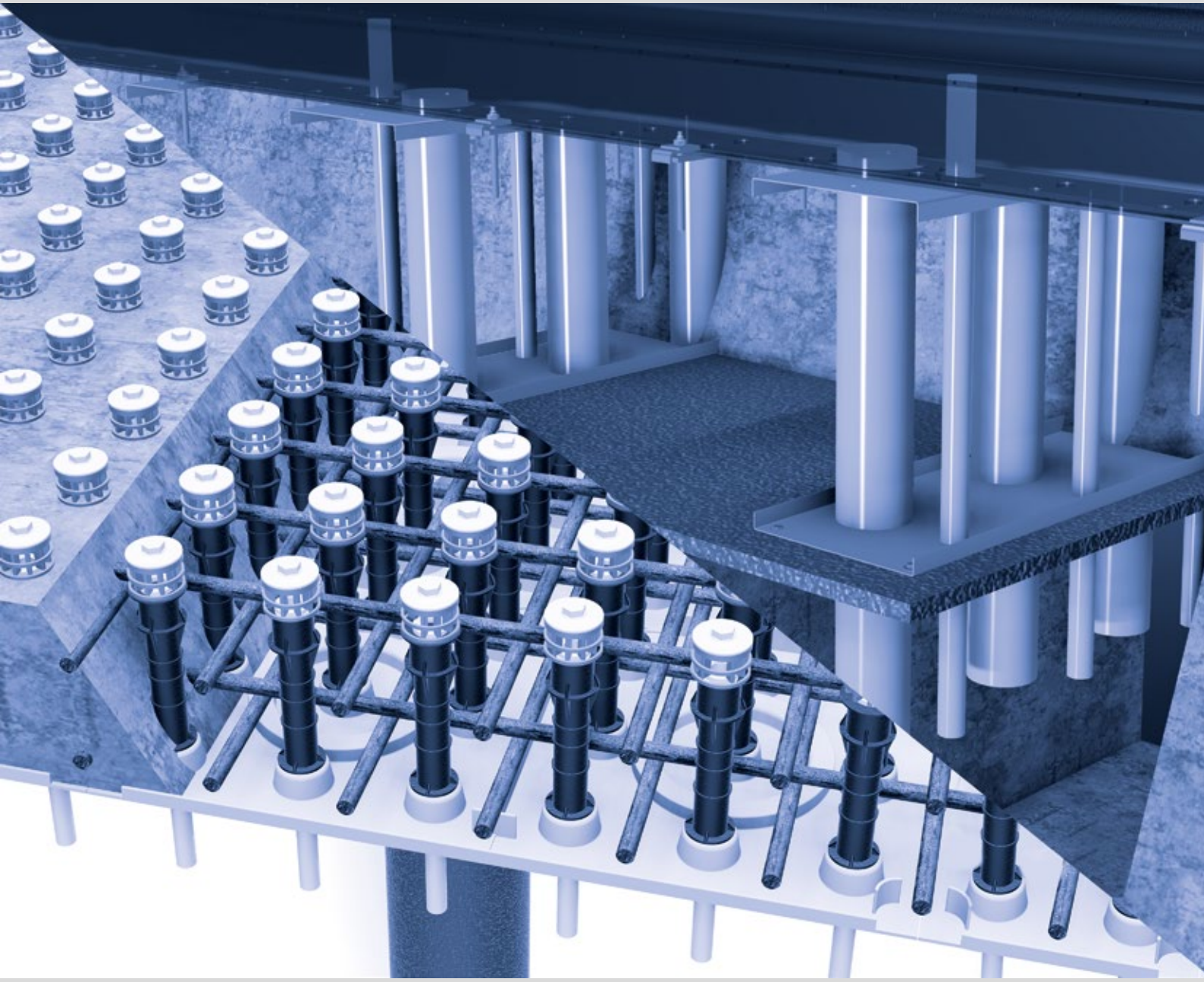
Technology Review

WABAG filtration



Filtration for water and wastewater treatment

WABAG

WABAG filtration

Water filtration
for drinking and process water

Filtration is an essential process in water treatment. It is frequently the case that it either represents the main processing phase, or is integrated into multi-barrier systems. Many membrane filtration plants also include conventional filters for pre- or post-treatment.

Thus, the continuous development of filtration technology has always been one of WABAG's most important objectives and for more than fifty years, the techniques originally developed by Sulzer have been subjected to on-going optimisation.

Today, WABAG's filter design constitutes an optimum solution for both, single- and multi-layer filters based on various unique features.

Wastewater filtration
for tertiary treatment and water reuse

Wastewater filtration is necessary when discharge limits are particularly stringent, e.g. in sensitive areas. In addition, wastewater filtration in combination with disinfection also offers a reliable and economic solution for water reuse.

In most cases, the elimination of micropollutants requires a filtration stage adapted to the chosen treatment process (oxidation/adsorption).

WABAG's wastewater filtration technology derives from its experience with water filtration, which has been acquired since the late 1970's. It incorporates all the necessary know-how about the particular factors related to wastewater filtration such as the biological activity in the filter bed and control of filter operation with flow variations.

Like water filters, wastewater filters are realised as single- and multilayer filters and offer the same features.

Kunming, China
Drainage Filtration for treatment of surface water
Commissioning 2003, capacity 400'000 m³/d

TaiPo, Hongkong
Aerated Drainage Filtration for nitrification and multilayer Drainage Filtration for mangenese removal
Commissioning 2002, capacity 450'000 m³/d

Werdhölzli WWTP, Zurich, Switzerland
Drainage-Nozzle Floor Filtration for tertiary treatment
Commissioning 2011/2013, Capacity 23'400 m³/h

Fällanden WWTP, Switzerland
Nozzle Floor Filtration for tertiary treatment
Commissioning 2003, capacity 1'800 m³/h

Filtration process

Filter features
for most efficient backwashing

General

The filtration process is based on a downflow operation mode and filtrate outlet regulation. This maintains a constant water level in the filter, which offers the best process conditions for high elimination rates.

Deep bed filtration with long filter running times is achieved by the selection of the optimum filter media in a single- or multilayer configuration.The filters can take the form of rectangular concrete cells (open or closed) or steel vessels.

Filter floor

The filter floor is a key system component. The design has to ensure the uniform distribution of the corresponding media during operation and backwashing, while the construction should be simple, cost-efficient and flexible enough to accommodate various filter dimensions.

WABAG has developed differing types of filter floors, which allow a design in accordance with specific requirements, which is particularly important when existing filters are refurbished. The types of filter floors available are either based on the WABAG nozzle floor or the WABAG drainage system.

WABAG drainage system

The drainage system consists of cast-in distribution batteries and parallel drainage pipes, which are arranged across the filter bottom. The drainage pipes are surrounded by a supportive gravel layer. The appropriate orifices in the individual drainage pipes allow filtrate to pass out of the filter material and scouring air and water to move in the opposite direction. The drainage pipes are individually connected with the filtrate channel by means of distribution pipes. The gravel layer, drainage pipes and distribution batteries ensure the even distribution of the flushing media.

An alternative drainage design consists of drainage pipes equipped with nozzles instead of orifices. In this case, the drainage pipes are also cast-in and there is no supporting layer of gravel needed.

Backwashing

Effective backwashing is vital for the optimised long-term operation of filters. The uniform distribution of the backwash media and efficient backwash sequences are therefore essential elements in backwashing.

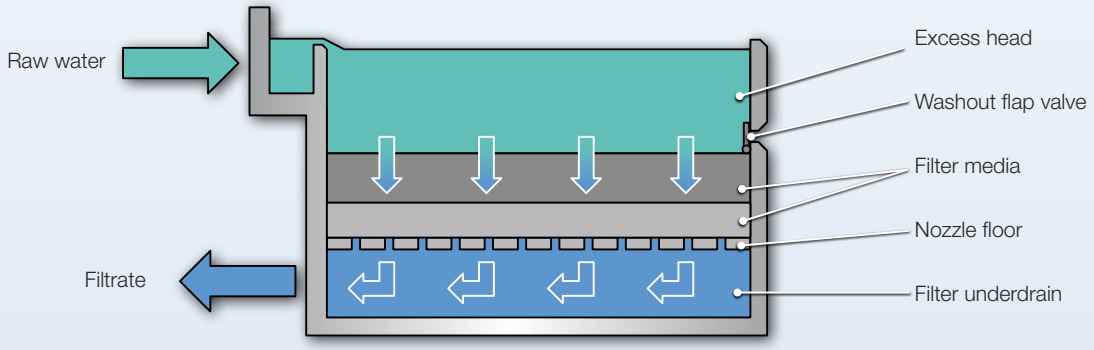
As far as operational costs are concerned, backwash water consumption should be as low as possible and filter media loss has to be avoided.

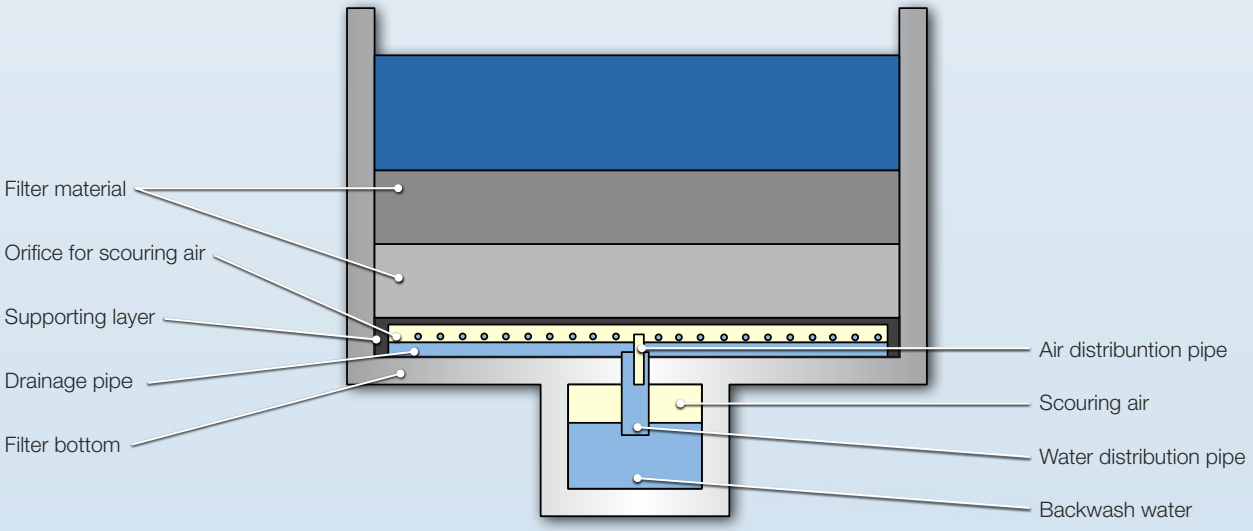
These objectives are achieved by WABAG filter floor systems and a sophisticated backwash principle (excess head backwash, see below) using an internal flap valve for sludge water withdrawal. The flap valve is either situated on the front or the rear side of the filter cell, just above the top level of the filter medium.

The excess head backwash principle divides the backwash sequence into a first phase of backwash medium introduction and a second phase of sludge water withdrawal. Backwash medium introduction can therefore be precisely matched to individual operational conditions.

WABAG nozzle floor system

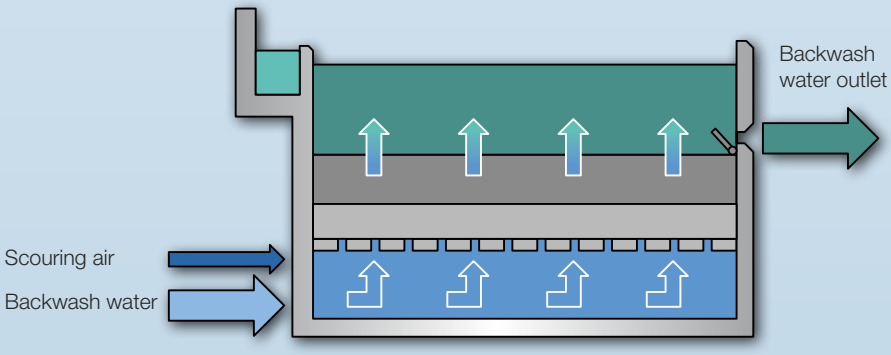
This system is based on a concrete nozzle floor with a plenum chamber. The latter is fed from the front via a special backwash connection. The nozzle floor can easily be built using shuttering elements.

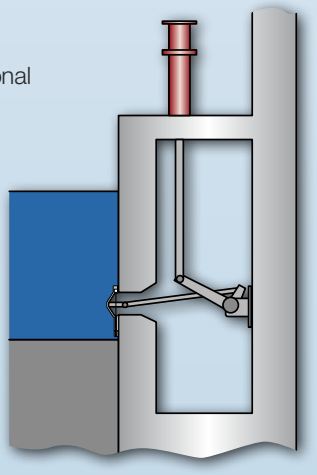




Sludge water extraction is based on the gradual opening of the flap valve, which prevents filter media loss, even where this is highly possible as in the case of specifically light media. This allows an additional degree of flexibility with regard to filter media combinations.

The repetition of the two phases leads to an efficient backwash with low backwash water use.





Schematic diagram of the flap valve

Rehabilitation & Elimination of micropollutants

Rehabilitation
The available filter floor systems offer optimised solutions for filter rehabilitation. The upgrading of pure water rinsing into air-water backwashing is entirely feasible. Extensive experience in filter rehabilitation also allows the optimisation of conventional backwash principles based on continuous flow and sludge water withdrawal channels.

Elimination of micropollutants
At present two processes, oxidation and/or adsorption, are employed for the elimination of micropollutants. This means that the process involved is generally based on ozonation and/or activated carbon adsorption.

In both cases, filtration plays a key role in the overall system:

- In connection with ozonation, downstream filtration with its biological activity serves the degradation of any resultant reaction products (BIOZONE®). In addition, micropollutants are biologically degraded or captured via the filter effect.
- Powdered activated carbon can be dosed directly into the filtration feed and retained (PACOPUR-SF®). As an alternative, filtration can also be used to capture residual, suspended matter following powdered activated carbon separation by means of sedimentation.
- Filtration with granulated activated carbon (GACOPUR®) can be operated with or without upstream ozonation.

WABAG filtration advantages in brief

- Outlet regulated (constant water level) deep bed filtration results in high filtration performance
- Efficient backwashing without filter media loss
- Low backwash water consumption
- Various filter floor systems enable tailor-made solutions and a wide range of filter media combinations
- Compact design
- Flexible realisation due to a wide range of filter surface areas (10-150 m^2)

St. Pourçain, France
Nozzle Floor Filtration for elimination of micropollutants (BIOZONE®)
Commissioning 2013, Capacity 90 m^3/h

WTP Hardwasser AG, Switzerland
GAC Nozzle Floor Filtration for micropollutant removal
Commissioning 2013, capacity 70‘000 m^3/d

Zurich Lengg, Switzerland
Rehabilitation of 38 multi-layer nozzle floor filters
Commissioning 2013, capacity 250‘000 m^3/d

WABAG

WABAG offers sustainable solutions for:

- Drinking water treatment
- Industrial and process water treatment
- Water reclamation
- Sea and brackish water desalination
- Municipal wastewater treatment
- Industrial wastewater treatment
- Sludge treatment

WABAG is one of the world's most innovative water treatment companies with know-how in specific technologies and in-house developed processes such as:

Biofiltration	BIOPUR®
Moving bed biology	FLUOPUR®
Activated sludge processes	Hybrid™, SBR, MICROPUR-CAS®
Membrane bioreactor	MARAPUR®, MICROPUR-MBR®
Membrane filtration	RO, MF, UF, NF CERAMOPUR®, CERAMOZONE®
Denitrification	BIODEN®, ENR®
Oxidation processes	ADOX®, BIOZONE®
Adsorption processes	CARBOPUR®, PACOPUR®
Thermal desalination	MED, TVC, MVC, MSF MED XXL™
Fine sieving	MICROPUR®

- Deep bed filtration in various designs
- Anaerobic sludge digestion including advanced energy recovery

The WABAG Group represents a leading multinational player with companies and offices in 20 countries and a focus on emerging markets in Europe, Africa, Middle East, South East Asia, China and India.

sustainable solutions. for a better life.

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