



EVERZIT[®] / EN 12909

Analysis, Characteristics and Standard sizes

- Technical Data Sheet TI 033 -

1. General information

EVERZIT[®] N is an anthracite mined from a depth of about 1,500 m. The resources in the northernmost German coal deposit are sufficient to provide an anthracite of constant excellent quality for many future decades. Especially favourable geological processes formed an anthracite with a particularly special structure. As a purely natural product in its original form, it is used for the filtration of water and for this reason is called **Everzit[®] N**.

2. Fields of application

EVERZIT[®] N in rapid gravity and pressure filters serves to filter water containing suspended solids and turbidity in the fields of drinking-water, process water and wastewater treatment. It is also used in the water purification process for swimming pools.

EVERZIT[®] N promotes

- An improvement in the filtration efficiency
- A decrease in the uncertainty of filter breakthroughs
- A saving of washwater
- An increase in the filtration velocity
- A lengthening of the filter run

3. Advantages

The natural product already possesses the properties which are necessary for an ideal filter medium:

- High resistance to abrasion
- High bulk density
- High backwash velocity without washout loss
- Good flushout also of dirt particles with a higher specific weight

- Optimal separation of the filter layers after back-washing
- Low tendency to clump due to the smooth surface
- No adhesion of precipitated iron, calcium or manganese compounds
- No release of silicic acid or heavy metals into the water
- Fully functional between pH 3 to pH 12
- Higher retention capacity for solids
- Lower pressure loss
- Lower initial filter resistance
- Longer filter-runs
- Higher filtration velocity
- Better filtrate quality
- Lower backwash frequency
- Less space requirement
- Which together have the attractive economic aspect of lower running costs

4. Physical and chemical data

Carbon	approx. 92,0	%
Moisture	approx. 1,0	%
Ash	approx. 3,5	%
Volatile matters	approx. 5,5	%
Acid-solubility (19% hydrochloric acid)	max. 0,18 % according to AWWA B100-01	
Bulk density*	730	kg/m ³
Density	1,40 – 1,45	g/ccm
Grain porosity	< 10	%
Hardness	4	Mohs
Hardgrove	32 – 34	dH°
Attrition loss**	0,06	%

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- * This figure is an annual average value
- ** Attrition loss is the portion of particles < 0,5 mm grain size of initially 200 ml filter material, which was moved upside down with 30 Upm in a 300 ml flask for 5 hours

Partical values for the backwash rate

Type	Grain size range	Backwash rate
I	0.8 – 1.6 mm	35 – 40 m/h
II	1.4 – 2.5 mm	55 – 60 m/h
III	2.0 – 4.0 mm	85 – 95 m/h
IV	3.5 – 7.0 mm	130 – 140 m/h

5. Standard grain sizes

Type	Grain size range mm	Effective size d_{10} mm	Uniformity coefficient $U=d_{60}/d_{10}$
S	0,001 – 0,1	-	-
0	0,1 – 1,0	-	-
I	0.8 – 1.6	0.9 – 1.0	≤ 1.4
II	1.4 – 2.5	1.5 – 1.6	≤ 1.4
III	2.0 – 4.0	2.6 – 2.7	≤ 1.4
IV	3.5 – 7.0	< 4.0	≤ 1.5

6. Grain size combinations for the multi-layer filter

for dual – media filters are recommended on the grounds of investigations by several research institutes and experience gained form existing units:

Filter material	Grain grade combinations		
	I	II	III
Everzit® N	0.8 – 1.6 mm	1.4 – 2.5 mm	2.0 – 4.0 mm
Filter sand	0.63 – 1.0 mm	0.71 – 1.25 mm	1.0 – 2.0 mm
Supprot. layers*	1.0 - 2.0 mm	2.0 - 3.15 mm	3.15 - 5.6 mm
Consist. of filter	2.0 - 3.15 mm	3.15 - 5.6 mm	5.6 - 8.0 mm
Sand/gravel	3.15 - 5.6 mm	5.6 - 8.0 mm	8.0 - 12.0 mm

7. Single layer filter

Height of layer in case of	
open plants	at least 500 mm
closed plants	at least 300 mm

8. Filter speed

open plants	3 – 15	m/h
closed plants	10 – 30	m/h

9. Backwash techniques of single layer filters

9.1 Washing with air and water

- Backwashing with air

Air speed	60 – 90	m/h
Duration	about 1 – 3	min

Following treatment, a period of about 2 minutes should elapse to allow the air to dissipate from the filter bed before washing water is started. During clear washing, the water content of the filter should be replaced at least once (wash water speed and duration of washing see table “practical values”). A long period of washing is of less importance for the cleaning effect. Better results are obtained by repeating the whole wash programme: lowering – air washing – retention time – water washing as described above.

- Backwashing with air and water (combined)

Air speed	60 – 90	m/h
Duration	about 1 – 3	min

Following 1 – 2 minutes of washing with air only, treatment is continued with air and water in combination.

Water speed	7 – 20	m/h
Duration	about 3 – 5	min

Following this procedure a clear washing with water only is performed (speed of washing see table “parctical values”) and if necessary (in case of multi-layer filters) a separated washing.



9.2 Special points for the washing of multi layer filters

In case of multi layer filters which have a freeboard height which is only adjusted to the bed expansion it is **not allowed** to wash with air and water simultaneously!

When the height of freeboard is 2 m or more (submerging filter), a combined washing with air and water can be performed. In such cases washing has to be performed according to manufacturer's specifications because the optimisation of the washing rate and duration is limited by the submerging volume.

In case of filters used for removing flocs, it can be of advantage to perform a washing with water only before air washing takes place. During washing with water only a great part of the flocs from the upper filter layer are removed. Herewith a distribution of the dirt particles in the filter bed during air washing is avoided.

In the case the filter materials are mixed to a great extent, for example caused by a combined washing with air and water at the end of the washing a re-arrangement of the filter layers by an increase of approx. 15 % wash water speed is reached
(⇒ separated washing).

The height of the freeboard should be achieved according to the washing technique as well as according to filter bed expansion (in accordance with DVGW worksheet W 211 Pos. 3.2.2.1) with a safety extend of at least 300 mm.

Especially in case of biologically assisted filtration processes, a period of preparation or seeding of the filter with prepared material may be necessary. Following such preparations, it may be useful to control the washing conditions (speed of washing, duration of washing etc.) and if necessary to optimise them. In the case of wastewater filtration, the required bed expansion will often be achieved with lower washing speeds than expected with fresh material.

An automated process of the washing programme is desirable. The possibility to make corrections for optimal running at low efforts should be possible.

10. Delivery

The delivery of Everzit[®] N is done in

- 50 l plastic bags
- 1.2 t big bags (about 1.65 m³)
- as bulk in silo lorries

Subsize filter material which may arise during transport into the filter can be removed by backwashing alone or scraped off after backwashing.