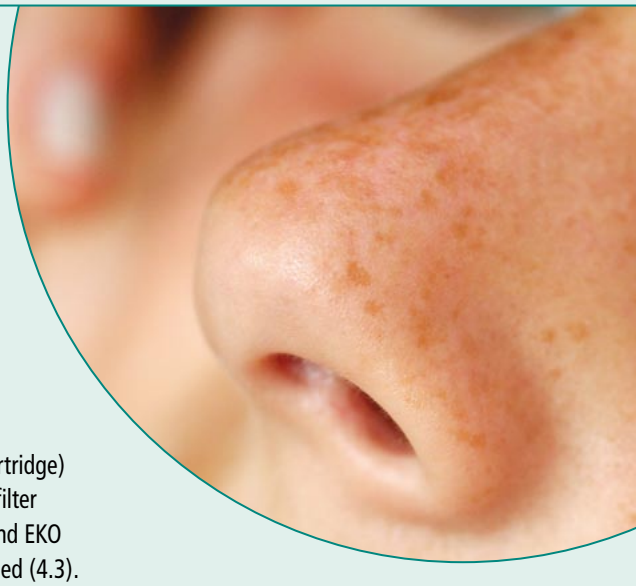
Odour-filter: no smell capacity



IKT product test „odour-filter“

Odour-filter for sewer manholes under test: None of the candidates was able to convince throughout in the system test. That is the central result of the latest IKT product test. The IKT - Institute for Underground Infrastructure examined six odour-filters for sewer manholes for effectiveness in collaboration with partner institutes.

The IKT tested six odour-filters for sewer manholes on behalf of eleven sewage network operators. In four focuses of investigation, the products had to prove their worth: system test, handiness, quality assurance of the supplier and in-situ-investigations. The results still allow space for improvements.

On the test stand: The filters had to prove their effectiveness in numerous measurements – what not all could succeeded in

None of the test candidates got beyond the overall assessment „satisfactory“. Less glossy winner is the COALSI® Geruchssperre BN 00.2001.0K (Hybrid) (smell barrier) with the grade 2.8. Similarly, grade was attained by the Kanalschachtfilter FIS 0600 (sewage shaft filter) of ROMOLD GmbH (grade 3.0). The UGN® Hybrid-Kanalschachtfilter Standard 170032 (sewage shaft filter) attained grade 3.5. The products belflor®-Biofilterpatrone FIP 700 (organic filter cartridge) attained grade (3.6), belflor®-Aktivkohlefilter AKTIVFIP (activated carbon filter) (3.8) and EKO Biofilter Typ KF-400 (organic filter) attained (4.3).

Hindrance to ventilation

If the odour-filter hinders the manhole ventilation, the smell can be diverted to other manholes. Moreover, the IKT test staff fear intensified corrosion through hydrogen sulphide in such cases in concrete buildings. In a large part of the investigated odour-filters, insufficient flow-through possibility was detected. Only belflor®-Aktivkohlefilter AKTIVFIP (grade 2.5) and COALSI® Geruchssperre BN 00.2001.0K (Hybrid) (3.1) show acceptable values in this central test criterion.

Reducing sewage smell

In the second central test criterion, the smell efficiency, the test staff found clear differences. The Kanalschachtfilter FIS 0600 of ROMOLD attains the best result here with a large gap (grade 1.7) evidently at the expense of flow-through capability. The use with the highest air throughput (belflor®-Aktivkohlefilter AKTIVFIP) features the smallest smell efficiency (grade 5.5). The remaining candidates obtain satisfactory and adequate assessments.

Different filter capacity

Also with the chemical determination of material concentrations, the candidates were examined for their cleaning capacity. Five of the six tested filters attained a relatively high efficiency in the retention of hydrogen sulphide (at least „adequate“); the belflor®-Aktivkohlefilter AKTIVFIP attained a below average grade. All four products with organic filter or hybrid filter featured at least an „adequate“ cleaning capacity regarding the gas component - ammonia - both pure activated carbon filters were „poor“. With the retention of Dimethyl disulphide and limonene, especially the organic filters had difficulties. Altogether the filter from ROMOLD (grade 2.2) and the COALSI® Geruchssperre BN 00.2001.0K (Hybrid) (2.5) have the best cleaning capacity in comparison.

Good to handle

The network operators involved in the product test were interested also in its handiness besides the function of the odour-filter. A test installation in three different manholes on the test compound of the IKT in Gelsenkirchen gave information about the fitting accuracy. The weight of the systems that also flowed into the assessment did not at all pose impairment to handiness. In addition, the installation did not appear to be difficult.

In the practice test: A technician installs odour-filters in manholes on the IKT compound

Weakness in fitting accuracy

The test staff found partial considerable lack of leakage tightness between filter housing and manhole wall. The effectiveness of the filter can as such be diminished clearly. The leakage quantities were measured and included in the assessment. In some odour-filters, the dirt trap could no longer be fitted in properly after the installation.

What are effective alternatives?

In addition to the odour-filters, further products were tested in this product test, which is considered in the practice mostly as simple and economical alternatives. Ventilation and corrosion risks seem ruled out in contrast to the odour-filters. Products from manufacturers like Biothys und Clemens & Dupont release active agents that should fight rising smells. Grades were not allocated because readings cannot be interpreted based on unknown material mixtures. The exact manner of action was not comprehensible in the test. Subjective observations in the tests, however, suggest smell-diminishing or changing effect.

Conclusion of the test staff

None of the tested odour-filters was able to convince generally in the criteria of the system test. Only one product showed both in the flow-through capacity as well as in the cleaning capacity at least adequate results. The quality assurance of the product supplier is very good with an exception. Assembly and installation are possible in all models, without great effort. In the fitting accuracy of manhole inserts, there is still need to catch. Products that release the tested active agents can be a remarkable alternative, according to engineers' assessment at least in an individual case.

The latest product test of the IKT reveals clear weaknesses of the odour-filter in central functions. The manufacturers are now demanded to improve the flow-through capability, sealing to the manhole and in some cases also the filter capacity of its products.

Background

Especially in summer months, smell emissions lead from the sewage system leads to odours irritation. Increased complaints from citizens are received as such by the communities. The sewage network operators increasingly use odour-filters in the respective sewer manholes, in such cases. In order to acquire information about their mode of operation and efficiency, the IKT was commissioned with the test of selected products.

Evaluation criteria

The system tests were evaluated in the test stand (weighting 80 percent), the quality assurance of the product's supplier (weighting 10 percent), as well as the handiness (weighting 10 percent). Evaluation criteria of system tests were flow-through capability, smell efficiency, as well as efficiency of material retention.

Test program

The odour-filters were subjected to an extensive test program. On a test stand, leakage quantity measurements were carried out initially at the institute for water economy of the University of the Federal Armed Forces (Bundeswehr) Munich. Then the investigation of air flow-through capability was carried out.

In the end, tests were carried out at the institute for settlement, water quality, and refuse economy (ISWA) of the University of Stuttgart, with respect to cleaning capacity. In addition, a synthetic, smell-intensive exit sewage air was produced on the same test stand. Based on the substrate and smelling material concentrations in raw and pure gas, the substrates and/or smell reduction effect could then be evaluated.

In the investigations of odour-filters for handiness, the weight, the fitting accuracy, and leakage quantity stood on the foreground.

In-situ-investigations of the involved network operators as well as the University of Kassel supplemented the test program. Measurements on sewer manholes by the University of Kassel served especially to review the approach in system tests and the results obtained there for plausibility.

For further findings, most of the tested products in manholes of the involved network operators were used to investigate handiness and operational suitability under practice conditions.

Results available on the Internet

The detailed final report of the IKT product test „odour-filter" is ready on the Internet for download free of charge:
www.ikt.de

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(Result table on the following page)

Systems in the IKT product test – odour-filters 2010

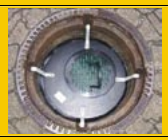
Manufacturer	Filters
COALSI®	COALSI® Geruchssperre BN 00.2001.0K (Hybrid) (smell barrier)
ROMOLD GmbH	ROMOLD Kanalschachtfilter FIS 0600 (sewage shaft filter)
Störk Umwelttechnik GmbH	belflor®-Biofilterpatrone FIP 700 (organic filter cartridge)
	belflor®-Aktivkohlefilter AKTIVFIP (activated carbon filter)
UGN – Umwelttechnik GmbH	UGN® Hybrid-Kanalschachtfilter Standard 170032 (sewage shaft filter)
Warwas	EKO Biofilter Typ KF-400 (organic filter)

Products that release active agents in the supplementary investigation

Manufacturer	Product
Biothys	Gelly mat Gelactiv® SHK-P and/or NHK-P
Clemens & Dupont OHG	C&D Brick

IKT product test „Odour-filter"

Installation situation (system tests): Plastic shaft with class D 400 shaft cover according to DIN EN 124 and shaft frame made of cast iron - form C according to DIN 19584-2

Product supplier	**COALSI®**	**ROMOLD GmbH**	**UGN – Umwelttechnik GmbH**	**Störk Umwelttechnik GmbH**	**Störk Umwelttechnik GmbH**	**Warwas**
Product	**COALSI®Geruchssperre BN 00.2001.0K, Hybrid**	**Kanalschachtfilter FIS 0600**	**UGN® Hybrid-Kanalschachtfilter Standard 170032** (2001-oxi-1.0)	**belflor®-Biofilterpatrone FIP 700**	**belflor®-Aktivkohlefilter AKTIVFIP**	**EKO Biofilter Typ KF-400**
						
Type of filter	**Hybrid filter**	**Active carbon filter**	**Hybrid filter**	**Organic filter**	**Active carbon filter**	**Organic filter**
IKT test mark	**SATISFACTORY (2.8)**	**SATISFACTORY (3.0)**	**SATISFACTORY (3.5)**	**ADEQUATE (3.6)**	**ADEQUATE (3.8)**	**ADEQUATE (4.3)**
System tests on test stand (weighting 80%)	**satisfactory (3.1)**[1]	**satisfactory (3.3)**	**adequate (4.1)**	**adequate (4.0)**	**satisfactory (4.2)**[4]	**inadequate (4.7)**
Efficiency - flow-through capability[3] (40%)	3.6[4]	5.5	5.4	5.1	2.5[5]	5.2
Smell efficiency[6] (40%)	2.9	1.7	2.9	2.9	5.5	4.5
Efficiency - material retention[7] (20%)	2.5	2.2	3.7	4.2	5.1[8]	4.3
Hydrogen sulphide (45%)	1.9	1.8	2.6	3.9	4.7	4.2
Dimethyl-disulphide (30%)	2.6	1.4	5.5	4.7	5.6	4.6
Ammonia (15%)	3.6	5.5	2.5	3.3	5.0	3.5
Limonene (10%)	3.2	1.7	5.7	5.0	5.4	5.3
System suppliers' quality assurance (weighting 10%)	**very good (1.0)**	**very good (1.0)**	**very good (1.0)**	**very good (1.0)**	**very good (1.0)**	**satisfactory (3.5)**
Completeness of the installation and maintenance description[9] (50%)	yes	yes	yes	yes	yes	yes
Measures for guaranteeing constant quality of filter materials[10] (40%)	yes	yes	yes	yes	yes	no
Recommendations on disposal suitability of filter materials[11] (10%)	yes	yes	yes	yes	yes	no
Handling suitability (weighting 10%)	**good (2.4)**	**good (2.2)**	**good (1.7)**	**satisfactory (2.6)**	**satisfactory (3.3)**	**good (2.1)**
Fitting accuracy / installation (80%) – Optical impression[12] (50%)	2.7	3.5	1.8	1.8	1.8	3.5
Fitting accuracy / installation (80%) – Share of leakage amount[13] (50%)	2.7	1.6	1.4	3.4	6.0[14]	1.1
Weight[15] (20%)	1.0	1.0	2.3	2.7	1.0	1.3
Additional information: Impression from in-situ investigations of network operator	seepage leaks during the installation in shaft frames made of cast iron with concrete (BEGU); constructive deviations from filter model from system tests (e.g. hook-in noses)	a fold-bracket of the clamp ring prevents proper insertion of dirt catcher (consequence: clogged gully); difficulties in adapting the clamp ring on existing shaft neck	stiff and/or inflexible arrangement of the hook-in angle leads, where appropriate, problems during insertion into the shaft	Seal slips and/or rotates when fit into the assembly ring	*no in-situ investigations, due to construction features comparable with the belflor® organic filter cartridge FIP 700*	Dirt trap could not be incorporated
Installation time[16]	2 min	3 ½ min	2 ½ min	2 min	2 min	1 min
Service life / durability of filter materials (accord. to supplier)[17]	active coal mat: 2 ½ – 3 years hybrid filter mat: no information	2 Years	no information	4 – 6 Years	no information	3 Years
Tolerance area for shaft entry opening DN 625 (accord. to supplier)[17]	no information	595 mm to 645 mm	no information	610 mm to 630 mm	610 mm to 625 mm	no information
Available for shaft entry opening with diameter (accord. to supplier)[17]	650 mm, 800 mm	-	DN 560, DN 600, DN 800	-	-	625 mm
Recommended improvements	offer standard seal for BEGU shaft frame; standardise construction features (e.g. hook-in noses, seal)	improve flow-through capability; optimize fitting accuracy for dirt trap; handling capability of clamp ring	improve flow-through capability; flexibility of hook-in angle improve	improve flow-through capability; improve material retention; Fix sealing element	Improve cleaning capacity; improve sealing to the shaft wall; fix sealing element	improve flow-through capability; improve cleaning capacity; fitting accuracy improve dirt trap

1 In the test stand for system tests a shaft frame with interior cavity (cast iron frame form C according to DIN 19584-2 was used. The system tests were carried out for this reason by means of an adapter ring that is offered by the manufacturer COALSI® expressly for this type of shaft frame. In shaft frames made of cast iron and concrete (BEGU) adapter ring is forgone according to manufacturer. In this case, no other sealing element finds application, in accordance the manufacturer.

2 The system test for cleaning capacity (smell efficiency, material retention efficiency) resulted on a filter housing with a sealing that was modified by test personnel - in consultation with the manufacturer. The filter housing hence does not correspond with the delivered standard condition.

3 The efficiency of flow-through capability is the percentage share of the filter throughput Q_t from reference volumetric flow Q_0 (shaft without filter). Assessment: Efficiency of flow-through capability 67% = 1.0 to efficiency of flow-through capability 0% = 6.0; grades are computed through a linear function. Average value computation from 10 individual grades in shaft excess pressure Δp = 5, 10, 20, 25, 50 Pa respectively with a dry and with damp air.

4 Average value computation from 2 individual grades at shaft excess-pressure Δp = 2.4 Pa respectively with dry and with damp air, because filter throughput of practice-relevant maximum values was already reached under these pressure conditions.

5 Average value computation from 2 individual grades in shaft excess-pressure Δp = 2.4 Pa respectively with dry and Δp = 4.9 Pa with damp air because filter throughput of the practice relevant maximal values was already reached in these pressure conditions.

6 Smell efficiency: Percentage reduction of smell material concentration (GE/m³) of the gas mixture of hydrogen sulphide, DMDS, ammonia and limonene in air volume flow of 20 m³/h; assessment: Smell efficiency 100% = 1.0 to smell efficiency 0% = 6.0. Grade computation by means of a linear function

7 Efficiency of material retention: Percentage reduction of the substrate concentration of individual gas components (ppm); average value computation of efficiency of material retention out of 4 individual values in air volume flow of 1 m³/h, 5 m³/h, 20 m³/h and 50m³/h. Efficiency of material retention 100 % = 1.0 to efficiency of material retention 0% = 6.0; computation of grades through a linear function

8 Average value computation of efficiency of material retention out of 3 individual values in air volume flow of 5 m³/h, 20 m³/h and 50 m³/h. Material retention in air volume flow of 1 m³/h could not be measured technically.

9 Completeness of installation and maintenance description; Assessment: complete = yes; incomplete = no

10 Measures for guaranteeing constant quality of filter materials can be presented in a comprehensible manner (incl. proof documents): yes; no

11 Recommendations for disposal suitability of the filter materials offer sufficient help to the user: yes; no

12 Assessments of the visual effect with respect to fitting accuracy: (++++++) = 1.0; (+++++ -) = 1.8; (++++ - -) = 2.7; (+++ - - -) = 3.5; (++ - - - -) = 4.3; (+ - - - - -) = 5.2; (- - - - - -) = 6.0

13 Assessment of the share of leakage amount in the total volume flow QL / (QF+QL): 0% = 1.0 to 50% = 6.0; computation of grades through a linear function.

14 Computation of grades based on mathematically determined leakage quantity because no realizable measuring result (additional seal, which is not component of the filter system, had to be mounted to enable testing)

15 Assessment of the weight (effective load): ≤ 5 kg = 1.0; 5 kg = 1.0 to <25 kg = 4.5 (computation of grades through linear function) ≤ 25 kg = 6.0

16 Installation time: Average of three installation processes (installation process 1: Person A, untrained, standard shaft; installation process 2: Person B, untrained, extreme shaft; installation process 3: Person B, practiced, standard shaft)

17 Referred to in the documents of manufacturer (installation and maintenance descriptions, product descriptions on the Internet homepage of the manufacturer, pamphlets and prospectuses of the manufacturer), which were obtained within the scope of product test

* Grade calculation based on unrounded value

Key to test-result grades: Excellent = 1.0 - 1.5; Good = 1.6 - 2.5; Satisfactory = 2.6 - 3.5; Sufficient = 3.6 - 4.5; Deficient = 4.6 - 5.5; Insufficient = 5.6 - 6.0

neutral
independent
non-profit institute

IKT - Institute for Underground Infrastructure

ABOUT IKT

IKT - Institute for Underground Infrastructure is a research, consultancy and testing institute specialized in the field of sewers. It is neutral and independent and operates on a non-profit basis. It is oriented towards practical applications and works on issues surrounding underground pipe construction. Its key focus is centred on sewage systems. IKT provides scientifically backed analysis and advice.

IKT has been established in 1994 as a spin-off from Bochum University, Germany.

The initial funding for setting up the institute has been provided by the Ministry for the Environment of the State of North-Rhine Westphalia, Germany's largest federal state.

However, IKT is not owned by the Government. Its owners are two associations which are again non-profit organizations of their own:

a) IKT-Association of Network Operators:
Members are more than 120 cities, among them Berlin, Hamburg, Cologne and London (Thames Water). They hold together 66.6% of IKT.

b) IKT-Association of Industry and Service:
Members are more than 60 companies. They hold together 33.3% of IKT.

You can find information on projects and services at:
www.ikt.de

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