals of no more than 5 years the waste water treatment plant has to be inspected on proper condition and appropriate operation, after prior complete drainage and cleaning by a specialist.

Following points must be checked or tested, respectively, at that time:

- information about the test location, the owner of the plant under mentioning the inventory data, the customer, the tester and the responsible authority.
- state of repair of the waste water treatment plant,
- proof of proper replacement of the filter inserts and disposal of the solids collection chamber contents,
- presence and completeness of the required approvals and documentation (approvals, drainage plans, operating and maintenance instructions etc.),
- dimensioning, suitability and performance capability of the waste water treatment plant in regards to actual waste water supply.

For conducting the inspection a test report has to be made with stating the inventory data and possible defects. Defects must be removed in agreement with the responsible authority, as the case may be.

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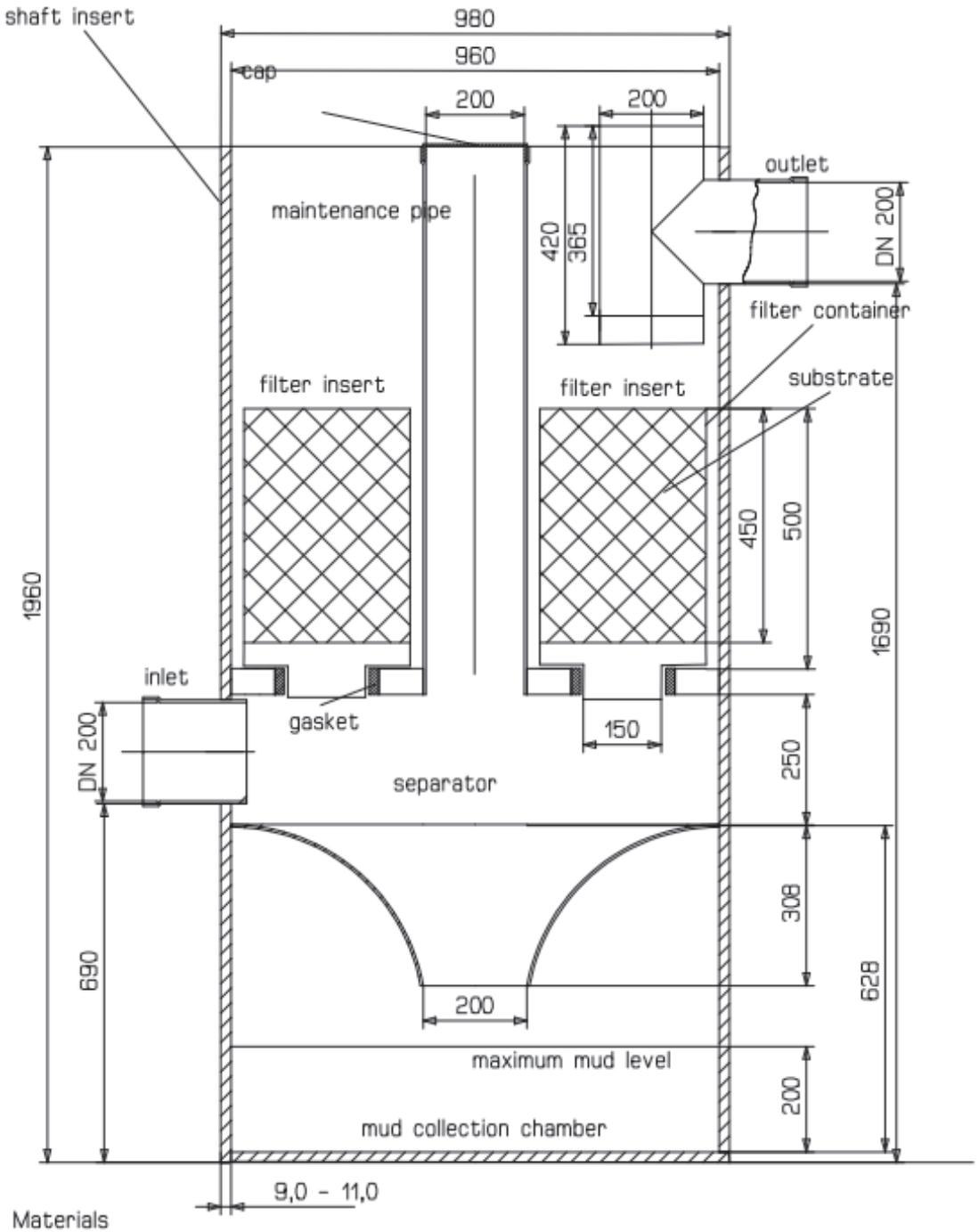
5.3 Disposal

Used filter inserts must be returned to the filter supplier. The contents have to be disposed properly.
The solids taken from the mud collection chamber contains hydrocarbonates and heavy metals and must be properly disposed of according to applying legal regulations.

Herold

Certified

(Signature)



Materials
shaft insert: polyethylene (PE)
filter insert: polyethylene (PE), stainless steel 1.4016, substrate
gesket: styrole-butadiene-rubber (SBR)
other components: polyethylene (PE)

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plant for treatment
of rainwater runoff

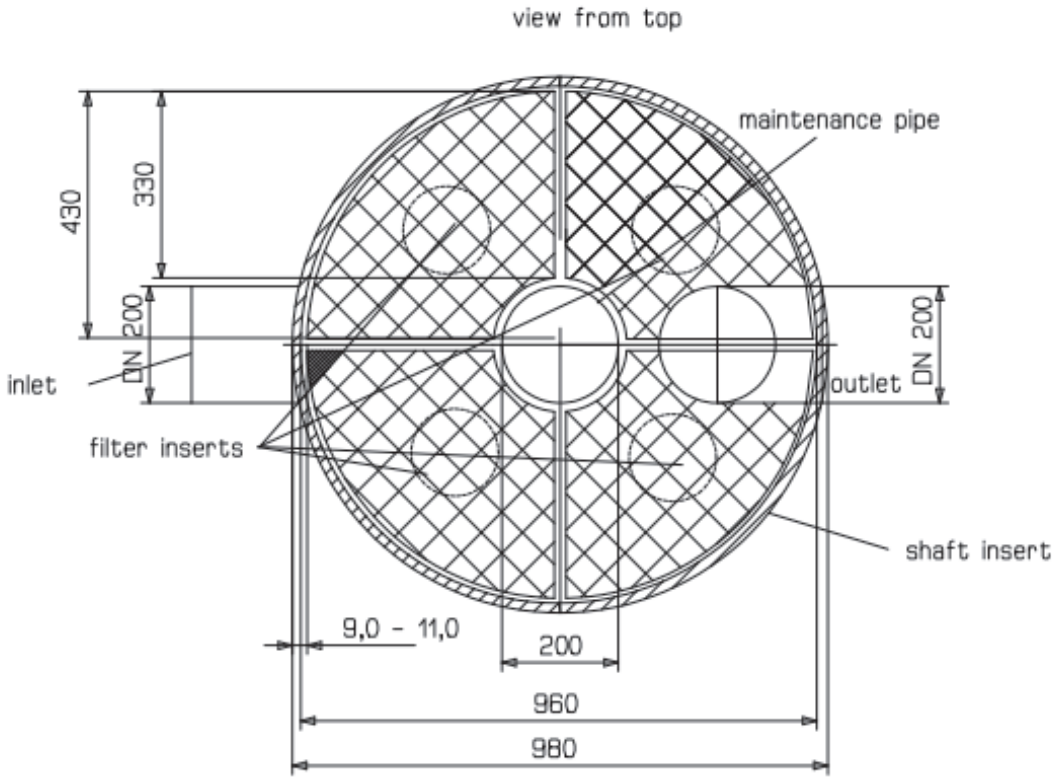
3P Hydrosystem
heavy traffic

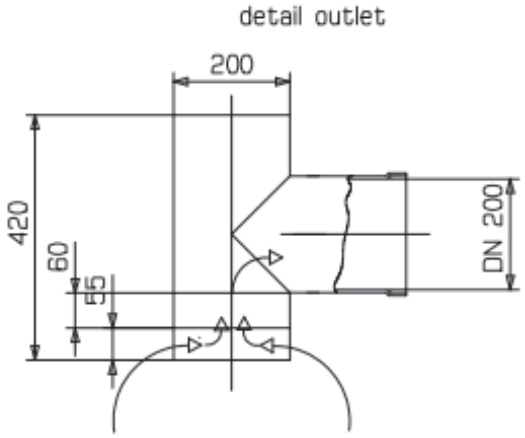
Appendix 1

to general technical

approval No. Z-84.2-4

from 12 May 2010





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3P Hydrosystem
heavy traffic

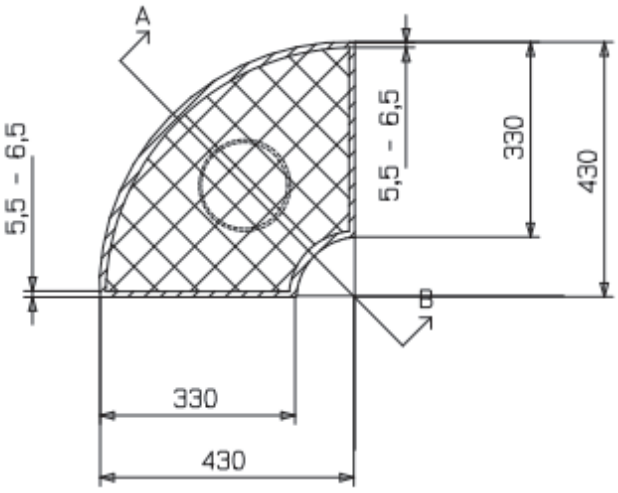
View from top

Appendix 2
to general technical

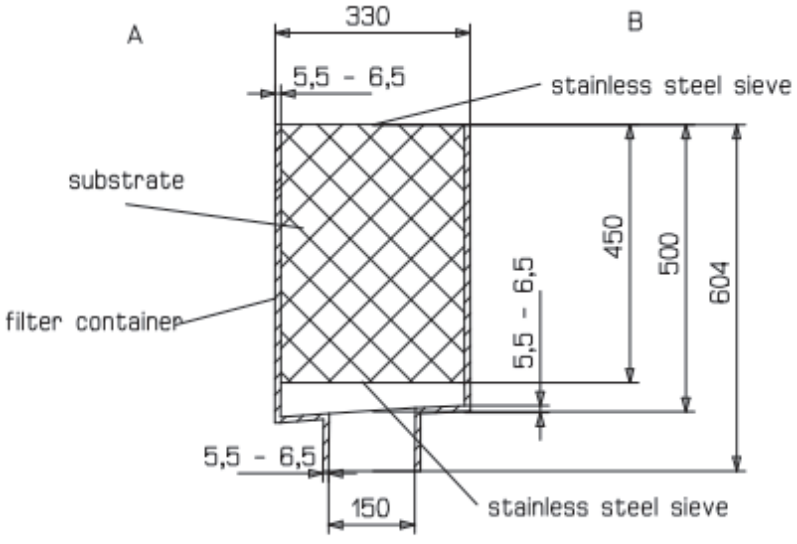
approval No. Z-84.2-4

from 12 May 2010

View from top



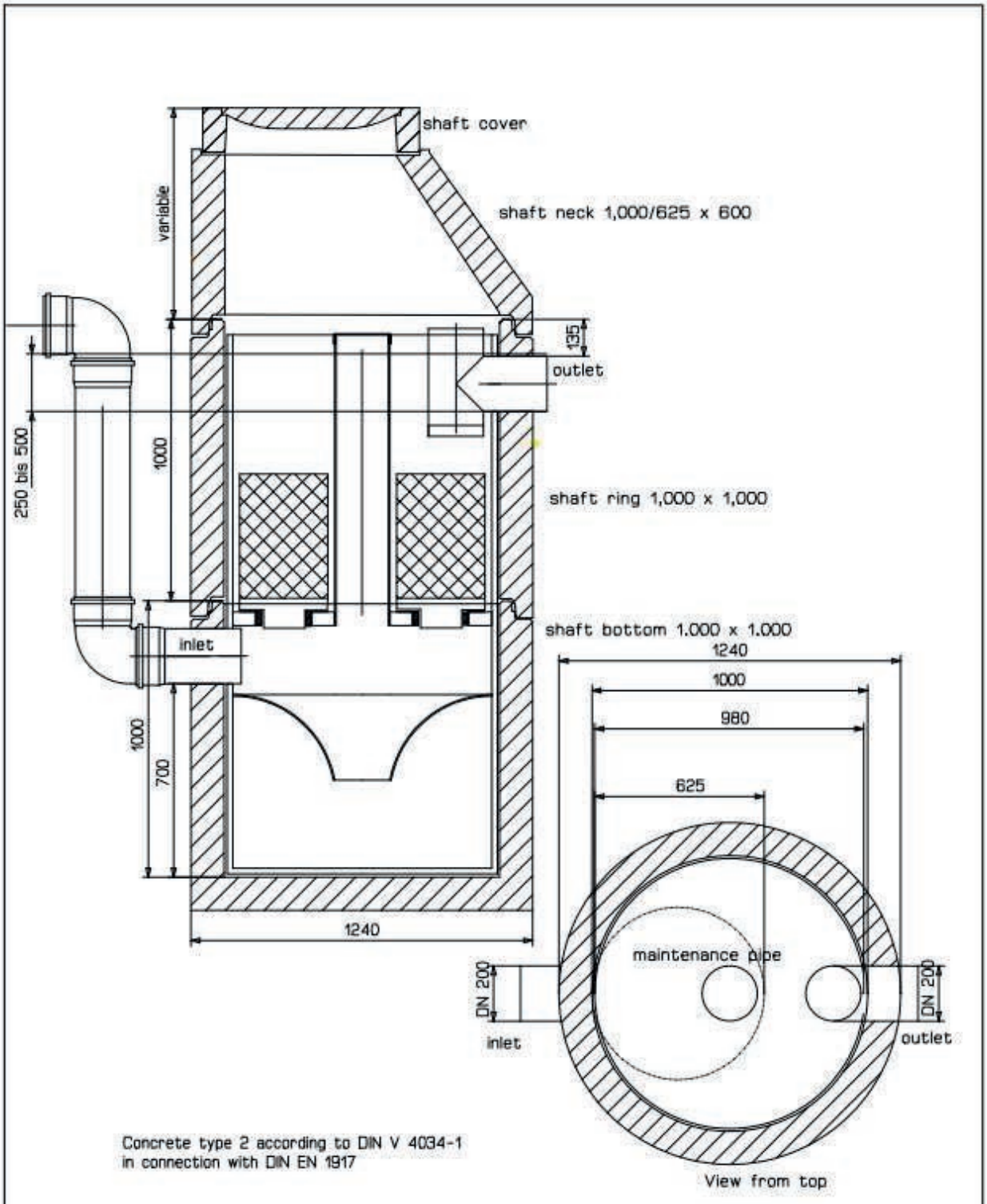
Sectional view A-B



3P Technik Filtersysteme GmbH Oschstraße 14 73072 Donzdorf Fon +49 (0) 71 62 94 60 7 - 0 Fax +49 (0) 71 62 94 60 7 - 99	3P Hydrosystem heavy traffic filter element ht	Appendix 3 to general technical approval No. Z-84.2-4 from 12 May 2010

Technical regulations for planning and designing rainwater runoff treatment plants

DWA work sheet A 138 Version April 2005	Planning, construction and operation of stormwater infiltration facilities; German Association for water supply and distribution waste water and waste - DWA
ATV-DVWK leaflet M 153 Version February 2000	Handling recommendations for stormwater runoff; German Association for water supply and distribution waste water and waste - ATV-DVWK
RAS-Ew draft 2003	Directives for road construction (RAS), part drainage (RAS-Ew); Research Association for roads and traffic - FGSV
DIN 18196:1988-10	Civil and foundation engineering; ground classification for construction purposes
DIN 18130-1:1998-05	Subsoil - Investigation of soil samples; Provisions of the water permeability coefficient - part 1: Laboratory tests
DIN EN 752:2008-04	Drainage systems outside of buildings



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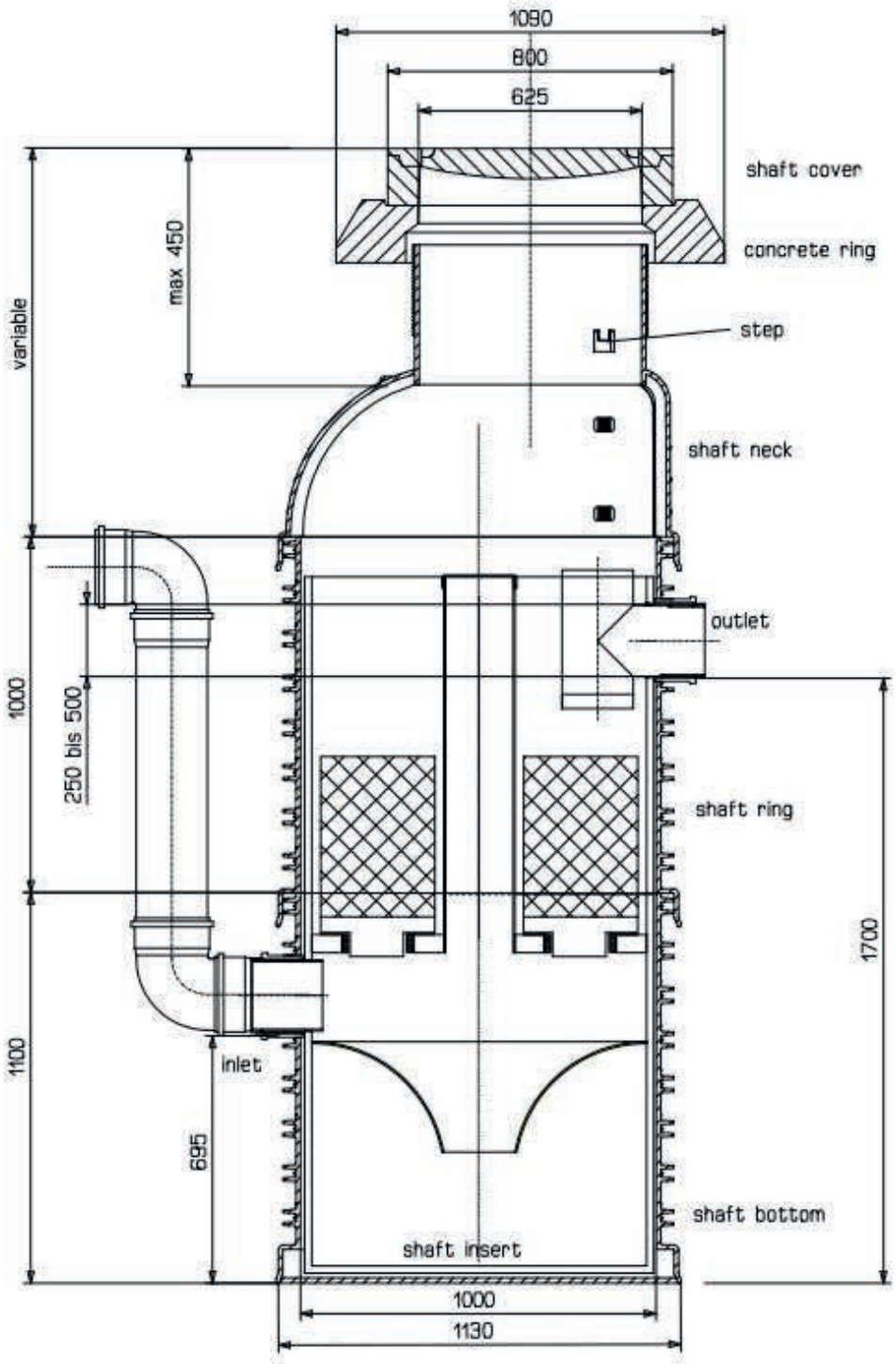
3P Hydrosystem
heavy traffic

Installation in concrete shaft

Appendix 5

to general technical approval No. Z-84.2-4 from 12 May 2010



plastic shaft from polypropylene

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3P Hydrosystem
heavy traffic

Installation in
plastic shaft

Appendix 6

to general technical

approval No. Z-84.2-4

from 12 May 2010

Installation instructions for 3P Hydrosystem heavy traffic

Important notes: The 3P Hydrosystem must be protected against pollution of the filter inserts during installation! The shaft inserts will be supplied with installed filter inserts.

1. The filter must be installed with a plunge. The distance from the bottom of the incoming pipe to the bottom of the outlet pipe must be 250 mm to 500 mm.
2. No pollution may reach the filter inserts from the top. The filter inserts must be covered or be removed prior to installation of the systems and be re-installed only after completed installation. Polluted rainwater runoff by the construction site must be disposed of properly after connecting the 3P Hydrosystem (pump out shaft). Only then the filter inserts may be re-installed.
3. If after installation of the system pavement works should be performed on the area to be drained, or construction work in the vicinity, it must be observed, that no joint mortar or mortar residues will intrude into the system. That will lead to obstruction of the filter inserts, which have to be cleaned or replaced in that case. The filter inserts should be removed prior to such works and the polluted precipitation water drainage from rinsing the area has to be disposed of properly.
4. The rubber gaskets for the filter inserts must be cleaned thoroughly prior to re-installation.

If the waste water treatment plant shall be installed in a plastic shaft structural evidence has to be provided.

Installation:

1. The waste water treatment plant must be pre-mounted in the respective outer shafts (or shaft components, respectively). Connections for inlet and outlet must be made and sealed.
2. Foundation excavation and wall supports according to applying technical rules. Place a horizontal bed of sand or concrete at a thickness of 10 to 15 cm.
3. Put in the shaft and check horizontal position. Align inlet and outlet opening to the correct direction.
4. Connect flow-in line.
5. Fill foundation excavation partly and compress. Filter inserts must be covered or removed before.

6. Connect outlet pipe. Observe level difference between inlet and outlet according to manufacturer information.
7. Put in further shaft rings, cone, if required adjustment rings and cover.
8. After installation re-insert the filter inserts if they had been removed or remove cover, respectively.
9. Put T-piece (outlet) from the inside on the drainage line. Secure T-piece with supplied threaded rod. Observe alignment (inlet slots must be located on bottom).
10. Check if end cap on the maintenance pipe, buoyant protective device for the filter inserts and buoyant protective device for the shaft element are installed properly.

An extensive installation instruction is supplied by the manufacturer for each plant, which has to be observed.

Prior to first operation the plant must be inspected for proper installation by a competent person.

Operating and maintenance instructions 3P Hydrosystrem heavy traffic

Because of occurring pollutants and harmful substances in the rainwater runoff the 3P Hydrosystem heavy traffic must be inspected and cleaned in regular intervals in the same way as any other waste water treatment plant.
At rainwater runoff with unusually low or heavy solid contents the intervals for inspection may vary from following specifications.

Annual inspections:

- Visual inspection of the system: after opening the shaft cover the inside of the shaft must be inspected if all functional components are existing and are in proper condition (filter inserts, maintenance pipe, buoyant protective device, drainage pipe).
- Measurement of permeability of the filter inserts: for doing this the cover of the maintenance pipe must be removed. Via a pump, which is equipped with a control valve and a flow meter in the pump line, water must be taken above the filter elements and to be pumped into the maintenance pipe. Thus water is pumped in circulation. Based on the specified test plan of the manufacturer it has to be determined what value the permeability shows. For doing this the difference between water level in the maintenance pipe and above the filter elements must be determined. This should be maximum 30 cm. At too low permeability according to maintenance instructions (depending on local rain falls and connected areas) the filter elements must be rinsed or to be replaced. After completing the works the cover has to be replaced on the maintenance pipe.
- Rinsing the filter elements: by means of a suitable pressurized air and water rinsing device according to maintenance instructions or by dismantling and rinsing them outside the shaft, the filters must be cleaned. The cleaned filter elements must be replaced in the latter case after cleaning the shaft interior. Following an inspection of the permeability of the filter inserts is required again.
- Measurement of mud level: by means of a pipe camera and a gauge stick, which is put into the mud the level of sediments in the mud must be measured. Alternatively a mud measurement plate can be used. If the maximum level has been reached the mud collection chamber must be emptied.

Appendix 9

Emptying the mud collection chamber

- In case the mud collection chamber has been filled by occurring mud it must be emptied, the latest, however, after five years.
- For doing this the end cap on the maintenance pipe must be removed. The suction hose of a suction vehicle must be positioned into the mud collection chamber through the maintenance pipe. The mud collection chamber must be emptied following with this suction hose. Additionally water can be pumped via the maintenance pipe to loosen the mud. After completing the works the cover has to be replaced on the maintenance pipe. The mud must be disposed of properly.

Changing the filter unit

- The latest after three years of operation the filter inserts must be replaced. For doing this the old inserts must be taken out from the shaft insert and be replaced by new ones. The old filter inserts must be returned to the manufacturer, where they have to be disposed of properly.
- If a backflow of water from the area to be drained occurs more frequently than provided in the dimensioning, the filters must be inspected on permeability non-regularly. They can either be rinsed or replaced in order to ensure proper function.

To be observed under all circumstances:

- Water pumped out from the shaft, the mud collection chamber or a rinsing unit for filter inserts may only be discharged to the wastewater treatment plant. It may not be discharged into surface waters, a rain water drainage system or infiltration facility.

The Hydrosystem 400 / 400 Cu and 1000 metal

For roofs made of copper and zinc

Type approval dated 29.12.2010 under Bavarian Water Act Article 41f

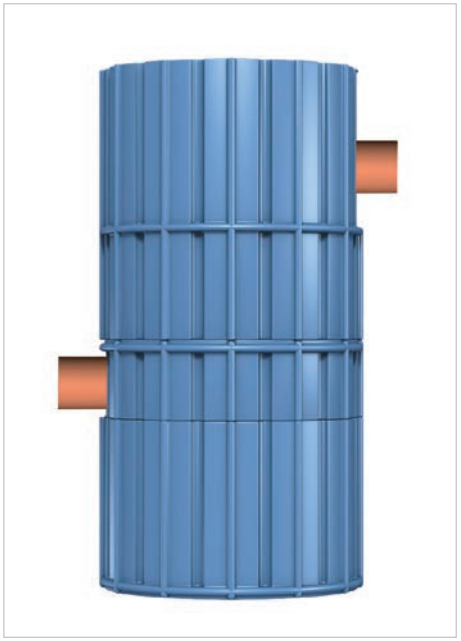
Treatment plant for a permit-infiltration of stormwater exemption (NWFreiV in Amended on 01.10.2008) in Bavaria. Tested over a year (18.09.2010 to 10.08.2010) at the Department of Urban Water Management University of Technology Munich on a roof in Garching.

The water from the system must permit free also underground facilities such as trenches or sicker be drained.

Retention of dissolved copper:
≥ 97% (flow ≤ 50 g / l)

Retention of dissolved zinc:
≥ 90% (flow ≤ 500 g / l)

Hydrosystem 400



Hydrosystem 1000

Hydrosystem 400 Cu

The Hydrosystem 1500 is the big brother of the Hydrosystem 1000. It is installed in the factory in a plastic, concrete or fiber shaft with an internal diameter of 1.5 m.

A hydrodynamic separator brings about the sedimentation of solids in a radial flow regime characterized by secondary flows.
Through the effect of the separator, the solids enter the flow-calmed sludge trap located underneath the separating funnel. There are six filter elements above the separation chamber. The water flows upwards through the filter elements. The system removes pollutants such as heavy metals, mineral oil hydrocarbons and polycyclic aromatic hydrocarbons from the stormwater.
Apart from that it binds nutrients such as phosphates. The quality of the cleaned water is so high that it can be discharged directly into the seepage or any receiving sewer.
The height difference between inlet and outlet is only 25 cm. As the system is installed under the traffic area, it needs no additional space on the property or in the road space. The treatment plant can be used with traffic areas such as car parks and roads with all volumes of traffic, industrial areas and metal roofs. Four different filter cartridges are available for this.
In comparison with the smaller Hydrosystem, about three times the area can be connected to the treatment plant.
The outlet is fitted with an immersion pipe for retaining the light density matter. The sludge trap can be evacuated via the central maintenance pipe.

APPROVALS AND VERIFICATIONS

• General building authority approval from the **DIBt** for seepage Z-84.2-22
• Tested according to requirements of **DWA-A 102**
• Tested in accordance with the **NJDEP** protocol

TECHNICAL DATA

• **Internal diameter of the concrete or plastic shaft:** 1.5 m
• **Minimum height loss between inlet and outlet:** 25 cm
• **Connectable area:** 1600 m^2 to 3200 m^2 depending on the degree of treatment level
• **Maximum flow rate:** 105 l/s
• **Maximum filtration capacity:** 24 l/s

Deutsches Institut für Bautechnik

DIBt

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamt

Eine vom Bund und den Ländern gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Allgemeine bauaufsichtliche Zulassung/ Allgemeine Bauartgenehmigung

Datum: 26.03.2019

Geschäftszeichen: II 35-1.84.2-5/18

Nummer:
Z-84.2-22

Geltungsdauer
vom: **26. März 2019**
bis: **26. März 2024**

Antragsteller:
3P Technik Filtersysteme GmbH
Robert-Bosch-Straße 16-18
73337 Bad Überkingen

Gegenstand dieses Bescheides:
Anlage zur Behandlung von mineralölhaltigen Niederschlagsabflüssen für die Versickerung 3P Hydrosystem 1.500

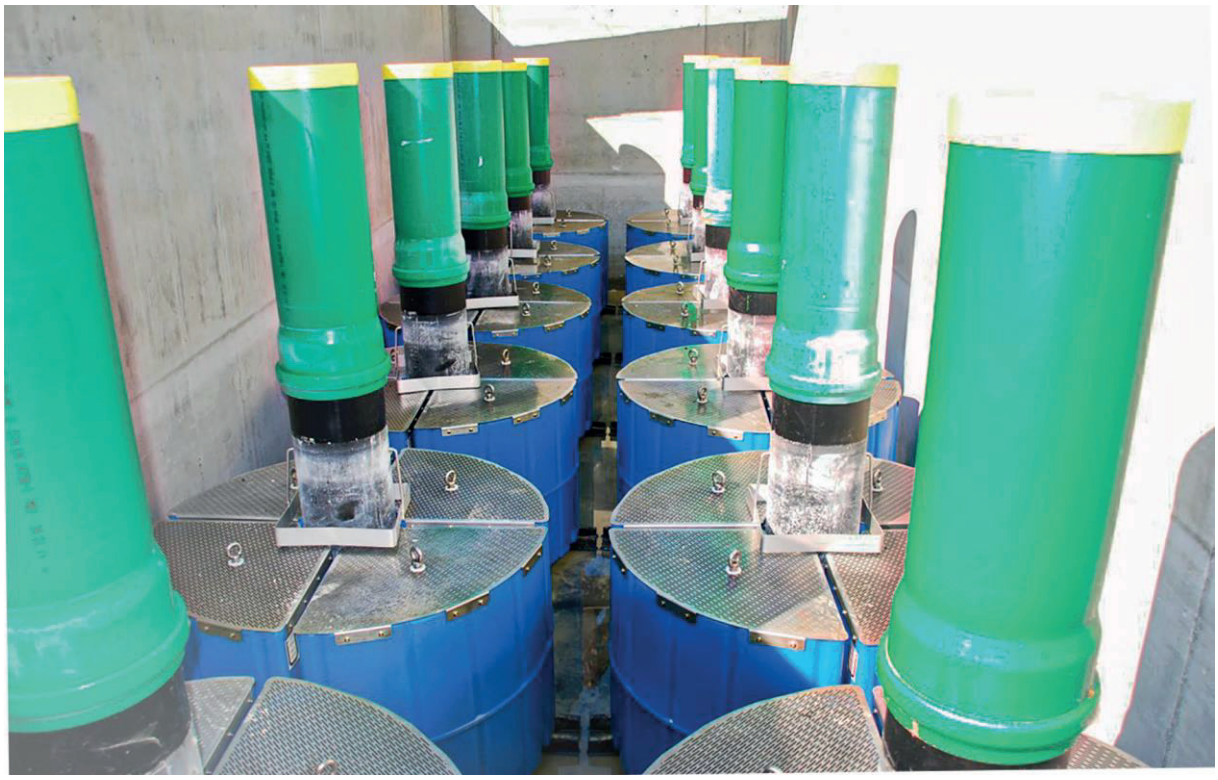
Der oben genannte Regelungsgegenstand wird hiermit allgemein bauaufsichtlich zugelassen/genehmigt.
Dieser Bescheid umfasst elf Seiten und elf Anlagen.

For larger catchment areas or larger flow rates there is a possibility to individually combine a certain number of filter elements.

The sedimentation and filtration are separated for such filter structures; this means that a sedimentation plant has to be installed upstream of the actual filter system. Specifically configured for robust treatment of contaminated runoff from trafficked areas and industrial sites.
Planning takes place in the individual case in accordance with the conditions of the catchment area and the cleaning goal.
The systems can be designed as filter units with direct inflow. Note that each filter compartment has to be closed off for maintenance purposes.
Individually adapted filter structure with Hydrosystem 1000 or Hydrosystem 1500 units possible.
In a field trial percentage retention of more than 80% of TTS could already be achieved.

APPROVALS AND VERIFICATIONS

- Tested in a **field trial** on a motorway in Giessen
- Tested according to requirements of **DWA-A 102**
- Tested in accordance with the **NJDEP** protocol



The Hydroshark sedimentation plant reliably Removes filterable solids (TSS) from the rain runoff. It thus protects bodies of water and seepage systems.

The water is initially fed tangentially into the centre of the system, where the sedimentation of the solids takes place by means of the so-called teacup effect. The solids sink into the sludge trap below, which is hydraulically separated from the treatment chamber by flow breakers so that remobilisation of the settled particles cannot occur in case of heavy rain. The water subsequently flows evenly upwards in the outer ring of the system. A serrated weir ensures that no short-circuit flows arise in the system and that the most homogeneous flow possible prevails. The water then subsequently flows over the serrated weir into the outlet. Lightweight substances such as oils or pollen are effectively retained as they cannot pass through the separation wall. There is no height offset between inlet and outlet. The system cannot block. The system can be used for all areas, from roof areas to traffic areas and industrial areas. The cleaning performance is designed such that the Requirements of M 153, the future A 102 and the NRW separation decree are met.

APPROVALS AND VERIFICATIONS

• Transmission value according to **DWA M 153** D = 0.35 (field D25) for connectable areas according to table, r_{crit} = r(15.1), here with 150 l/(s · ha) for simplification
• Transmission value according to **DWA M 153** D = 0.50 (field D24) for connectable areas according to table, r_{crit} = 45 l/(s · ha)
• Tested in the laboratory on the basis of the requirements for **DWA A 102** with **TSS63** (retention of TSS63 > 55 % for Category 2 areas, > 70% for Category 3 areas)
• Laboratory test according to **NRW regulations decree** with **TSS200** according to the modified DIBt method
• Tested according to the American **NJDEP** protocol

The purification process of this separator is based on physical sedimentation which evolves through a vortex flow within the treatment facility. Results in experimental testing showed high percentage in retention levels for particulate solids > 63 µm. As these Total Suspended Solids (TSS) serve as "carriers" of adsorbed heavy metals in precipitation water, they constitute a decisive criteria for performance evaluation of an hydrodynamic separator. Thus, total freight efficiency of 84,89 %, 86,92 %, 87,26 % and 75,41 % could be made out for separators with connectable treatment areas of 2.000-12.500 m^2. The percentage in backing depends only marginally on the inert mass of solids. Further experiments show stable flow conditions within the treatment facility despite of vortex flow. There are no short-circuit currents or dead zones within the treatment area. Another study proves, the entry of rainwater containing de-icing salts with low NaCl concentrations may act facilitating on the sedimentation of particulate solids. Higher concentrations in salts come along with many times over reduced grain size of colloidal solids. As a consequence, a proportionally higher discharge of the suspended solids of the hydrodynamic separator in winter months can be expected.

Hydrodynamic separators offer an economic, space-saving and efficient alternative against large, technically elaborate rainwater treatment facilities.

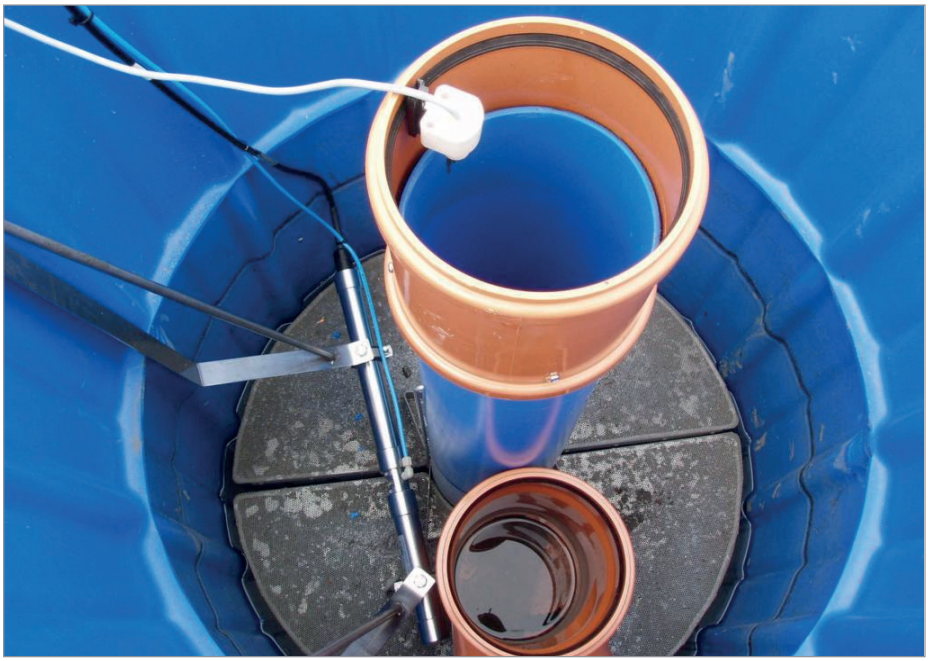
The Hydrosystem 1000 heavy traffic

For effective outflow areas in separation systems tested to the requirements of the separation decree NRW (Circular dated 26 May 2004 „Requirements for rainfall drainage in the separation process“) investigated from July to November 2009 by Dr. Pecher AG to a stormwater sedimentation tanks (RKB) in Wuppertal.

The retention of solids (AFS) is 57%, however, the system was experimental conditions with a fixed rainfall intensity applied, which corresponds to 2.4 times the critical rainfall. 1.2 times the annual rainfall was applied.

„At a loading of the filter system with a maximum of 0.75 l / s , depending on the characteristics of the catchment area, are assumed to be significantly higher AFS support and extend the service life. The efficiency of the filter system and the RKB terms of solid retention are comparable to the results available (Dr. Pecher AG (2011)).

Explanatory report
„Comparative study of the effectiveness of the hydraulic system“ heavy traffic“ and a rain clarifier (RKB)“



The Hydrosystem 1000 heavy traffic

For traffic areas

Proved to the results of the german "Trennerlass NRW" (Circular dated 26 May 2004 „Requirements for rainfall drainage in the separation process".

Investigated from October 2009 to September 2010 by Dr. Grontmij GmbH in Königswinter; additional monitoring in a laboratory of the "Institute of underground technologies (IKT)" in Gelsenkirchen.

„The experience in Königswinter with the 3P Hydrosystem from 3P Technik GmbH show that the proof of a permanent operation may well be given. The system turns out to about a year trouble free service life to be reliable, simple and low-maintenance „(Koch, A. (2011): Decentralized stormwater treatment systems in isolation, first experiences).

The Hydrosystem 1000 heavy traffic

For the treatment of heavily polluted road runoff

Long-term study on a busy Federal Road (B75) in Hamburg Harburg investigation of two Hydrosystem 1,000 heavy traffic of December 2006 to December 2011, over five years.

Approximately 2,300 m2 of road surface are connected to the system.
The water runs through a Sedimentation-shaft DN 2500 in the filter systems. The sequence is cut off in a amphibious habitat.

Retention of solids (AFS):	92%
Retention of mineral oil (TPH):	86%
Retention of copper:	85%
Retention of zinc:	87%
Retention of lead:	88%
Support to Ptotal:	81%

Inspection report

Results year of operation 2009

Examination of a treatment plant for street drainages on the street

Bremer Straße in Hamburg-Harburg over a period of three years

February 11th, 2010

author: Dr.-Ing. C. Dierkes

3P Technik Filtersysteme GmbH, Öschstraße 14, 73072 Donzdorf

Contents

Introduction

This report is a supplement to the report on the plant at the street Bremer Straße in Hamburg-Harburg and describes the performance and the retain of substances over the third year of operation 2009.

Results of the samplings

Since the installation in December 2006 the rainwater treatment plant at the street Bremer Straße has been manually sampled at regular intervals in order to control the function and the harmful substance retention. The results of the first years are indicated in a report from February 2009. Here the performance in the third year after commissioning is described. Now the current filter elements have been operated since two years without maintenance.

Precipitation and runoff situation

The data of the weather station Hamburg Fuhlsbüttel were used for the assessment of the precipitation, because they are freely available on the internet (www.wetteronline.de). Although the measuring point is situated some distance away northwards, the tendences of the precipitation should basically match.

As the plant was taken into operation on 06.12.2006, the precipitation has been observed since this date. The montly sums of the precipitation are illustrated in figure 1. This report refers to the complete year of operation from December 2008 bis December 2009.

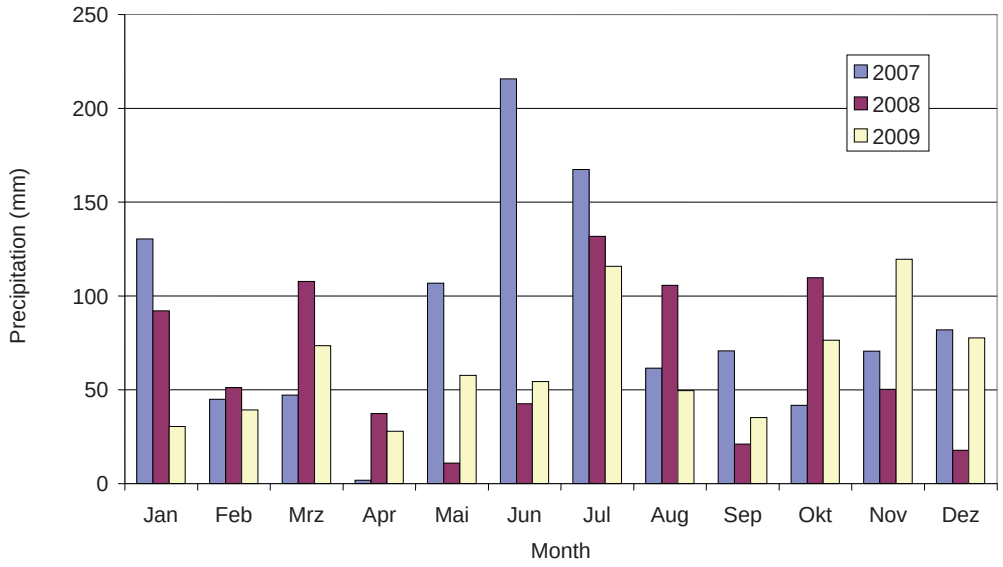


figure 1: monthly precipitation in Hamburg from January 2007 to December 2009

The year 2009 has lower precipitation than the previous years (with 757 mm). Especially the first half-year is drier than the previous ones, the autumn 2009 is clearly wetter than autumn 2007 and 2008 (figure 2.)

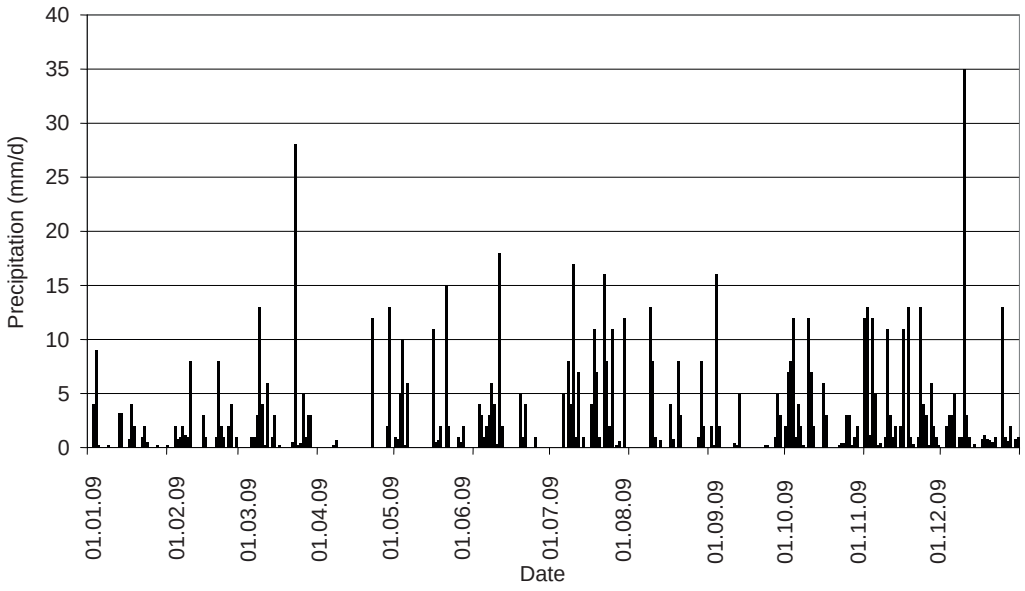


figure 2: daily precipitation over the period of examination

Also the daily precipitation is more balanced. The heaviest daily precipitation in December amounts only 35 mm. In the previous years almost 50 mm was achieved several times (figure 2).

Considering a connected area of 2.300 m^2 that means for the total volume of water, which flew by 31.12.2009 through the filter plants, that approx. 5.400 m^3 street drain got into the plant with a scheduled discharge coefficient of 0,9. In the year 2009 there were 1570 m^3.

Pressure heads and emergency overflows

Also in 2009 the pressure heads in the system have continually been recorded in order to determine the emergency spillways. The pressure heads are illustrated in figure 3. The battery failed twice in the period of examination due to corrosion at the contacts. The periods are described in the diagram. 6 overflows were detected in the measuring period, however two of them reached just the overflow height. Here it is not clear, if it has really come to an overflow. The measured overflow duration in the year 2009 amounts 40 minutes. In total the whole duration of the rain drainage 2009 amounts approx. 800 hours. Thus more than 95 % of the yearly rain drainage volume was treated.

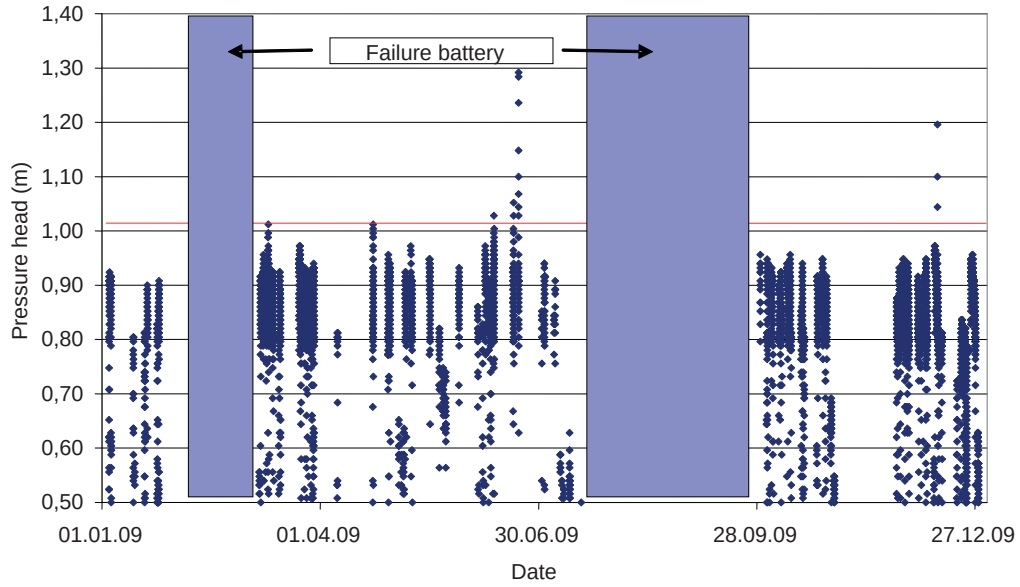


figure 3: pressure heads in the system over the year 2009

However the performance of the plant clearly changed compared to the years 2008 and 2009. The filters were not rinsed after one year operation despite the extreme conditions. Only the sludge traps were emptied every six months together with the sedimentation pit. Figure 4 shows the presssure heights in the system referring to the duration of the rain drainage.

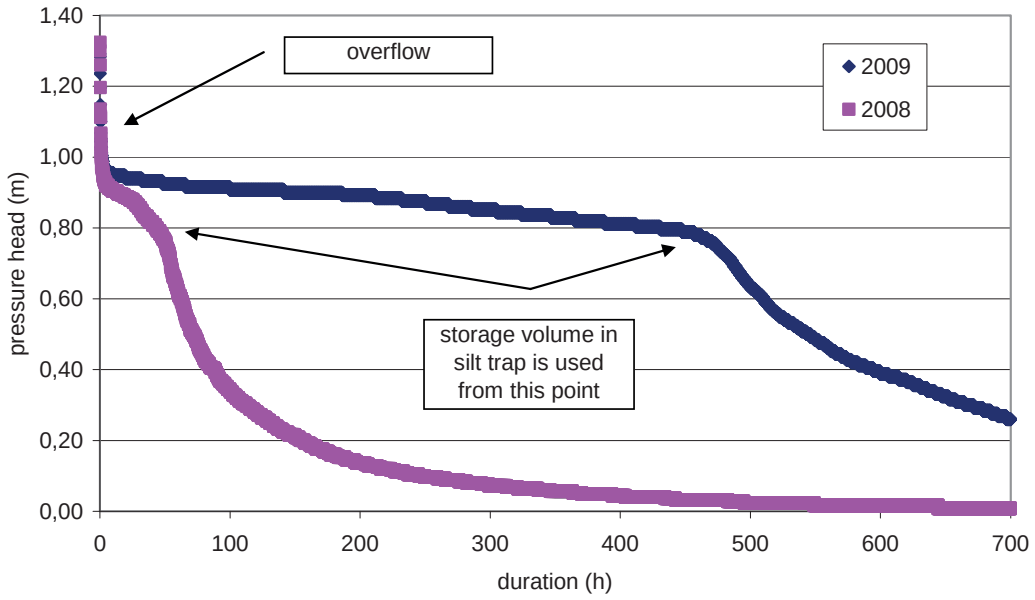


Figure 4: performance comparing the years 2008 and 2009

Here you can clearly see the decreasing permeability of the filter. From a pressure height of 80 cm the sedimentation pit is stowed. Thus an additional retention is used. In 2008 this was the case for only approx. 50 hours. In 2009 the sedimentation pit was operated approx. 450 hours as retention volume.

Solids retention

As in the previous years samples were taken manually from inflow and outflow of the plant in order to make statements about the solids retention at one month intervals at rain events. The samples were pumped by means of a submersible pump out of the distribution duct in front of the plant and from the water over the filter.

The inflow samplings were taken from the distribution duct and not from the sedimentation pit, because the performance of the filter systems should be examined as a matter of priority.

The parameters filtratable substances (AFS) and the heavy metals zinc, copper, lead, cadmium and the hydrocarbons were analyzed. Deviating from the samplings of the years 2007 and 2008 the total phosphorus content P_{ges} instead of ortho phosphate and the total nitrogen N_{ges} instead of the ammonium were determined. This decision was made, because these parameters are used abroad (especially in Australia and the USA) for assessement of rain water treatment plants. All measured values of the year 2009 are indicated in enclosure A. We refer to the previous report for the earlier measured values.

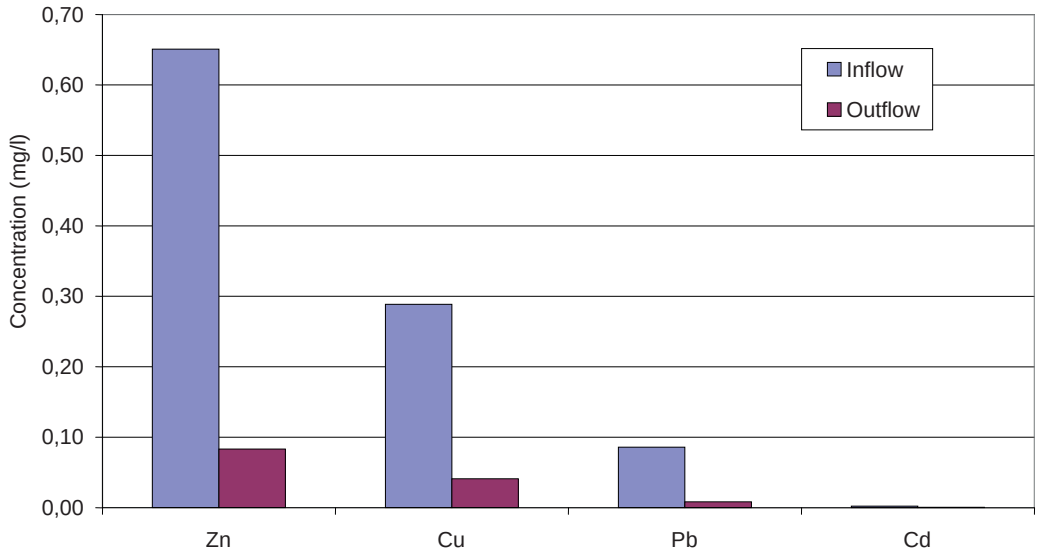


figure 5: Medium concentrations of the heavy metals from inflow and outflow for the year 2009

Figure5 shows the medium inflow and outflow concentrations for the heavy metals. For zinc the concentrations of 650 µg/l are reduced to 80 µg/l. Thus the values can be easily compared to the values of the previous years. This is particularly for copper, lead and cadmium. Cadmium could not be proven in the drain.

In figure 6 the results for phosphorus and nitrogen as well as for hydrogencarbons are illustrated. Here the reduction of P amounts approx. 85 % similar to the reduction of ortho phosphate of the previous years. The total nitrogen is reduced by approx. 65 %. For the hydrocarbons the target value of 0,2 mg/l could be met.

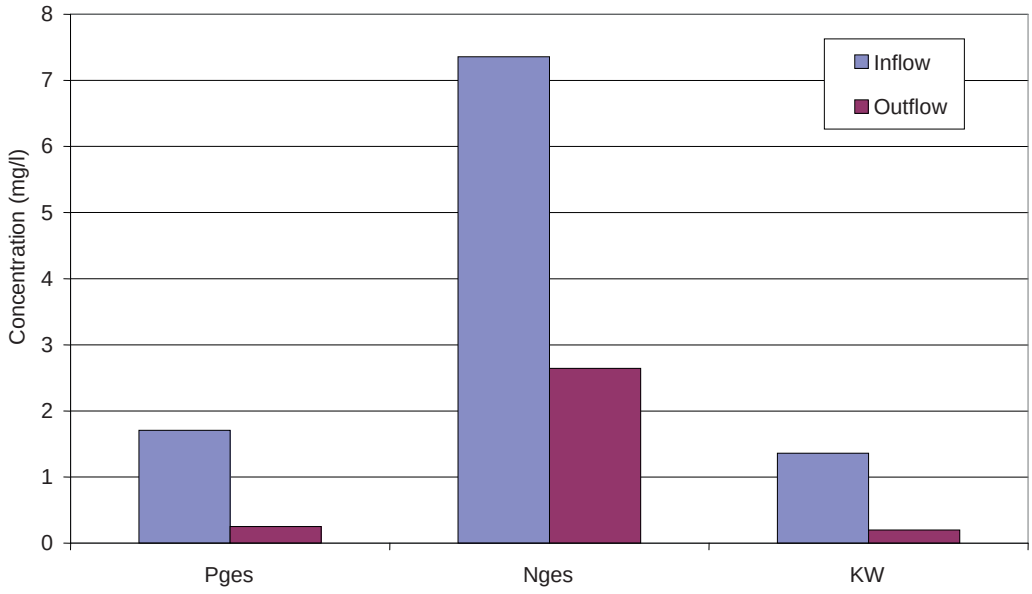


figure 6: inflow and outflow concentrations of P, N and the hydrocarbons

Figure 7 shows a comparison of the efficiency of the plant for three years of operation. The filtratable substances were retained with approx. 92 %. You see a constant cleaning performance for the heavy metals over the three years between 80 % and 90 %. Ortho phosphate and total-P were retained for approx. 80 to 85 %. Whereas ammonium was removed for more than 90 %, the retention of total-N amounts only approx. 65 %. This has to be attributed to the compounds, which cannot be treated, as nitrate. The hydrocarbon retention amounts approx. 90 %.

The results of three years sampling of the rain water treatment plant show, that up to now almost all relevant substances are removed with a high level from the street discharge. The cleaning result has been very constant over the three years of operation.

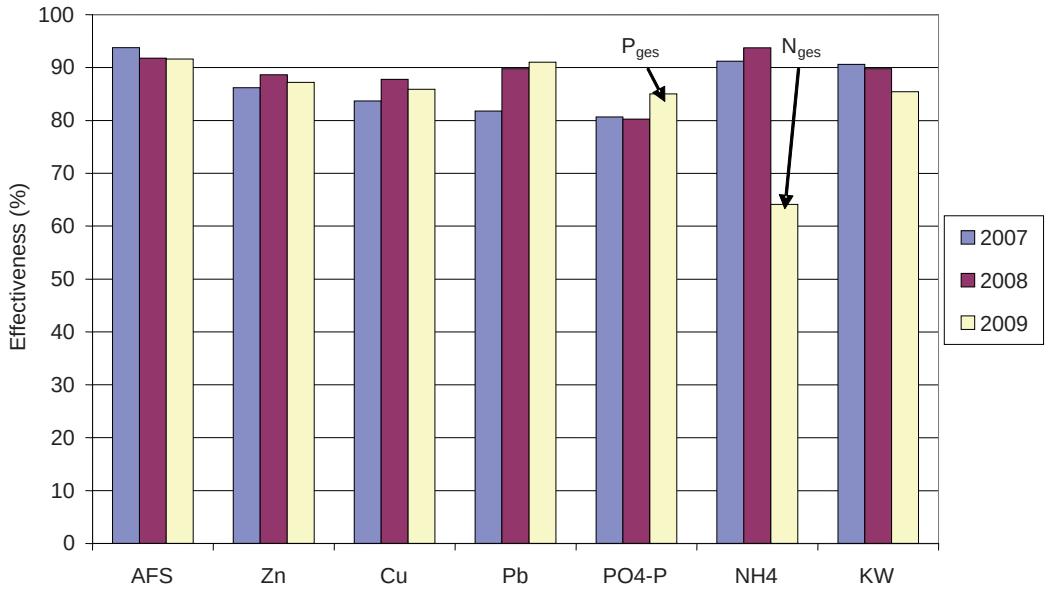


figure 7: Efficiency of the plant for the years 2007, 2008 and 2009

Outlook

The measurements and samplings will be effected further on. After the end of the frost period in March/April 2010 the filters will firstly be rinsed at site with a new procedure in order to see, if the permeability can be restored. Subsequently the filter elements will be exchanged, because they reach the capacity limit after two years of operation under these conditions. In future the rinsings will be effected once a year. The sludge traps will be emptied further on semi-annual.

Summary

Since the installation of the filter plants at the B75 in Hamburg Harburg samplings of the plant were taken at rain events over a period of three years in one month intervals. A volume of approx. 5.400 m^3 water was treated. As contrary to the initial layout of the filter system more than twice the of the impereable area was connected, there were 4 to 6 rain events in 2009, when the internal overflow of the plant led past the filters (possibly more due to a temporary failure of the measurements). In total max. 5 % of the yearly running off water volume was not treated by means of the filters. The filters were intentionally not rinsed or cleaned over the last two operating years. Only the sludge traps were regularly emptied.

The inflow of the filter system and the outflow were analysed for solid matters, heavy metals, hydrocarbons and nutrients. The following results were found in 2009:

- The filtratable substances are reduced by 92 %.
- The concentration-related efficiencies for heavy metals amount between 80 % and 90 %.
- P_{ges} is removed by approx. 85 % and N_{ges} by 65 % from the rain discharge.
- In 2009 the hydrocarbon index in the inflow amounted 1,4 mg/l and in the outlfow 0,2 mg/l.
- The target concentrations for the running off water, which were gathered from the value figures of the Federal Soil Protection Act for the path soil groundwater (if available), are currently met without exception, although more than twice the area is connected to the plant as the area for which it has been really layouted.

Especially the flat catchment area as well as a certain retention volume of the pilot shafts and pipelines have a positive effect. They allow a temporary flushing of the water and thus compensate extreme inflow peaks in the volume flow. This became clear in 2009, because the pressure heads in the system increase due to a stronger clogging of the filters. But this does not impinge on the number of emergency spillways.

Acc. to these results a yearly rinsing of the filters seems to be necessary. Besides he filters should be exchanged every two years under these conditions.

The plant will be further on observed and sampled in order to follow the development of the operating behaviour.

Enclosure A: measured values

Date	AFS mg/l	Zn mg/l	Cu mg/l	Pb mg/l	Cd mg/l	P_{ges} mg/l	N_{ges} mg/l	KW mg/l
Inflow								
12.01.2009	346	0,26	0,087	0,025	0,0007	0,22	2,10	0,6
12.02.2009	224	0,62	0,340	0,067	< 0,002	1,10	0,61	0,1
30.03.2009	136	0,11	0,035	< 0,005	< 0,0005	< 0,3	4,60	4,7
27.04.2009	545	0,14	0,057	< 0,01	< 0,0005	< 0,3	8,10	0,7
28.05.2009	37	4,30	2,300	0,510	0,0043	7,80	26,00	0,1
23.06.2009	234	0,20	0,089	0,024	< 0,0005	0,36	8,50	0,8
23.07.2009	576	0,06	0,028	0,005	< 0,0005	< 0,3	2,20	0,2
27.08.2009	213	0,95	0,049	0,098	0,001	1,80	15,00	5,0
25.09.2009	67	0,13	0,055	0,011	< 0,0005	0,81	8,40	0,1
27.10.2009	156	0,25	0,078	0,019	< 0,0005	0,70	4,20	1,3
27.11.2009	617	0,14	0,054	0,014	< 0,0005	0,84	1,20	< 0,2
Outflow								[2]
12.01.2009	24	0,27	0,110	0,030	< 0,0005	0,39	2,00	0,9
12.02.2009	12,5	0,09	0,045	0,012	< 0,0005	< 0,3	0,60	0,1
30.03.2009	36	0,11	0,037	< 0,005	< 0,0005	< 0,3	4,00	0,5
27.04.2009	12,5	0,20	0,100	0,021	< 0,0005	0,53	5,30	0,1
28.05.2009	27	0,03	0,019	< 0,005	< 0,0005	0,42	2,80	0,1
23.06.2009	54	0,03	0,008	< 0,005	< 0,0005	< 0,3	1,30	0,1
23.07.2009	12,5	0,03	0,019	< 0,005	< 0,0005	< 0,3	1,80	0,1
27.08.2009	34	0,05	0,042	0,005	< 0,0005	< 0,3	5,00	0,2
25.09.2009	27	0,00	0,020	< 0,005	< 0,0005	< 0,3	3,10	0,0
27.10.2009	12,5	0,07	0,029	0,006	< 0,0005	0,06	2,90	0,2
27.11.2009	12,5	0,03	0,019	< 0,005	< 0,0005	0,44	0,25	0,1
averages								
average inflow	286	0,65	0,288	0,086	0,002	1,70	7,36	1,4
average outflow	24	0,08	0,041	0,015	< 0,0005	0,37	2,64	0,2
efficiency	92	87	86	91	-	85	64	85

The Hydrosystem 1000 heavy traffic

Testings
University Münster
Prof. Dr. Uhl

For the treatment of stormwater in the separation system

Investigation of stormwater treatment systems in comparison.

Laboratory experiments with tracers and solids (AFS) for the improvement of test methods. We investigated the effect of the system over the entire hydraulic range at varying feed concentrations.

A performance analysis was developed.

Retention of solids (AFS)

in the middle:	93%
at low rainfall intensities:	≥ 90%
at high rainfall intensities (270l/(sxha)):	≥ 48%