Plimmer® - The Next Generation Water Treatment System for Ground and Surface water

IDROPAN-DELL'ORTO
DEPURATORI S.R.L

Milan, Italy

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The Next Generation Water Treatment System for Ground and Surface water

Reduces TDS, Hardness, Metals and Salts to deliver

World Health Organisation (WHO) standard drinking water

- Low Wastage
- No Chemicals
- Low Power

Introduction

- **Plimmer®** is a new generation water treatment system that treats Ground / Surface water to reach drinkable standards
- Based on Capacitive Deionization Technology (CDI) pioneered by Idropan Dell'Orto Depuratori S. r. l. of Italy
- High recovery system that reduces TDS, Hardness, Arsenic, Fluoride, Nitrates and other contaminants in water in a single process
- Delivers drinking water at the lowest operational cost of any water treatment plant in today's market
- Has the lowest waste water rejection (<20%) compared to other conventional technologies in today's market
- Totally Green Technology – uses no chemicals during water treatment. Ensures an environmentally safe discharge process

The Unique Plimmer® Advantage

- **Plimmer® is the market leader in CDI technology**
  - Has been in Operation since **2005**
  - Over **400** installations globally
  - Partners in Europe, USA, India, Australia, Saudi, Tunisia, Korea, Russia
- **Pioneered by Idropan Dell'Orto Depuratori S. r. l. of Italy – a technology leader in CDI**
  - Over **40 years** of experience in Water technologies
  - Global patents - related to power consumption, design & construction of Electrodes, cleaning of electrodes, electronic control of CDI units, & flow management in Electrodes
- **Clever control systems that ensure the minimum possible interference from Users**
  - Automatic working of plant
  - GPRS interface for remote management
  - Web interface for governance

Plimmer® Delivers Value

Easy Implementation

Simple to deploy using local resources

Low Wastage

Results in better Ground / Surface water sustenance

Simple to Operate

Requires no specialized skill to operate plant

No Chemicals

Environmentally safe - does not contaminate ground water

Low Power Use

Can use solar or alternate power in remote locations

Small Footprint

Can be deployed in small places like schools, medical centers community centers etc.

In a single pass, Plimmer® removes ……

SALTS	METALS	OTHERS
• Total Dissolved Solids • Total Hardness • Calcium Carbonate • Magnesium Carbonate • Sodium Chloride • Phosphates • Sulphates • Chlorides • Nitrates • Fluoride ...	• Chrome • Iron • Arsenic • Nickel • Copper • Zinc • Cadmium • Mercury • Manganese • Lead • Vanadium	• Ammonia • Chromium 6 ...

A single system to treat multiple contaminants in water

Plimmer® is different!

Conventional RO Systems	Plimmer®
1. 60% of water is wasted during a RO treatment process. This reduces a ground water source quickly. Most systems need to be shut down in summer	**Plimmer®** has a maximum of 20% wastage during the treatment process. Can be reduced further based on water conditions
2. RO does not retain adequate levels of minerals required for human health. RO takes out all minerals from water	**Plimmer® r**etains adequate minerals required for human health. Water is delivered to WHO standards
3. RO systems need high power input for efficient treatment	**Plimmer®** is a low power input technology, easy to use, and can use alternate energy sources in power-scarce locations
4. RO requires frequent use of chemicals for cleaning RO membranes.	**Plimmer®** uses diluted citric acid – a simple and safe organic acid - for cleaning. Environmentally safe waste water discharge
5. RO requires skilled operators to manage systems effectively	**Plimmer®** is fully-automated to ensure a minimum possible input requirement on operators

Why the Operating Cost for Plimmer® is low

- **Plimmer® needs very few consumables for operation**
  - Citric acid for cleaning cells regularly
  - Sand media change (if installed) once a year
  - Carbon media change (if installed) once a year
  - 25 Micron cartridge filter replacement once every 2 months
- **Plimmer® consumes little power**
  - Single Phase 0.5 hp pump
- **Plimmer® requires low maintenance and little user input**
  - Cells will run for 8-10 years without replacement
  - Pro-active maintenance done to clean cells regularly like extra acid wash, bio-cleaning etc.
  - **Plimmer®** requires no specialised skills to operate and manage – fully automated with touch pad controls

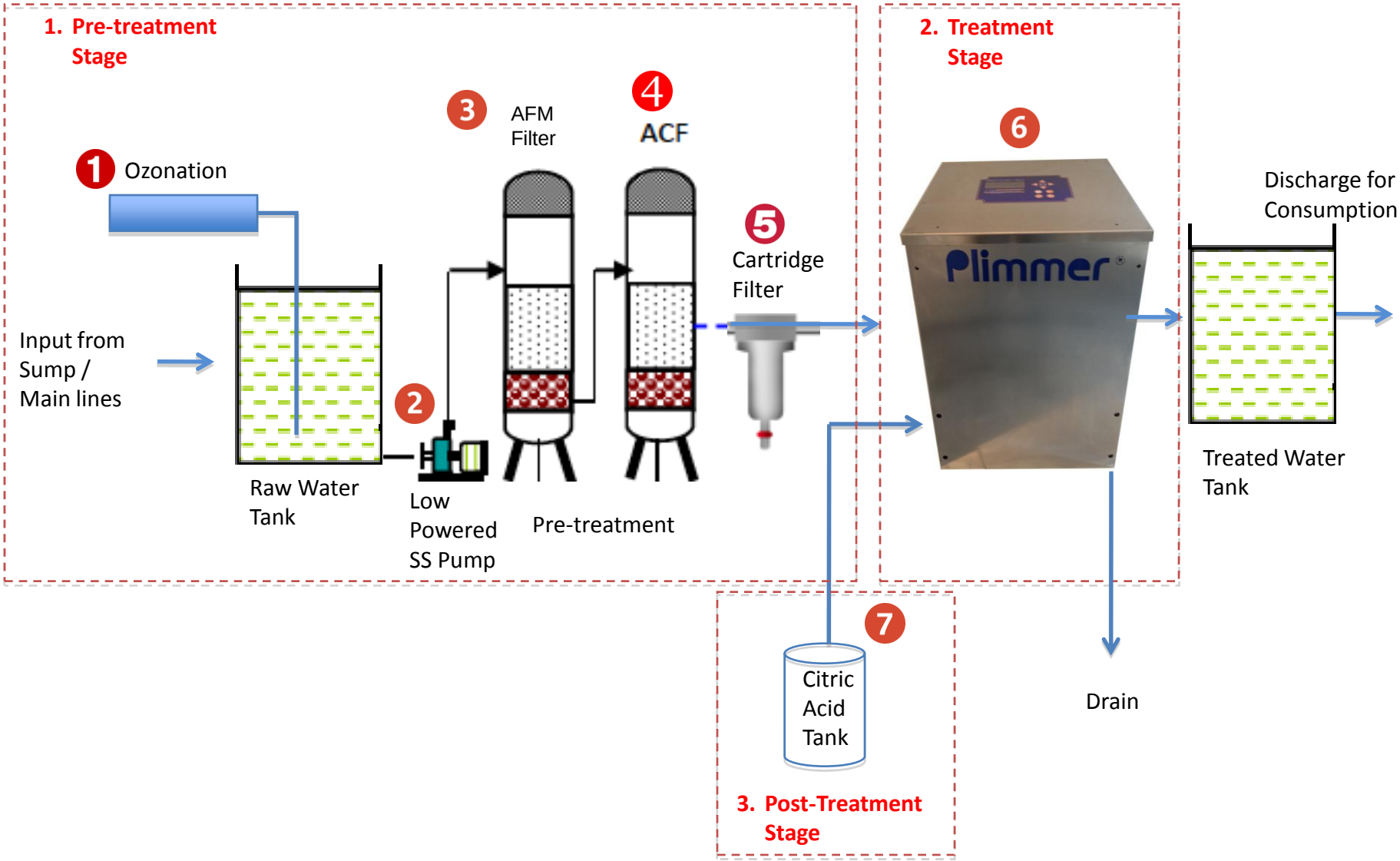
Description	Unit	Plimmer
Capacities		
Maximum Input conductivity	µSiemens	2000
Maximum Input Hardness	ppm	500
Average Salt reduction		65-70%
Temperature range	° C	4 - 45

The Best Applications for Plimmer®

- **As a drinking water solution**
  - For rural and urban areas
  - In Government-owned health centres
  - In Government schools & community centres
- **Point of Entry (POE) water treatment in residential developments**
  - Delivers treated water in ALL taps at home
  - Better water conservation
- **Hotels & Malls**
  - Laundry & Kitchen water supply in hotels
  - Food courts and public drinking water supply in malls
- **Industries**
  - Food, beverage and pharmaceutical manufacturing
  - Bottling plants

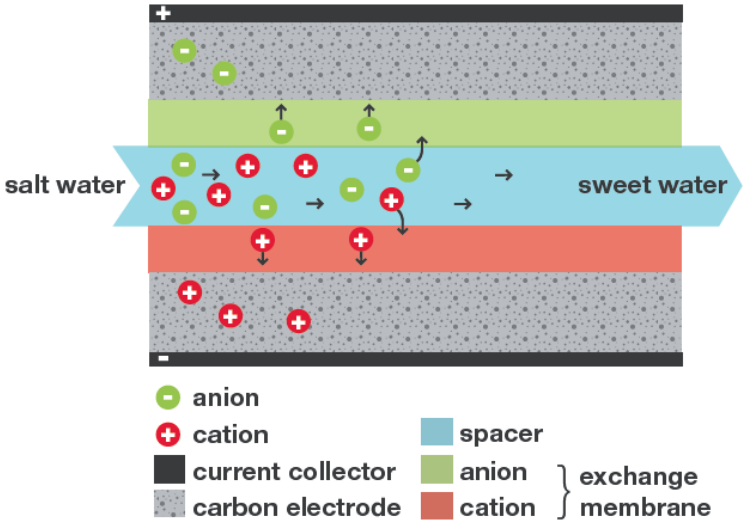
How Plimmer® Works

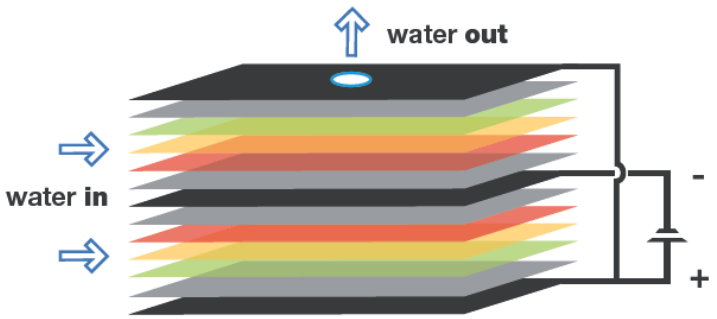
Overall Plimmer® System Operation



Plimmer® Technology

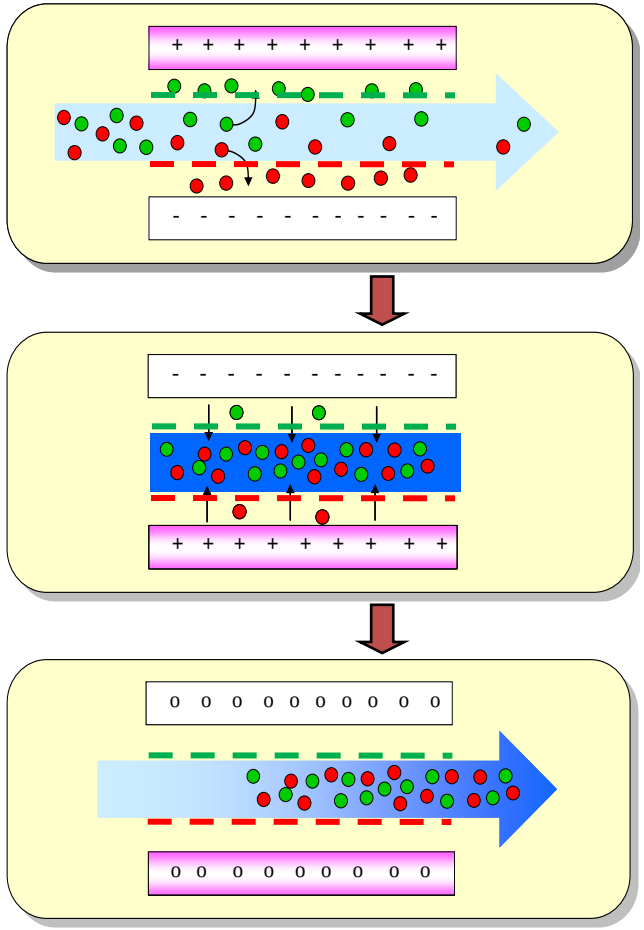
- The technology used is called Capacitive Deionization (CDI)
- This is a non-membrane technology where the ions in solution are attracted to a pair of electrodes as water flows through the **Plimmer®** cell
  - requires very low pressure – resulting in low power consumption
  - reduces water wastage since water is not pushed through a membrane under high pressure
- **Plimmer®** has 12 patents covering the number of electrodes, the coating on electrodes and the electronics required to handle the process
- No chemicals required for treating water
- Electrodes require just 1.6 V charge to operate – providing an option to run on alternate energy sources





Plimmer® Operational Cycle

Purification cycle → 3 main steps



Step 1
Ion removal

When water passes between the electrodes, ions are attracted to the oppositely-charged electrodes. The output water with these salts and metals removed exits the system

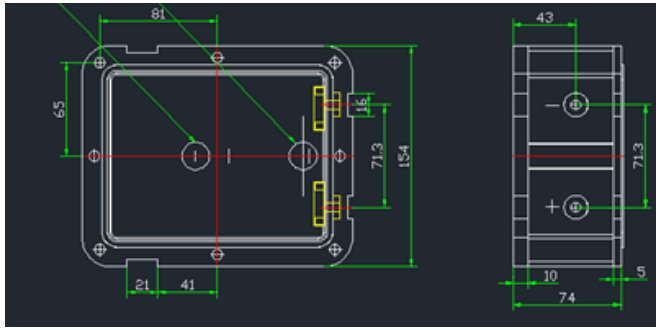
Step 2
Regeneration

As more and more ions are attracted to the electrodes, the electrodes become saturated. At this point, **Plimmer®** automatically stops the input flow, reverses the electrode polarity and discharges the adsorbed ions back into the cell

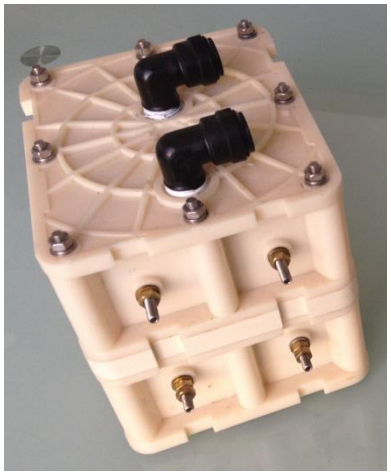
Step 3
Flush

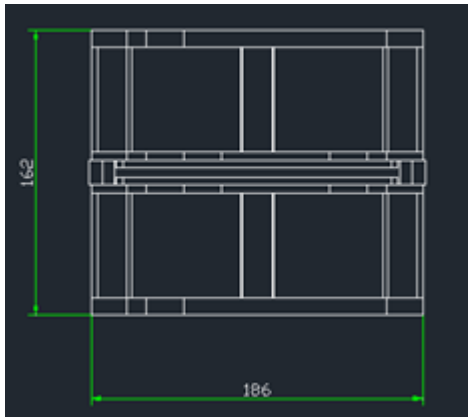
The cell is then flushed and the ions trapped in the cell are sent to waste. **Plimmer®** then re-establishes the original electrode polarity and the ion removal process (Step 1) starts again

Characteristics of Plimmer® Cells



Model 2.5M
Flow rate 1.65 – 2.5 LPM (Service)
Productivity 50-75 LPH
Removal rate 65-85%



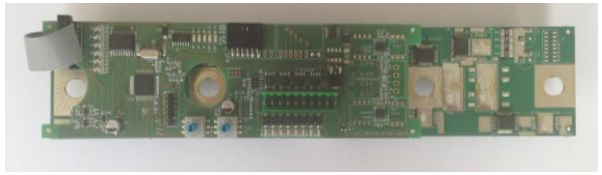


Model 5M
Flow rate 3.3 – 5 LPM (Service)
Productivity 100-150 LPH
Removal rate 65-85%

Evolution of the power supply boards

The first **Plimmer®** systems used copper bars and lacked short circuit protection

Today's **Plimmer®** systems are cheaper and have hardware short circuit protection

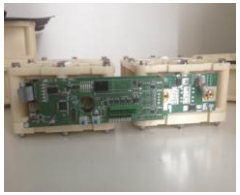


AL7

Needs water cooling and aluminium case

AL10

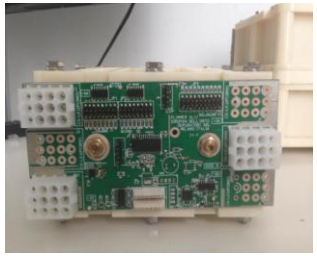
Directly mounted on the cell. Sophisticated componentry, designed to work on a cell pair



AL11

Directly mounted on the cell.

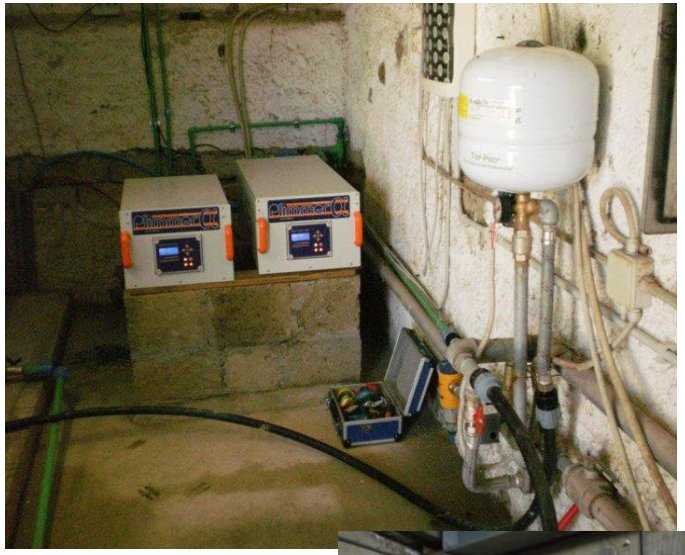
Sophisticated componentry, designed to work on a single cell



Installations in 2009

Examples

Installations in 2010



Installations in 2011

Installations 2012

Installations 2013

Plimmer® Post-process Treatment – Citric Acid Cleaning

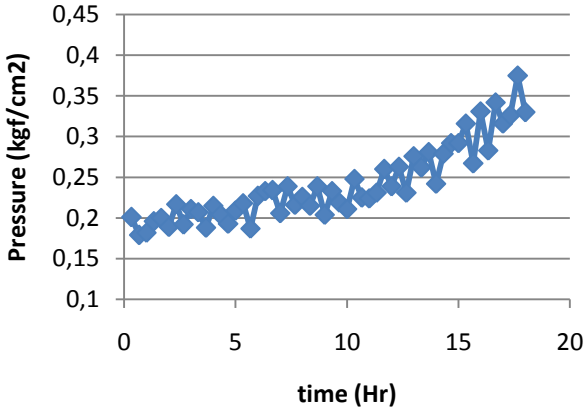
- **The Plimmer® process for cleaning cells**
  - This is a patented process for pro-actively cleaning cells to avoid excess calcium build-up in cells
  - This is done automatically at end of every production cycle
  - **Plimmer®** can set production cycles to 5 / 10 / 20 hours with rest period of 1 / 2/ 4 hours
  - At the start of a rest period, **Plimmer®** automatically takes in a small quantity of citric acid solution to clean cells. This will be flushed out at the start of a production cycle
  - Citric acid is environmentally friendly – a simple organic acid with no discharge hazards
  - This process ensures electrodes have a long life
  - Solution can be prepared locally at the Regional Support Centre

Plimmer® Post-process Treatment – Citric Acid Cleaning

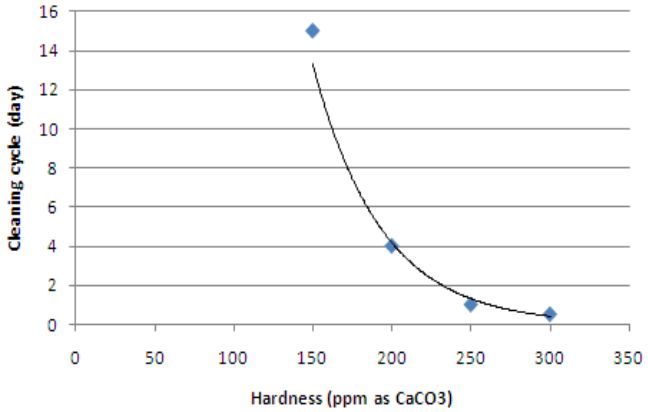
Tests were performed on the long-term efficiency of daily “self-maintenance” with the special maintenance solution produced by Idropan

In normal work WITHOUT the use of citric acid the pressure drop (fouling index) increases rapidly during the work period

From tests carried out there is a precise relationship between Temporary Hardness and the effect on efficiency of fouling of the cell.



Fouling Index



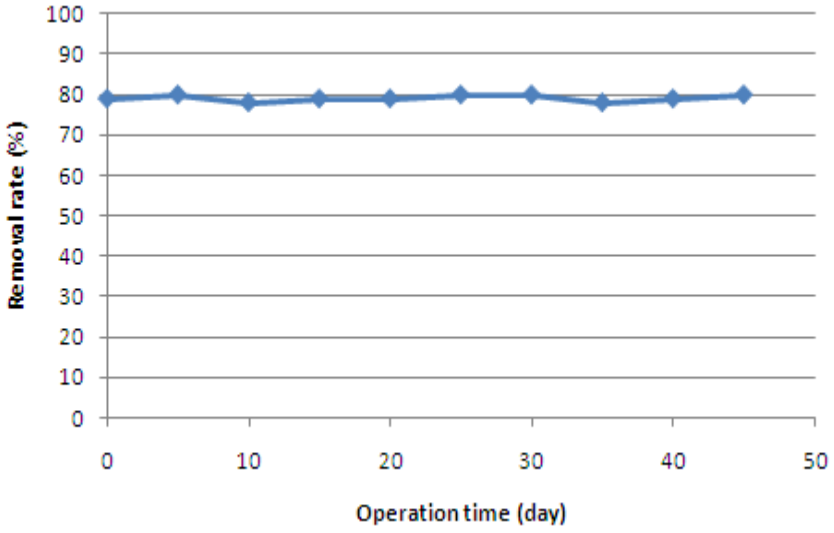
Days before cell cleaning WITHOUT Self maintenance

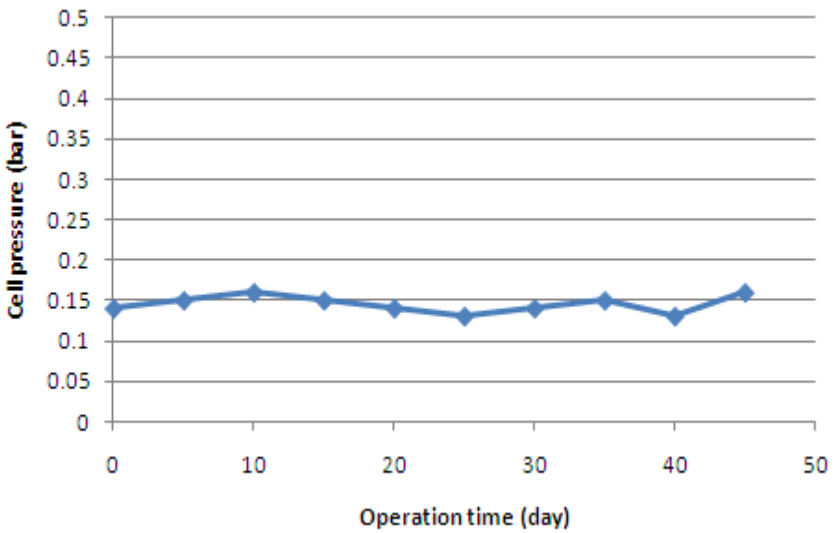
Test conditions recommended by European legislation :

Inlet water: Hardness300 ~ 340 ppm, TDS 450 ~ 500 ppm, IEC60734

Plimmer® Post-process Treatment – Citric Acid Cleaning

- In contrast, the following values of long-term performances were obtained with daily cleaning using Idropan citric acid solution
- The recommended maintenance procedure ensured long term stable operation, constant salt removal rate & consistent cell pressure

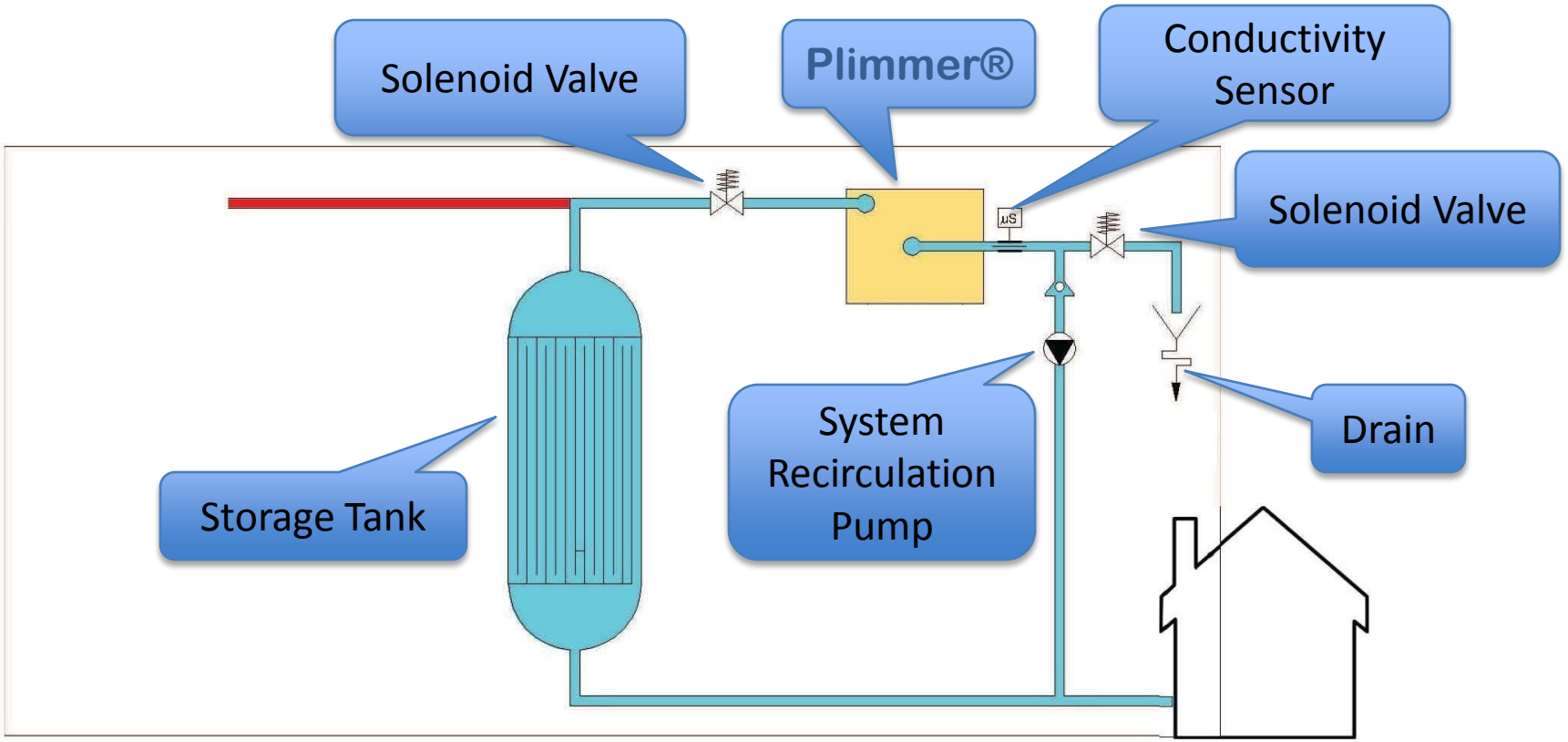




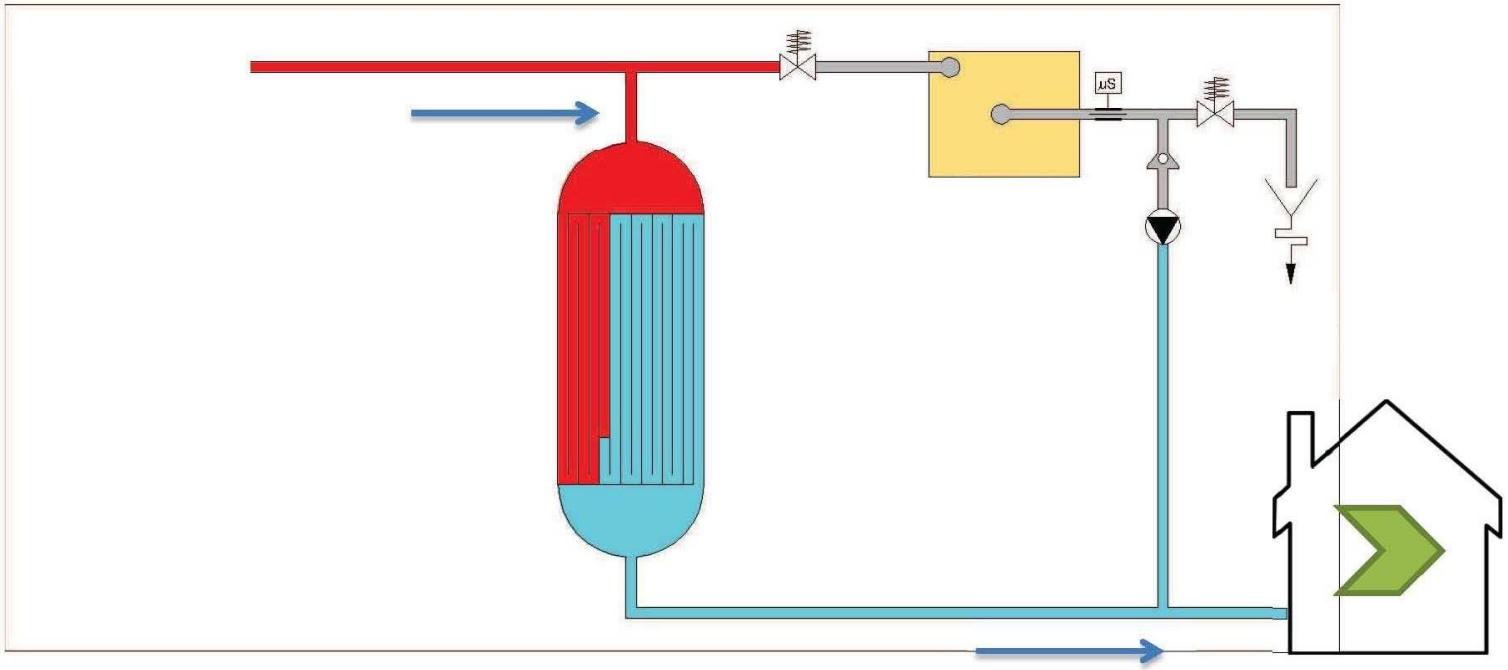
Plimmer® Saltless CDI Water Softener

The Concept

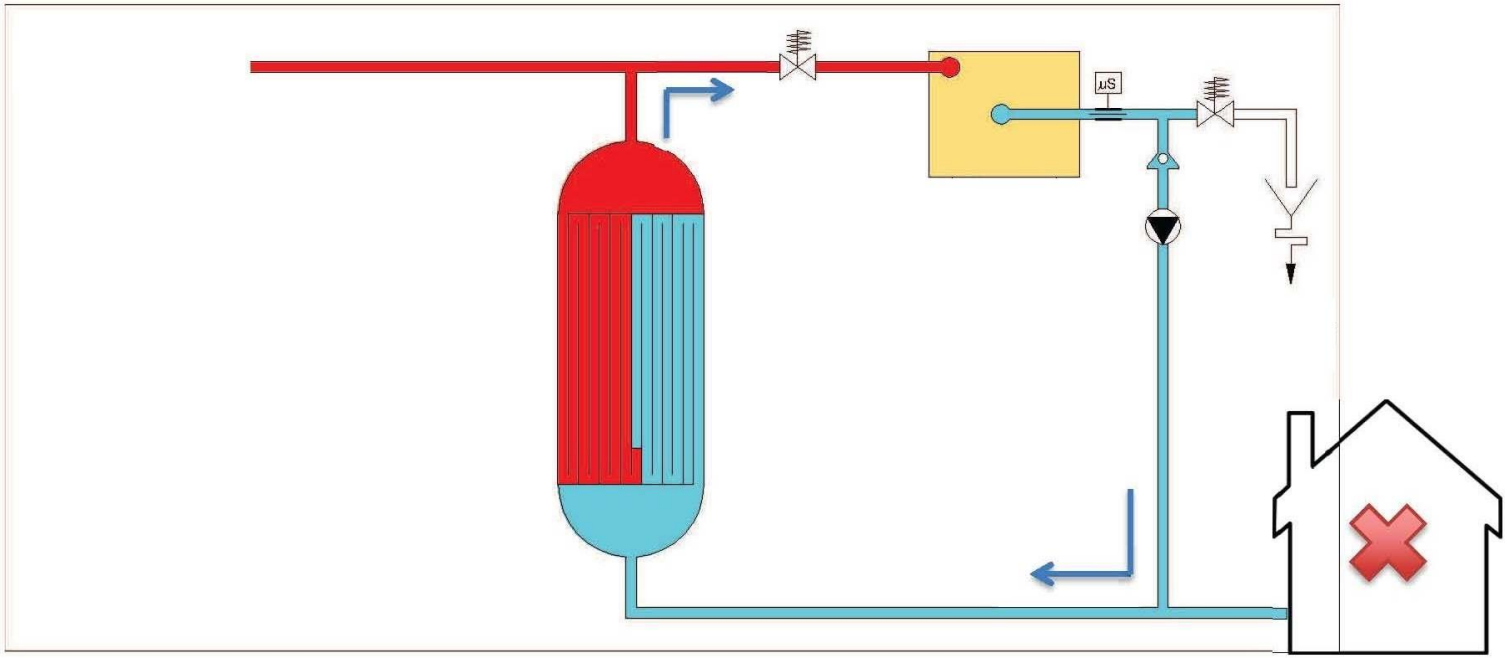
At the beginning of the day



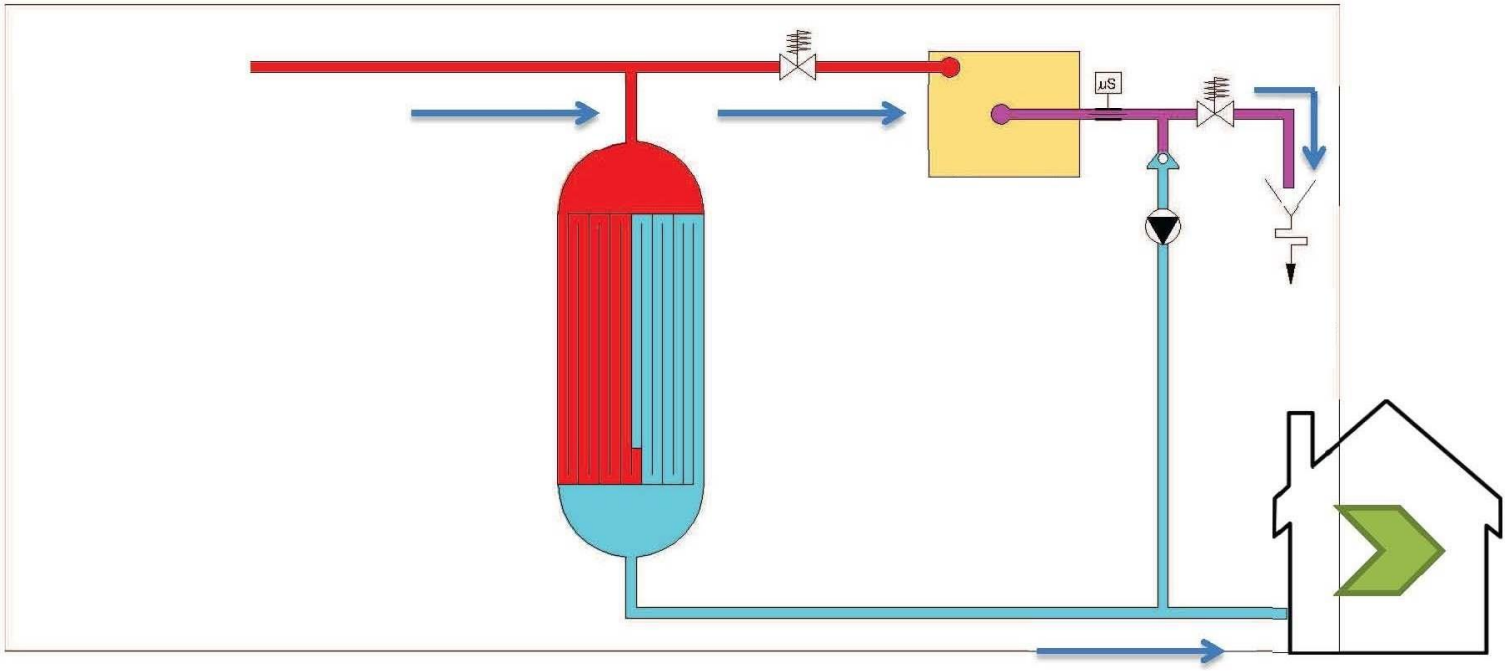
As water is used



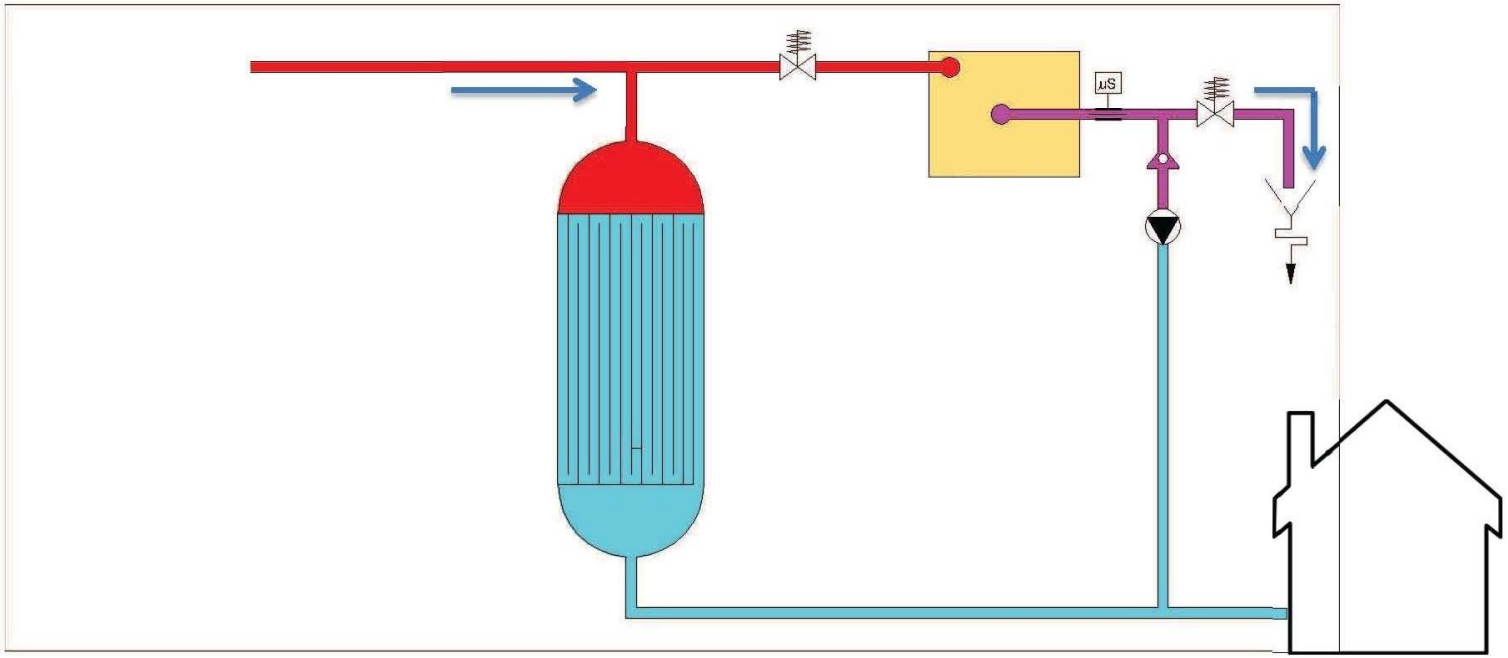
Water demand stops in the home but the **Plimmer®** continues to treat water in the tank



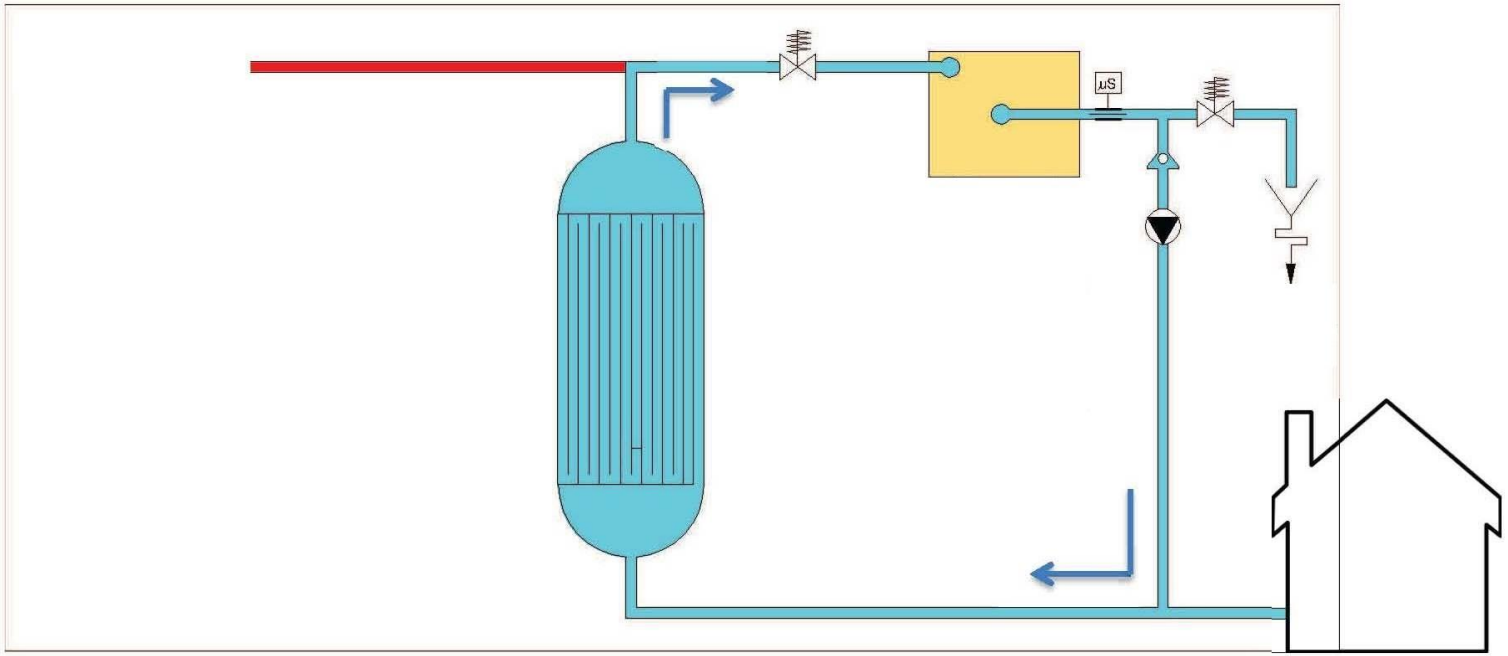
Plimmer® regenerates as needed



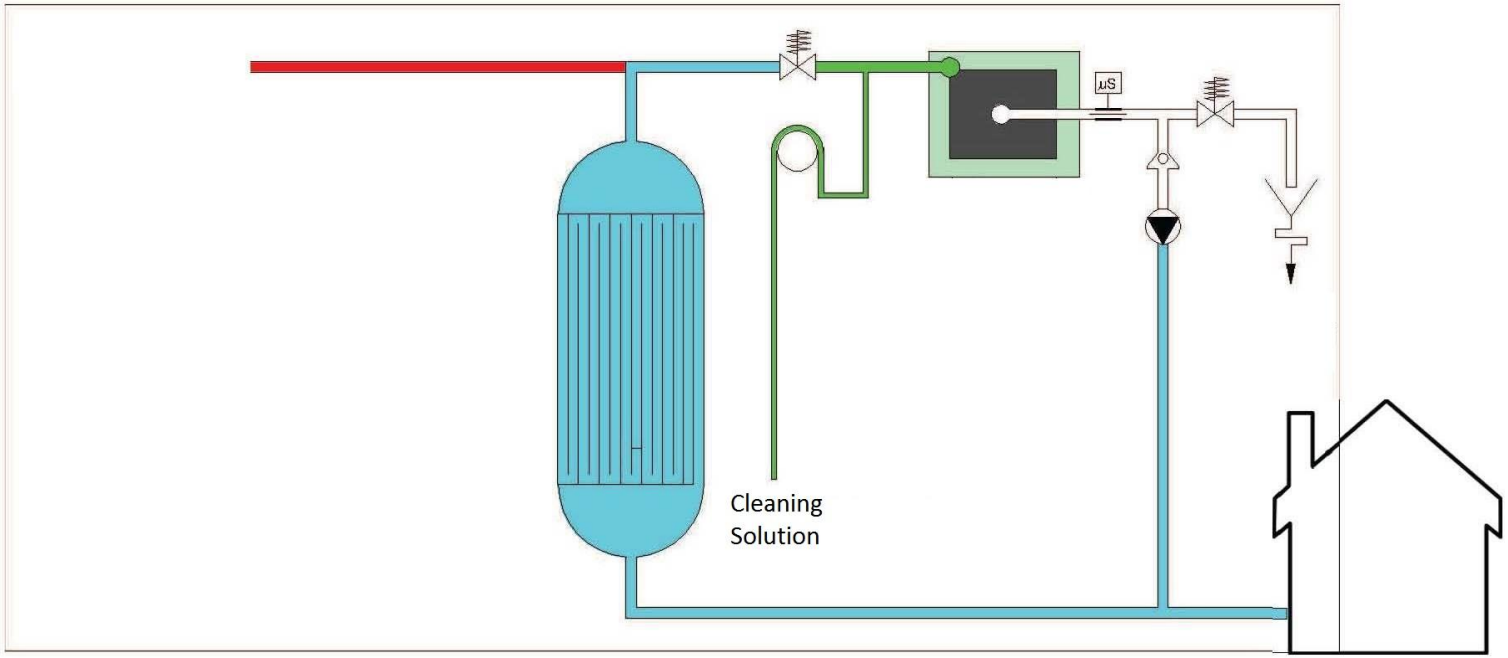
Tank is almost filled…



Tanks is full and **Plimmer®** shuts off automatically



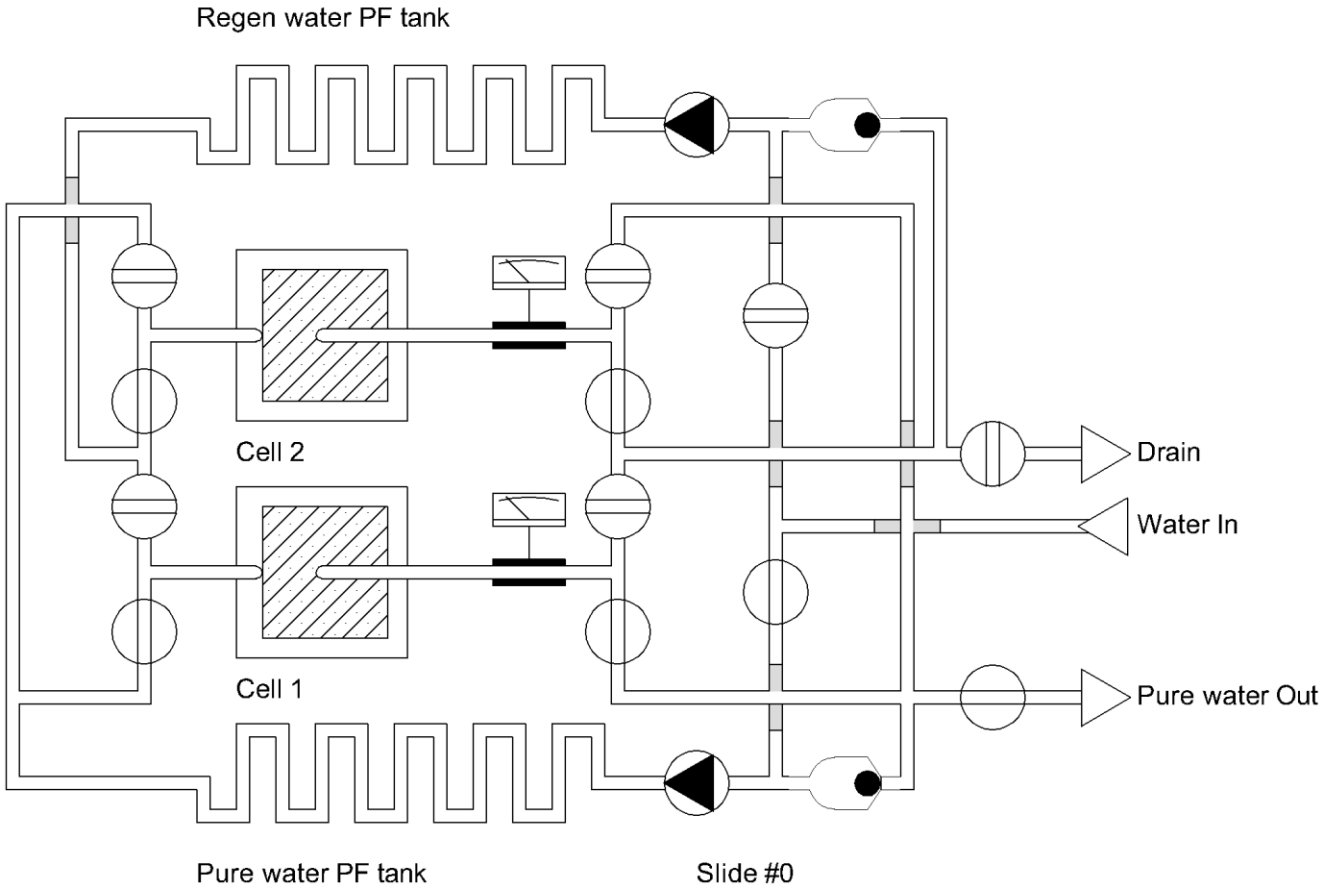
Plimmer® goes into maintenance mode and initiates self cleaning (set time off peak)



Plimmer® High Salinity

The Concept

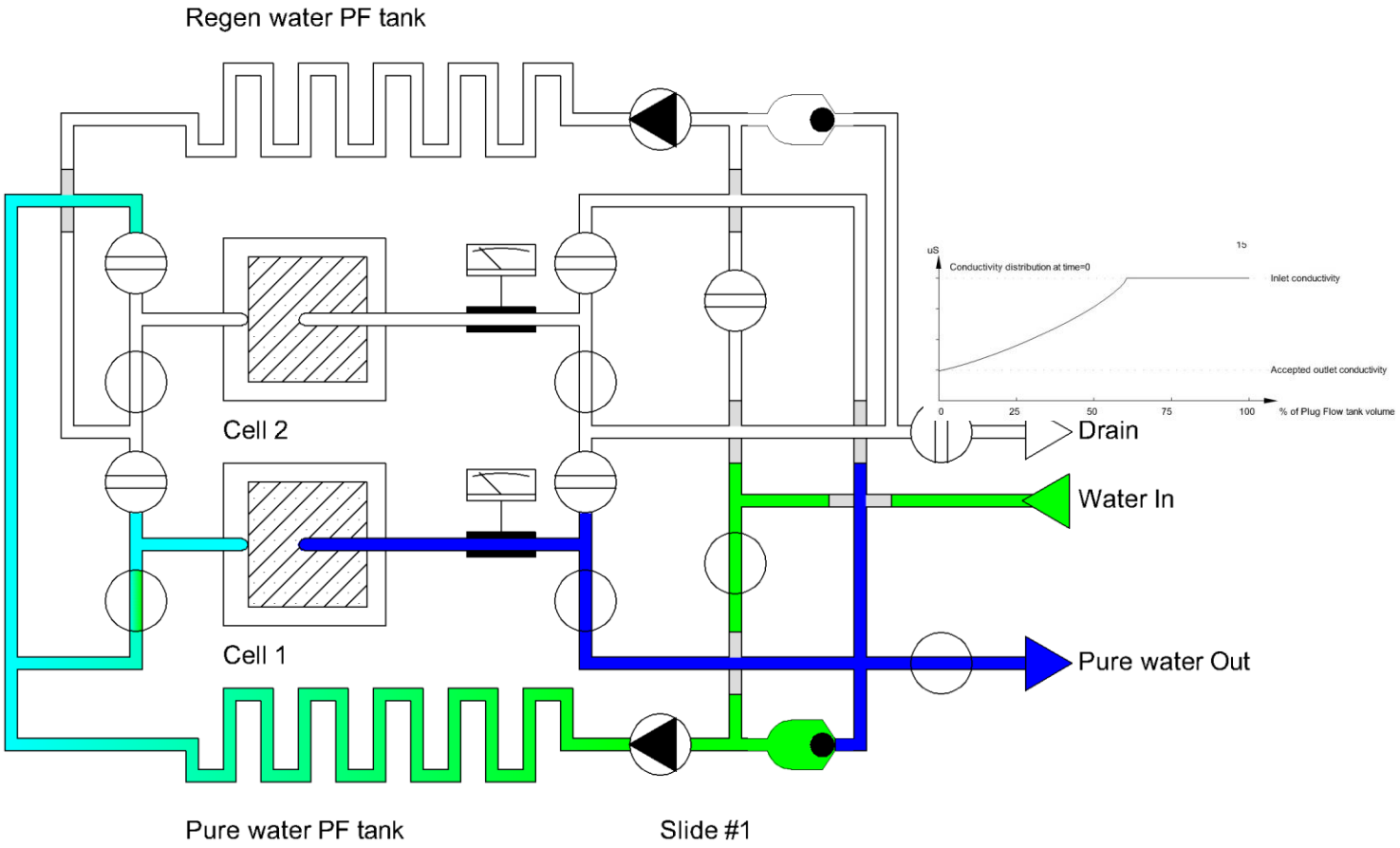
Our idea – a high salinity conductivity reduction system



Two phases – Production and Regeneration

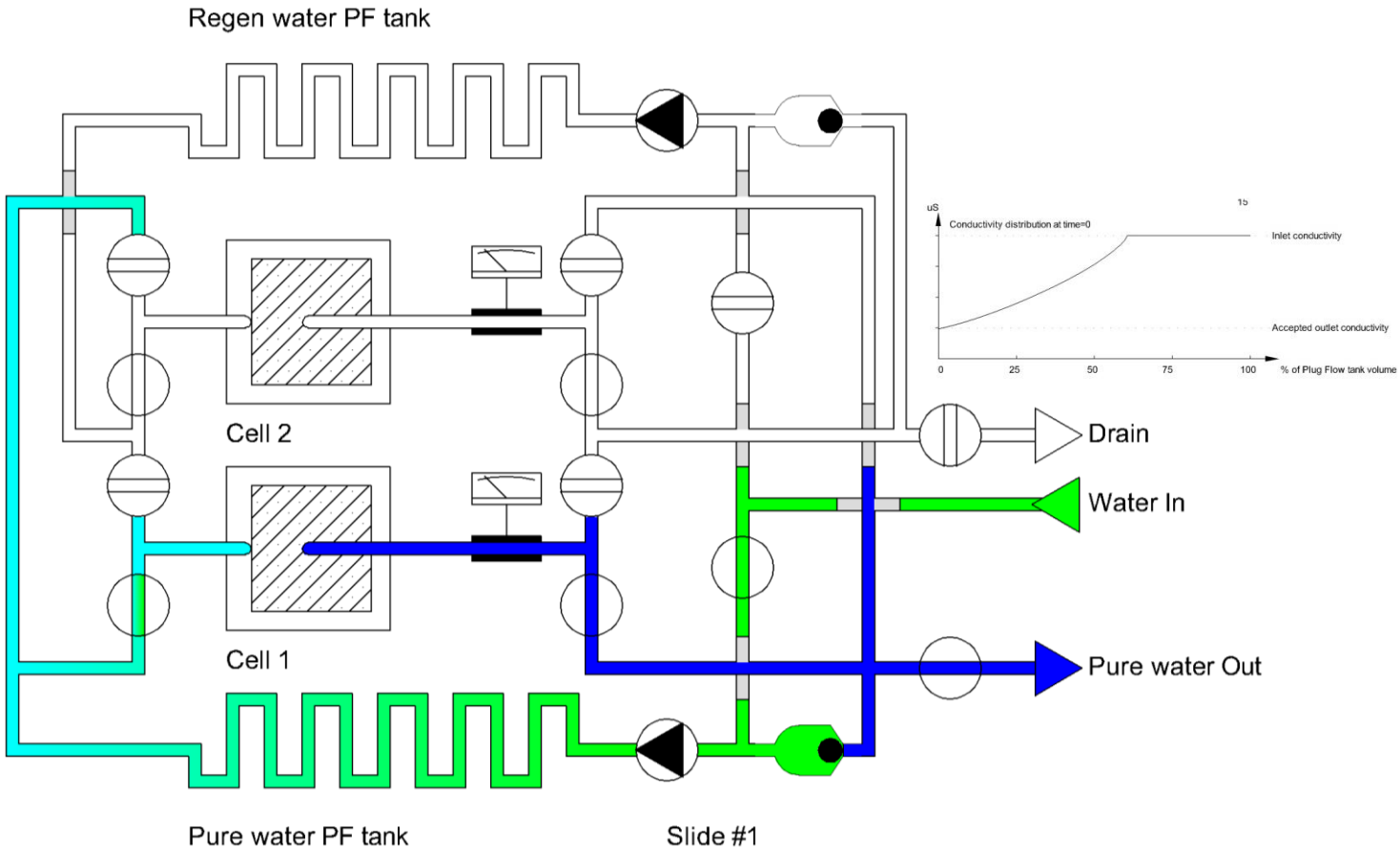
- Cells work in twin mode: while one is producing water, the other is regenerating.
- Cycling interval is very short: cells switch about every minute
- Until output water is at the desired conductivity, the system continues flow in the plug flow and in the cells.
- If waste water has not reached the desired minimum conductivity, it stays in the regeneration plug flow.
- System design helps energy recovery and lower waste water volume

Production phase (1)



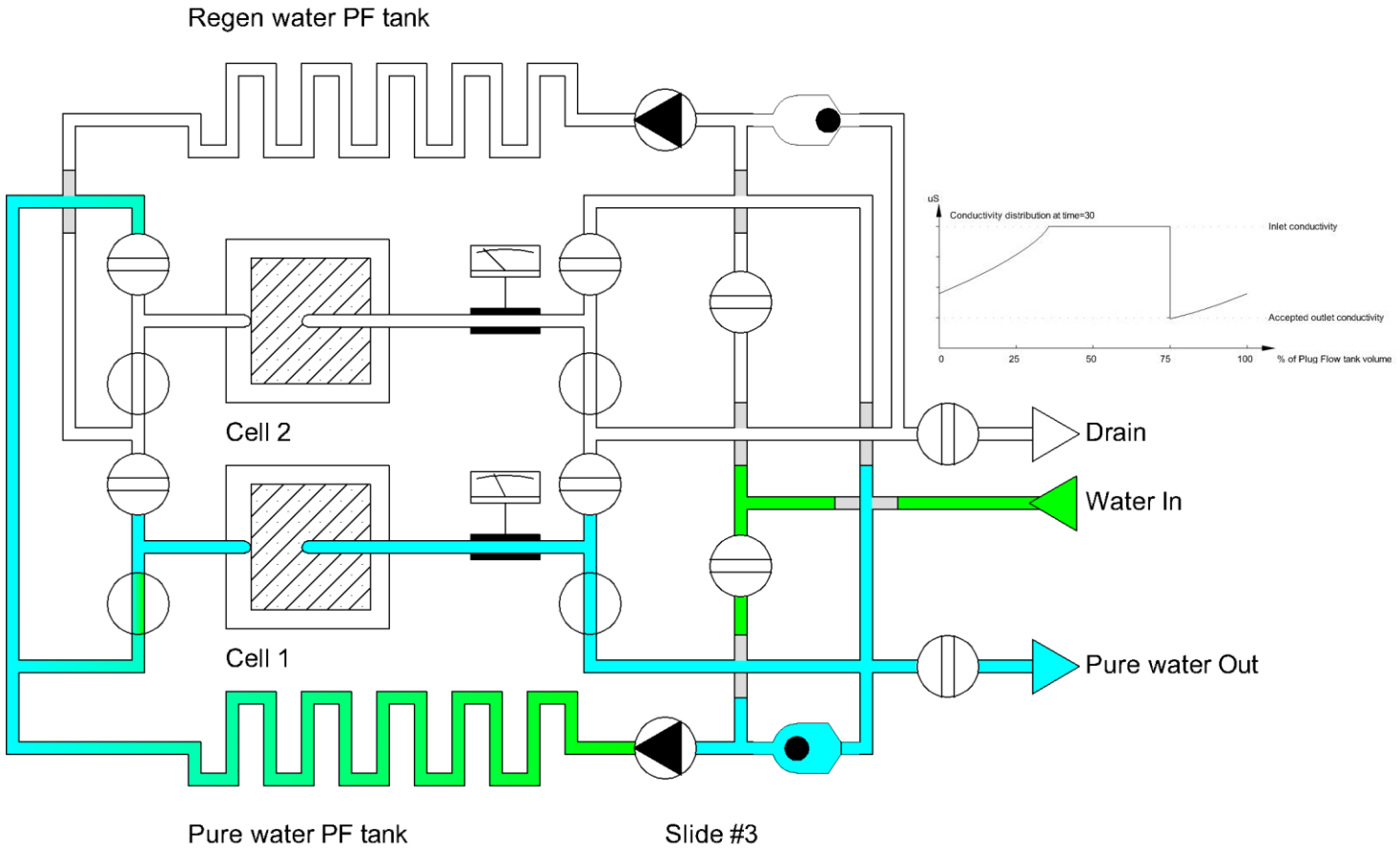
When water coming from the cell reaches the required output conductivity, it is delivered to the outlet. Same amount of new untreated water is added to the plug flow

Production phase (2)



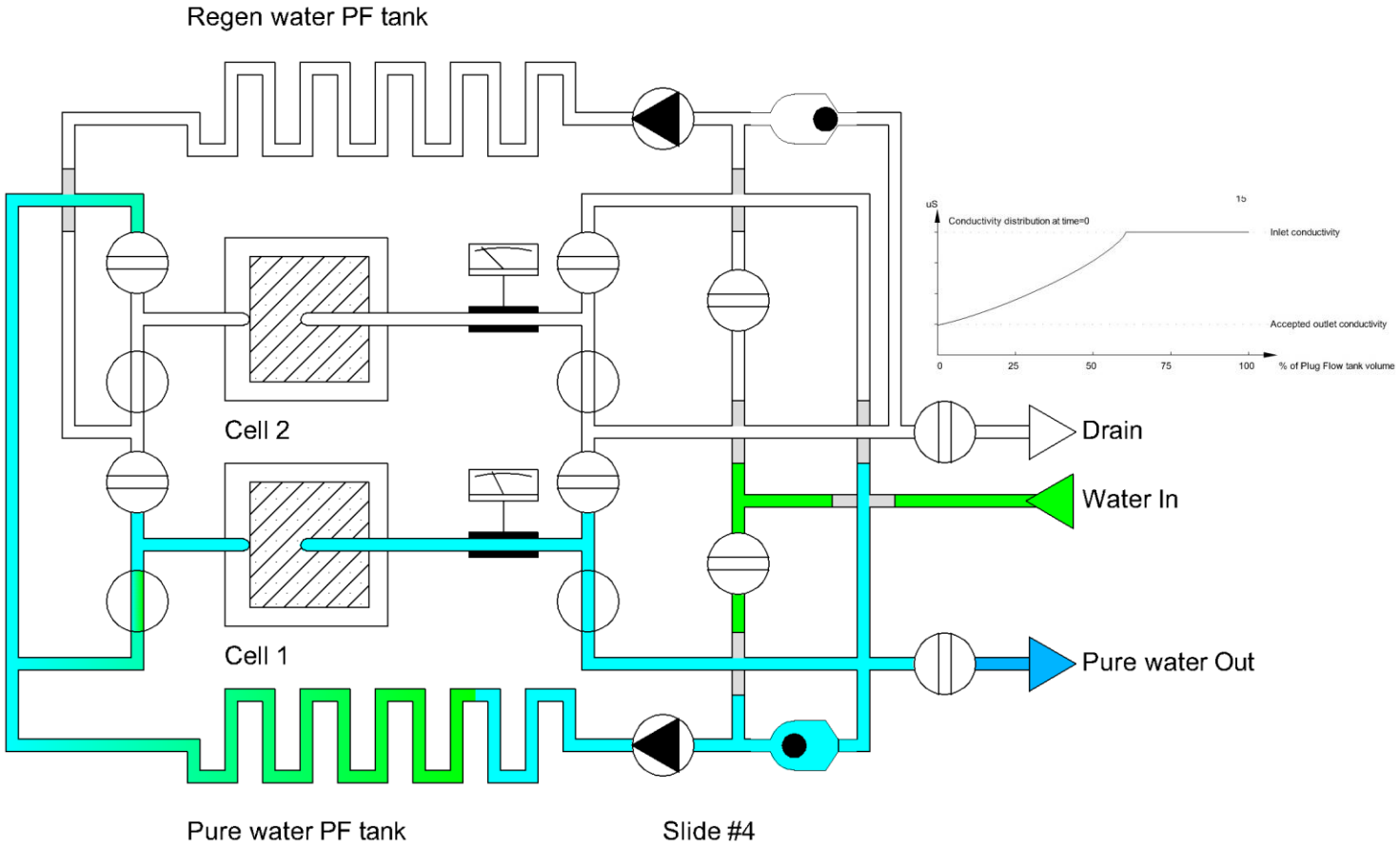
Water still goes to the outlet until it exceeds the specified conductivity.

Production phase (3)



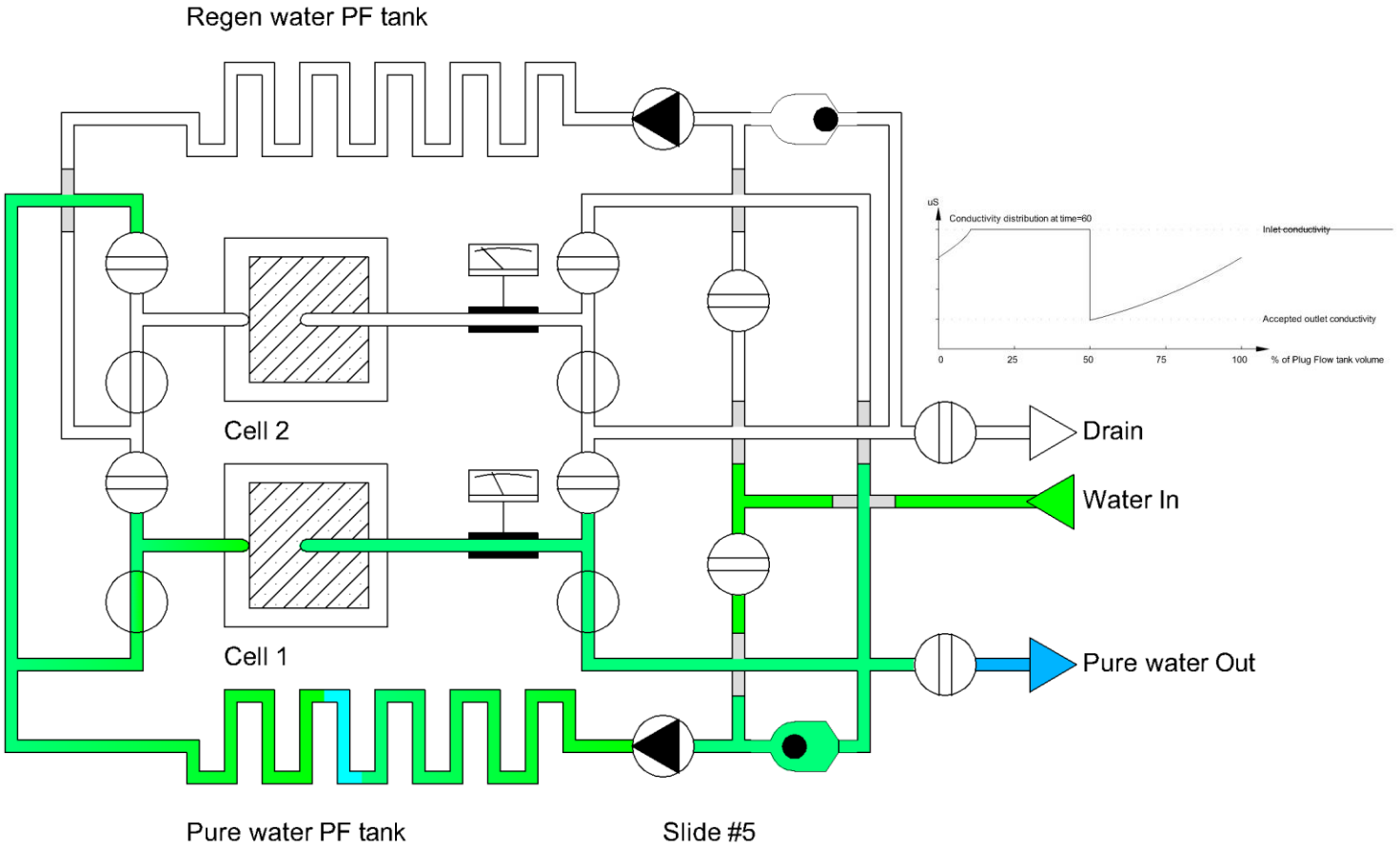
When the specified conductivity is exceeded, water starts to recirculate. In some cases the quality will go down to the desired value.

Production phase (4)



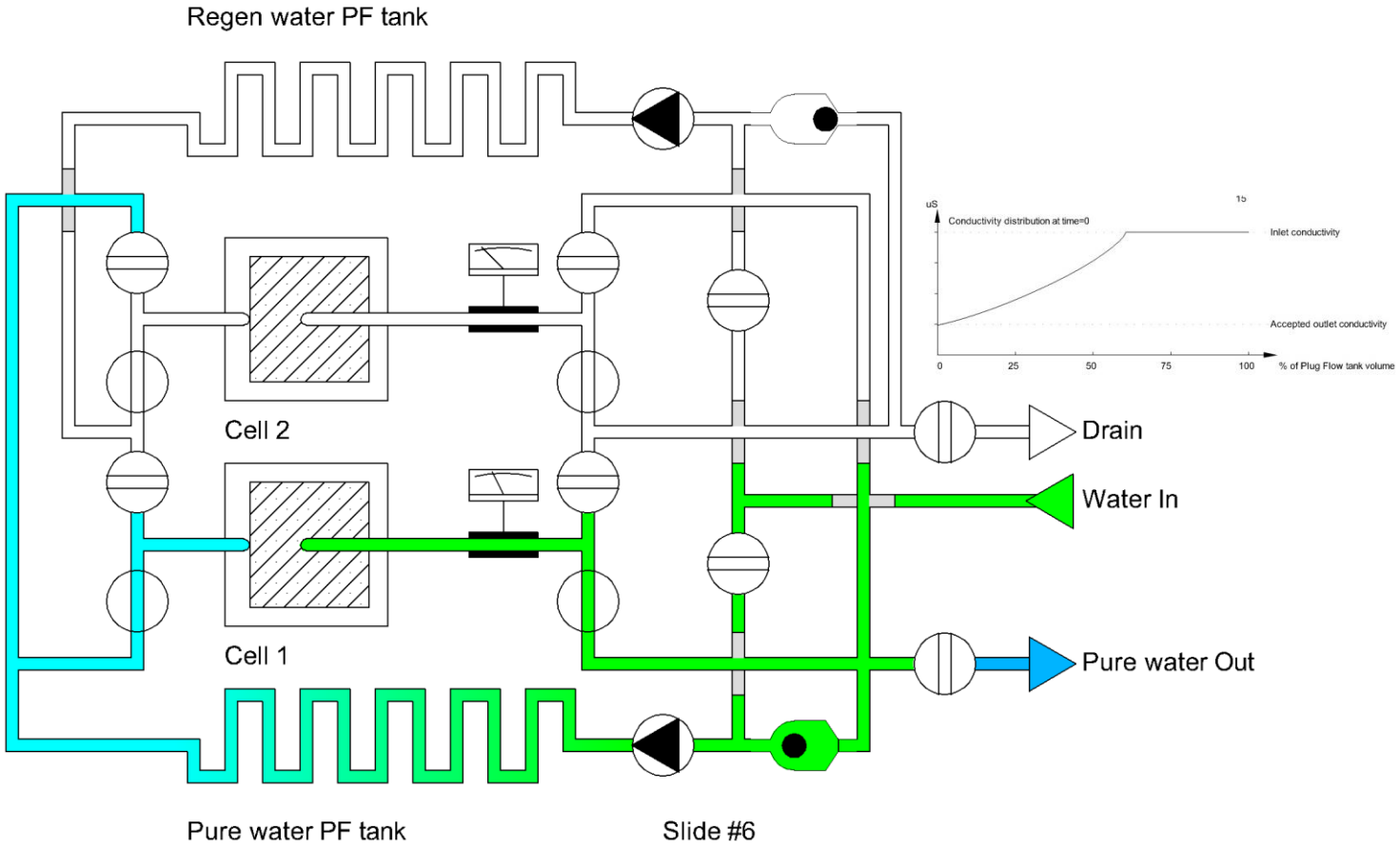
The cell continues to treat water. The water will not mix and inside the tank there will be different conductivity areas.

Production phase (5)



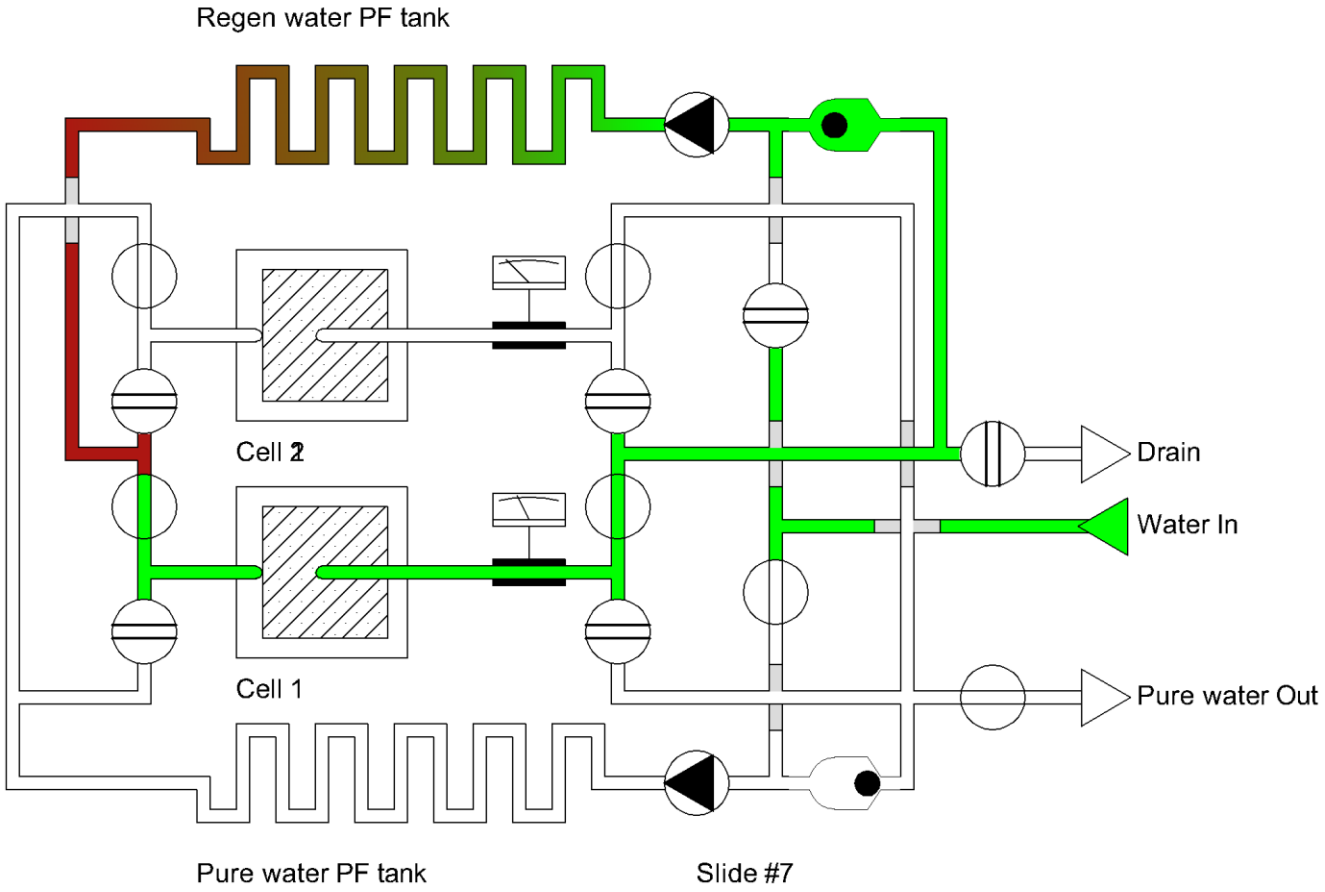
The cell continues to treat water. The water will not mix and inside the tank there will be different conductivity areas.

Production phase (6)



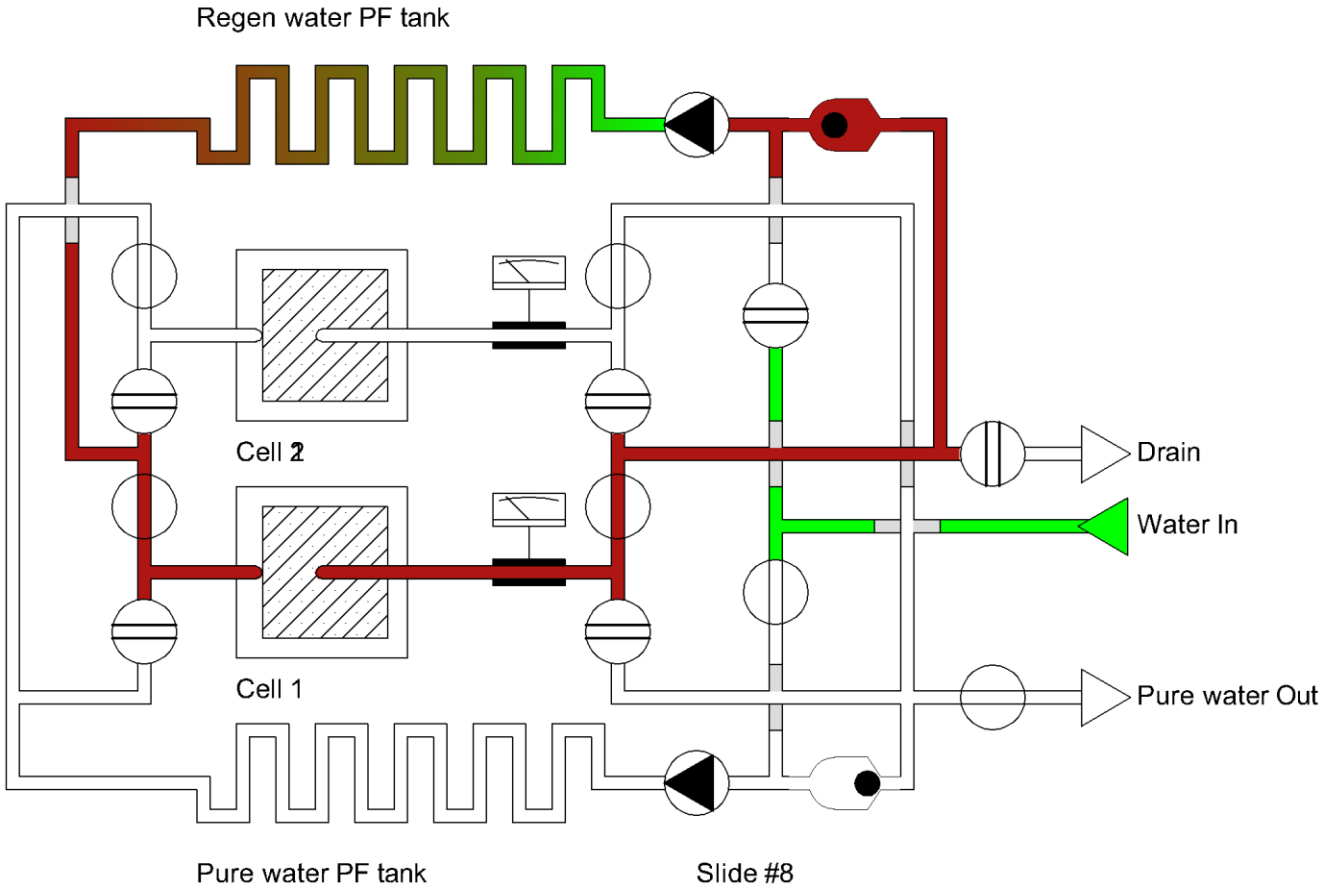
When the water out of the cell is not treated, it means that the cell is exhausted and regeneration needs to start

Regeneration phase (1)



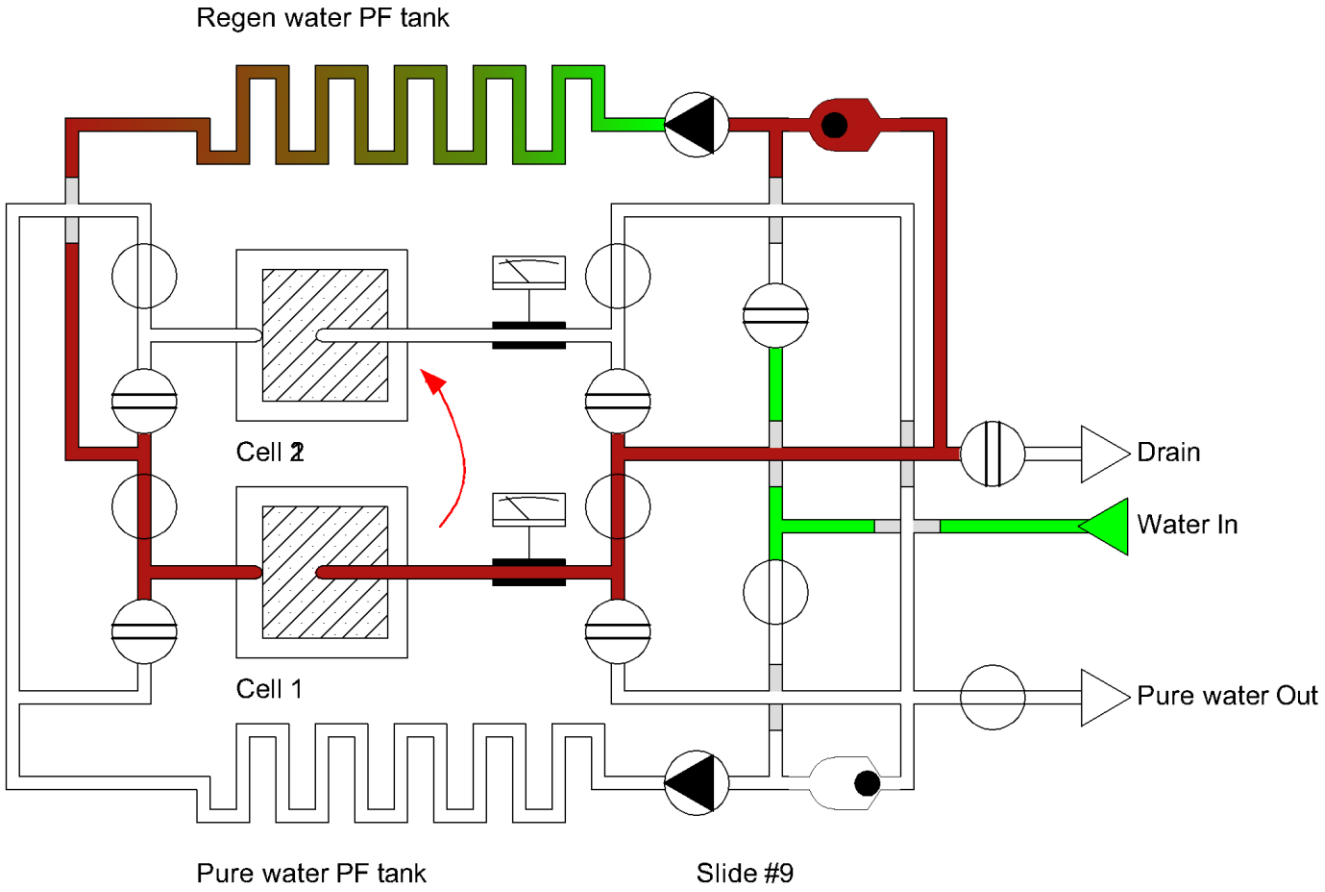
At the beginning of regeneration, circulation will move high salinity water in the cell

Regeneration phase (2)



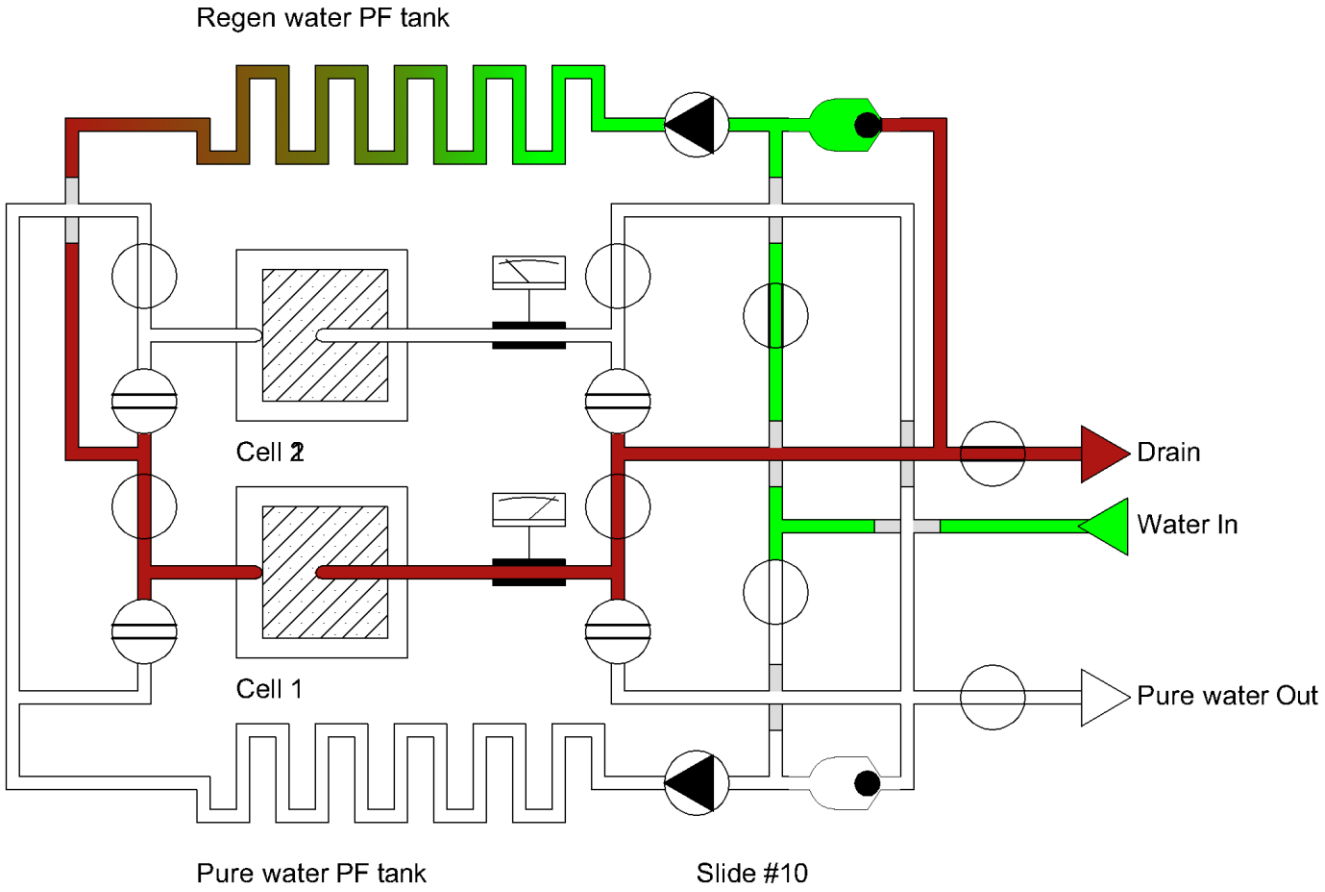
At this time ions begin to be removed from cell electrodes

Regeneration phase (3)



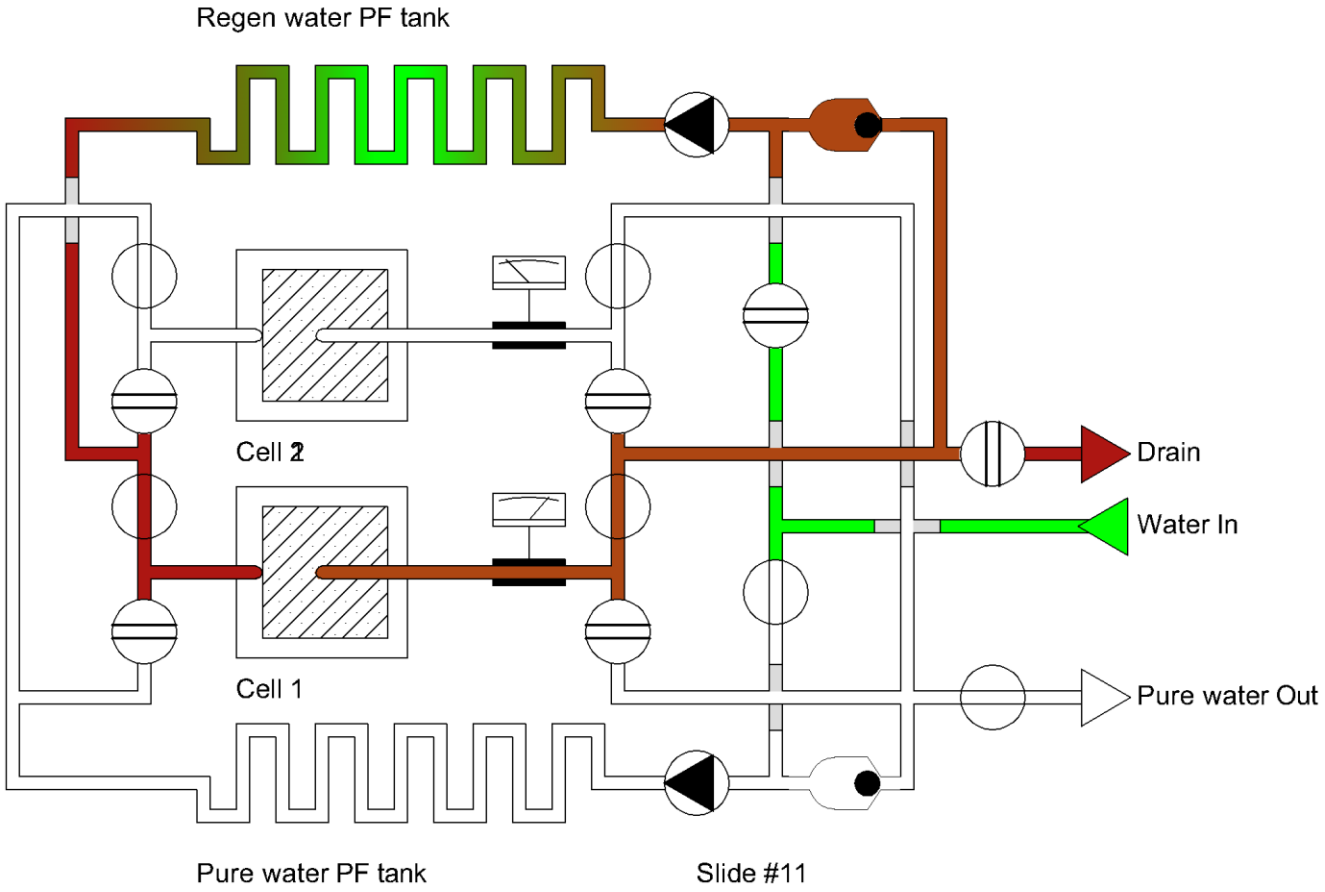
Removal of ions give rise to a voltage over the cell terminals - this energy will be forwarded to other cells by the system's electronics

Regeneration phase (4)



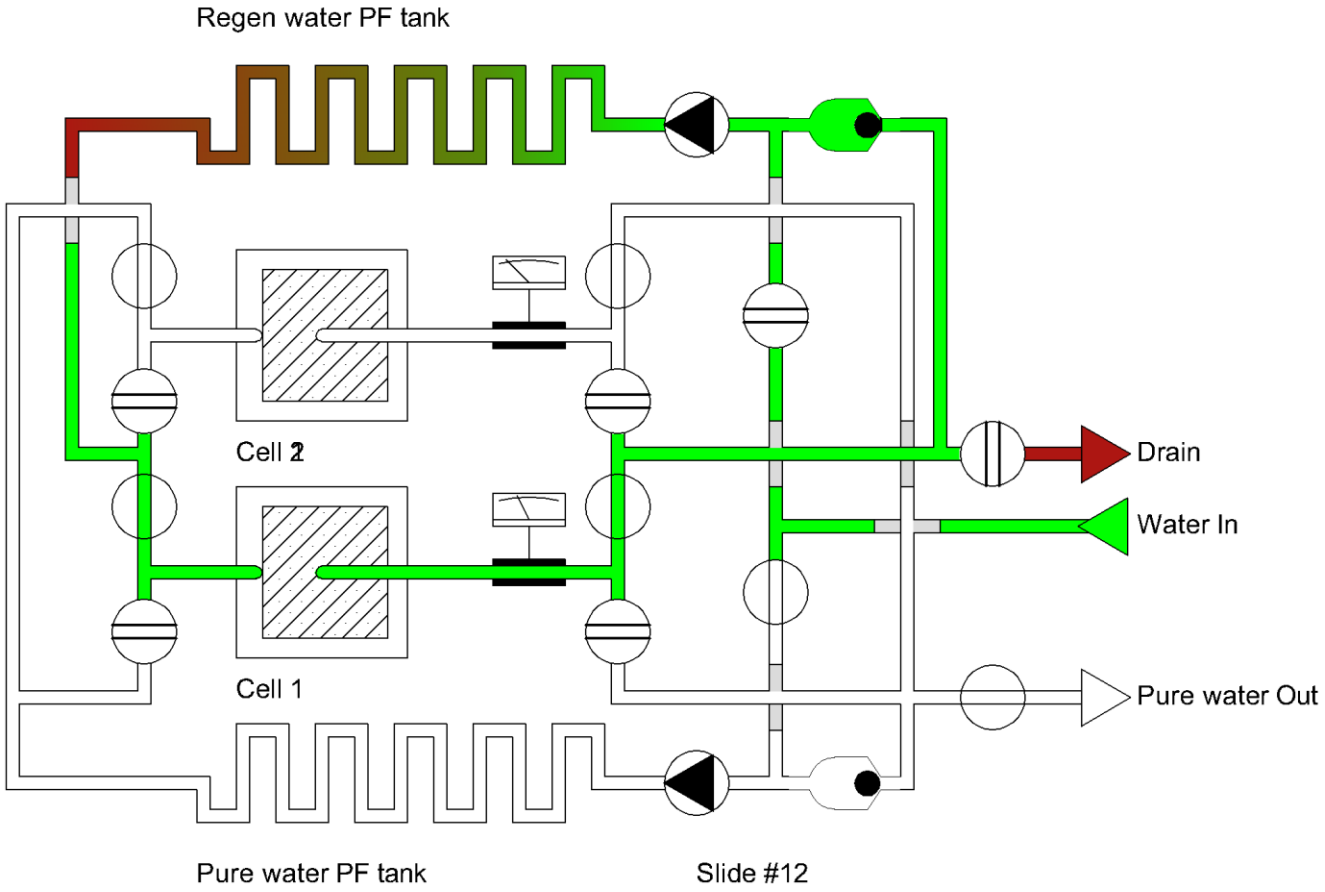
When all ions are discharged from electrodes the conductivity increase will lead to some waste

Regeneration phase (5)



As soon as conductivity islower than the set point circulation will begin and the cell will be washed from PF tank liquid

Regeneration phase (6)

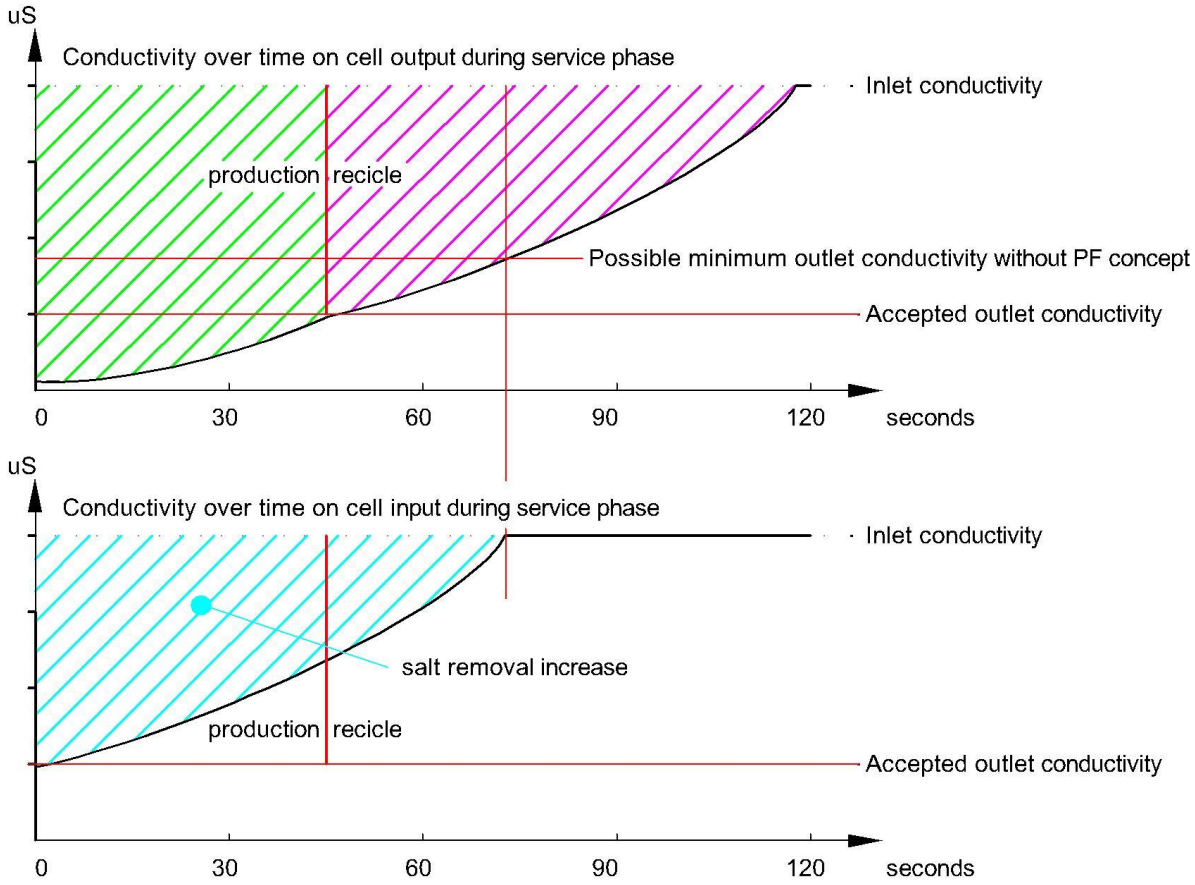


When water is at the same conductivity as the input water, the cell is clean and production can restart

Twin operation

- The above explanation relates to a single cell but actually while Cell 1 is in operation Cell 2 undergoes a regeneration - continuous operation and energy recovery are possible

Overview of results



Goals achieved

- System recovers energy
- System wastes a minimum amount of water (based on specified conductivity)
- System provides treated water at a specific & user-specified quality

Key Aspects of Plimmer® technology

What CDI can and cannot handle

- **CDI cannot handle**
  - Any particles that are not charged
  - Silica & clay
  - If these problems are present, they can be overcome by:
    - first assessing the water condition with an SDI kit to determine the levels of silica and clay
    - installing a pre-treatment process before the inlet tank or **Plimmer®** installation to coagulate and filter silica and clay

- **What can go wrong**
  - Scaling of the Electrodes
    - this happens when the electrodes are not cleaned regularly with citric acid solution
    - if the citric acid dosage is incorrect or if the citric acid solution is not properly managed
    - how **Plimmer®** deals with scaling:
      - automated citric acid cleaning at end of every production cycle
      - facility to set the dosage timing dependent upon water quality
      - extra citric acid wash button for regular routine maintenance
      - **Plimmer®** controls and supplies the citric acid solution through our Regional Centres
      - cleaning cells in labs (only required when pro-active treatment described above fails for any reason)

What CDI can and cannot handle

- **What can go wrong**
  - Bio-fouling of the cells
    - Bio-fouling is a common problem in all water technologies – unless treated proactively
    - how **Plimmer®** deals with biofouling:
      - ozonating the inlet tank
      - using media that are not prone to bacterial contamination
      - treating cells in labs (only required when pro-active treatment described above fails for any reason)

Conclusion & Summary

- Idropan has developed a viable and well-considered **Plimmer®** system for managing drinking water in residential developments
- **Plimmer®** is the only proven solution available with such high levels of automation and consistency
- **Plimmer®** is the only system that can manage all known water contaminants
- Clever automation ensures pro-active management of technology – reduced stoppage time of plants
- Proven technology backed by global patents
- **Plimmer®** is a single system that ensures consistency of maintenance and reduced costs of management

Projects using **Plimmer®** technology

Plimmer® CDI Active projects

- Rewagen – FP7 Project
- DemEAUmed – FP7 Project
- NovEED – FP7 Project
- King Saud University
- Project on Clinic laboratories ultrapure water production

REWAGEN
Electrochemical WAter treatment system in the dairy industry with hydroGEN REcovery and electricity production

Visibility of **Plimmer®** around the world

Plimmer® Cdi


ТАМОЖЕННЫЙ СОЮЗ
РЕСПУБЛИКИ БЕЛАРУСЬ, РЕСПУБЛИКИ КАЗАХСТАН
И РОССИЙСКОЙ ФЕДЕРАЦИИ
СВИДЕТЕЛЬСТВО
о государственной регистрации
ЕВРАЗЭС


network
enterprise europe
EXPOCOMFORT PARTNERING EVENT
Elevator pitch presentation
29 March 2012
Hall 5-7, booth U31 / V40
Program
16.30 -17.00 Companies Presentations
Welcome address
17.30 - 18.30 Informal Meetings


Plimmer


Plimmer
la soluzione facile, sicura e garantita
contro il rischio "arsenico" e non solo
Lo sapevate che...

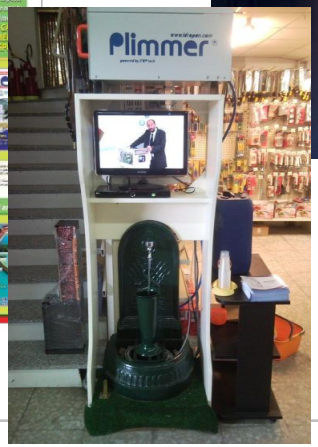

Plimmer

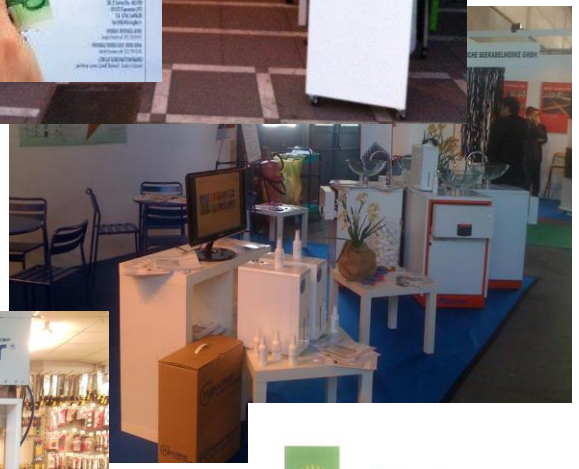

ГК Транслайн
Plimmer
Hypoclean


Scopri il tuo nuovo centro di bellezza e benessere
SABATO 21 MAGGIO
K2 Chocolate
Beauty Center
Aprilia Via Aldo Moro, 41/F - Tel. 06 92 73 09 00 - www.k2chocolate.net


Plimmer
LA NUOVA FRONTIERA DELLA DEPURAZIONE


12-21 Febbraio 2011
sorarreda
"Bere acqua ottima qualità"
PISCINE


Plimmer

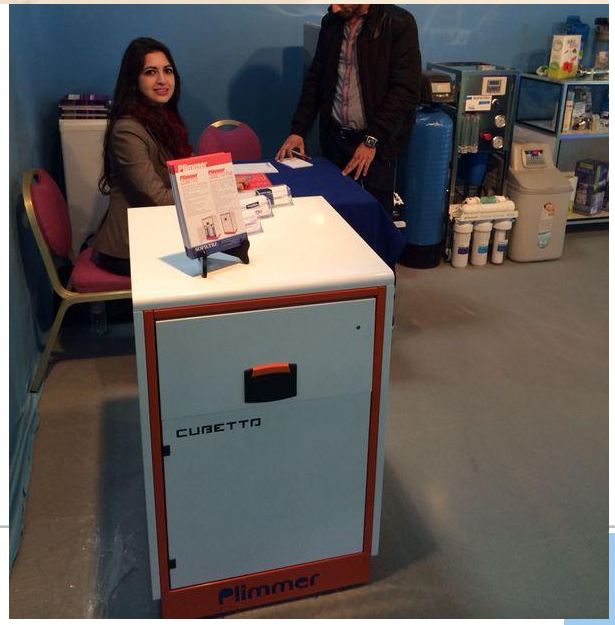



MILANO P.TA VENEZIA
Plimmer
LA TUA ACQUA
IL MODO SEMPLICE PER MIGLIORARLA
www.plimmer.it


Premio all'innovazione amica dell'ambiente
2009
LEGAMBIENTE
RegioneLombardia
Conferiscono a
IDROPAN DELL'ORTO DEPURATORI SRL
l'attestato di partecipazione al
Premio Innovazione Amica dell'Ambiente 2009
GREEN ECONOMY

Plimmer® Cdi


SOFILTRA
SOFILTRA
Produits de Filtration
PURIFIES WATER
ENVIRONMENT
Plimmer


CUBETTO
Plimmer

Plimmer CDI Partners

- Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB DE
- LEITAT Technological Center - Spain
- VITO - Belgium
- EcoSynt – Belgium
- Supsi - Switzerland

Fraunhofer
IUK-TECHNOLOGIE

LEITAT Technological Center
managing your technologies
member of TECNIO

vito
vision on technology

Plimmer CDI Visibility

- 4th March 2010 EcoRadio - ECOBuild London (Tullio Servida)
- 4th March 2010 TG1 - ECOBuild London
- 8th March 2011 TG3 Buongiorno Italia (Mariella Servida)
- 14th May 2012 Il Sole 24 Ore – Italia al quarto posto per le alleanze con l'estero (Mariella Servida)
- 21st November 2012 RAI 3 - Geo&Geo – record (Tullio Servida)

Plimmer CDI Visibility (2)

- 2009 Politenico di Milano - Plimmer Technology and supercapacitors
- 2009 AIFM at Fiera Trattamenti e finiture di Parma - I trattamenti delle superfici tra globalizzazione, innovazioni e sviluppo sostenibile
- 2009 Premio innovazione Lega Ambiente 2009
- 2010 Premio innovazione Lega Ambiente 2010
- 2011 Marina Militare Italiana – Plimmer Technology introduction
- 2011 Comune di Salsomaggiore
- 2011 Premio innovazione Lega Ambiente 2011

Thank You

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