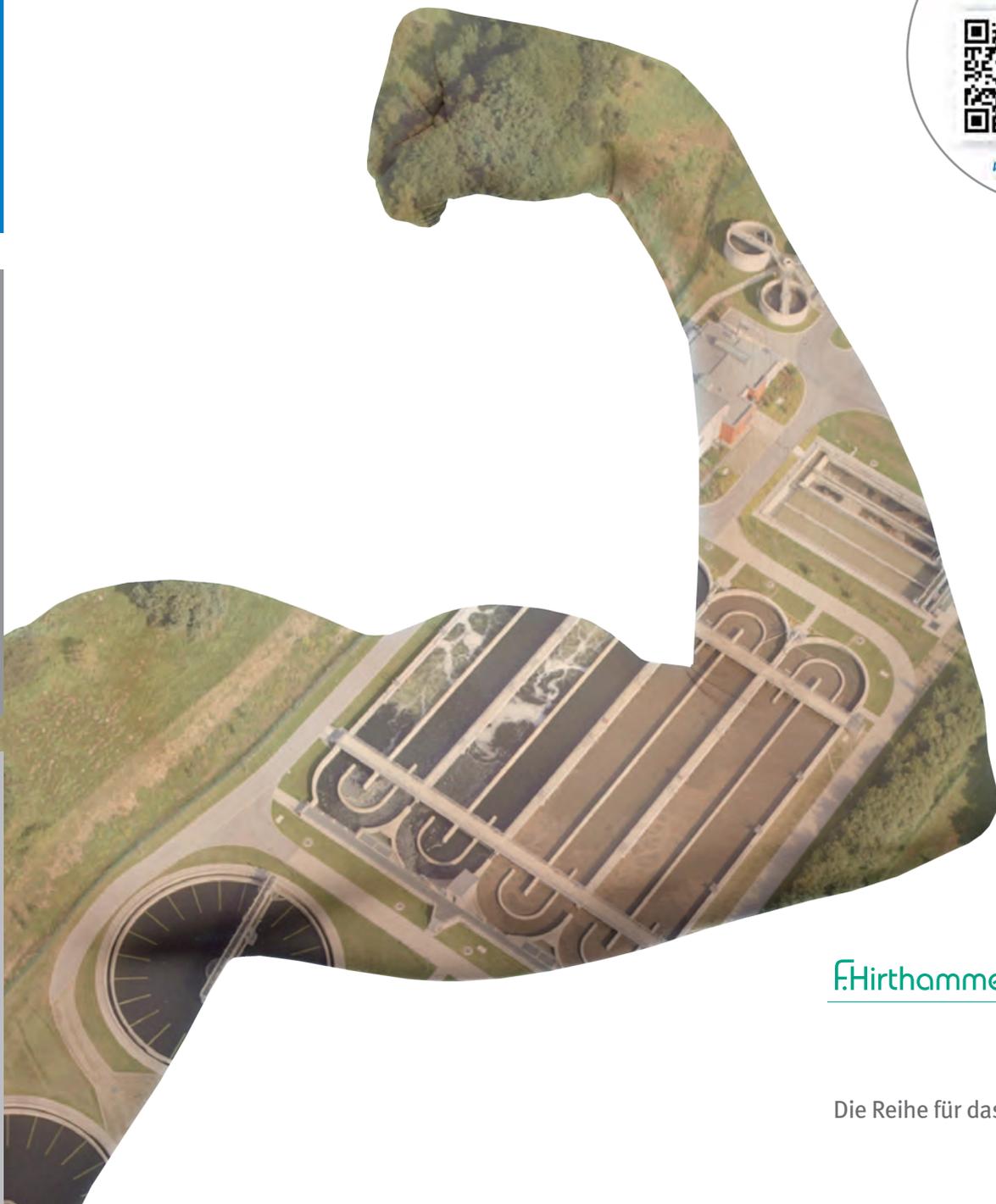


Fit in Wastewater

Technology?



F.Hirthammer 

in der 
DWA

Die Reihe für das Betriebspersonal



Fit in Wastewater Technology?



German Association for Water, Wastewater and Waste
Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.



The German Association for Water, Wastewater and Waste (DWA) is strongly committed to the development of secure and sustainable water and waste management. As a politically and economically independent organisation it is professionally active in the field of water management, wastewater, waste and soil protection.

In Europe DWA is the association with the largest number of members within this field. Therefore it takes on a unique position in connection with professional competence regarding standardisation, professional training and information. The approximately 14,000 members represent specialists and executives from municipalities, universities, engineering offices, authorities and companies.

Imprint

Publisher and marketing:

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Revised edition:

Januar 2016

Translation:

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Layout:

DWA

Print:

Bonner Universitäts-Buchdruckerei, Bonn

ISBN:

978-3-88721-247-6 (Print)

978-3-88721-330-5 (E-Book)

Cover: Fotolia

Printed on 100 % recycled paper

© DWA Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V., Hennef, Germany 2014
German Association for Water, Wastewater and Waste

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Dear Reader,

Or better said, dear actors and practitioners! With this document, you hold in your hands a part of our new and additional learning and teaching tool for environmental technology that consists of a set with textbook and magnetic cards.

This new concept was solely developed for the practical exchange of knowledge, concerning the technical and environmental connection in the sectors of water – wastewater – energy. The special content of this set, is a training system with 60 magnetic cards and an accompanying book. With this combination you are able to simulate nearly any process variation, for example, in wastewater treatment. The book is conceptualized in such a way, that you may use it 'solo' – it will be a useful addition to your technical library.

The special charm of this whole set lies in its wide-ranging possibilities of use: As an instructor in the area of vocational training and in-service training, you can swiftly and easily place and rearrange different plant types and their differences in a visual way on the (magnetic) board. For example, at an open day you may present your own processes to laymen, persons not familiar with the subject and external persons, as well as your new colleagues.

This modular magnetic wastewater training system has passed its baptism of fire during job competition at the IFAT Entsorga 2012

Greetings of the Lord Mayor of the City of Bonn

"I can see only little glamour in an empire that may rule the waves, but is not able to remove its wastewater." (Winston Spencer Churchill)

We all have by now recognized how important a clean environment is. It is all the more urgent to not relax on the achieved success, but to continually and actively stand up for the environment.

In order to be able to offer in the future the apprenticeship to become a sewage engineering technician, we have to teach in a professional and comprehensive manner now. Only in this way can we guarantee qualified trainees. The City of Bonn has committed itself to this goal.

The textbook "Fit in Wastewater Technology" has been drafted by an experienced wastewater professional of the Office of Civil Works of the City of Bonn. It serves especially as an addition and for the

fair. There you could observe how even experts in their subject were challenged and worked up a sweat with the questions asked. The discussions and talks about the possible process variations combined with the swift changes in the magnetic picture makes the training system and its accompanying book so valuable.

I do wish you not only a lot of success with this document and the whole set, but also a lot of fun in its application. At the same time, I would like to sincerely thank the developers and authors for their engagement and upkeep of a high quality level. This set is a good and important addition to the technical environmental teaching and learning tools.

Water is Life – this has to be secured and preserved also in future.



Otto Schaaf
President of DWA



optimal utilization of the modular wastewater training system developed by the same professional. I am sure, that these two teaching tools will contribute in future to the training of qualified trainees. These tools will enable and facilitate the apprentices to obtain the needed knowledge and skills for the practice.



Jürgen Nimptsch



Information for Non-German Users:

With “Fit in Wastewater Technology” you hold in your hand training and self-learning material which had been developed for the requirements of a German wastewater engineering technician.

The occupational profile “wastewater engineering technician” has existed since 1984; it is based on 3 years of dual training (vocational school and practice in a training company) leading to a state-recognised qualification. Wastewater engineering technicians in Germany are eligible to operate wastewater treatment plants and sewer networks up to a size of 10,000 total population and equivalents PT, corresponding to about 1500 m³/d on their own responsibility. This is regulated by the technical guideline DWA M 1000; 2012. In practice, the wastewater engineering technician is responsible for the operation and maintenance of wastewater treatment components or mans larger control rooms of wastewater treatment plants. This machinery and equipment under his responsibility often has a value of several 100,000 EUR. Skilled operation and good maintenance preserve the value of the investment. So the plant manager is particularly keen that his technicians independently and fundamentally accomplish a high standard of work every day, and therefore attaches great importance to the vocational education and further training of his employees.

As the publisher of “Fit in Wastewater Technology”, the DWA is primarily a large German technical scientific association. With its 14,000 DWA members it determines the technical rules for water management. In addition, the DWA is Germany’s biggest provider of training in the field of water and wastewater with more than 30,000 training participants/year and is involved in the vocational training of wastewater engineering technicians and senior wastewater engineering technicians.

“Fit in Wastewater Technology” is intended as training and self-learning material which supplements the “modular wastewater training system”. This training kit consists of magnetic picture cards with wastewater technology components and a set of flashcards with the key associated facts. The Modular wastewater training system in combination with “Fit in Wastewater Technology” is a kick-off for all active learning orientation. The Modular wastewater training system is now available in various languages. For some issues (wastewater chlorination, use of digester gas) there are supplementary cards. See <http://en.dwa.de/modular-wastewater-training-system.html>. Further translations are possible at any time in collaboration with the DWA.

In several tasks, “Fit in Wastewater Technology” refers to the German legal and regulatory framework. In many countries, other rules apply, and in some there are other treatment objectives that require adapted technologies. So you can also understand and solve the tasks of “Fit in Wastewater Technology” in your country, we have summarized everything that differs significantly from international concepts in the following glossary. There you will also find a brief outline of German laws and regulations. You can easily note the relevant laws and regulations in your country next to them.

a) Concept of total population and equivalents

Wastewater treatment plants are designed on the basis of a standardized unit of daily contamination or wastewater load of 1 inhabitant. It could be discharged by

- a) 1 inhabitant (population = P) for daily washing, toilet, bathing and kitchen
- b) 1 population equivalent (PE) for load from an industrial or commercial wastewater discharger.
- Population (P) + Population Equivalent (PE) = Total Population and equivalents (PT)
- PT, P and PE are measured in the unit „inhabitant“ [I]
- The standard contamination load of 1 Population [P] = 60 g BOD₅/d

German values of PT		How is your raw water?
Daily load of 1 Population (P)	Daily load of 1 Population Equivalent (PE)	Fill in your raw water data and compare.
60 g/d BOD ₅	60 g/d BOD ₅	
	120 g/d COD	
	11 g/d N _{tot}	
	1,8 g/d P _{tot}	
150 l/d	200 l/d	

b) Size classes of wastewater treatment plants

See e.g. chapter 1.1.5 – 1.1.8; 1.4.4; 2.2.14; 2.3.2

The German Wastewater Ordinance (AbwV) classifies treatment plants according to their daily load of BOD₅ in their inflow. According to the size class, different discharge values are required.

Remember: The standard contamination load of 1 population [P] = 60 g BOD₅/d and 150 l/d

Size class	Kg/d BOD ₅ in raw water	Equivalent to load of BOD ₅	Estimated equivalent to hydraulic load
1	< 60 Kg	PT < 1,000 l	< 150 – 200 m ³ /d
2	60 to 300 Kg	PT < 5,000 l	< 750 – 1,000 m ³ /d
3	300 to 600 Kg	PT < 10,000 l	< 1,500 – 2,000 m ³ /d
4	600 to 6000 Kg	PT < 100,000 l	< 15,000 – 20,000 m ³ /d
5	> 6000 Kg	PT > 100,000 l	> 15,000 – 20,000 m ³ /d

How are the treatment plants classified in your county?

c) Cleaning requirements

See e.g. chapter 1.3.6; 2.2.14; 3.4

Treatment requirements on wastewater for the discharge point depend in Germany on the size class of the wastewater treatment plant. The German Wastewater Ordinance (AbwV) Appendix 1 gives the following discharge values:

Size class	1	2	3	4	5
COD [mg/l]	150	110	90	90	75
BOD ₅ [mg/l]	40	25	20	20	15
NH ₄ -N [mg/l]	-	-	10	10	10
N _{tot} [mg/l]	-	-	-	18	13
P _{tot} [mg/l]	-	-	-	2	1

Keep in mind: a qualified random sample or 2-hour composite sample is obligatory.

d) Indirect discharge for industrial wastewater

See chapter 1.4.1

In Germany the municipalities are in charge of wastewater discharge and treatment. Most industries and companies discharge their wastewater into the public sewer system after an in-plant pre-treatment. The municipal operator monitors the industrial wastewater quality at the entrance to the sewer network according to the German Wastewater Ordinance (AbwV). In the Appendix there are specific pre-treatment limits for 53 types of industrial contamination. Further detailed knowhow is not needed to work with „Fit in Wastewater Technology“.

e) Water quality classes according to LAWA

See chapter 3.3

In the past the quality of surface water bodies in Germany had been classified by biological features (saprobic system), which build up a typical state of a water body and permit its rating in 4 grades and 3 interstates.

Class I = unloaded to very lightly loaded

Class I-II = lightly loaded

Class II = moderately polluted

Class II-III = critically loaded

Class III = highly contaminated

Class III-IV = extremely contaminated

Class IV = excessively contaminated

Nowadays the classification is ruled by the EU-Water framework directive (2000/60/EG) using a variety of parameters. Overall objective of water management is a good water body status.

f) German laws and regulation

Abbreviation	Abbreviation	Main relevant message	Used in chapter	Fill in the corresponding regulation in your country
Sewage Sludge Ordinance	AbfKlärV	Targets the control of nutrient loads from sewage sludge within the meaning of good practice and restricts the entry of inorganic and organic pollutants to an agronomic and environmental safe level. Prescribes limits and defines regular soil and sludge tests as well as criteria for supervising laboratories.	2.4.7	
Wastewater Levy Act	AbwAG	Regulates the obligation to pay a water tax for the discharge of sewage (waste water, rain water). (§3)The amount of levy is oriented to the harmfulness of the waste water.	2.4.7	
Wastewater Ordinance	AbwV	Regulates the minimum requirements that should be fixed for permits for discharging wastewater into water bodies. 53 different appendixes give specific pre-treatment limits for types of industrial and municipal wastewater. It also specifies the analysis and measurement methods.	2.4.7	
Civil Code § 839	BGB §839	§ 839 deals with the breach of (official) duties by civil servants	3.9	
Fertilizer Ordinance	DüV	Provides for the approval and labelling of fertilizers. Binding requirements for the use of sludge in agriculture	2.4.7	
Basic Law Art. 10	GG Art. 10	Constitutional law of the Federal Republic of Germany. Article 10 deals with telecommunications secrecy and inviolability of the mail	3.9	
Penal Code § 324	StGB § 324	§ 324 deals with water pollution: (1) Whoever contaminates a water body or alter its properties without authorization, is punished with imprisonment for up to five years or a fine. The attempt is punishable. Imprisonment for up to three years or a fine in case of negligence	3.9	
Highway Code	StVO § 324	Only 53 paragraphs!	3.9	
Self-Monitoring Ordinance	SÜwV	Determines the form and frequency of self-monitoring for municipal wastewater treatment plants operation and their discharge. Includes measurements and sample points, documentation in operating logbook and reporting. Self-monitoring is randomly checked by the water authority.	1.4.3; 2.4.7	