BILFINGER WATER TECHNOLOGIES

Bilfinger Water Technologies GmbH

# WE MAKE WATER TREATMENT WORK

## JOHNSON SCREENS ® TRITON UNDERDRAIN SYSTEM ™

Global Business Unit Water Treatment

**Date: October 2014**

# JOHNSON SCREENS ® TRITON UNDERDRAIN SYSTEM ™

Triton Underdain system utilizes Johnson's world renowned Vee Wire® screen technology and our wealth of filtration technology experience.

Available in stainless steel and in PVC, Triton Underdrain offer maximum surface area to optimize filtration efficiency

# GENERAL INFORMATION

- Underdrain system are designed for the collection of water and distribution of water & air with direct retention of filtering media. The filtering bed is composed of single or dual media layers.

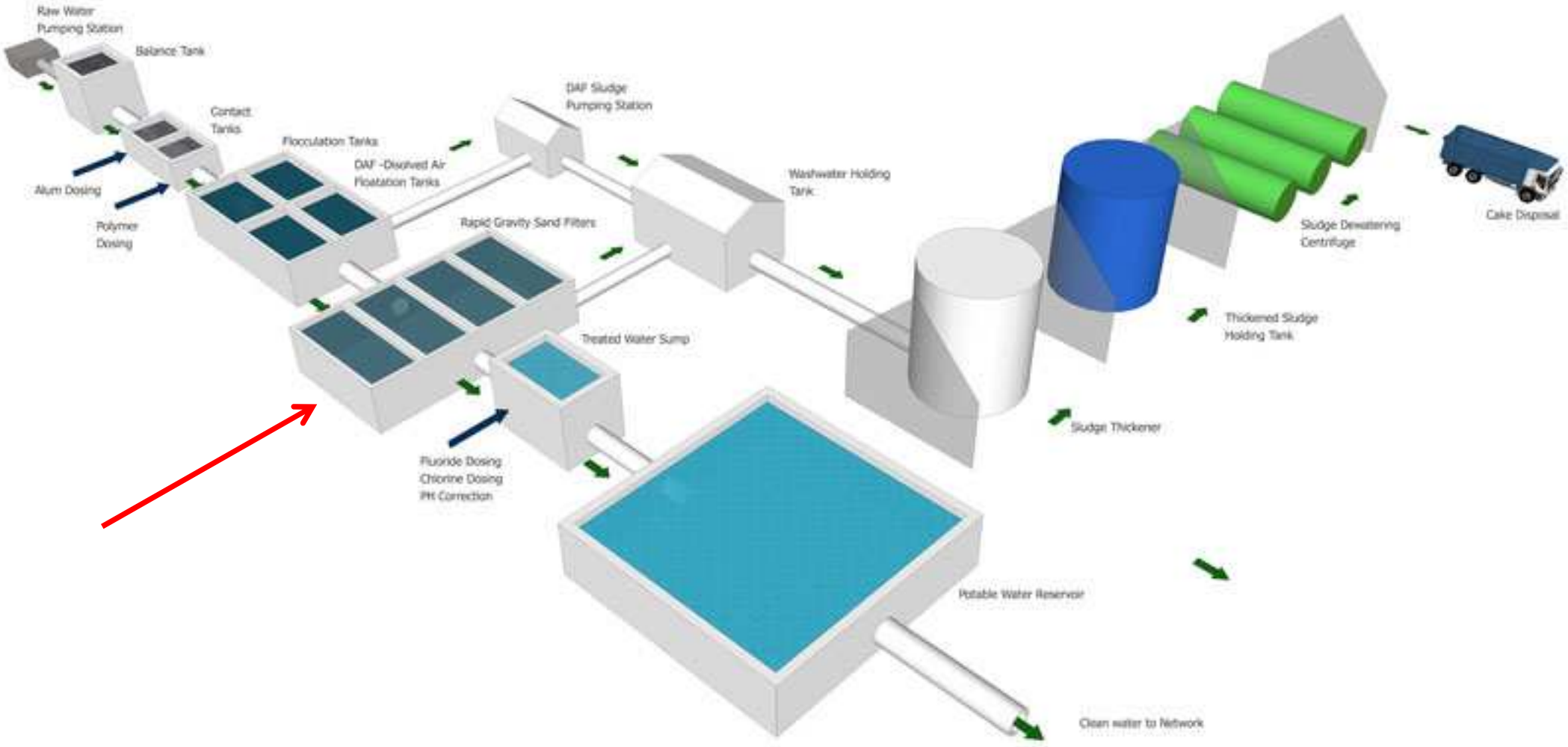
- Depending on the quality of water to be treated and the filtering objectives, different filtering media can be employed : sand, activated carbon, anthracite, pumice, shale, limestone, etc..

The filter has multiple function:

- Physical function : retention of suspended particles (suspended solids, iron and manganese precipitate.)
  Physical-chemical : adsorption of micro pollutants (pesticides, detergents, chlorinated solvents, sapid components, etc.) Manganese removal with manganese dioxide.
  Biological function : biodegradation of organic carbon Oxidation of ammonia, iron, manganese , denitrification.
- Chemical function : acidity correction with calcium.

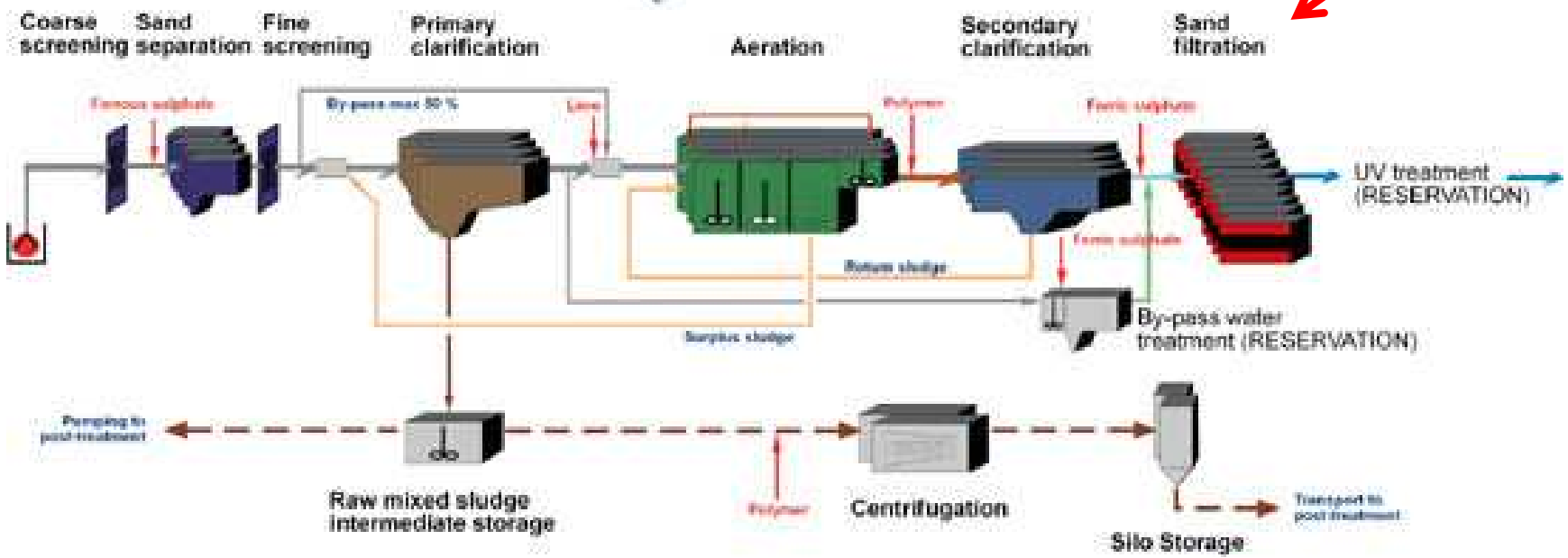
- 4 majors applications:
  - **Drinking water**
  - Tertiary treatment
  - Desalination
  - Industrial pretreatment

# EXAMPLE OF LAYOUT OF DRINKING WATER PLANT



# EXAMPLE OF LAYOUT OF WASTER WATER PLANT

- SCREENING AND SAND SEPARATION
- PRIMARY CLARIFICATION
- AERATION
- SECONDARY CLARIFICATION
- TERTIARY TREATMENT (SAND FILTERS)
- HEAT PUMPING STATION



# EXAMPLE OF LAYOUT OF DESALINATION PLANT

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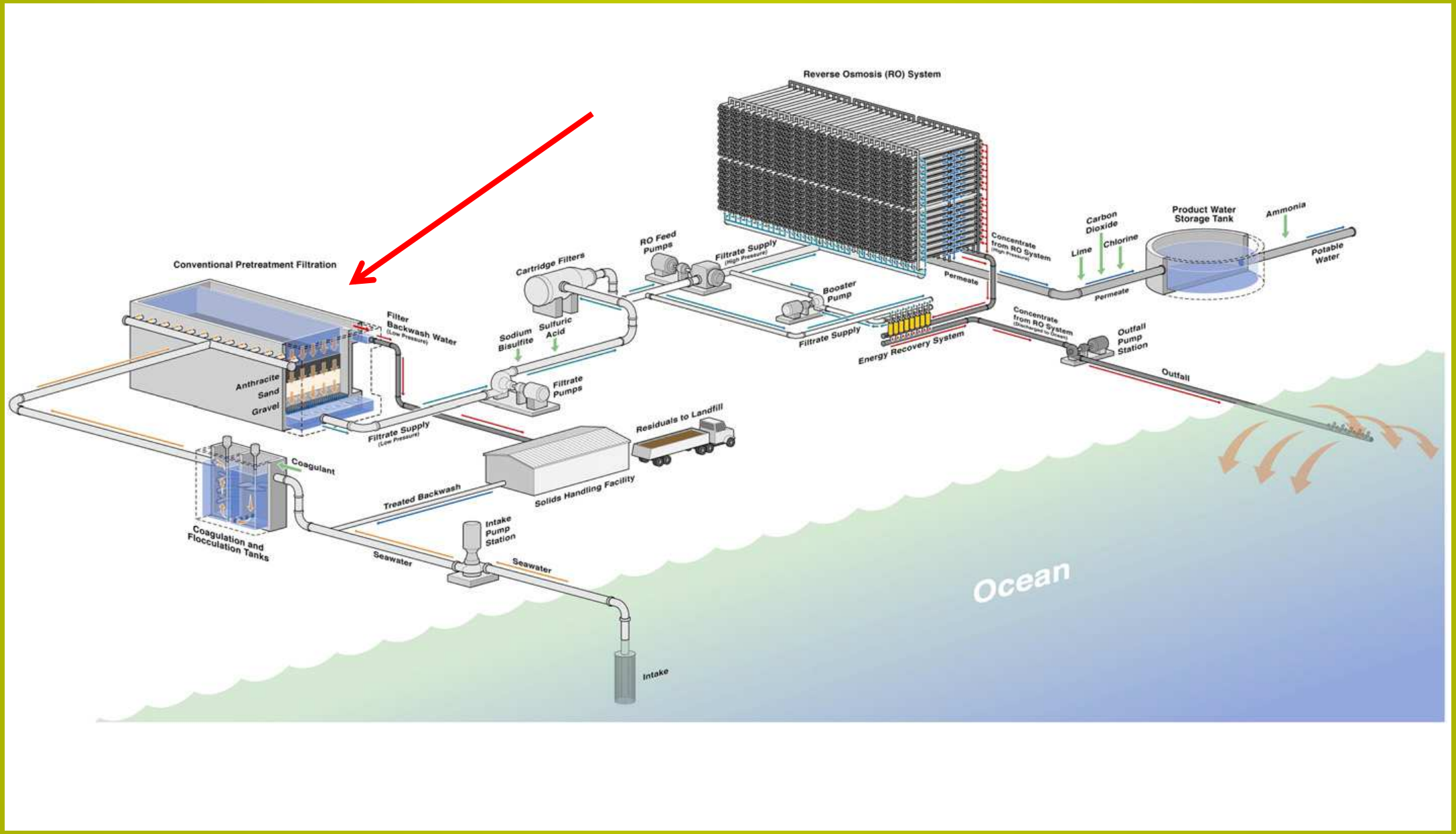
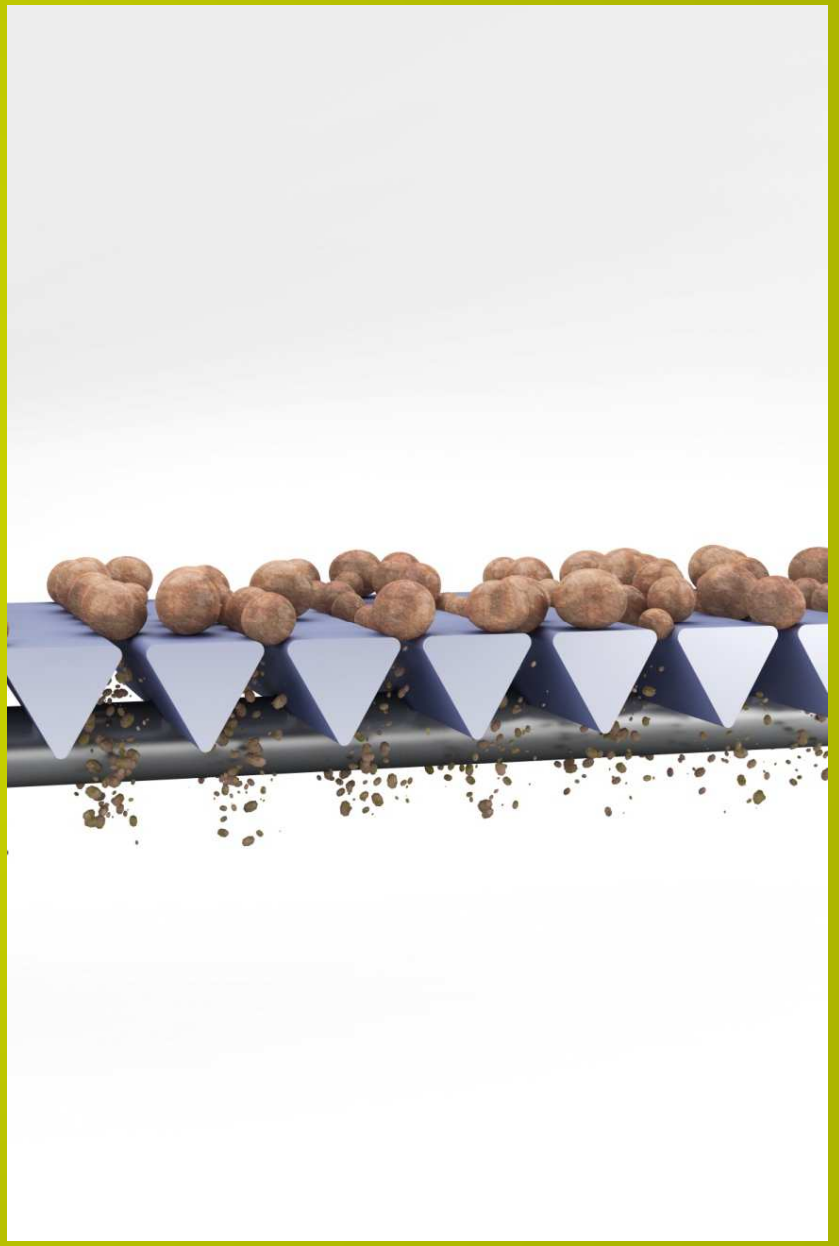


# TRITON UNDERDRAIN

- The main components of a potable rapid gravity sand filter are the filter media, the filter underdrain. The underdrain is used to support the filter medium (sand, activated carbon, limestone for example)
- The Triton Underdrain is designed for the collection and distribution of water with direct retention of filtering media
- With large open areas, U shaped perforated supports and Vee – Wire filtering media support profiles, the Triton Underdrain system offers fine slots to suit the selected filter media spec.
- The slot width can be constructed and controlled to handle many different types of media
- The Triton Underdrain system because of its superior flexibility, can be customized to suit your needs

# THE FILTRATION TECHNIQUE

- The Triton Underdrain design is essentially stainless steel or PVC Vee Wire wound around and welded to “U” shaped channel rods
- The design ensures a very robust construction
- Plugging problems are considerably reduced as the Vee Wire opening allows only two point particle contact.



# FOR SUPERIOR PERFORMANCE AND PROBLEM SOLVING CAPABILITIES

- Tritons Underdrains are designed to solve typical problems that occur in filtration plants and offer the following advantages:
  - Smooth robust plug free rentention surface
  - Covers the entire filter area
  - Direct retention of filter media
  - Slot opening to suit various filter media sizes
  - Effective washing (air / water)
  - Low initial headloss
  - Several layers of filter media may be used without risk
  - Lower throught slot velocity compared to nozzles reduces the possibiity of fines breakthrough
  - Reduced number of backwash cycles resulting in higher production (m3/m2)

# UNIFORM AIR AND WATER BACKWASH FLOW DISTRIBUTION

- **Primary flow control**

- Primary Flow Control Assembly is located internally and custom designed to achieve specific open area allowing flow control for both air and water. These custom designs allow us to manipulate underdrain head loss to provide any desired distribution efficiency across the entire filter basin

- **Secondary Flow Control**

- Secondary Flow Control Assembly is the Vee - Wire filter media retaining surface. This secondary flow control allows increased flexibility to meet optimised design requirements for media retention and air / water distribution while minimizing pressure loss across the system

# IMPROVED BACKWASH EFFECTIVENESS

- The uniform bubble pattern of the Triton Underdrain system allows you to apply air / water backwash as vigorously as required without media upsets
- Improved backwasing results in longer filter runs, less backwash water used and a cleaner, better performing filter bed

# INCREASED FILTER CAPACITY

- Curved scallop design of Tritons increases collection area of filtering surface to 110-120% of basin floor, increasing the total basin capacity
- This means flow through is unimpeded and because Triton Underdrain have a higher open area and a dramatically smaller slot or opening, pressure drop is reduced and media selection expanded compared to alternate designs.
- This allows the end user to have greater flexibility to meet operational demands

# INCREASED FILTER CAPACITY

| | Effective Size ↑ | Media Height ↑ | Filtration Velocity ↑ | Head Available ↑ |
|---|---|---|---|---|
| **Turbidity** | ↑ | ↓ | ↑ | = |
| **Cycle Time** | ↑ | ↑ | ↓ | ↑ |
| **Load per m2** | = | ↑ | = | ↑ |

The Triton Underdrain's unique design provides a higher water velocity than conventional nozzles and provides a higher filter loading rate

Low profile screens and the elimination of gravel media layers make more room for additional filter media, which results in a treatment that is more effective. In new installation less expensive filter basin can be used.

# CUT MAJOR DOWNTIME COSTS

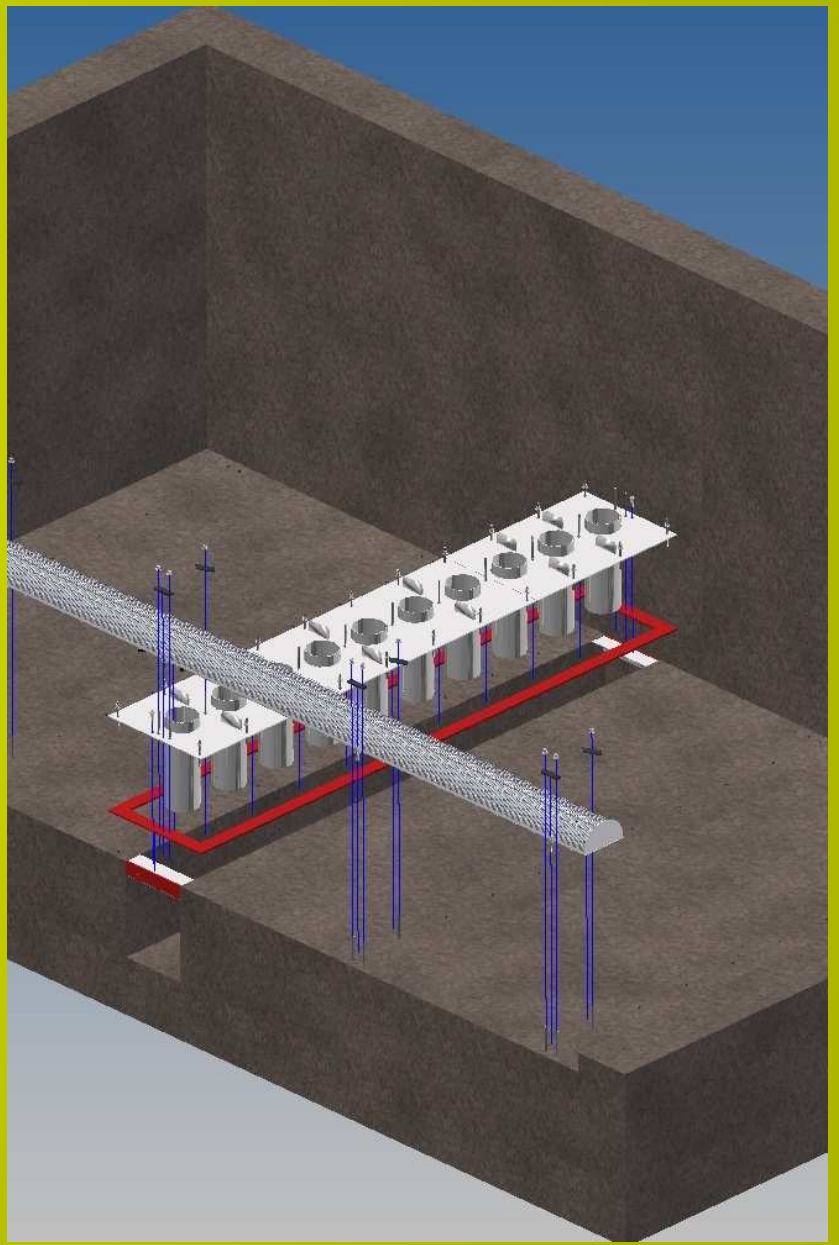
- When conventional systems experience serious bed upset, they need to be shut down and all the support gravel and treatment media must be removed and replaced.
- Since Triton Underdrain eliminates bed upset, it also eliminates this costly, time consuming rehabilitation cycle.

# ADAPT TO ANY FILTER DESIGN

- Johnson Screens will help design a Triton Underdrain system that precisely fits your filter size, capacity and budget. We will provide any level of assistance you need from supplying basic components to handling complete turnkey installations, retrofits and upgrades

# INSTALLATION FASTER AND EASIER

- Despite their great strength, Triton Underdrains are lightweight and under proper supervision can be easily installed by one or two people.
- Laterals are supplied as a single piece ready to install.
- Placing the treatment media is also simplified
- Support gravel does not need to be purchased or carefully stratified.



# INSTALLATION FASTER AND EASIER

# HOW TRITON UNDERDRAIN SYSTEMS CAN SAVE YOU TIME AND MONEY

- A higher capacity system that lasts longer and reduces both installation and operating costs
- Reduced consumption of treated water for backwashing
- Reduced maintenance, repair or shutdown
- Savings in filter height and volume
- No need for a suspended plenum floor
- No need for gravel
- Installation is faster and easier
- Filter design simplified

# COMPUTATIONAL FLUID DYNAMICS (CFD)

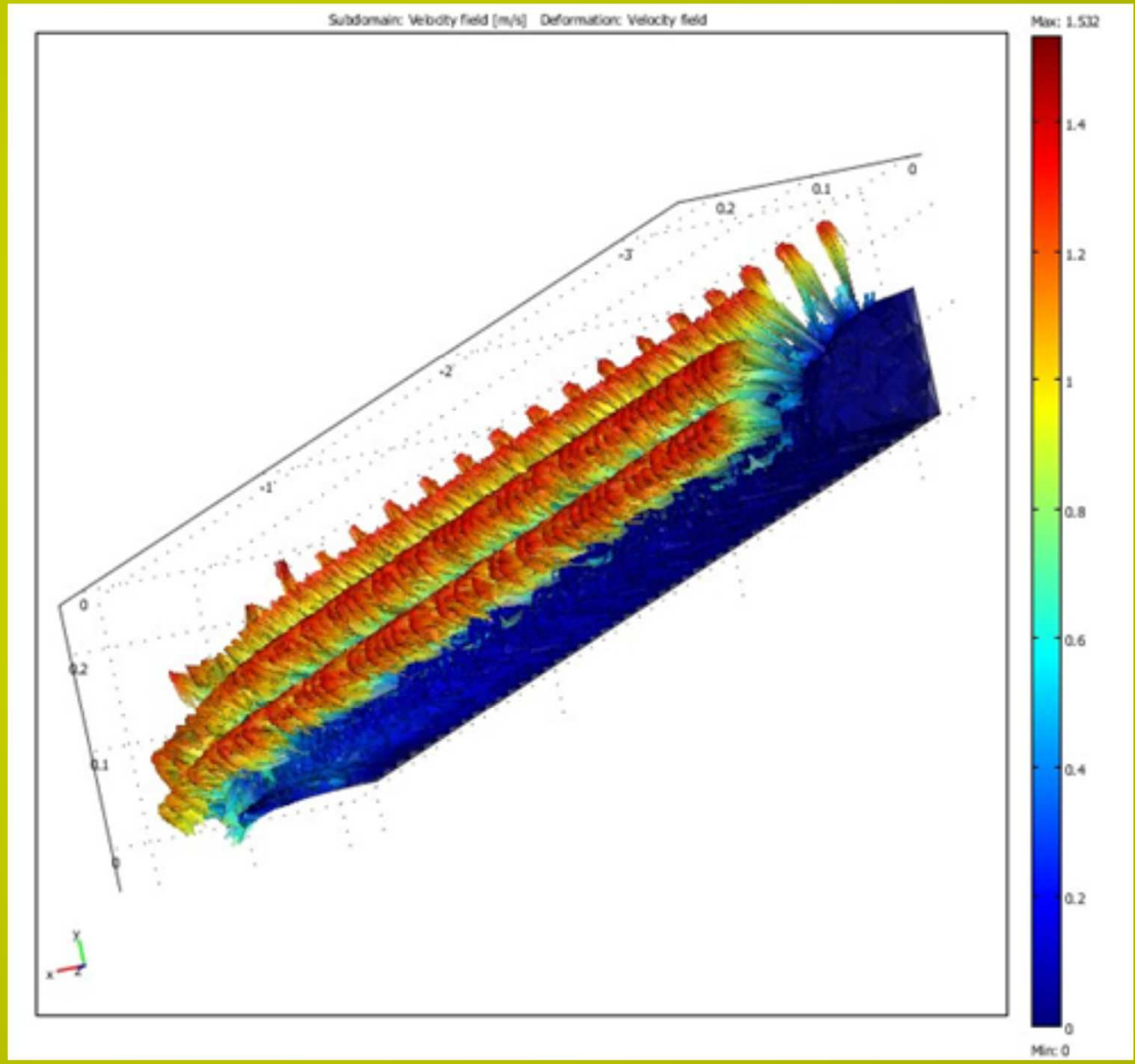
Computation Fluid Dynamics (CFD) models have been used to prove and illustrate that the design will provide adequate flow to evenly fluidize the bed.

Several advanced computer modeling tools for fluid flow are used to evaluate and verify performance for projects.

The model shown indicates the amount of flow leaving the lateral during backwash. The even length of the flow streams indicates good distribution.

Special engineering methods have been developed to accurately design underdrain systems for a variety of applications.

Our calculations models have been verified by physical testing and field performance.



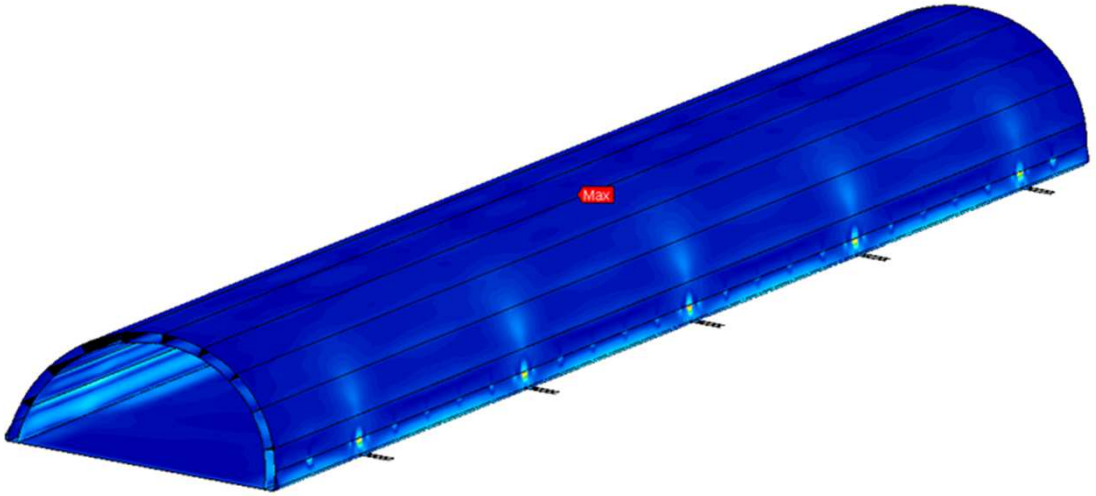
# FEA MODEL – FINITE ELEMENT ANALYSIS

Finite Element Analysis (FEA) models have been used to review potential loads, fatigue analysis.

The model shown was created using Autodesk Simulation Mechanical 2014. It illustrated the complex structural interaction of an underdrain in operation, and verifies that the product will provide a long, maintenance free service life.

The proper design for water and air flow as well as structural performance is critical to the performance of the underdrain.

Our skills in advanced underdrain engineering, computer modeling and extensive installation experience allow us to design optimal solutions for your application.



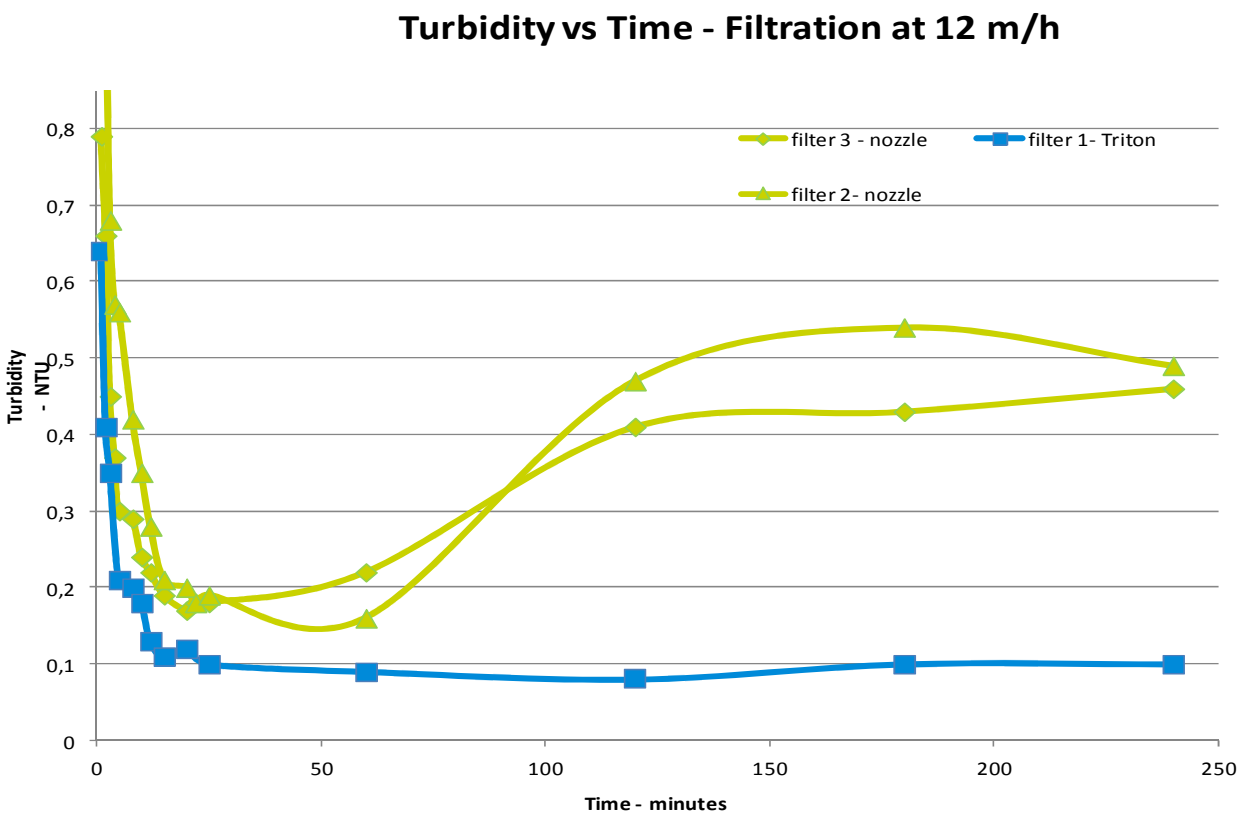
# FIELD SERVICE

- **SCOPE OF SERVICE**

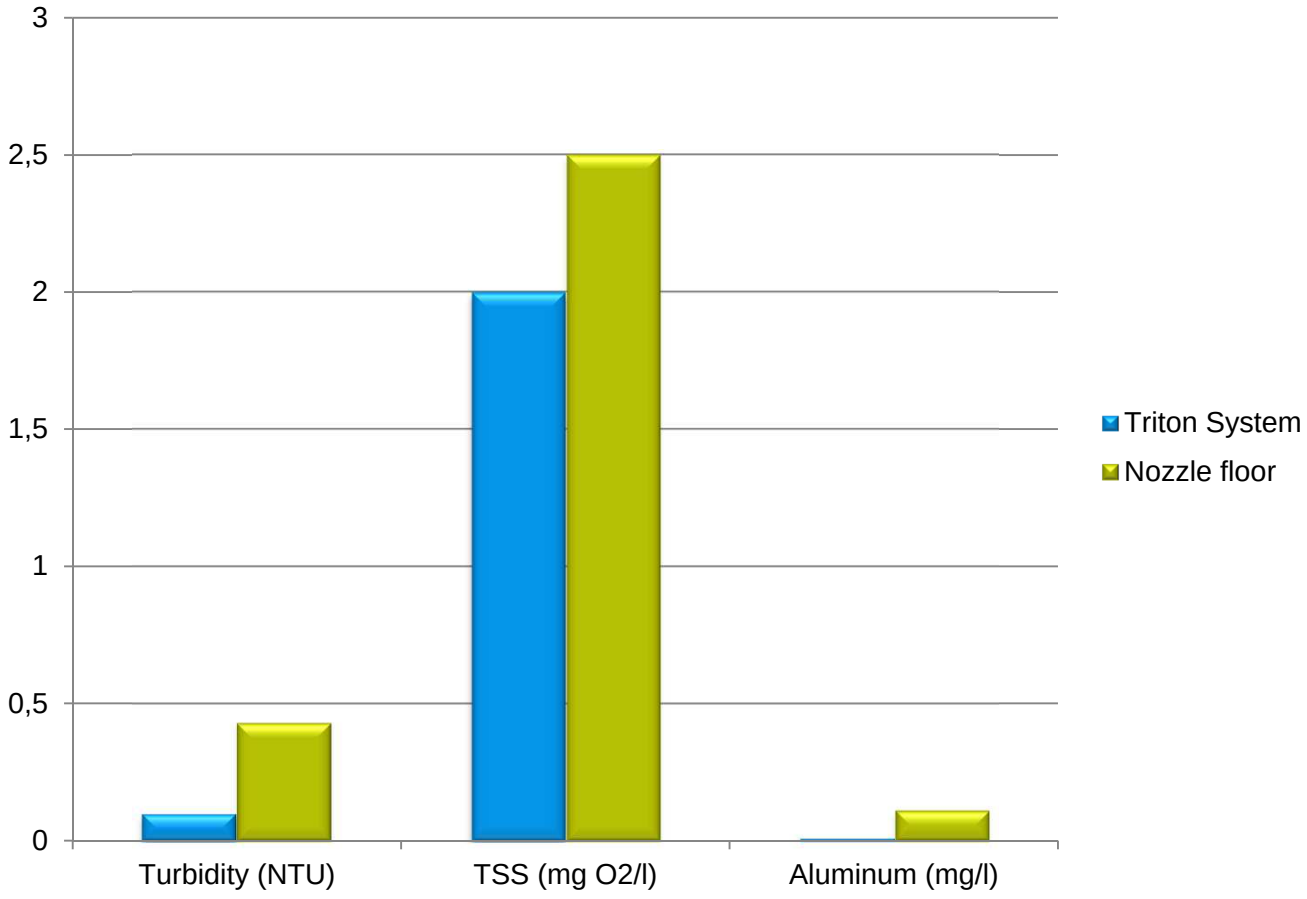
- On site installation of Johnson equipment
- Supervision of contractor’s installation

# PERFORMANCE

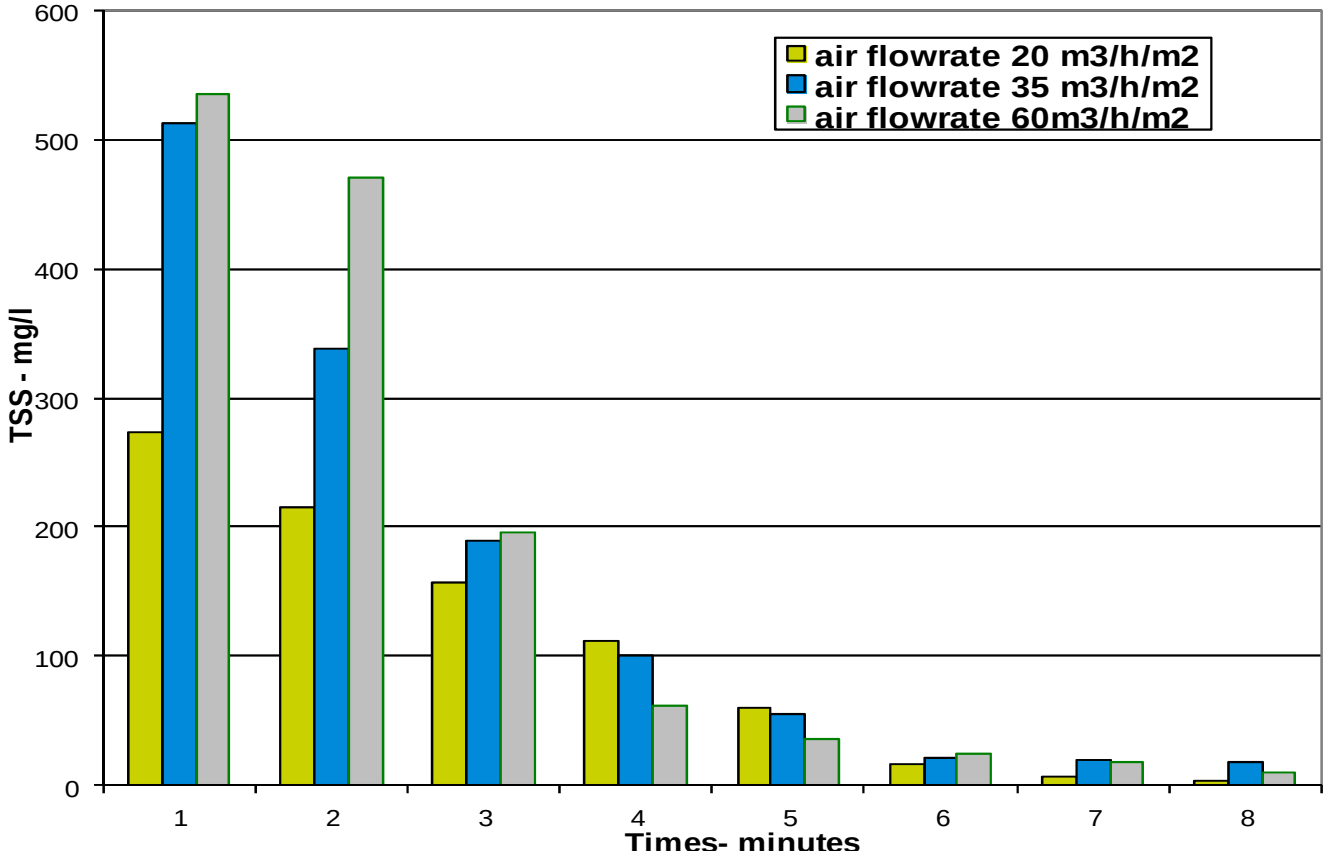
- DWTP Chatellerault - France
- Test made in 2000/2001 with the collaboration of Vivendi (Veolia)
- Raw water coming from Vienne river
- Coagulation / Floculation with aluminium sulfate
- Lamella decanter
- 4 sand filters, each 12 m2
- 2 equipped with nozzle floors and 2 with Tritons
- Same media, same height.



# SYSTEME TRITON
## Quality of filtered water after 3 h of operation at 12 m/h



# SYSTEME TRITON
## Backwash water quality vs air flow rate



# TYPICAL INSTALLATION

Vodovody a kanalizace Kroměříž, a.s.
Kojetínská 3666, 767 11 Kroměříž

# TYPICAL INSTALLATION

Turun Seudun Vesi Oy

# TYPICAL INSTALLATION

# MAIN DRINKING WATER APPROVALS

- ✓ CHEMICAL ANCHORS
- ✓ GASKETS
- ✓ STAINLESS STEEL

# JOHNSON SCREENS ® TRITON UNDERDRAIN SYSTEM ™

**Best choice for superior performance and reliable operation !**

**info.water@bilfinger.com**