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Akdolit[®] Hydro-Anthrasit N Filtration

1. General overview

Akdolit[®] Hydro-Anthrasit N is a filter material made out of broken and sifted natural anthrasit coal. The abrasive-resistant grains are characterized by their sharp-edged structure and a splinter form.

Akdolit[®] Hydro-Anthrasit N meets the requirements of the standards DIN EN 12909, DIN 2000, DIN 19643 as well as of the DVGW worksheets W 213.

Once incorporation is complete, the material behaves mostly inert and no matter is released to the water which may lead to exceeding limit values of regulation on drinking water.

Akdolit[®] Hydro-Anthrasit N guarantees safe operation requiring only little maintenance due to its stable structure. Akdolit[®] Hydro-Anthrasit N is mainly used as upper layer in double-layer filter systems on the engineering basis of the multi-layer filtration. In order to solve special purification problems it can also be used in single-layer filters.

2. Applications

Akdolit[®] Hydro-Anthrasit N is used as filter material in open and closed fixed bed filters according to standard DIN 19605:

- Filtration of turbid well, spring and surface water
- Filtration of contaminated raw water by chemical and/or biological and/or catalytic deferrization and demanganization.
- Filtration of raw water treated with flocculants or flocculation agents.
- Filtration of decarbonized water after a decarbonization reactor.
- Filtration of cooling and industrial process water.
- Filtration treatment for swimming pools water according to DIN 19643.
- Coating of chemically reacting filter materials to protect active surfaces against pollution.
- Filtration of mechanically and/or biologically pre-treated waste water.

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3. Setting of tasks

3.1 Improvement of filtration yield

Akdolit[®] Hydro-Anthrasit N in multi-layer filters improves the filtration yield by:

- Increasing the particle adsorption capacity of the filter bed.
- Improving and stabilizing the filtrate quality in combination with fine grain materials as lower layer.
- Increasing the protection against filter breakthroughs.

3.2 Increase in cost-efficiency

The use of Akdolit[®] Hydro-Anthrasit N in multi-layer systems increases the cost-efficiency by:

- Prolongation of filter run-time.
- Reduction of backwash water consumption.

4. Chemical and physical data

4.1 Chemical composition

• Carbon.....	approx. 90%
• Ash, water free.....	approx. 2 - 4%
• Volatile components.....	approx. 6%
• Water.....	approx. 1%

Values represent the average of regular analyses carried out over several years.

4.2 Grain size

• Grain size 1.....	0.6 – 1.6 mm
• Grain size 2.....	1.4 – 2.5 mm
• Grain size 3.....	2.0 – 4.0 mm
• Grain size 4.....	3.5 – 7.0 mm

4.3 Bulk density, density and porosity

• Bulk density size 1.....	approx. 700 kg/m ³
• Bulk density size 2.....	approx. 700 kg/m ³
• Apparent density.....	approx. 1.4 g/cm ³
• Grain porosity.....	< 5%

4.4 Consumption

Depending on the backwash frequency and filter run-time: approx. 2% p.a.



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5. Technical data

5.1 Material layer for multi-layer filters

Grain combination 1	Grain size in mm	Layer height in mm
Hydro-Anthrasit	0.6 – 1.6	600 – 800
Filter sand	0.4 – 0.8	≥ 600

Grain combination 2	Grain size in mm	Layer height in mm
Hydro-Anthrasit	1.4 – 2.5	600 – 1,200
Filter sand	0.71 – 1.25	≥ 600

5.2 Filtration rate

According to task set and hydraulic conditions:

- Open filters.....up to 15 m/h
- Closed filters.....up to 30 m/h

Higher filtration rates are possible in special cases.

5.3 Head loss and filter bed expansion

The head loss depends on:

- Grain diameter
Head loss increases exponentially with the decrease of grain diameter.
- Height of layer
Head loss increases linearly at higher layers of material.
- Filtration rate
Head loss increases at higher filtration rates.
- Temperature
Head loss increases at lower water temperatures.

Diagram 1: Head loss

Diagram 1 shows the head loss [mmWS] as a function of the filtration rate [m/h], relating to a filling height of 1,000 mm in cleanly washed filters. Values have been collected for materials with an average grain distribution at a water temperature of 10°C.



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5.4 Backwash

Depending on the filter load the backwash has to be done according to the DVGW worksheets W 213-3.

Due to the low density of the filter material we do not recommend combined air/water backwash in multi-layer or single layer filter systems.

The actual cleaning effect is achieved by water backwash. The backwash velocity should be selected so that at least the fluidization velocity is reached. Backwash velocities below this fluidization velocity are not suitable to reliably remove impurities.

Diagram 2: Bed expansion

Diagram 2 shows the bed expansion of Akdolit[®] Hydro-Anthrasit N as a function of the backwash water velocity [m/h].

Diagram 2 is based on a water temperature of 10°C. For temperatures in the range of 0 °C to 50 °C, backwash water velocities read in the diagram have to be multiplied with a temperature factor given in table 1.

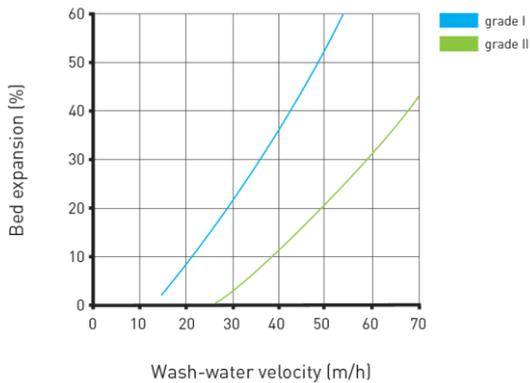


Table 1:

Water temperature [°C]	Factor
0	0.90
5	0.95
10	1.00
15	1.05
20	1.09
25	1.14
30	1.18
35	1.22
40	1.26
45	1.30
50	1.34

Backwash (Recommendation)

1. Lowering the water level just above the filter layer
 2. Air scouring..... approx. 60 m/h
Duration..... approx. 3 – 5 min
 3. Dwell time for degassing of purge air
Duration 2 – 5 min
 4. Water backwash [10°C]
At grain combination 1..... approx. 35 m/h
At grain combination 2..... approx. 55 m/h
Duration..... approx. 3 – 5 min
until the water is clear
 5. Filtration
- Discharge of the first filtrate.





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6. Filling and starting-up

6.1 Initial filling

6.1.1 Preparation

Before introducing materials, the nozzle floor and the backwash conditions have to be checked carefully. In order to do this, the filter should be filled with water about 15 - 20 cm above the nozzle floor and the air blower is put into operation. Rinsing air must flow evenly across the whole area.

6.1.2 Supporting layers

The layer heights and grain sizes of the support layer material specified by the supplier of the filter system must be observed. If several different grain sizes are used, each individual layer must be levelled after it has been filled in. Since bacteriological contamination cannot be excluded during handling, the support layers and the complete filter system should be disinfected. (see DVGW work sheet W 291).

6.1.3 Freeboard height

To avoid backwash losses, a freeboard of 25% of the filter layer height (without supporting layers) plus a 200 - 300 mm safety margin is required.

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6.1.4 Filling and starting-up

After the support layers have been placed, levelled and disinfected, the filter is filled with water from below up to 2/3 of the filter volume. Afterwards, the fine-grained filter material of the lower layer is either flushed in or applied manually. This layer should then be backwashed to remove undersized particles.

If necessary, undersized particles must be removed by hand from the surface of the lower-layer material and the filter must then be disinfected again.

Finally, Akdolit® Hydro-Anthrasit N is flushed in or applied manually in accordance with the usual hygiene rules.

6.1.5 Wetting

Akdolit® Hydro-Anthrasit N is a filter material with low porosity. However, we recommend observing a wetting time after the material has been introduced into the filter. The wetting time should be approx. 12h before the first backwashing.

6.2 Starting-up

Once the wetting is completed, the filter system should be backwashed several times. It should be put into regular operation immediately afterwards.





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7. Operating Instructions

7.1 Loading the filter

Satisfying filtration results should be achieved if the hydraulic load is maintained and if the filter are properly backwashed at regular intervals.

Hydraulic underloads up to a minimum of approx. 3 m/h have no negative effects on the filtration result. Abrupt or constant changes of the hydraulic load can have a lasting negative effect on the filtration result.

7.2 Refilling

Akdolit® Hydro-Anthrasit N is an inert filter material that is not subject to consumption. Due to abrasion and discharge during backwashing, material losses up to 2% per year can occur, which must be compensated by occasional refilling in accordance with the instructions in Section 6.1. The filter must be backwashed after each refill.

7.3 Shutdown

Before shutting down, the filter needs to be backwashed intensively. The filter can be kept filled with water for short-time standstills (3 - 4 weeks). Before longer periods of standstill, water needs to be drained via the bottom drain after washing with open sludge water drain.

After the water has been drained, the filter material will require drying for 15 minutes with rinsing air. In order to prevent condensation, the upper manhole should remain open until restart.

7.4 Restart

The filter is backwashed intensively several times before it is put back into operation. During water backwash, the bulk density of the filter material should be checked with open manhole.



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8. Storage

Akdolit[®] Hydro-Anthrasit N can be stored indefinitely in a clean and dry place. To limit the risk of material contamination, it is important to prevent damages to the packaging and bags. Refills should only be made from original packaging. If stored properly, the material has an unlimited shelf life. Possible aging effects of the outer packaging must be taken into account.

9. Delivery

Ex works

- In poly-bags of 50 l each
- Loose in silo vehicles
(Minimum transport load per silo truck is 30 m³)
- In big bags (filling quantities by arrangement)

10. Disposal

The disposal of filter materials should be undertaken by specialized companies. In this context, a chemical analysis of the filter material is required, for which the analysis results must be approved by the waste disposal company. Depending on the local regulation, the waste code number of the filter material should also be indicated.

11. Individual advice

Due to the specific nature of each individual case, advice and recommendations can only be given on a case by case basis. To determine the treatment efficiency and the adaptation to the customer-specific requirements, Lhoist always recommends carrying out pilot tests before commissioning in order to be able to make a firm statement.

The information, indications and advices contained in this datasheet are therefore legally non-binding. Individual proposals will be made on request.

All the data given are guide values or average values with production and storage-dependent tolerances. They serve as a product description and should not be considered as warranted characteristics. It is the user's responsibility to check the suitability of the product for its intended use.

Experts of the Purest Water



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