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.

Odour-filter: no smell capacity

IKT product test „odour-filter“

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 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.
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-dimensional 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

Author
Dipl.-Ing. Thomas Brüggemann,
IKT - Institute for Underground Infrastructure

(Result table on the following page)
**IKT product test „Odour-filter“**

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

---

<table>
<thead>
<tr>
<th>Product supplier</th>
<th>CDN</th>
<th>RONOLD GmbH</th>
<th>DGN – Umwelttechnik GmbH</th>
<th>Störk Umwelttechnik GmbH</th>
<th>Störk Umwelttechnik GmbH</th>
<th>Warwas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of filter</strong></td>
<td>Hybrid Filter</td>
<td>Active carbon filter</td>
<td>Hybrid Filter</td>
<td>Organic filter</td>
<td>Active carbon filter</td>
<td>Organic filter</td>
</tr>
<tr>
<td><strong>IKT test mark</strong></td>
<td>SATISFACTORY (2.8)</td>
<td>SATISFACTORY (3.0)</td>
<td>SATISFACTORY (3.9)</td>
<td>ADEQUATE (3.6)</td>
<td>ADEQUATE (3.8)</td>
<td>ADEQUATE (4.3)</td>
</tr>
<tr>
<td><strong>System tests on test stand (weighting 80%)</strong></td>
<td>satisfactory (3.1)</td>
<td>satisfactory (3.3)</td>
<td>adequate (4.1)</td>
<td>adequate (4.0)</td>
<td>satisfactory (4.2)</td>
<td>inadequate (4.7)</td>
</tr>
<tr>
<td><strong>Efficiency – flow-through capability</strong></td>
<td>3.6</td>
<td>3.5</td>
<td>2.7</td>
<td>3.4</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Smell efficiency</strong></td>
<td>3.9</td>
<td>2.8</td>
<td>2.6</td>
<td>2.5</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Efficiency – material retention</strong></td>
<td>2.9</td>
<td>2.7</td>
<td>2.4</td>
<td>2.3</td>
<td>2.0</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Hydrogen sulphide (49%)</strong></td>
<td>2.1</td>
<td>2.0</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Dimethyl-disulphide (30%)</strong></td>
<td>2.6</td>
<td>1.6</td>
<td>1.5</td>
<td>1.4</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Limonene (10%)</strong></td>
<td>2.2</td>
<td>1.7</td>
<td>1.5</td>
<td>1.3</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>System suppliers’ quality assurance (weighting 10%)</strong></td>
<td>very good (1.0)</td>
<td>very good (1.0)</td>
<td>very good (1.0)</td>
<td>very good (1.0)</td>
<td>very good (1.0)</td>
<td>satisfactory (3.5)</td>
</tr>
<tr>
<td><strong>Completeness of the installation and maintenance description</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td><strong>Measures for guaranteeing constant quality of filter materials</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>Recommendations on disposal suitability of filter materials</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>Handling suitability (weighting 10%)</strong></td>
<td>good (2.4)</td>
<td>good (2.2)</td>
<td>good (2.1)</td>
<td>satisfactory (2.6)</td>
<td>satisfactory (3.3)</td>
<td>good (2.1)</td>
</tr>
<tr>
<td><strong>Fitting accuracy / installation (90%)</strong></td>
<td>2.7</td>
<td>2.5</td>
<td>2.7</td>
<td>2.5</td>
<td>2.7</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>2.7</td>
<td>2.5</td>
<td>2.7</td>
<td>2.5</td>
<td>2.7</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Additional information</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impression from in-situ investigations of network operator</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Service life / durability of filter materials (accord. to supplier)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tolerance area for shaft entry opening DN 625 (accord. to supplier)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Available for shaft entry opening with diameter of:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recommended improvements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1. In the test stand for systems a shaft frame with interior outlet has been used for tests, according to DIN 19584-2 was used. The systems were carried out by means of an clamp ring that is offered by the manufacturer CODAS® expressly for this type of shaft frame.

2. In shaft frames made of cast iron and concrete BEGU adapter rings, before according to manufacturer; in this case, no other clamping element fits applications in accordance the manufacturer.

3. The system tests for cleaning capacity (small efficiency, material retention efficiency) was carried out a filter housing with a shaft cover, modified by test personnel – in consultation with the manufacturer. The filter housing base does not correspond with the delivered standard condition.

4. 50% efficiency of flow-through capability is the percentage share of the filter throughput Q from reference volumetric flow Q (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 p = 5, 10, 20, 25, 50 Pa respectively with a dry and with a damp air.

5. Small efficiency: Percentage relation of small material concentration (mL/m³) of gas mixture of hydrogen sulphide (H₂S), dimethyl-disulfide (DMS), ammonia and limonene is in a volume flow of 20 m³/h: assessment: Small efficiency 100% = 1.0 to small efficiency 0% = 6.0; grades are computed through a linear function.

6. Efficiency of material retention: Percentage reduction of individual gas component (g) per average value computation of efficiency of material retention out of individual values of air volume flow of 1 m³/h, 5 m³/h and 250 m³/h. Efficiency of material retention 100% = 1.0 to efficiency of material retention 0% = 6.0; grades are computed through a linear function.

7. Efficiency of material retention: Efficiency of material retention 100% = 1.0 to efficiency of material retention 0% = 6.0; grades are computed through a linear function.

8. Average value computation of efficiency of material retention out of individual values in air volume flow of 1 m³/h, 5 m³/h and 250 m³/h. Efficiency of material retention in air volume flow of 1 m³/h could not be measured accurately.


10. Measures for guaranteeing constant quality of filter materials are summarised in a comprehensive manner (incl. proof documentation): yes, no.


12. Assessment of the visual effect with respect to fitting accuracy: Excellent = 1.0 to Excellent = 1.5; Good = 1.6 to Good = 2.0; Satisfactory = 2.1 to Satisfactory = 2.9; Sufficient = 3.0 to Sufficient = 3.5; Sufficient = 4.6 to Sufficient = 5.5; Insufficient = 6.0 to Insufficient = 6.0. Average value computation from 2 individual grades at shaft excess-pressure p = 2.4 Pa respectively with dry and with a damp air.

13. Assessment of the shaft excess-pressure (Δp): Excellent = 1.0 to Excellent = 1.5; Good = 1.6 to Good = 2.0; Satisfactory = 2.1 to Satisfactory = 2.9; Sufficient = 3.0 to Sufficient = 3.5; Sufficient = 4.6 to Sufficient = 5.5; Insufficient = 6.0 to Insufficient = 6.0. Average value computation from 10 individual grades in shaft excess-pressure p = 5, 10, 20, 25, 50 Pa respectively with dry and with a damp air.

14. Assessment of dirt trap: Excellent = 1.0 to Excellent = 1.5; Good = 1.6 to Good = 2.0; Satisfactory = 2.1 to Satisfactory = 2.9; Sufficient = 3.0 to Sufficient = 3.5; Sufficient = 4.6 to Sufficient = 5.5; Insufficient = 6.0 to Insufficient = 6.0. Average value computation from 10 individual grades in shaft excess-pressure p = 5, 10, 20, 25, 50 Pa respectively with dry and with a damp air.

15. Assessment of the fitting accuracy / installation: Excellent = 1.0 to Excellent = 1.5; Good = 1.6 to Good = 2.0; Satisfactory = 2.1 to Satisfactory = 2.9; Sufficient = 3.0 to Sufficient = 3.5; Sufficient = 4.6 to Sufficient = 5.5; Insufficient = 6.0 to Insufficient = 6.0. Average value computation from 2 individual grades in shaft excess-pressure p = 2.4 Pa respectively with dry and with a damp air.


17. Category: General improvement for shaft entry opening with diameter of 595 mm to 645 mm, also applicable for shaft entry opening with diameter of 655 mm to 705 mm.

18. Improvement of shaft entry opening: Average value computation from 2 individual grades at shaft excess-pressure p = 1.0 Pa respectively with dry and with a damp air.

19. Improvement of flow-through capability: Average value computation from 5 individual grades at shaft excess-pressure p = 1.0 Pa respectively with dry and with a damp air.

20. Improvement of material retention: Average value computation of efficiency of material retention out of 10 individual values of air throughput Q of 1 m³/h, 5 m³/h and 250 m³/h.

21. Improvement of flow-through capability: Average value computation from 2 individual grades at shaft excess-pressure (Δp): Excellent = 1.0 to Excellent = 1.5; Good = 1.6 to Good = 2.0; Satisfactory = 2.1 to Satisfactory = 2.9; Sufficient = 3.0 to Sufficient = 3.5; Sufficient = 4.6 to Sufficient = 5.5; Insufficient = 6.0 to Insufficient = 6.0. Average value computation from 10 individual grades in shaft excess-pressure p = 5, 10, 20, 25, 50 Pa respectively with dry and with a damp air.

22. Improvement of material retention: Average value computation of efficiency of material retention out of 10 individual values of air throughput Q of 1 m³/h, 5 m³/h and 250 m³/h.
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](http://www.ikt.de)