

June 4<sup>th</sup>, 2012



# Leopold product presentation

## General Introduction



# Index

- Who is Xylem Leopold?
- What does Leopold do for a living?
- The Leopold underdrain equipment
- The designs and installation
- Examples of projects done

# Xylem Leopold

## Leopold fact's:

- Located in Zelienople, USA
- Company established in 1924
- First underdrain in 1945
- Large knowledge on
  - Filter design
  - Filtration techniques
  - Filter optimization and operation
- Product development center
- R&D department
- Service and controls
- Project management, service and controls



# Xylem Leopold

## Product development center (PDC)

The PDC is Leopold's in house testing and laboratory facility.

- Demonstration of different filtration technologies
- Filter research
- Testing and validation of designs
- Jar testing equipment
- Media testing
- Development of new products

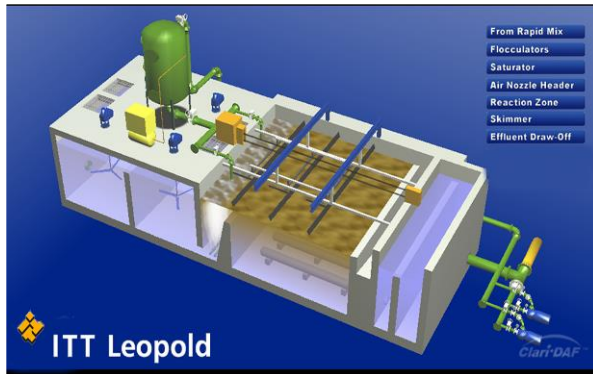


# Xylem Leopold

## Clarification

DAF

Dissolved air flotation



### Applications:

Wastewater  
Potable water  
Desalination pre-treatment

## Filtration

Rapid gravity filtration  
Leopold type S&SL

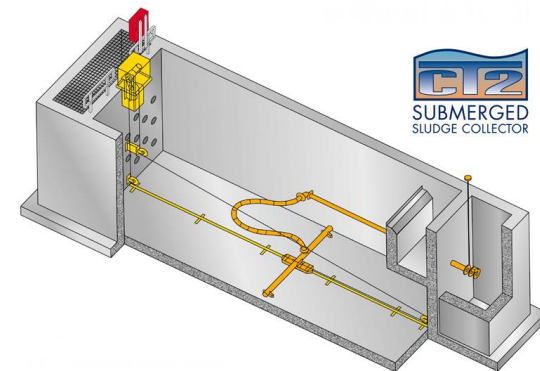


### Applications:

Potable water  
Wastewater  
Desalination pre-treatment

## Sludge handling

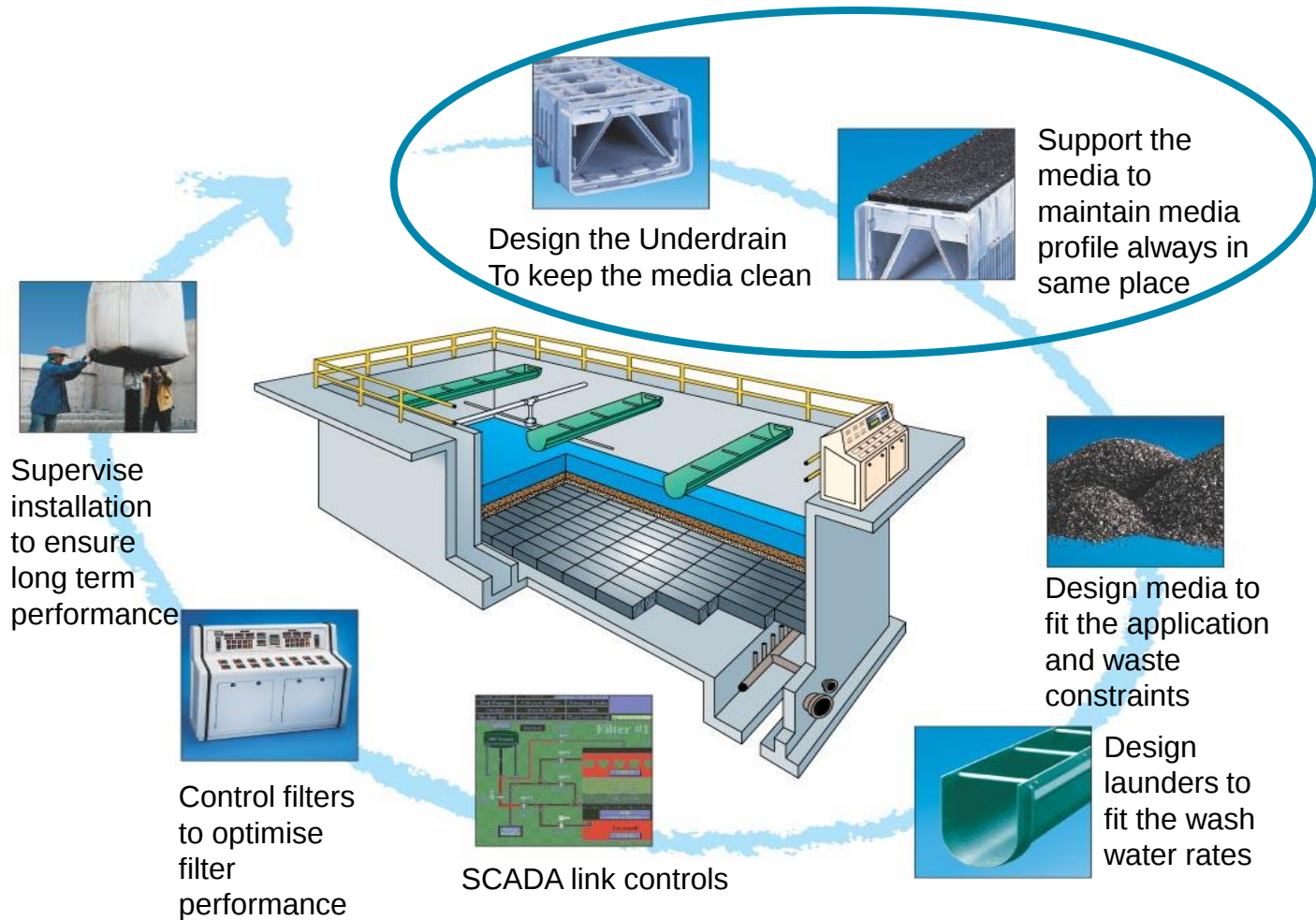
Sludge removal  
CT2 and CV



### Applications:

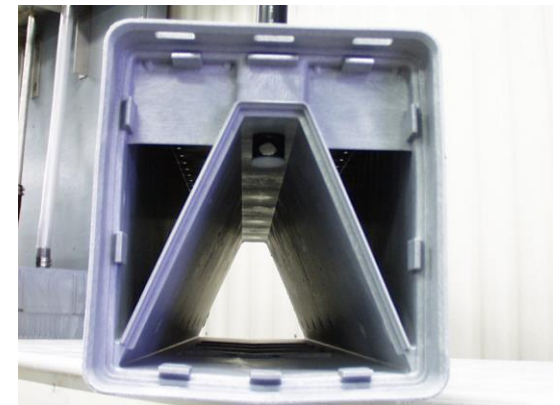
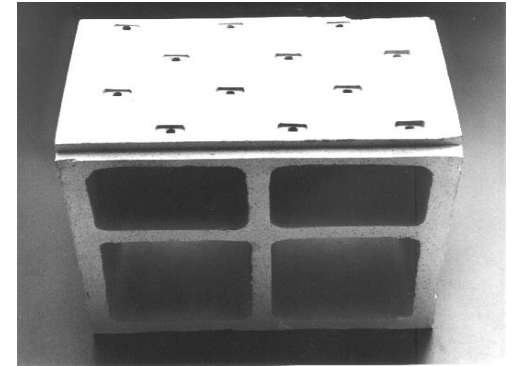
Potable water  
Wastewater

# Leopold underdrain filtration system

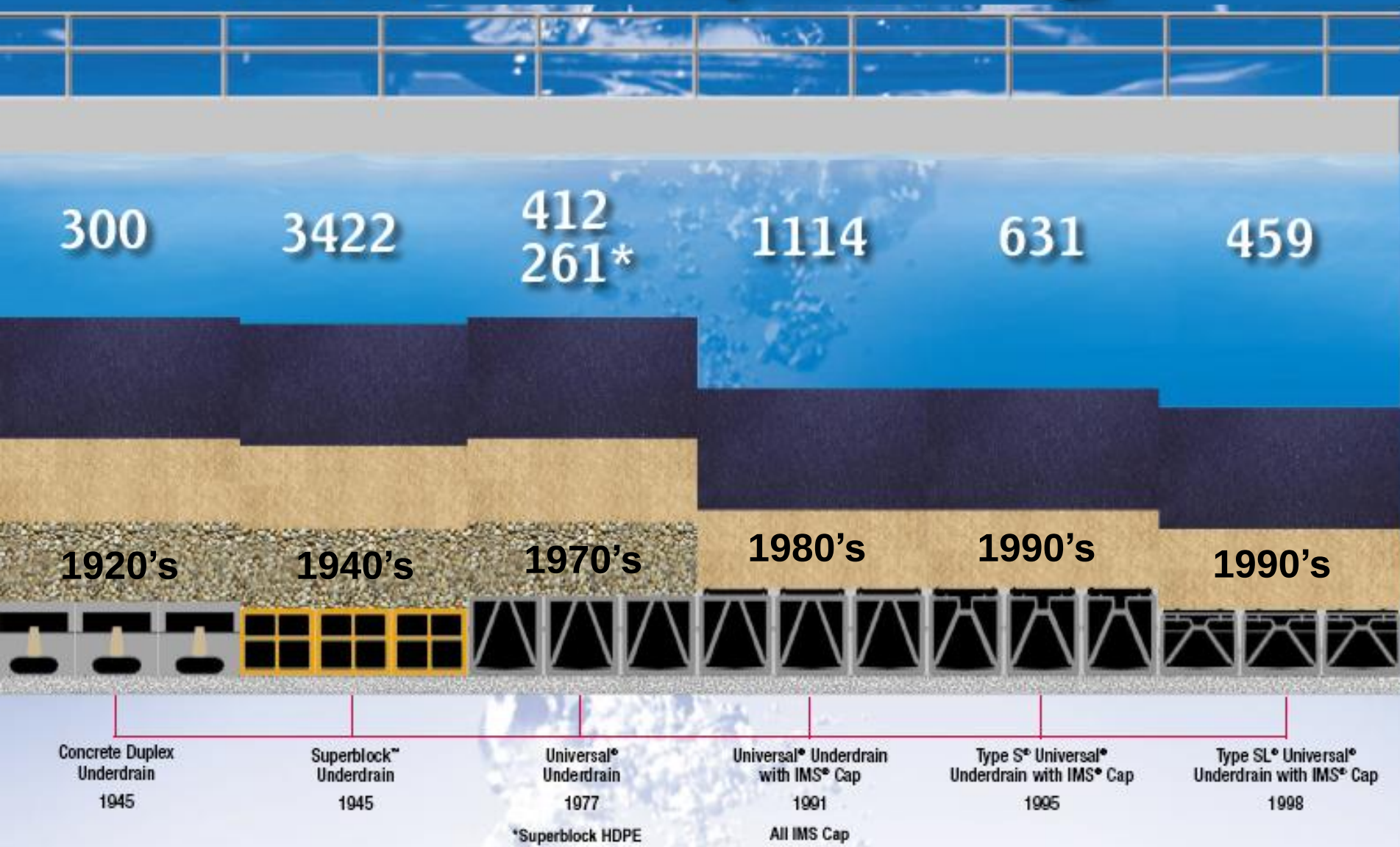


# History of Innovation in Design by Leopold

- Established 1924 with Concrete Duplex Underdrain
- Began with Revolutionary New Underdrain Design in Early 1940's
  - Dual Parallel Lateral
  - Over 3000 Clay Tile Installations
- 1977 Introduced the First High Density Polyethylene (HDPE) Plastic Underdrain
  - Currently Over 1200 Installations and 300,000 sqm installed
  - Over 200 Wastewater Treatment Plants treating more than 11,000,000 m<sup>3</sup>/day

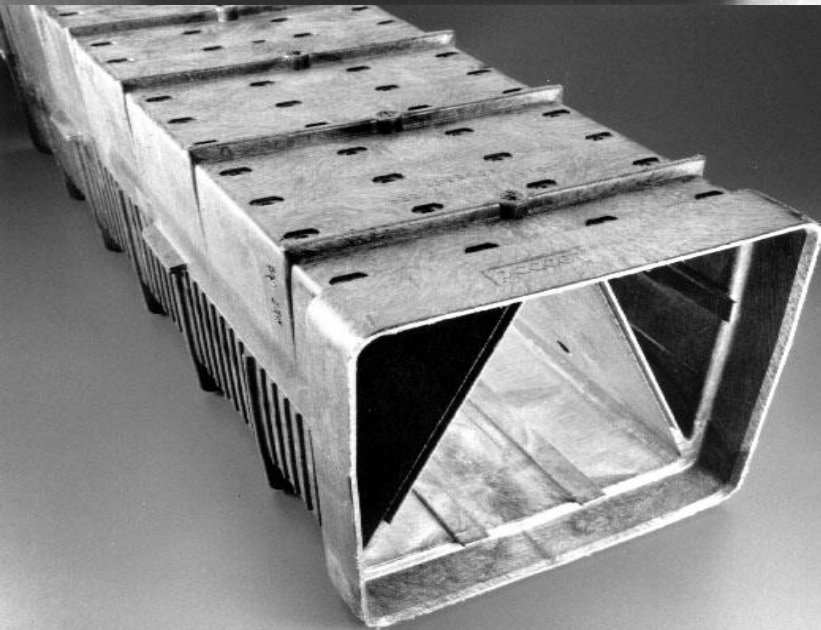
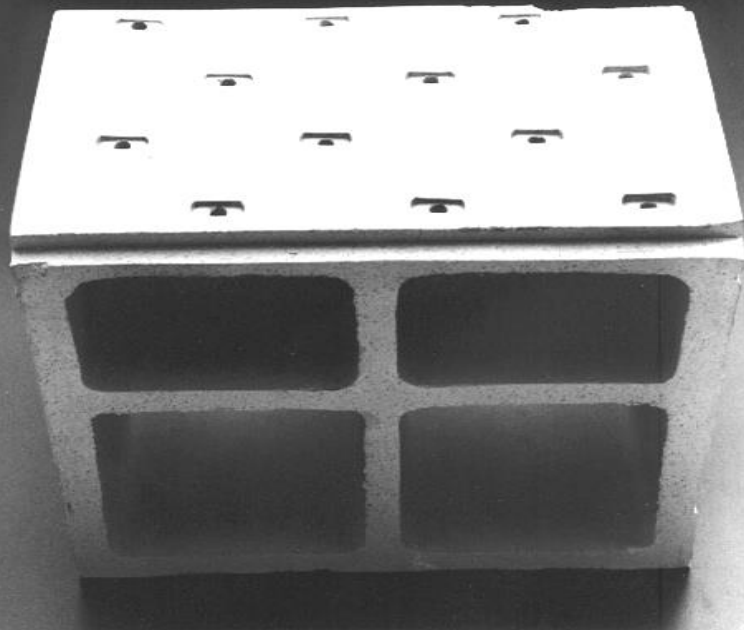


# Advancement of Leopold Technology



Over 6,000 Underdrain installations, 1,889,000 sq. ft. of Type S<sup>®</sup> Family and over 2,200,000 sq. ft. of IMS<sup>®</sup> Cap installed

# Leopold underdrains



# Leopold underdrains



**Over 8000 Installations World Wide**

# Xylem Leopold

## Types of treatment

Xylem Leopold have worked historically in all areas of the municipal water cycle. We do not work in the industrial business unless it is large volume water processing.

### POTABLE WATER:

Gravity filters; dual media, sand

GAC; Activated carbon

Mn & Fe removal

### WASTEWATER:

Gravity filters; dual media, sand

GAC; Endocrine removal

P removal

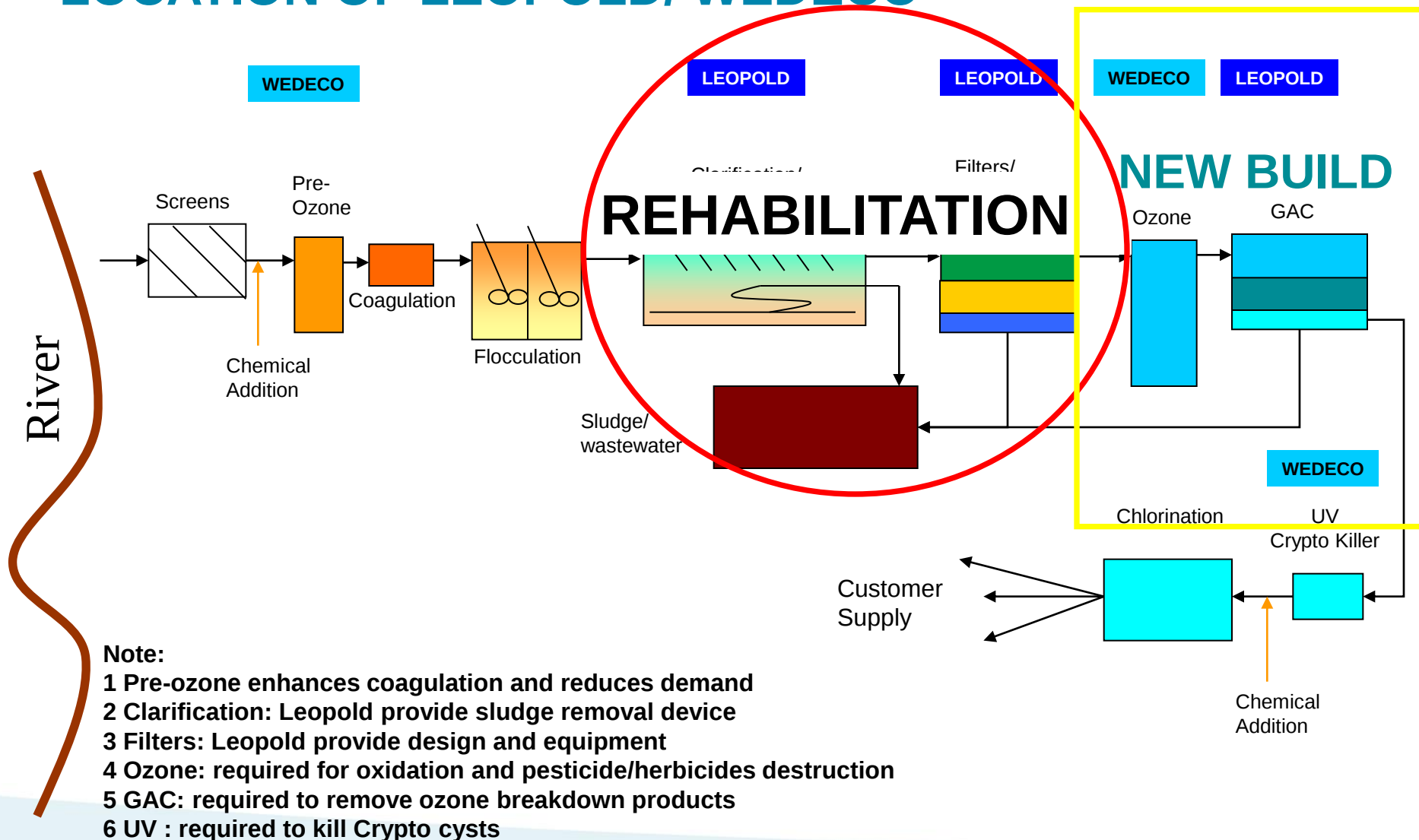
N removal (nutrients)

### DESALINATION:

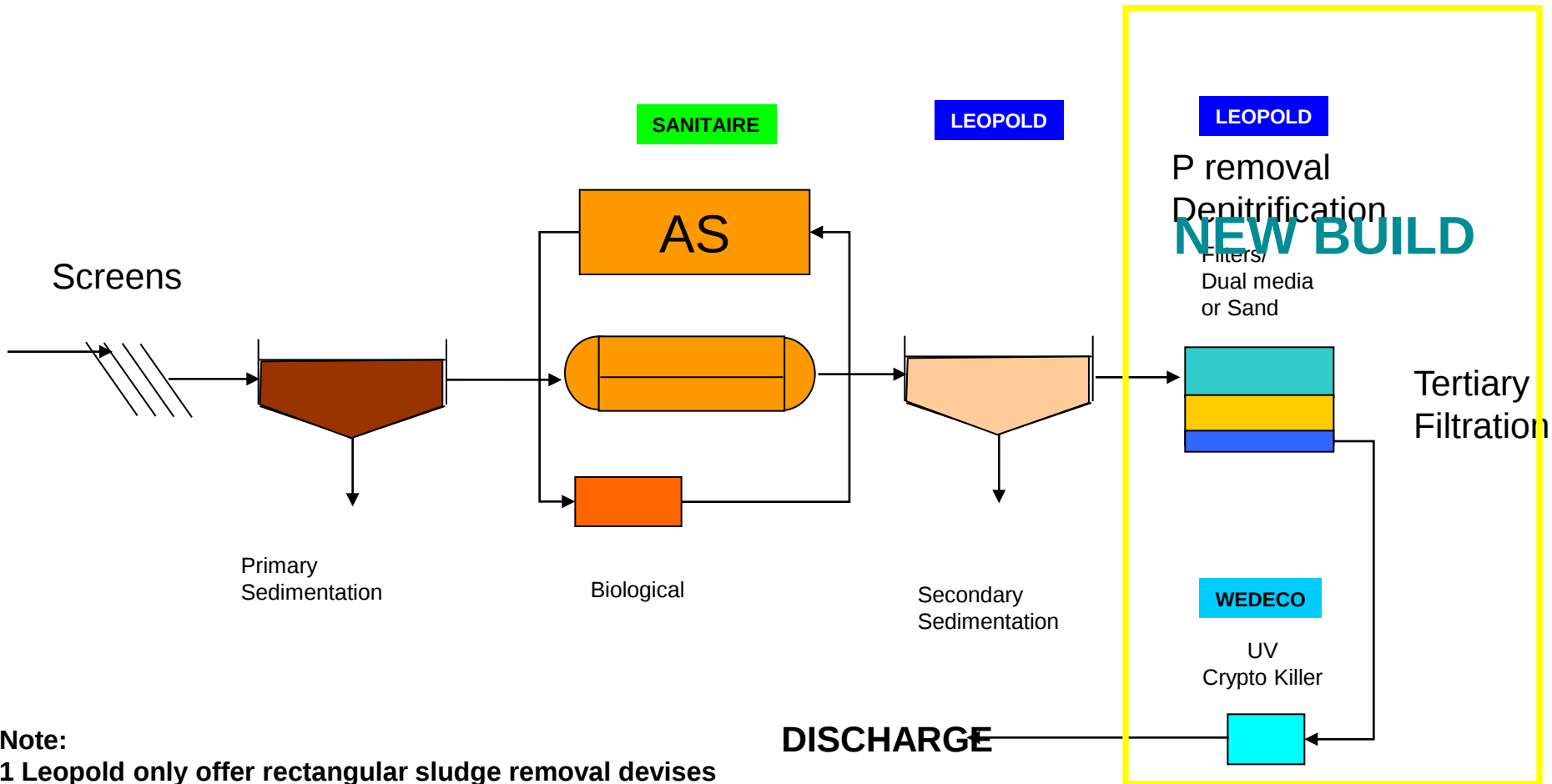
Gravity filters; dual media, sand

Post RO rehardening

# TYPICAL PROCESS TRAIN FOR POTABLE WATER – LOCATION OF LEOPOLD/ WEDECO



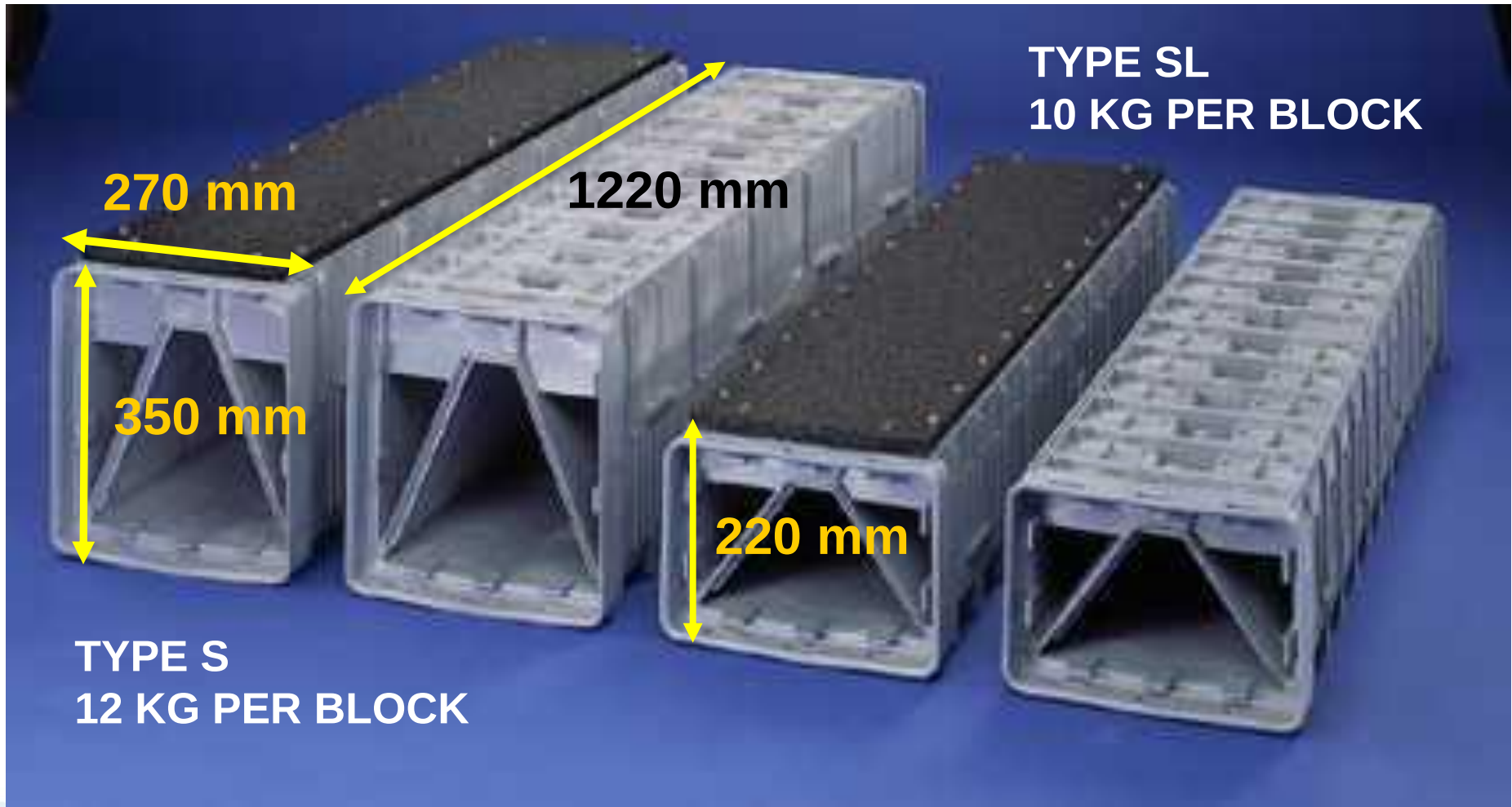
# SIMPLIFIED WASTEWATER PROCESS



## Note:

- 1 Leopold only offer rectangular sludge removal devices
- 2 Filters can be for P,N or TSS removal
- 3 WEDECO UV is a big synergy potential
- 4 Sanitaire diffusers are a big synergy potential
- 5 Leopold only work on the back of the works, no primary equipment at all

# Leopold underdrain filtration system



# Leopold underdrain filtration system

## Why to use an air water backwash?

- More treated water to sell
- Less backwash water to handle

## Effective bed cleaning

- Eliminates mud-balling in the system
- Longer filter runtimes
- Increase of effluent efficiency

### Water only

- High rate water 13min
- Low rate water 1min

Total water usage: **270m<sup>3</sup>**

### Air/water separate

- Air scour 2-3min
- High rate water 10min

Total water usage: **208m<sup>3</sup>**

### Air/water combined

- Air scour 2-3min
- Air water combined 2-3min
- High rate water 7min
- Total water usage: **160m<sup>3</sup>**

# Leopold underdrain filtration system

## TYPE S

Lateral maximum length = 30m

- Maximum air scour rate = 120 m/hr
- Maximum backwash rate = 90 m/hr

MAIN MARKET = NEW BUILD BIG FILTERS



## TYPE SL

Lateral maximum length = 12m

- Maximum air scour rate = 90 m/hr
- Maximum backwash rate = 75 m/hr

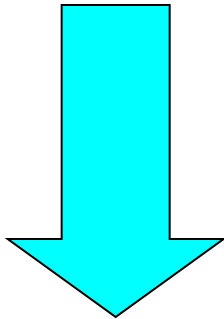
MAIN MARKET = RETROFIT SMALL FILTERS



# Leopold underdrain filtration system

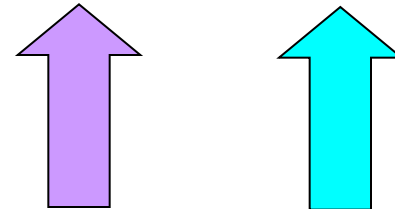
## EASY

Collecting the filtered water after the filter media and removing it from the filters to disinfection, holes in a pipe can do this.



## DIFFICULT

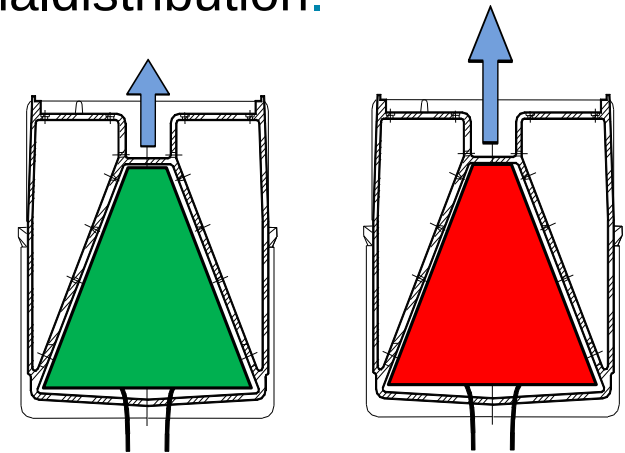
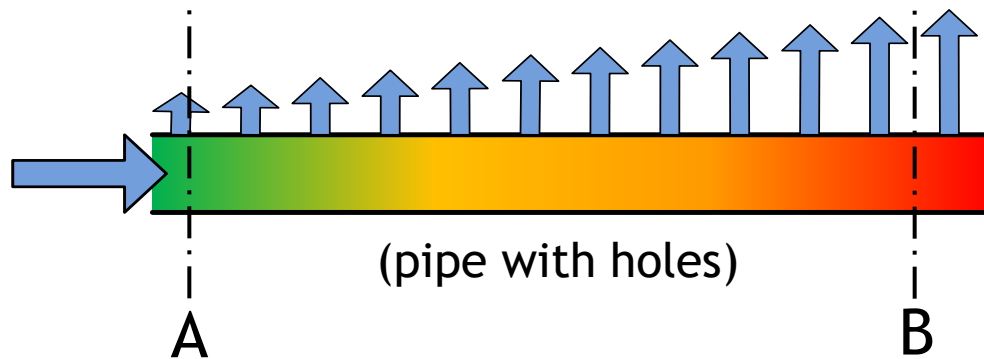
Backwashing the filter for complete regeneration of the filter media must have even distribution of **AIR** and **WATER** in a **COMBINED** method for efficient filter performance over life of filter



# Leopold underdrain filtration system

## Pipe lateral systems:

A water flow into a pipe with equal orifices will have a pressure/flow pattern according the picture below, this results in high maldistribution.



Section A and B

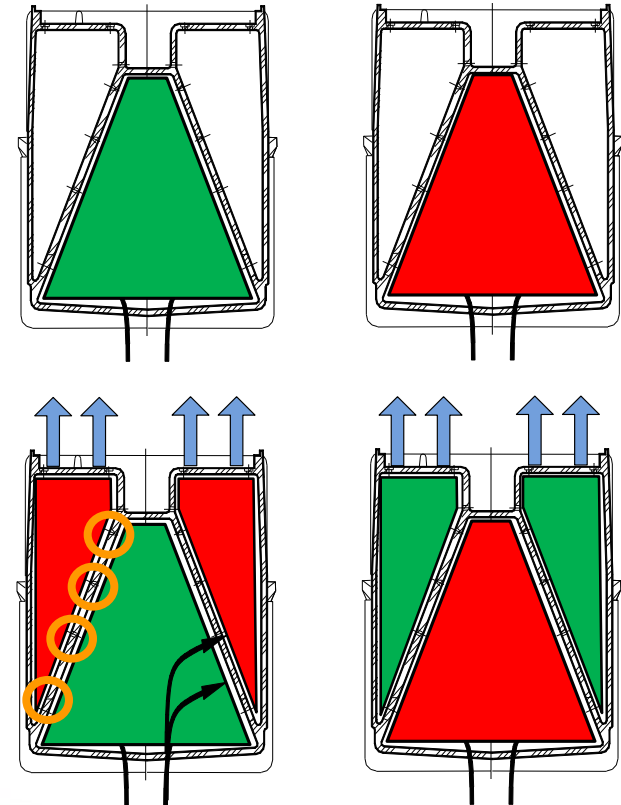
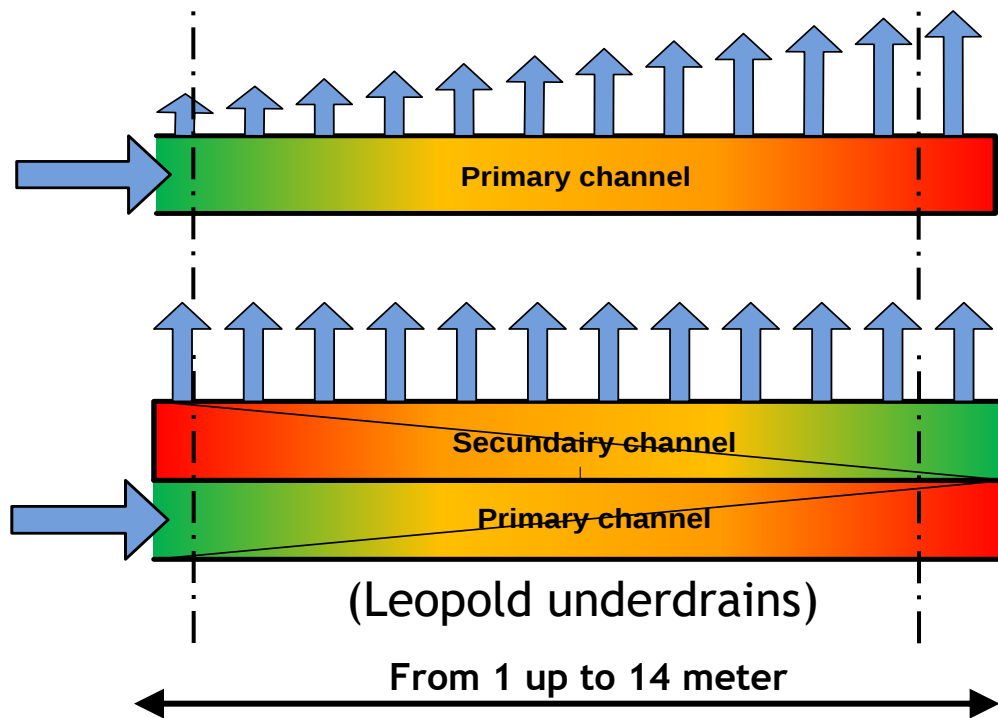
# Leopold underdrain filtration system



# Leopold underdrain filtration system

## Dual parallel underdrain:

With the use of two channels connected together a opposite effect will be created of the situation shown before.



# Leopold underdrain filtration system

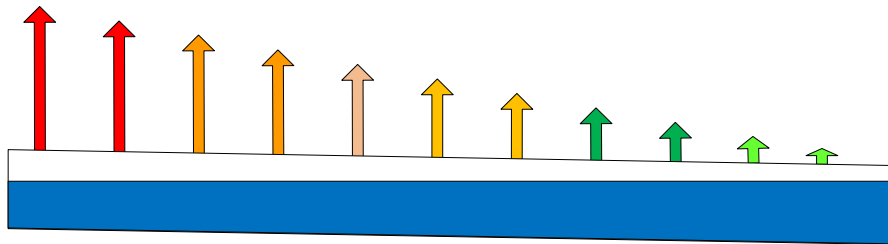


# Leopold underdrain filtration system

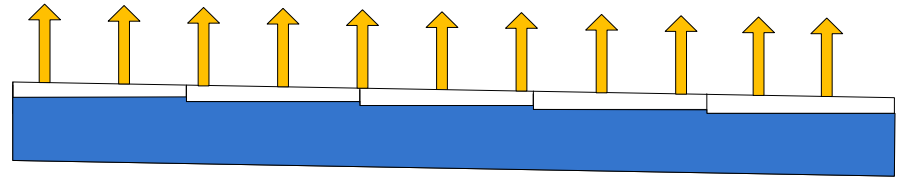
## Internal baffles:

Once the underdrain is connected and installed separate segments are created for a better distribution of air.

- Correct installation tolerances
- Absorb air movements in underdrain lateral



Wrong



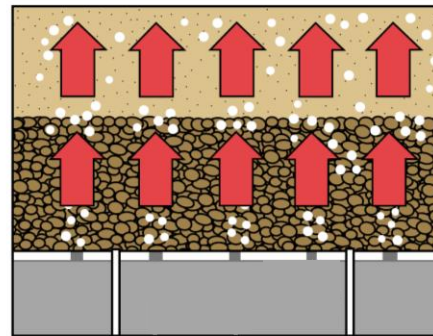
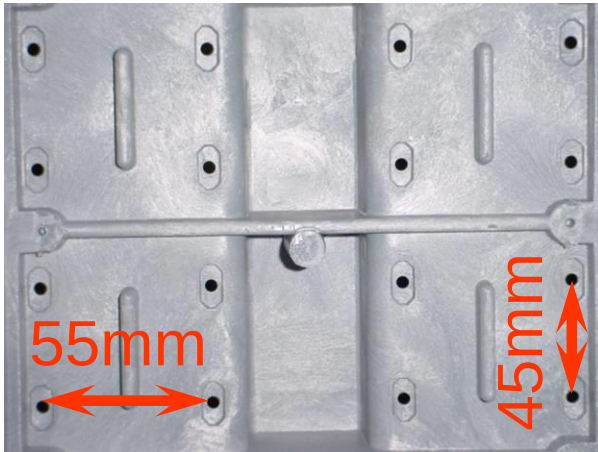
Right



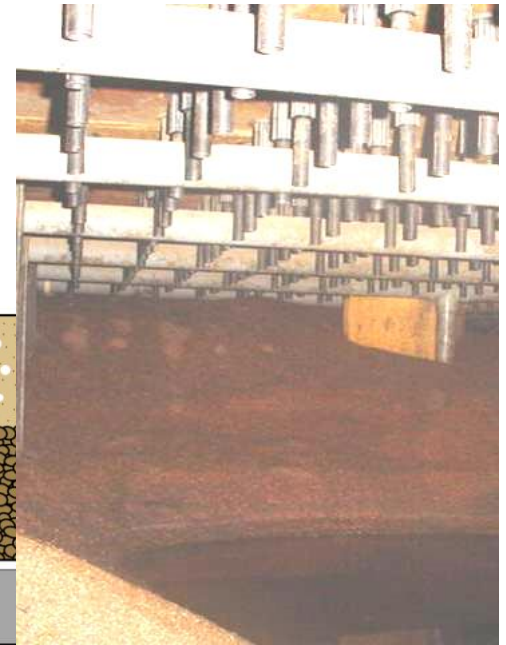
# Leopold underdrain filtration system

## The underdrain top surface

- Orifices 5,5mm in diameter
- 248 orifices per m<sup>2</sup>
- Center to center not more than 55mm
- Block coverage is 90% of total filter area
- No items which can break



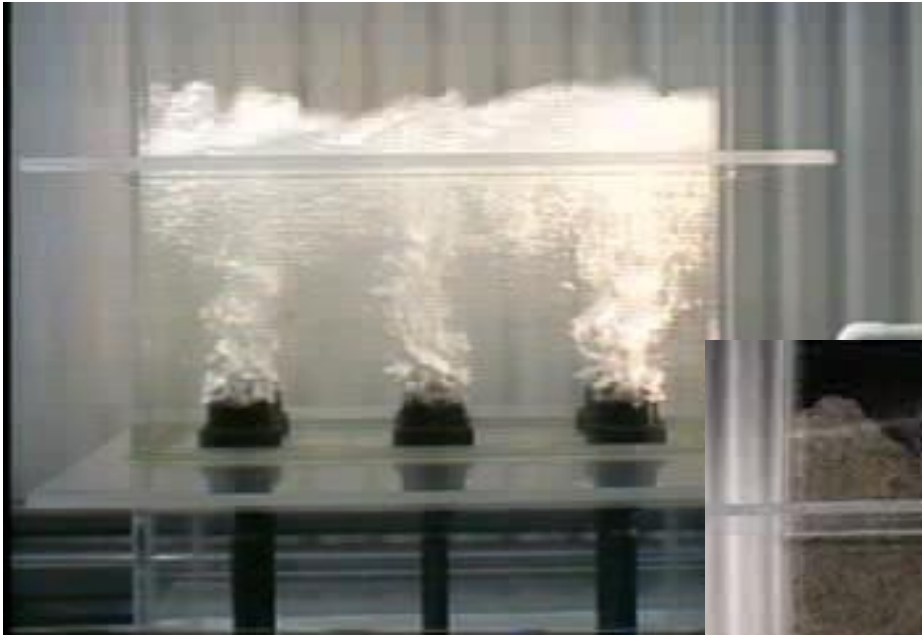
Leopold type S and SL  
underdrain system



Alternative backwash  
system

# Leopold underdrain filtration system

## Nozzles



Nozzles with media



# Leopold underdrain filtration system

## Leopold underdrain lateral



# Leopold underdrain filtration system

## IMS Cap or Support gravel?

A barrier between the media and the underdrain is required, there are two options: support gravel or an Intergraded media support cap.

### Support gravel

- Different silica gravel layers
- For potable water
- For waste water
- For desal pre treatment
- Maximum 375mm in height



### IMS cap

- Sintered PE beads.
- For potable water s
- For desal pre treatment
- More freeboard (+275mm)
- Corrosion resistant



# Leopold underdrain filtration systems

Because there is no false floor required height can be saved in the filtration system, this will allow for:

- Better hydraulic plant profile
- None complex civil structure (reduce cost)
- Energy friendly design\*

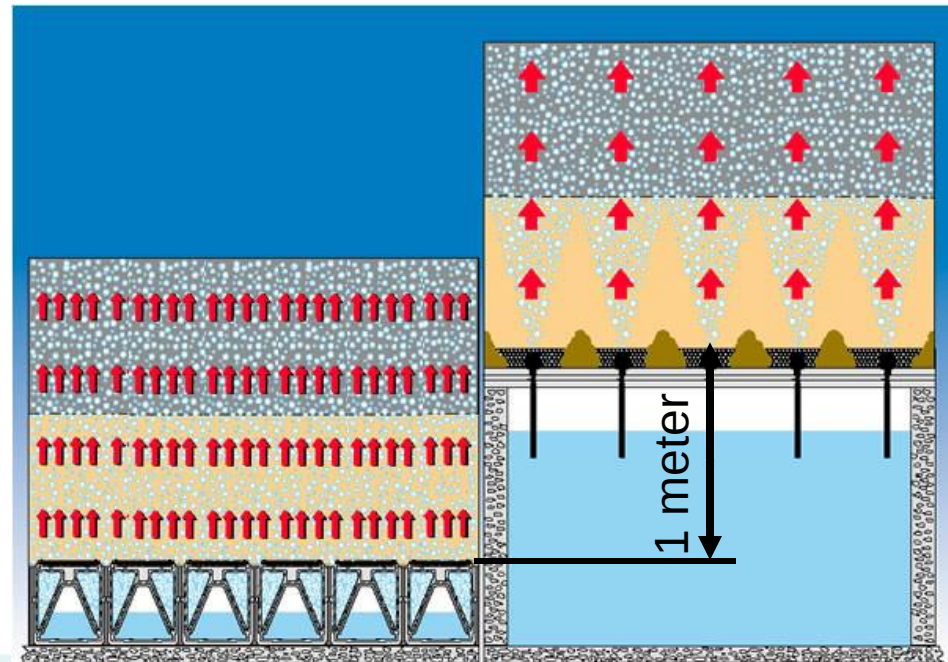
## \*Example:

Plant flow: 1250m<sup>3</sup>/hr  
KWh price: \$0,3125 KWh  
Life time: 10 years

Leopold design: 30KW  
Conventional: 40KW

Saving in 10 years: **\$27.300 USD**

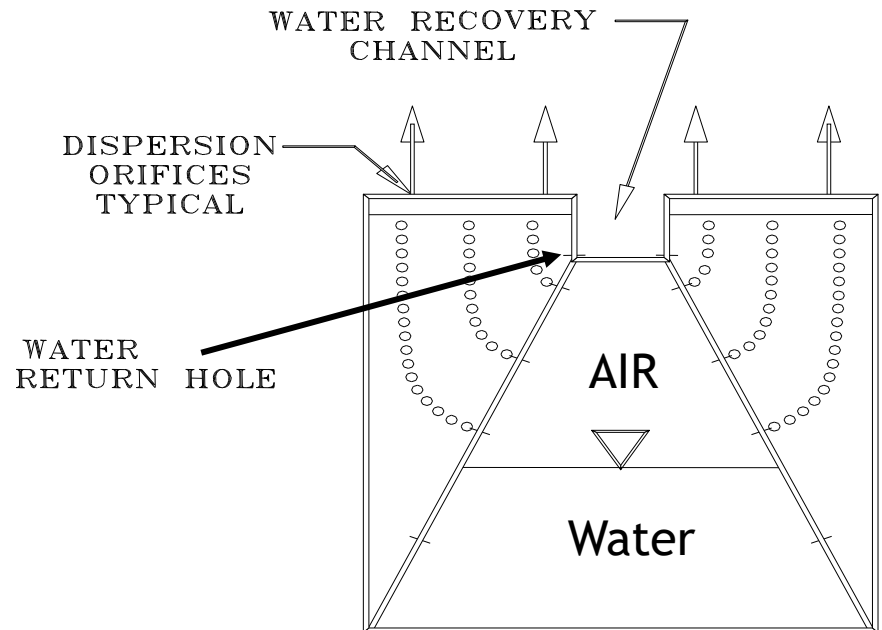
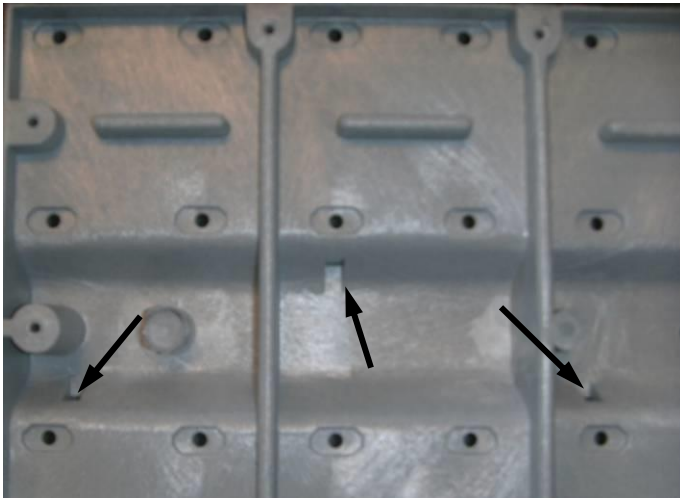
***Win of 25% PER PUMP***



# Leopold underdrain filtration system

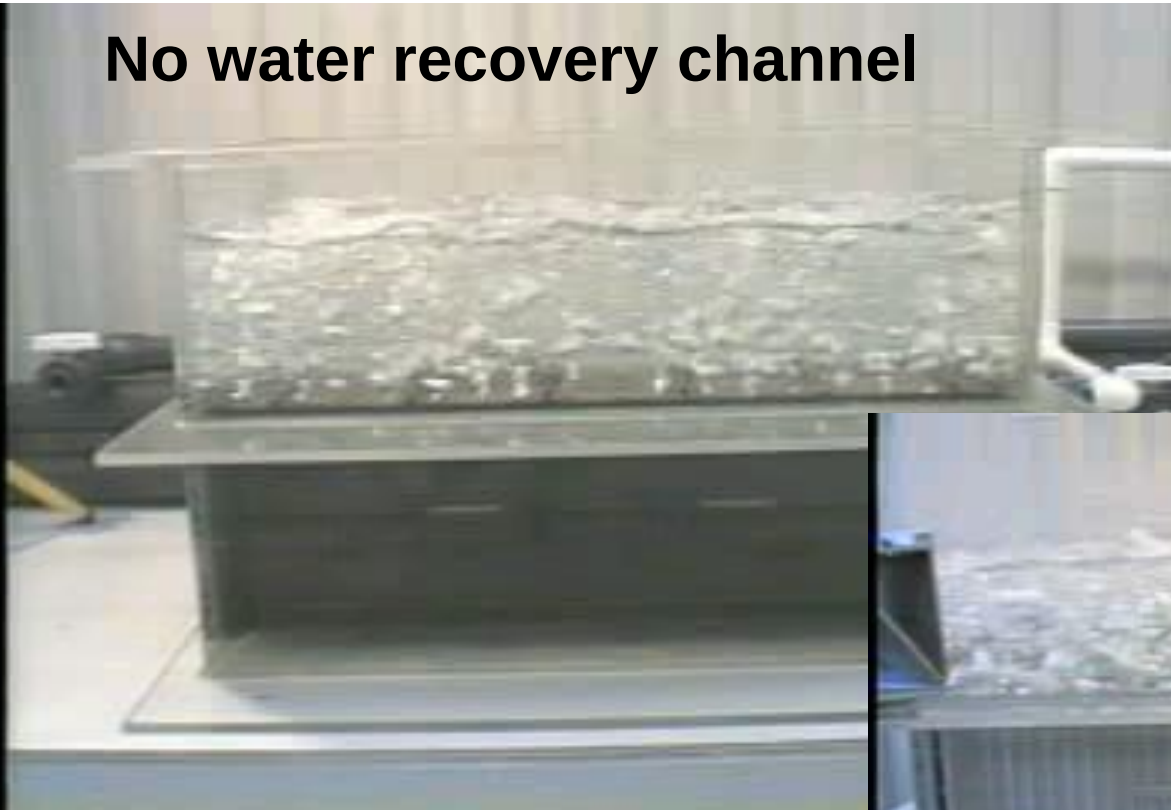
## Water recovery channel:

By the use of the water return holes is an even distribution of air established.



# Leopold underdrain filtration system

**No water recovery channel**



No other underdrain block except Leopold has an water recovery channel to improve air distribution.



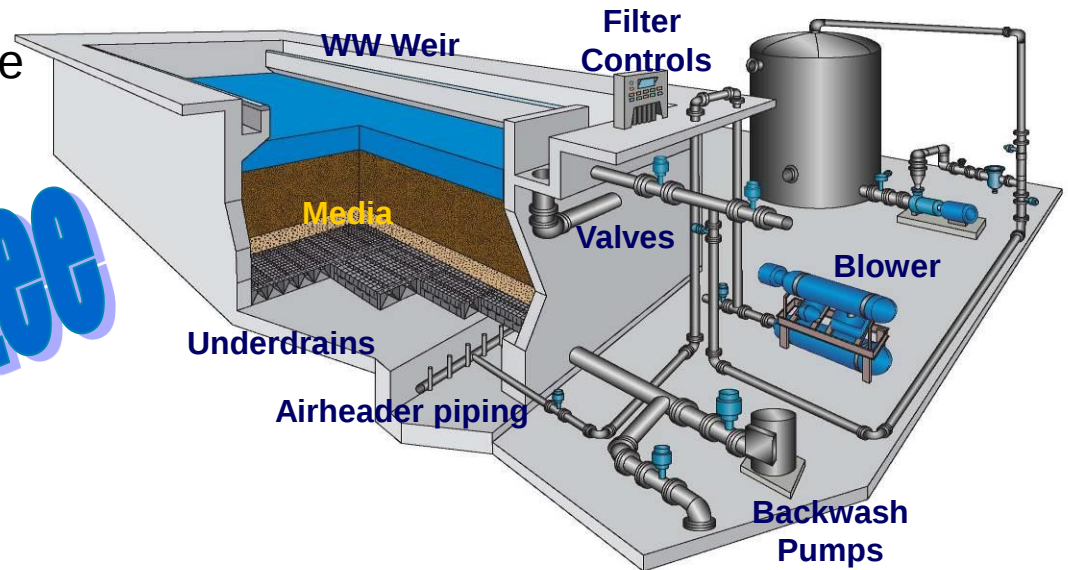
**Water recovery channel**

# Design and installation

## What does Leopold offers more?

We are **NOT** only a underdrain block supplier, the strength of a well designed filtration system is the **engineering** of it.

- System integration
- Media selection
- Valves and piping
- Filter controls
- Coagulation/ chem. dosage
- Underdrain floor design



**Process guarantee**

# Design and installation

## What does this exactly imply?

### System integration:

- Pretreatment → **Leopold** → Post treatment
- How to design the filters in the hydraulic profile of the plant
- System headloss calculations
- Pump design
  - Backwash pumps
  - Influent pumps
- Piping/channel design combined with valve sizing
- Media selection
  - Waste water                      coarse media
  - Potable water                    mono/dual media
  - Desalination                      Dual media



# Design and installation

What does this exactly imply?

## Media selection:

|                 | Potable water | Waste water                                                                                                                           |             |
|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Design:</b>  | Dual media    | Mono media                                                                                                                            | <i>Dual</i> |
| Effective size: | 0,5-1,15mm    | 1,7-3.0mm                                                                                                                             | 0,6-2.0mm   |
| Media depth:    | 700mm         | 1800mm                                                                                                                                | 1200mm      |
| L/D ratio       | >1100         | >900                                                                                                                                  | >900        |
| Water rate:     | ±50m/hr       | 20m/hr                                                                                                                                | 50m/hr      |
| Air rate:       | 60m/hr        | 90m/hr                                                                                                                                | 60m/hr      |
| Comments:       | --            | <ul style="list-style-type: none"><li>- High solids capture rate</li><li>- Effluent TSS 5mg/l</li><li>- Low backwash energy</li></ul> |             |

# Design and installation

## How to control the filters:

### Control system:

- Filter control panels
- Application/design/software engineering
- PLC based touch screen integration
- Full time field service representatives

### Plant control and monitoring

- PLC and computer networks
- Computer operator interface terminals
- Report generation
- Optimize performance
- Reduce operating cost

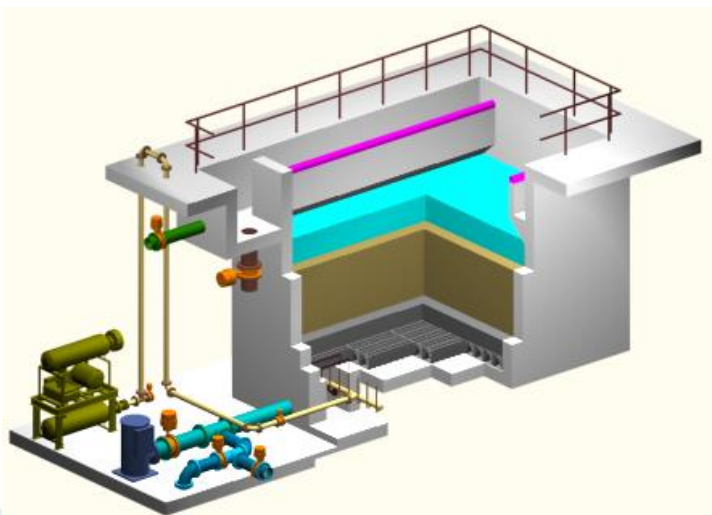
**More than 80 years of experience**



# Design and installation

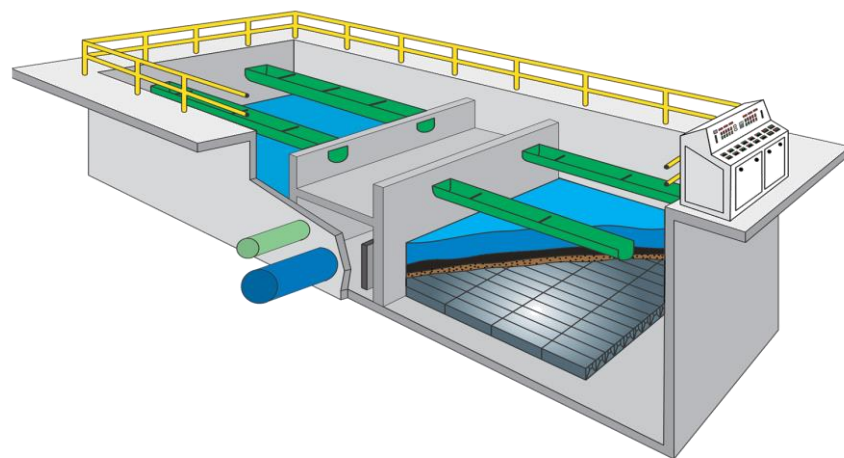
## Front flume filter lay-out:

- Flume on the short side of the filter
- Water and air introduction from underneath
- Long small filters
- Suitable for type S and SL
- Plain civil design



## Flat bottom flume filter lay-out:

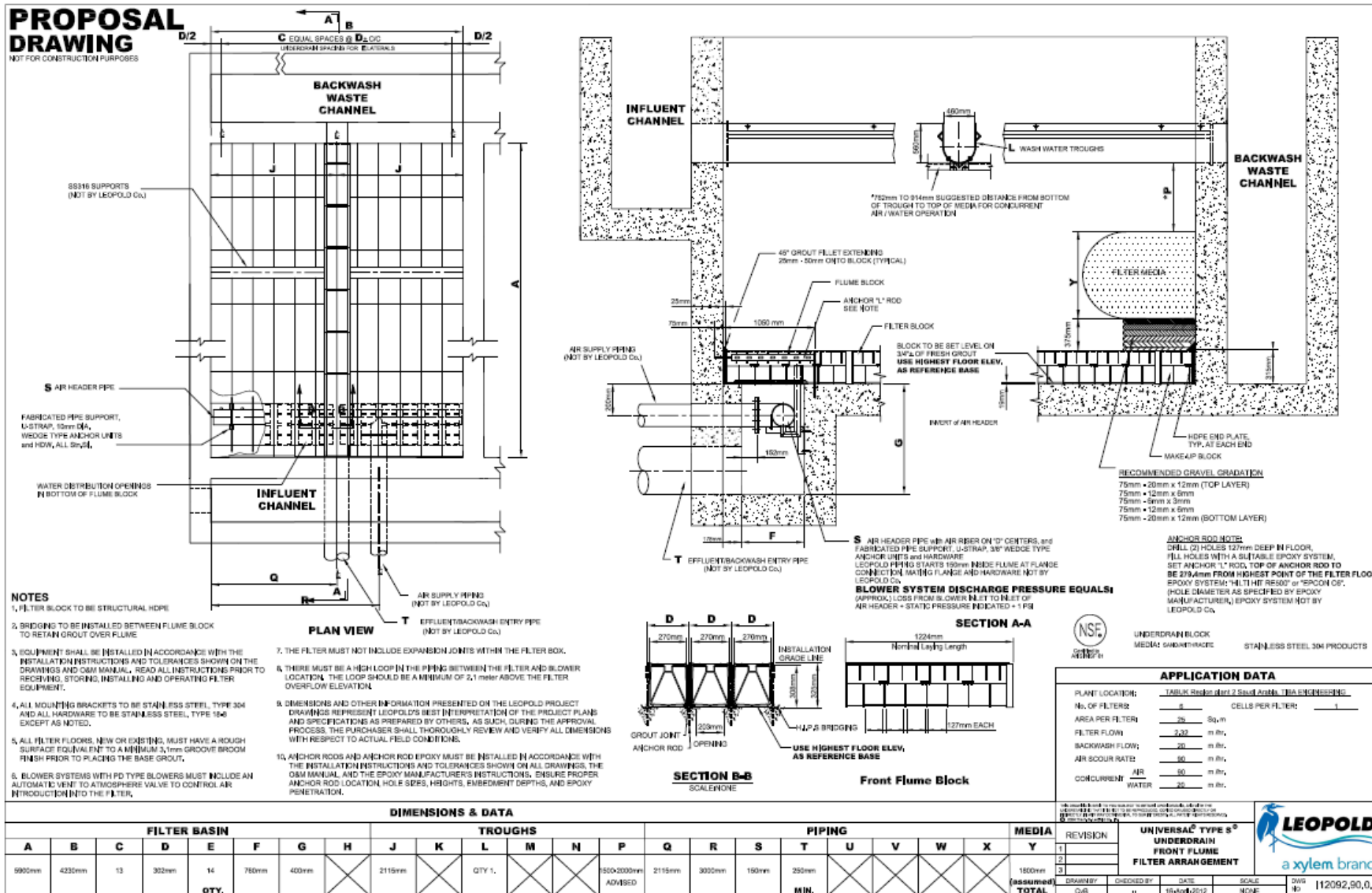
- Flume on the long side of the filter
- No excavation needed
- Suitable for large filter
- Suitable for type S and SL
- Great design for salt water applications.



# Design and Installation

## PROPOSAL DRAWING

NOT FOR CONSTRUCTION PURPOSES



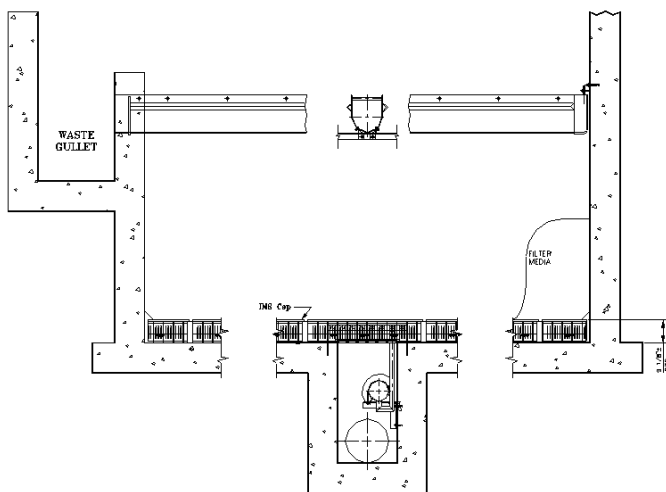
## 36



# Design and installation

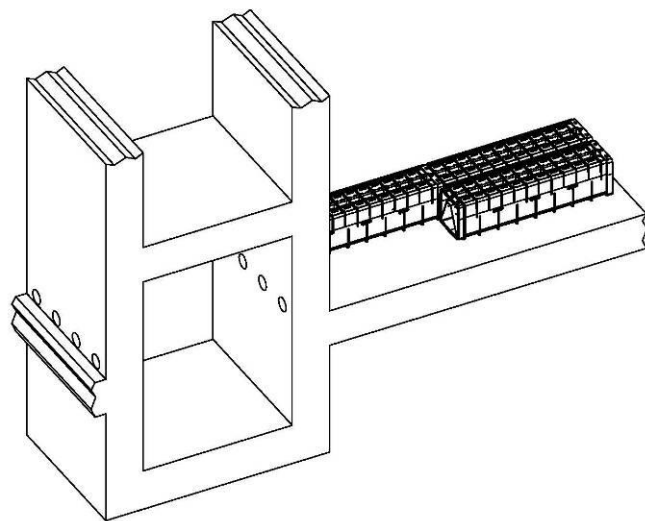
## Center flume filter lay-out:

- Flume in the middle of the filter
- Water and air introduction from underneath
- (very) Long narrow filters
- Suitable for type S and SL
- Often used for filter rehabilitations



## H-flume filter lay-out:

- Flume on the long side of the filter
- Better in footprint than a Flat bottom flume filter
- Suitable for large filters
- Suitable for type S and SL
- Great design for salt water applications.



## 38



8. DIMENSIONS AND OTHER INFORMATION PRESENTED ON THE LEOPOLD PROJECT DRAWINGS REPRESENT LEOPOLD'S BEST INTERPRETATION OF THE PROJECT PLANS AND SPECIFICATIONS AS PREPARED BY OTHERS, AS SUCH, DURING THE APPROVAL PROCESS, THE PURCHASER SHALL THOROUGHLY REVIEW AND VERIFY ALL DIMENSIONS WITH RESPECT TO ACTUAL FIELD CONDITIONS.

**xylem**  
Let's Solve Water

## 39



## 40



# Design and installation



Paterson Candy  
D Floor – refit

Low air rates of 20  
m/hr available from  
existing blowers

# Design and installation

## Check

Leopold will supervise the installation of the underdrains to guarantee a strong construction that will last the life time of the plant.

## Train

The supervisor is there to train the local personnel in the correct installation method and assembly of the underdrains

## Start!

The supervisor will inspect the delivered equipment and makes sure nothing is missing or damaged before installation to save time during installation.

# Design and installation

## Plant fact's:

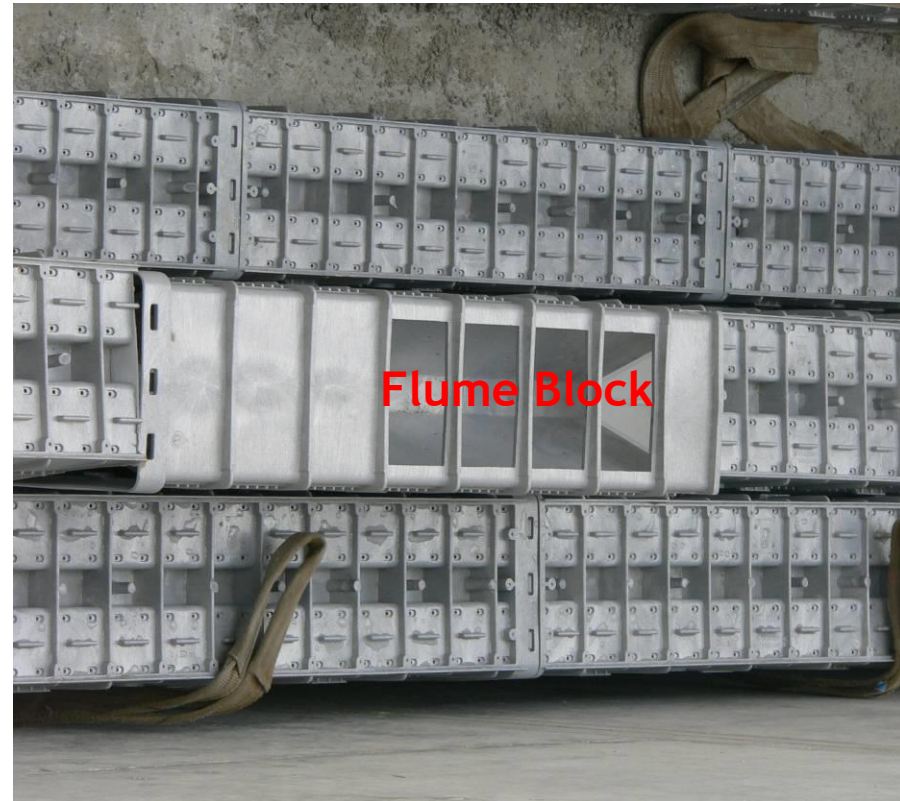
- Plant: Zeist (Holland)
- Type: STP
- Flow:  $1.250\text{m}^3/\text{hr}$
- Loading rate:  $10\text{m}/\text{hr}$
- Cells: 4
- Filter cell area:  $37,5\text{m}^2$
- Design: front flume
- Length: 12.0meter
- Width: 3,12meter
- Media: 1,8meter (coarse)
- Application:
  - TSS removal
  - Phosperus removal  $< 0,15\text{mg}/\text{l}$



# Design and installation



# Design and installation



# Design and installation

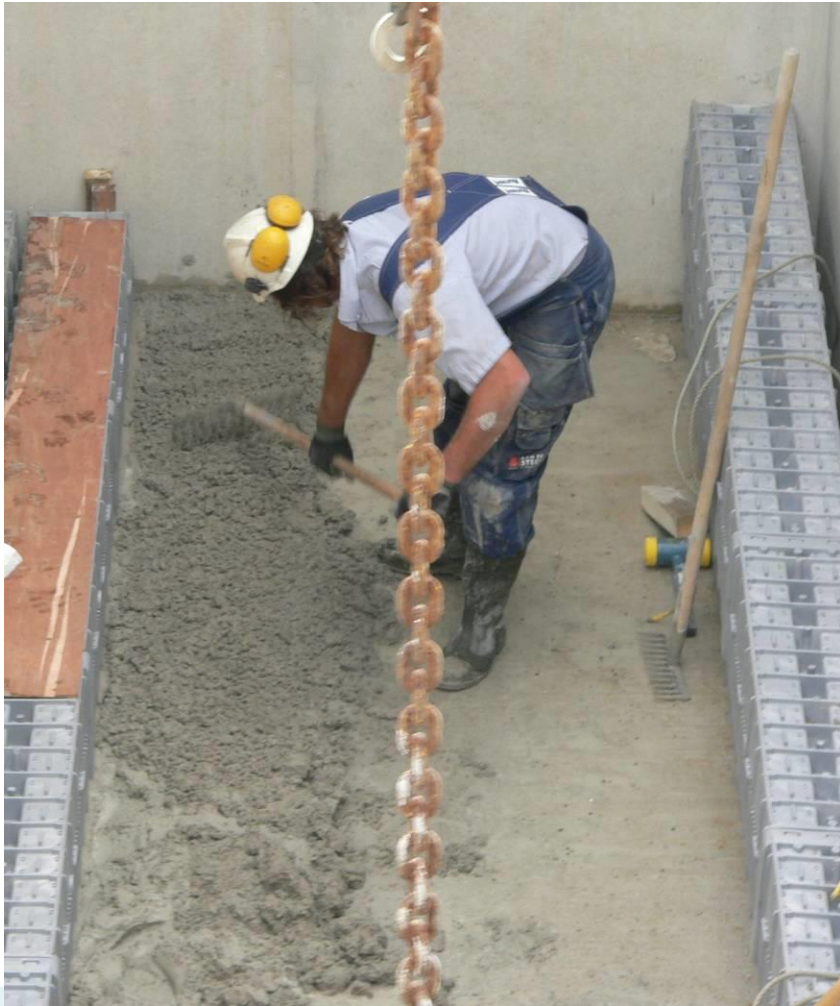


# Design and installation



# Design and installation

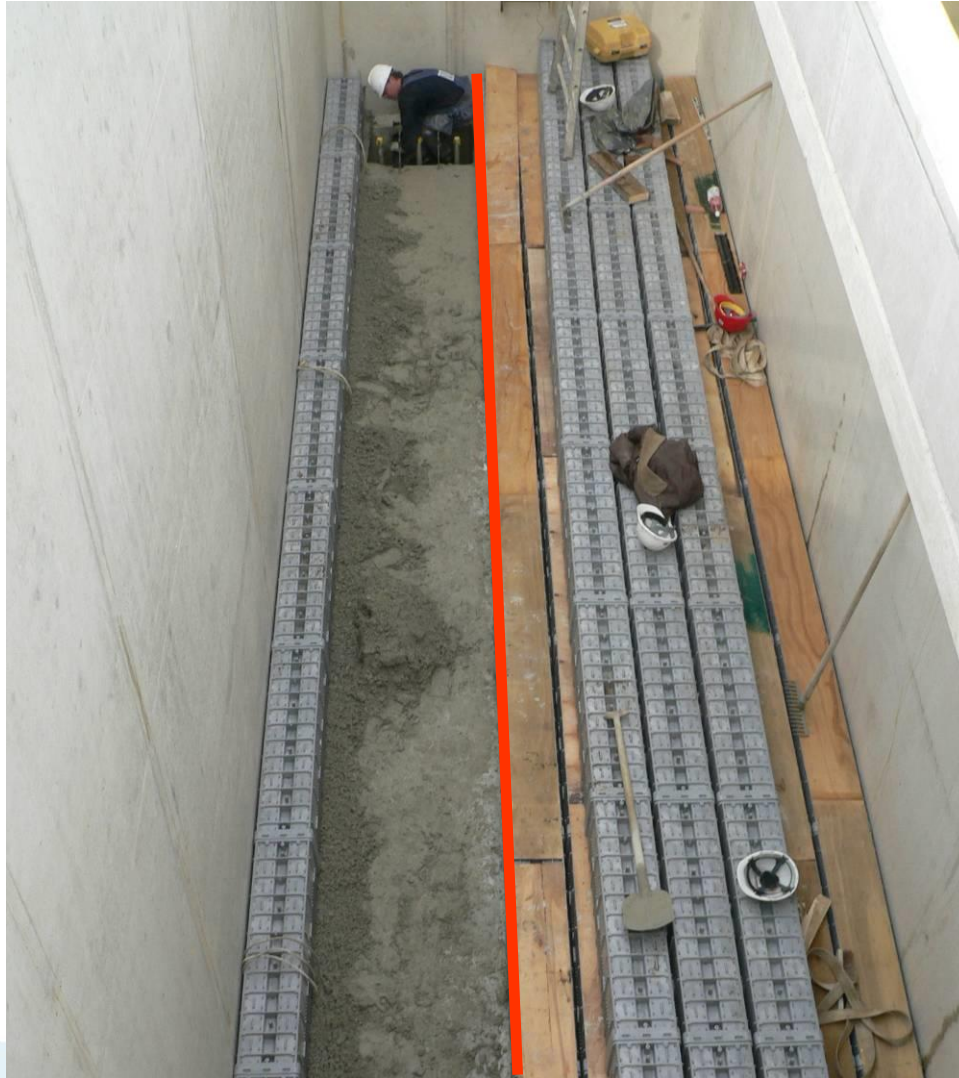
*Installation of underdrains two days included grout curing (4cells)*



# Design and installation



# Design and installation



# Design and installation



# Design and installation

## Visual inspection



# Design and installation

Air scour test with 100mm of water@ 90m/hr air



# Design and installation

Combined air water wash@ 90m/hr air-15m/hr water



# High rate backwash @20m/hr



# Design and installation



# Design and installation



# Design and installation



Ready for operation

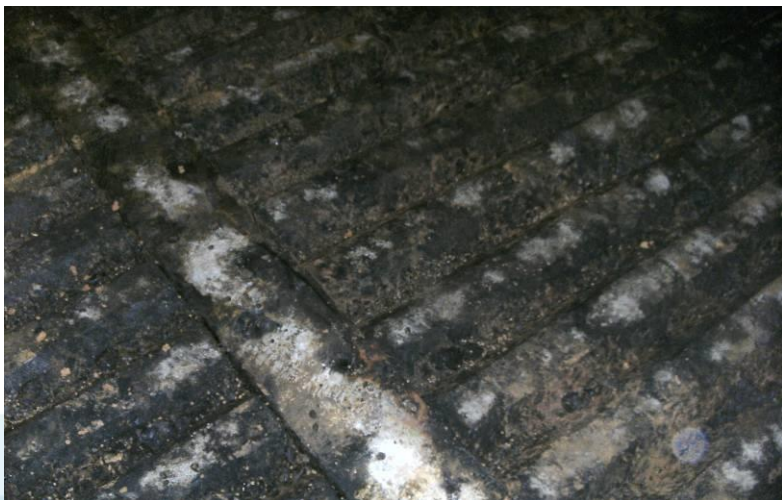
# Examples of projects done

## Woudenberg, The Netherlands (new)



# Examples of projects done

## WTP Onnen, The Netherlands (rehab)



# Examples of projects done

## Ukmerge, Lithuania (Rehab)



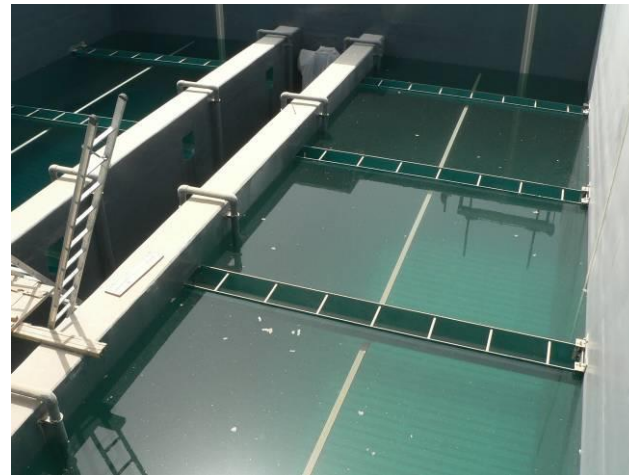
# Examples of projects done

## Ukmerge, Lithuania (Rehab)



# Examples of projects done

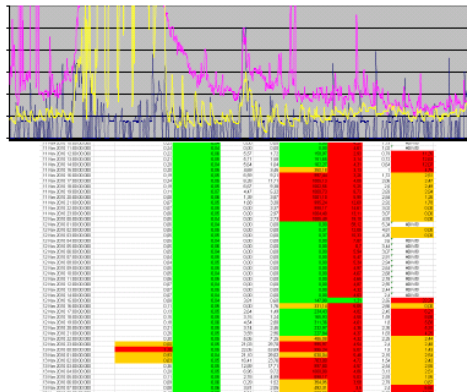
## Jebel Ali, STP (New)



# Examples of projects done

## Bennekom effluent improvement

|                                                                                                                                   |                                          |  |              |    |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--|--------------|----|
| <br>ITT<br>Water and Wastewater<br>Leopold, Inc. | Filter Performance Evaluation            |  | Job Number   |    |
|                                                                                                                                   | Phosphorus Removal Filter<br>Bennekom NL |  | REV.         | 01 |
|                                                                                                                                   |                                          |  | May 9 2011   |    |
|                                                                                                                                   |                                          |  | Page 1 of 17 |    |



Author: Christian van Boxtel  
Reviewer: Ivan Zhu  
Tom Getting

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Fax: (724) 452-1377  
www.FBL Leopold.com

Table 2: Total phosphorus measurements

| Day        | Total P influent | Total P effluent | Total P - "DOP" | Percentage off: |
|------------|------------------|------------------|-----------------|-----------------|
| 2-08-2010  | 0.58             | 0.15             | 0.1             | -50%            |
| 9-08-2010  | 0.42             | 0.14             | 0.09            | -67%            |
| 17-08-2010 | 0.54             | 0.16             | 0.11            | -36%            |
| 24-08-2010 | 0.56             | 0.24             | 0.19            | 21%             |
| 1-09-2010  | 0.98             | 0.14             | 0.09            | -67%            |
| 8-09-2010  | 0.65             | 0.32             | 0.27            | 44%             |
| 16-09-2010 | 0.42             | 0.17             | 0.12            | -25%            |
| 23-09-2010 | 0.30             | 0.15             | 0.1             | -50%            |
| 1-10-2010  | 0.26             | 0.19             | 0.14            | -7%             |
| 8-10-2010  | 0.30             | 0.12             | 0.07            | -114%           |
| 11-10-2010 | 0.31             | 0.11             | 0.06            | -150%           |
| 13-10-2010 | 0.25             | 0.13             | 0.08            | -88%            |
| 16-10-2010 | 0.44             | 0.21             | 0.16            | 6%              |
| 18-10-2010 | X                | 0.14             | 0.09            | -67%            |
| 20-10-2010 | X                | 0.16             | 0.11            | -36%            |
| 23-10-2010 | 0.48             | 0.23             | 0.18            | 17%             |
| 28-10-2010 | X                | 0.09             | 0.04            | -275%           |
| 1-11-2010  | 0.38             | 0.1              | 0.05            | -200%           |
| 2-11-2010  | X                | 0.22             | 0.17            | 12%             |
| 4-11-2010  | X                | 0.15             | 0.1             | -50%            |
| 8-11-2010  | 0.51             | 0.17             | 0.12            | -25%            |
| 16-11-2010 | 0.64             | 0.21             | 0.16            | 6%              |
| 16-12-2010 | X                | 0.35             | 0.30            | 50%             |

Figure 5: MeP and influent flow shown for 15th and 16th October

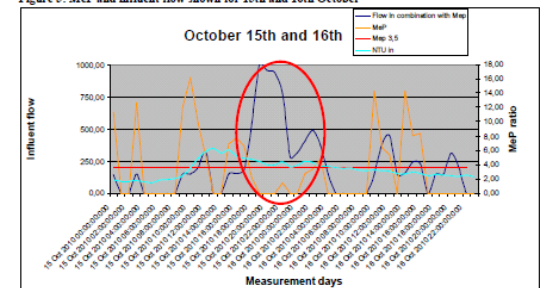
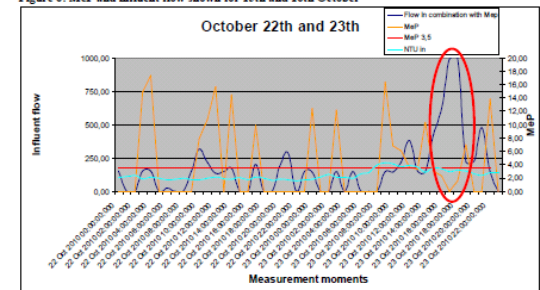


Figure 6: MeP and influent flow shown for 15th and 16th October



# Conclusion

## Why to buy Leopold filtration equipment?

- **We guarantee you the best underdrain design**
  - We are the inventors of the underdrain and we help you to design the best filter for the project
  - More than 85 years of experience to support you.
- **The best equipment for filtration and backwashing**
  - Leopold HDPE underdrain blocks
  - Effective media cleaning to achieve effluent and save on backwashing
- **Reduction of cost in civil design**
  - None complex civil structure
  - Easy and effective installation
- **Install and “forget”**
  - Very low maintenance required

# Thank you for your time



**For questions and support**  
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