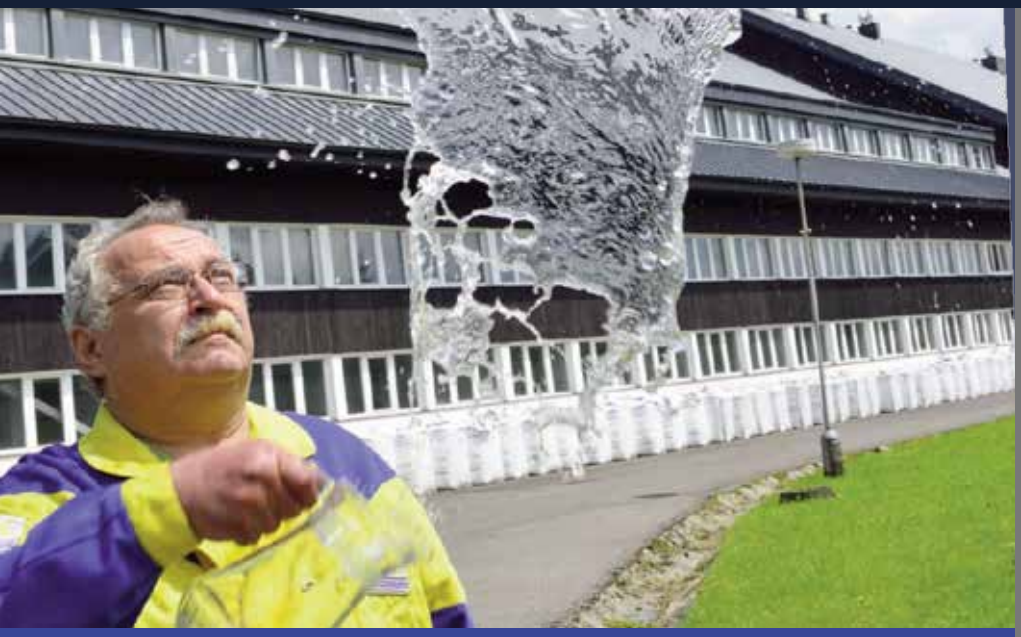
CASE STUDY
FILTRALITE PURE
DRINKING WATER TREATMENT

FILTRALITE®
FILTERING THE WATER FOR TOMORROW



A farewell to sand filters

" Celebrating: We have clearly seen the many advantages of Filtralite® compared to sand as filter medium, and we will go Filtralite® 100 %. "

Ladislav Rainis
Regional Manager of The North Bohemian Water Company

A NEW FILTERING MEDIUM IS BORN

By replacing the sand in the filters with Filtralite® Pure Mono-Multi, Bedrichov Drinking Water Treatment Plant reduced its energy cost by 75 %, doubled the production capacity of each filter and today delivers the best drinking water ever.

"WE HAVE CLEARLY seen the advantages of Filtralite, and we now replace the sand in the remaining basins with Filtralite," says regional manager Ladislav Rainis of The North Bohemian Water Company (ScVK), operating the Bedrichov water treatment plant.
The decision has been made after one year of scientific pilot testing at small scale at the work. The pilot results on site confirmed what other water works have reported: Energy saved, increased output and improved water quality.
"We then decided to replace the sand in the filters with Filtralite. After six months of comparative operation we have clearly seen what Filtralite is capable of, there is no way we will go back to sand," says regional director Ladislav Rainis.

Time is running out
The use of sand for water filtering is most likely the oldest method in history for treating water for consumption. Sand is still today widely used in water purification plants throughout the world, mainly because of its availability. Few alternatives to sand have nevertheless been presented.

Now time seems to be running out for sand as a filtering medium in modern processes. The main disadvantage of sand is the large amount of energy required for daily backwashing, taking an increasing toll on operating costs. Sand also has problems keeping up with modern efficiency and does not efficiently filter out microscopic particles, like small cyanobacteria, which today represent a threat to public water quality and has been related to public health issues.

Limitatons in sand
"When you filter by sand it is the network of sand grains that traps and holds back the particles. The water passes through the space formed between the grains. Since the sand grains are uniform in size, these "openings" are identical throughout the filter. However, the particles you want to filter out differ greatly in size, leading to frequent clogging of sand filters, and a need for very frequent backwashing," explains Petr Dolejs, professor at Brno University of Technology, who has been responsible for the pilot tests leading to the new filtering material at Bedrichov.
The flushing requires a lot of energy in using water and compressed air to reverse the water flow, thereby lifting and shaking the sand

in the filter beds by "frothing" the waste to the surface, preparing the filter bed for a subsequent filtering period.

Filtralite: An open medium

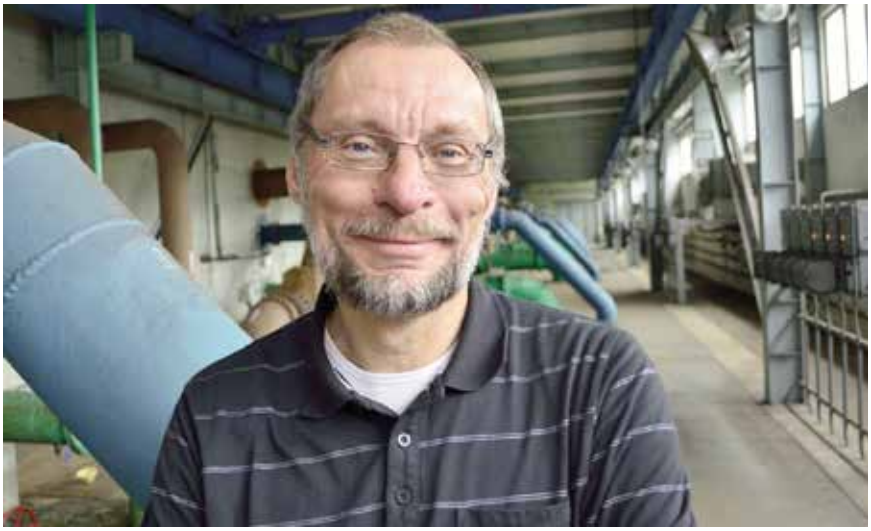
Filtralite is a modern product, made from expanded clay, developed especially for water filtering purposes. Filtralite works by a slightly different principle than sand, and the two kinds of Filtralite used at Bedrichov has the sizes of 0,8-1,6 mm(HC) and 1,5 - 2,5 mm(NC) respectively.

Filtralite can be characterized as small hard pieces of open sponge, full of internal pores of different sizes. As the water passes through the filtering bed, the particles we want to take out are trapped in the pouches on the Filtralite. The water is also free to pass right through the particle body itself, making clogging almost impossible. Thanks to its porous structure Filtralite is therefore a more open filtering medium, with extra large room for storing particles.

"The result in practice is more than four times longer filtering intervals, so 75 % less energy is needed in flushing – and in general a doubling in the speed of water, giving the plant a net doubling of its output," explains professor Dolejs.

Because the pores of Filtralite are smaller than the spaces between sand grains Filtralite also traps the much concerned cyanobacteria, and also reduces the total amount of small particles escaping the filters - by a factor of ten or more.

The wash water flow needed for each backwashing is also reduced, due to the lower specific weight of Filtralite.



MASTERMIND: Professor Petr Dolejs has played a key part in developing the Bedrichov Water Treatment Plant

"The good news is therefore that most water works of this type can reduce energy costs by a factor of four and in fact double its capacity, only through changing the filter medium. I say that is amazing," says the professor.

Good water standard

Bedrichov Water supplies approximately 100 000 inhabitants of Liberec in the north of the Czech Republic with municipal water of EU-standard. The Bedrichov water work is a typical representative of Czech water plants.

The plant was built in the late seventies and has since undergone several technological modernizations, the latest being an exchange of filter media to Filtralite.

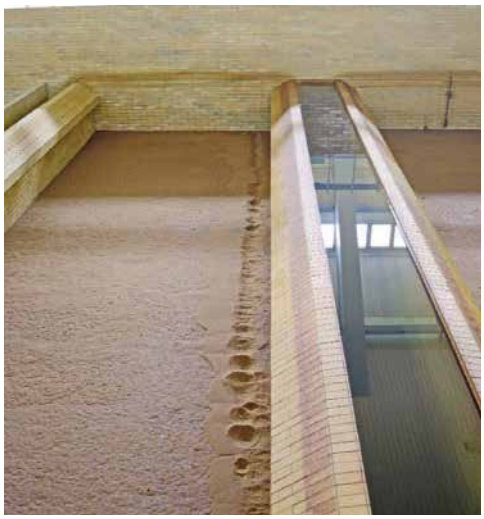
The plant uses raw water from the Josefuv Dul reservoir, processing it by flocculation, filtering, UV-disinfection, lime and carbon dioxide hardening, and a mild chlorination. Ozonation was originally built, but based mainly on the knowledge on assimilable organic carbon (AOC) it is no more in use.

Typical water plant

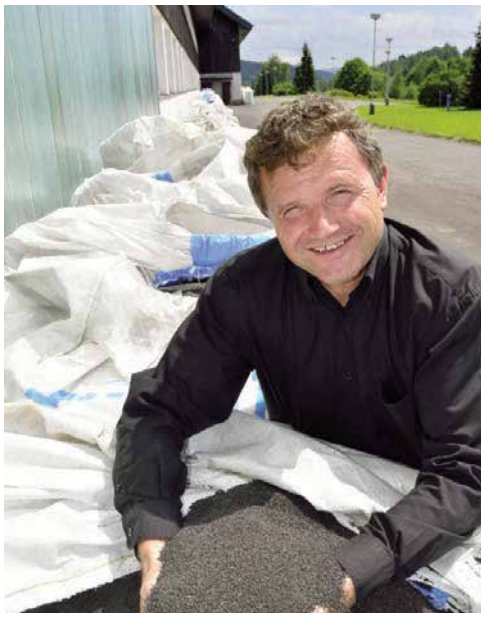
Professor Dolejs has for more than twenty years been cooperating with the Bedrichov Water Work, which has served as a field location for his work within water treatment research, often involving student projects at the University og Brno.

"I have been fortunate with the management of Bedrichov Water, which always has

MONO-MULTI: Filtalite at work, note its porous nature and distinct layers



LAID OFF: The last two sand filtering beds soon to be replaced



ARRIVAL: Technical director Milan Drda embracing the new filtering material

been interested in trying on new ideas. After many years of cooperation I have been familiar with the processes and a lot of my recent work has been done here on site. This because my main field of study has been the removal of organic components with flocculants and subsequent filtering," explains the professor.
On the other hand, the ideas and research of the professor has often been of great benefit to the operation.
"Professor Dolejs has often contributed in our progress and assisted us in tuning our processes. In the case of Filtralite, it was he who suggested we try out the new filtering medium. We are grateful for his contribution and take pride in being the first water work in the Czech Republic to use the new technology," explains Mr. Rainis.
The results from the thorough pilot testing has recently been presented at a scientific symposium in the Czech Republic and Slovakia, and the work has been acclaimed by local authorities.

The Filtralite era

The raw water from the reservoir is oligotrophic in nutrients and contain a high amount of humic substances. To be able to filter these, the water is first adjusted to pH 6.0 with lime water and C02 and added a mixture of aluminium sulfate and polymer flocculation aid. In the subsequent mixing the organic matter and organisms turn insoluble and is transformed into flocs, that look like dust particles.
"We have tuned our dosage and choice of chemicals finely to the water chemistry. The flocculation and subsequent filtration with Filtralite takes out nearly 90 % of the organic content," explains Mr. Rainis.

PLENTY: Josefuv Dul reservoir, where the raw water is collected, picture by Roman Fridrich

Two layers

The Filtralite used in the plant consists of two layers, a so called "Mono-Multi" solution. The two layers of Filtralite are of different size and density, which fall into place nicely after each flushing, forming the same layers.
The amount of particles remaining in the water after filtration is analyzed on-line, and these data are used for further improvements.
"After changing to Filtralite we have seen an improvement in the general performance. The amount of particles leaving the filters have been greatly reduced, and the numbers of particles evading has been improved by a factor of ten," explains professor Dolejs. The water leaving the filters are therefore well suited for subsequent UV-light disinfection, and since the introduction of Filtralite the need for chlorination has also been reduced.
The cost of changing from sand to Filtralite in this case has a payback time of 2-3 years. However, in other cases, when filtering capacity is the botteleneck, the payback time has been less than one year.
"Many water works in The Czech Republic will most likely follow our example," says Mr. Rainis.

FILTRALITE®

FILTERING THE WATER FOR TOMORROW

MODERNIZED: Bedrichov waterworks is in Liberec serve approximately 100 000 inhabitants with municipal water.

IMPRESSIVE: Only chloramine is used for safety desinfection, giving a tasty and healthy water quality, according to regional manager Ladislav Rainis.

BEDRICHOV WATER TREATMENT PLANT:

- Reservoir built 1976-82, treatment plant built in 1987
- Reservoir maximum depth: 30 m, average depth 10 m
- Watershed area: 20 km2
- Reservoir volume: 22.1 mil. m3
- Maximum production: 600 l/s
- Coagulant: aluminium sulphate or polymeric aluminium chlorides
- Polymer: nonionic
- UV-system: low-pressure, dose 400 mJ/m^2
- Filtering media: sand 1.0-1.6 mm
- Number of filtering basins: 8
- Desinfection method: UV + chloramination

FACTS ON FILTRALITE: Filtralite is a lightweight ceramic particle aggregate made from expanded clay. Filtralite is designed for and proven to be an excellent material for water and wastewater purification. The low density particles have large pore volumes with large surface areas, which are ideal characteristics for conventional filtration. Filtralite is also an ideal medium for biofilm growth.0

More information, cases and documentation at
www.filtralite.com