VOLTEA WATER

VOLTEA CLIENT LIST

Introduction

At Voltea, your business and water needs inspire us. By uniquely integrating electromembranes and pressure-membranes into a single advanced system, we maximize the benefits of both technologies. This synergy not only boosts economic efficiency but also overcomes the technical limitations that might arise if each system were used independently.

VOLTEA WATER

CASE STUDY

WELLINGTON BREWERY

APPLICATION
BREWERY PRODUCT WATER
WATER SOURCE
MUNICIPAL
YEAR INSTALLED
2019
LOCATION
ONTARIO, CANADA

INTRODUCTION

Dependable, consistent product water is an understated factor of importance for greattasting, superior brews, whether from a local artisan or large-scale beer production facility. Many breweries are located in areas of the world where municipal water sources have inconsistent or poor water quality, which can cause additional work for the brewer. From increased cleaning and maintenance to the inability to make certain styles of beer, these issues can adversely affect their brand, their proficiency at brewing consistent world-class beers and their ability to grow their business.

THE CHALLENGE

Wellington Brewery, located in Ontario, Canada - an area known for hard-water challenges - desired product water with lower hardness and overall TDS to continue to progress in their craft. Despite their municipal water being fantastic for heavier beers, it was causing significant maintenance issues, as well as impacting quality and consistency.

Wellington was frustrated with the high maintenance and labor demands from scale build-up in their brewery system - predominantly the hot liquor tank (HLT) and centrifuge - as well as the effect this may have on the lifetime of their valuable equipment. Heavy use of dangerous cleaning chemicals was required for the toofrequent cleanings caused by the scale build-up, as was excessive amounts of acid to manage the pH and water chemistry in their beers. All these factors were increasing their OpEx considerably. Natural variations in municipal water quality also posed an obstacle in keeping the quality and flavor profiles of their full line of brews steady after every batch.

Additionally, the level and distribution of mineral content, predominantly the hardness, sodium, sulfate and chlorides, were making production of their lighter styles of beer difficult. It is well known in the brewery industry that the balance of these ions can impact the flavor characteristics and profile of beer, such as hop bitterness, mouthfeel and body. Wellington was in need of a water purification solution.

VOLTEA'S CAPDI SOLUTION

The brewery considered both reverse osmosis (RO) and CapDI to address their water quality headaches. At Wellington, they have taken very seriously the desire to keep all things local; from their hops and yeast to their supply chain and product water. Marvin Dyck, Master Brewer voiced, "What is local about fully softened, RO water? Taking all minerals and salts out of the local water source and having to blend any ions back in to achieve a specific water quality removes the 'local' attributes of our city's water."

After evaluating all benefits and concerns with using RO, Wellington chose CapDI as their water purification solution. Some very important features of CapDI that influenced their decision were tunability, high water recovery, and low maintenance requirements. Rather than removing all ions and minerals from their water, they were able to reduce the TDS down to create a baseline water quality. They then used this tunably purified water, with the addition of certain minerals and ions, to build with as required for other unique brews in their arsenal.

Table 1 below references water quality data both pre- and post- CapDI purification.

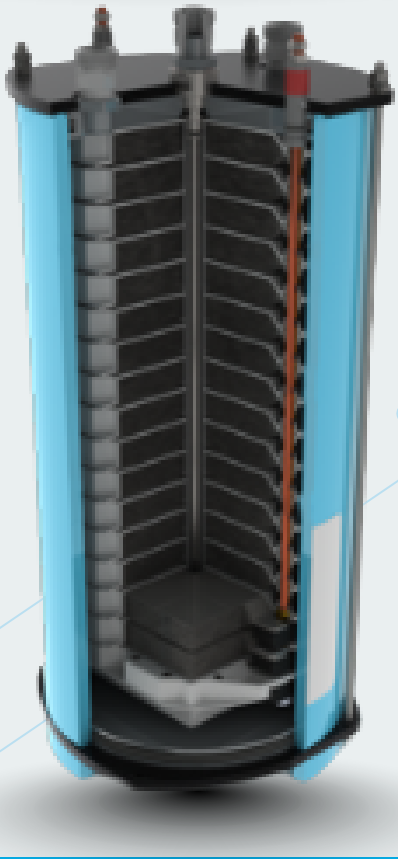
"What is local about fully softened, RO water? Taking all minerals and salts out of the local water source and having to blend any ions back in to achieve a specific water quality removes the 'local' attributes of our city's water."

- Marvin Dyck, Master Brewer

Table 1

Parameter	Feed Water	Treated Water
TDS (ppm)	588	128
Conductivity (µS/cm)	897	286
pH	7.6	7.2
Hardness (ppm as $CaCO_3$)	462	108
Calcium (ppm)	118	28
Magnesium (ppm)	41	9
Sodium (ppm)	34	32
Alkalinity (ppm)	279	103
Chloride (ppm)	71	16
Sulfate (ppm)	142	26

Table 1 – Water quality data both pre- and post- CapDI water purification



Wellington's first two brews with CapDI purified water!

Figure 1

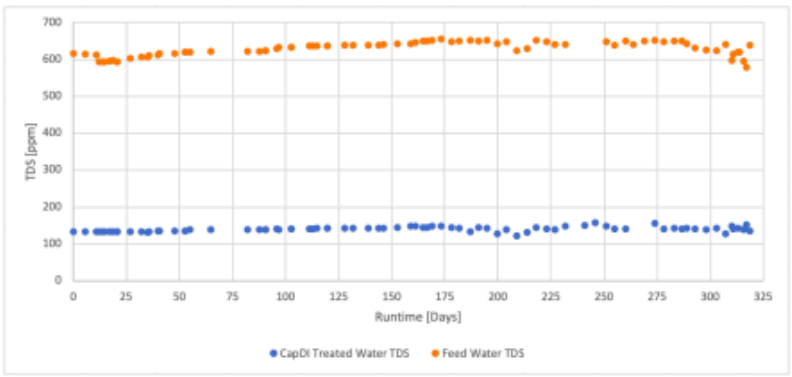


Figure 1 – Wellington Brewery feed water TDS hovers between 600-700 ppm pre-CapDI, with a target TDS of 125 ppm with CapDI purification.

PERFORMANCE RESULTS

Voltea's Industrial Series 24 CapDI System (IS-24), installed in April 2019, has provided the high-quality water that Wellington Brewery needs for their brand and business. It also enables them to continue improving and developing the flavor and consistency of their brews.

Figure 1 below displays both municipal feedwater TDS and CapDI purified water TDS over one year. Feedwater TDS hovers between 600–700 ppm pre-CapDI, with a target TDS of 125 ppm after CapDI purification.

Due to minimized scaling after the IS-24 CapDI installation, maintenance and labor issues on their brewery system have been reduced—most notably in the heat exchangers on the HLT. Cleanings were reduced from three times per week to only once every other week, freeing up staff to focus on what they are best at: making beer!

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CASE STUDY

NUMBER FIVE CAFÉ, DUBAI

APPLICATION
HORECA
WATER SOURCE
MUNICIPAL
YEAR INSTALLED
2019
LOCATION
DUBAI, UAE

THE CHALLENGE

Around the world, café owners are looking for ways to have high-quality water for their beverages while still maintaining consistent TDS output, low OpEx and high water recovery. In Dubai, Number Five Café was experiencing the usual challenges present in this region: Fluctuating feed water temperature, peaking at 50-55°C and reducing filtration equipment lifetime Fluctuating municipal feed water TDS, taking up barista time to check the blend or having to accept variable quality Scale (such as calcium carbonate) formation affecting equipment Low water recovery on existing filtration coupled with high maintenance

VOLTEA'S CAPDI SOLUTION

CapDI is known to be effective at salt-free water purification, especially in the HoReCa (Hotel/Restaurant/Café) industry, all while being an environmentally responsible desalination solution. Proving that it's possible to produce the water quality desired for high-quality, great-tasting coffee while maintaining minimal intervention, Voltea's DiUse System was chosen as the water purification solution for Number Five Café in Dubai. Furthermore, CapDI can achieve its targets at an increased water recovery compared to traditional technologies, such as Reverse Osmosis (RO). With CapDI, the traditional headaches are removed.

PROVEN RESULTS

To allow real-time monitoring and adjustment of the DiUse performance, conductivity is recorded and used as a measure of TDS. This data is sent daily via email, a feature which is standard on all DiUse systems. The results of this Number Five Café system are presented in the figures on the following page. The DiUse is set to achieve 150 µS/cm and consistently achieves this within 10% of the target (Figure 1). The unit does not record feed conductivity; however, a spot sample is also shown in Table 1 for reference.

Running on municipal feed water with a carbon and 5-micron particle filter, operation is achieved with simple pre-filtration. The concentrate runs to the usual sewage as no harmful chemicals or additional salts are added. The CIP (Cleaning-in-Place) is automated and achieved with food-grade citric acid that is diluted before being sent to waste. This removes the worry of having to remember when to clean the system, plus it eliminates any issues or discharge permitting. This unit was installed in June 2019 and continues to operate today.

CapDI easily fits under a countertop and doesn't require any complicated installation.

Reduction of water loss through improved water recovery is important, not just for the environment but also for keeping operating expenses to a minimum.

CAPDI PERFORMANCE RESULTS

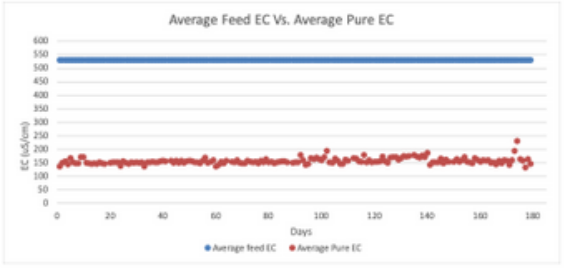

Fig. 1

Figure 1 – The conductivity of both purified water post-CapDI (Average Pure EC) and feedwater pre-CapDI (Average Feed EC).

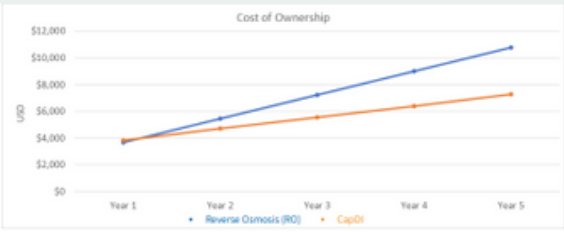

Fig. 2

Figure 2 – The cost of ownership over a 5-year period, including the CapEx of module replacement.

Figure 2 shows that operating expenses for the DiUse are, on average, lower than those for an equivalent RO unit over a 5-year period.

Table 1

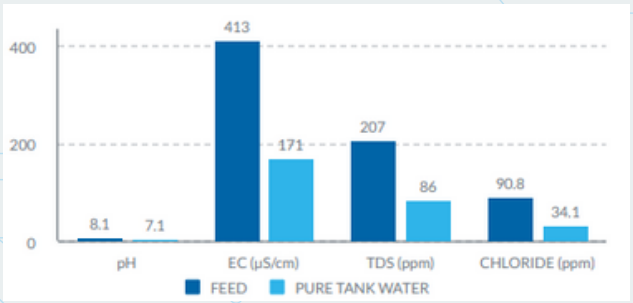

Table 1 – Sample of feed conductivity

"Our expectations in terms of performance and water quality have been fully met with the Voltea CapDI System. We have found the team to be very professional and supportive in helping us meet our stringent goals at our specialty coffee shop."
— The Management, Number Five Café

Expenditure Assumptions (Figure 2)

- Filter replacement: once a month
- RO requires CTO filter (chlorine, taste, odor)
- Module/membrane replacement:
  - 3–5 years for CapDI
  - 2 years for RO
  - (based on known water conditions and daily demand)
- Water recovery:
  - RO = 35%
  - CapDI = 73%
- Energy consumption: CapDI operates at ~0.61 kW/kgal (US)
- Module lifetime: Current CapDI set-up projected to last ~5 years, while meeting water demand easily

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CASE STUDY

HORTICULTURE IRRIGATION SUPPLY

INDUSTRY
HORTICULTURE
APPLICATION
IRRIGATION
WATER SOURCE
WELL WATER
YEAR INSTALLED
2016

INTRODUCTION

Agriculture is an important market for Mexico, with the industry employing 16% of the national workforce. Unfortunately, it also presents a huge, unsustainable demand on water sources. In Mexico, agriculture is responsible for 77% of the total water withdrawn.[1] 38% of countrywide withdrawl is from groundwater aquifers, many of which are over-exploited and located where annual rainfall is insufficient to replace extraction.[2] Water scarcity is causing increased salinity variability as well as increasing water prices[3], both of which are unfavorable for crop growers. What's worse is that for many crops, high salinity in irrigation water can cause significant reductions in yield.

[1] Mexico UN – water brief; http://www.unwater.org/fileadmin/user_upload/unwater_new/docs/Publications/MEX_pagebypage.pdf
[2] Richard Rhode, Tony Burton, Geo-Mexico excerpt, http://www.mexconnect.com/articles/3576-water-consumption-in-mexico
[3] Mexico Water Report; http://www.lgaconsulting.com/water/IE-MexicoWaterReport-2011Winter-WaterReuseInMexico.html

THE CHALLENGE

A leading Mexican tomato grower was purchasing tomato seedlings from a third party and growing their own greenhouse crops. They needed an optimal, improved feed water quality to grow their own seedlings, rather than purchasing them locally. Tomato seedlings are known to have high sensitivities to salinity, therefore the grower needed a solution to treat their irrigation water to allow for in-house growing.

VOLTEA'S CAPDI SOLUTION

Voltea provided an IS-12 CapDI System as it requires minimal pre-treatment and can cope with silica levels up to 150 ppm. Additionally, the fully automated cleaning and remote monitoring capabilities minimize user intervention and maintenance, allowing the customer to focus on their core business.

CapDI ***tunably*** removed sodium and bicarbonates without having to remove all of the more beneficial minerals in the grower's irrigation water. By implementing a tunable TDS removal solution, they saved on OpEx by reducing the use of fertilizers and allowing water reuse on-site. This Voltea customer now successfully grows their own seedlings in-house without having to purchase from a third party, thus increasing profitability

PROVEN RESULTS

Of high importance to the grower was the ability to target a series of different sodium levels as required by different crops. CapDI's tunable salt removal capability perfectly achieves this by automatically accounting for any variations in feed water quality and flow rate to give a consistent output quality. Table 1 on the following page shows a series of targeted water conductivities and their corresponding sodium and bicarbonate concentrations.

ABOUT VOLTEA

Voltea's award-winning tunable desalination technology, CapDI© (Membrane Capacitive Deionization), desalinates brackish water at a lower economic and environmental cost than any other available technology. CapDI is a simple and innovative way to remove dissolved salts from water.

Voltea's CapDI technology is scalable and helps consumers and industry reduce water usage and save money.

Voltea's IS-12 CapDI System consistently produced the quality and quantity of water required to meet our customer's demands.

85% water recovery was maintained by Voltea's fully automated Cleaning-In-Place (CIP) features that automatically clean if the CapDI System measures a rise in differential pressure. This water was treated to a suitable reuse quality, therefore reducing the overall amount of fresh deep well water consumed. The high water recovery also allows a smaller volume of waste that would require treatment before discharge, resulting in a reduced impact to the aquifer.

Voltea's CapDI System is continuing to help this facility with the production of crops at a reduced environmental impact, which in the long term will assist in greater productivity and reduced operating expense.

OPERATIONAL DATA

Table 1

Constituents	Unit	Feed Water	Sample 1	Sample 2	Sample 3
Target Conductivity	µS/cm	1,300	300	400	800
pH		7.2	6	6.3	6.6
Chloride (Cl^-)	ppm	104	18	32	78
Sulfates (SO_4^{2-})	ppm	211	10	38	77
Bicarbonate (HCO_3^-)	ppm	353	61	85	146
Potassium (K^+)	ppm	37	< 8	8	12
Sodium (Na^+)	ppm	89	21	32	51
Calcium (Ca^{2+})	ppm	124	16	24	64
Magnesium (Mg^{2+})	ppm	190	5	10	22
Silica (SiO_2)	ppm	72	72	72	72

From the short term testing performance in Table 1, the customer was able to select a long term operational setting with which to operate the CapDI System based on the crop to be irrigated and its sodium requirements.

Table 2

Summary Period	Period 1	Period 2	Period 3	Period 4
Target Conductivity (µS/cm)	**500**	**300**	**700**	**700**
Average Output Conductivity (µS/cm)	**489**	**302**	**670**	**679**
Average Feed Conductivity (µS/cm)	1,324	1,433	1,433	1,380
Volume Produced (m^3)	1,173	448	984	864

Table 2 shows actual CapDI System data over a five month period at the customer's site. The tunability benefit can be observed while the targeted water quality was met as changes in irrigation water use demanded different sodium levels corresponding to the overall water conductivity. The removal of only the excess sodium allows the crops to benefit from the nutrients and salts remaining in the water.

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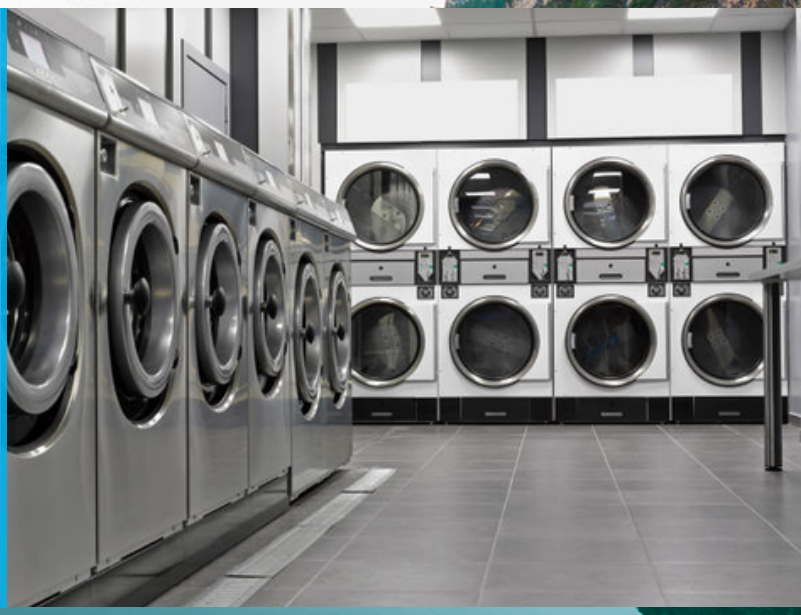
CASE STUDY

COMMERCIAL LAUNDRY

INDUSTRY
COMMERCIAL LAUNDRY
APPLICATION
HOT WATER RECYCLE
WATER SOURCE
FILTERED WASTEWATER
YEAR INSTALLED
2014



INTRODUCTION & PROCESS DESCRIPTION

Commercial laundries consume and discharge large volumes of water. Due to the nature of this water, many regulatory authorities enforce stringent water quality standards and regulate discharge volumes. As a result, commercial laundry operations are under ever increasing pressure to reduce water consumption and minimize discharge volumes, all while delivering whiter, brighter linens.

It is generally accepted that TDS (Total Dissolved Solids) above 750 - 1,000 ppm causes dull linens; TDS includes iron, manganese, calcium, alkalinity, and other dissolved salts, all of which are known to cause linens to gray. Consequently, effective use of recycled laundry water has been limited by the inability to affordably and reliably remove TDS at high temperatures.

Due to the local regulations, this specific site was limited to an 8 hour work shift due to discharge limits.

VOLTEA'S CAPDI SOLUTION

Voltea's CapDI technology cost-effectively removes dissolved salts from recycled laundry water resulting not only in white linens and water savings, but also significantly reduces heating costs. Traditional desalination technologies require the water to be cooled before TDS removal, which means it must be reheated for laundering. This is expensive, time consuming, and now unnecessary.

CapDI removes TDS at high laundering water temperatures and recovers up to 90% of the treated water.

PROVEN RESULTS

Voltea closely monitored the laundry facility installation for a period of 6 months. This laundry facility achieved significant cost savings and could double their daily throughput without exceeding daily discharge permit limits. This was attained because of the ability to utilize recycled water more effectively.
The addition of CapDI to the laundry wastewater treatment system delivered TDS removal at laundering temperatures, high water recovery, and enabled efficient recycling of spent laundry water.

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ABOUT VOLTEA

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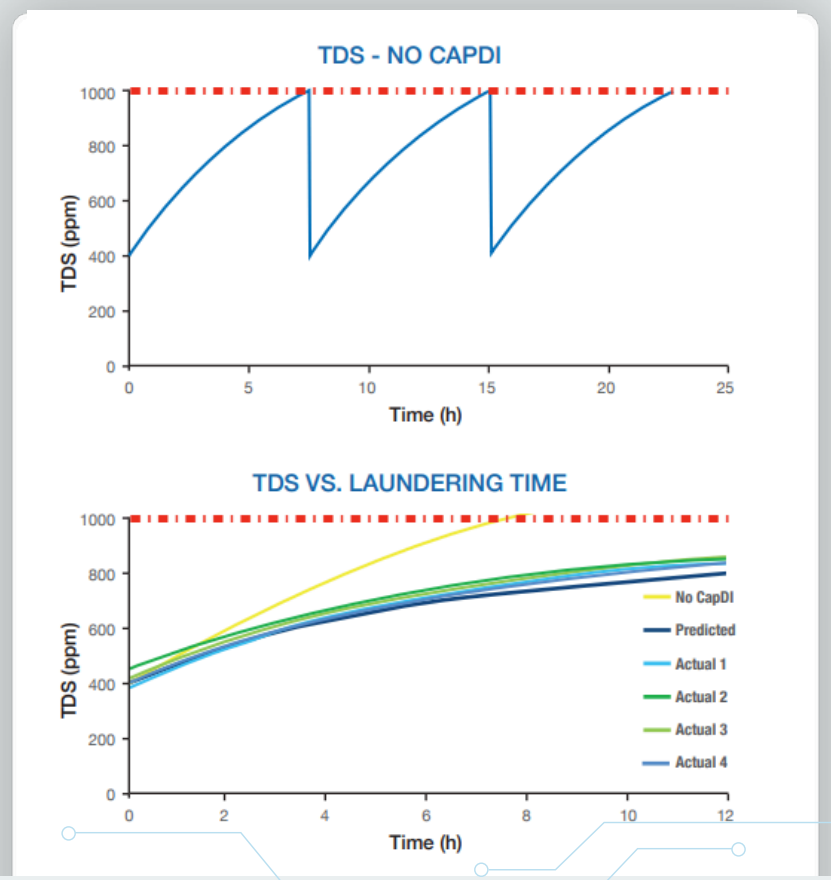
Voltea's CapDI technology is scalable and helps consumers and industry reduce water usage and save money.

Without CapDI, this laundry only ran 8 hours before reaching a TDS limit of 1,000 ppm, as shown in the adjacent graph. The water was drained, refilled and reheated before continuing operation.

Notably, Voltea's original forecast model was remarkably in line with the actual 100 data sets run over the 6-month operational time period. The data in the adjacent graph shows that CapDI allows the laundry reuse process to run for longer since the daily discharge limit of 1,000 ppm was not reached. As a consequence, multiple shifts can operate, allowing the laundry to be more efficient and cost effective. Of critical importance is that this is all achieved at laundering temperatures, meaning there are no additional energy costs as there is no additional cooling necessary.

CAPDI PERFORMANCE RESULT



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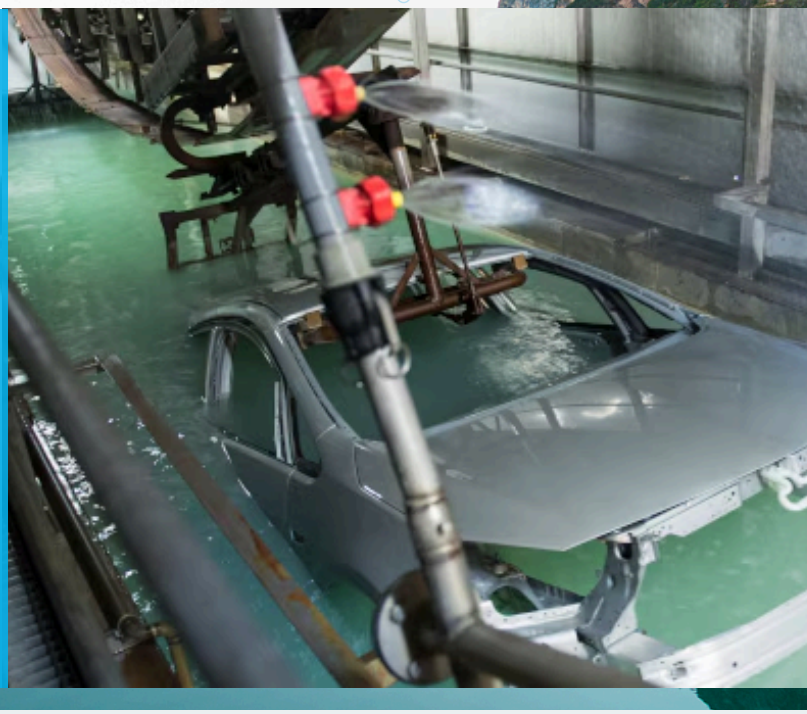
VOLTEA WATER

CASE STUDY

AUTOMOTIVE PAINT LINE RINSE WATER REUSE

INDUSTRY
AUTOMOTIVE
APPLICATION
WATER REUSE
WATER SOURCE
PAINT LINE RINSE
YEAR INSTALLED
2014
ANNUAL SAVINGS
$1.78M & 6.24M GAL
SYSTEM INTEGRATOR
PAPSCO



INTRODUCTION & PROCESS DESCRIPTION

The global automotive industry is a significant water consumer with an estimated 39,000 gallons used to produce a single car.[1] A large proportion of this water consumption is attributed to paint lines, where processing equipment must be regularly cleaned, leading to thousands of gallons of water being used weekly.[2]

This water is traditionally disposed of as hazardous waste or must undergo extensive pretreatment before disposal; both of which result in high costs. One option to improve the water footprint while reducing operating expense is to treat the water from the paint line rinse baths and reuse it.

[1] Water, water, everywhere in vehicle manufacturing, 6 October, 2014, automotiveworld.com
[2] Energy Efficiency Improvement and Cost Saving Opportunities for the vehicle assembly industry, Christine Galitsky, Ernst Worrell, Ernest Orlando Lawerence Berkely National Laboratory, p46

PAPSCO FILTRATION

VOLTEA'S CAPDI SOLUTION

Voltea's CapDI was selected for desalinating paint line rinse water owing to minimal pretreatment requirements. With low energy consumption, high water recovery, fully automated operation, and low operational costs, CapDI delivered an environmentally friendly and favorable business case.

PROVEN RESULTS

Feed water to the CapDI system was taken from a stage 5 paint line and stored in a buffer tank. This water was then passed through a 3 micron nominal bag filter before entering the CapDI system for desalination. Feed water to the CapDI system had a conductivity of approximately 1,200 µS/cm and the target conductivity for purified water was 300 µS/cm. This target was chosen so that purified water would be of similar quality to the raw, city feed water that it would replace.

Voltea's CapDI system was set to a fixed ion removal rate to meet the water requirements. The table on the following page lists a sample of the feed water characteristics sent to the CapDI system, and the resulting purified water that was delivered.

Of critical importance, the level of zinc, iron and copper ions in the purified water were decreased by 91%, 97% and 93% respectively, and the concentration of nitrites and nitrates reduced by 89%. Hardness and conductivity were reduced by 87% and 86%, respectively. This desalination process was obtained at an energy cost of <0.9 kWh/m3 (3.5 kWh/kgal) purified water. ***Most impressively, the addition of CapDI allowed an annual water recovery savings of $1.78M, as explained in the table on the following page!***

VOLTEA WATER

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Voltea's CapDI technology is scalable and helps consumers and industry reduse water usage and save money.

CapDI PERFORMANCE RESULT

As shown in the adjacent table, Voltea's CapDI system achieved the water quality target and removed roughly 90% of the metals, enabling cost effective water reuse.

The above was achieved at >80% water recovery, meaning that >80% of the water sent to the CapDI system was returned for reuse, thereby reducing the amount of city water consumed. The high water recovery also results in a smaller volume of waste that would require treatment before discharge, resulting in reduced operating expense.

This water recovery was maintained by implementing a fully automated clean-in-place (CIP) twice a week that utilized low-cost, non-hazardous citric acid and compressed air.

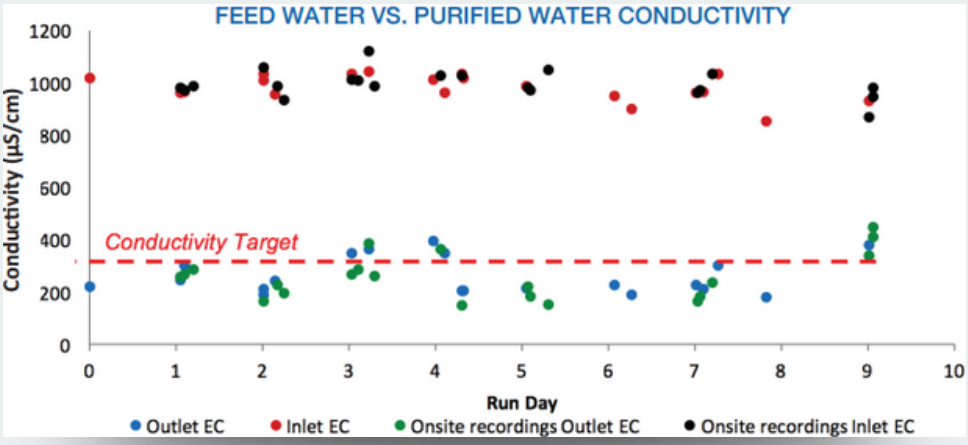
CapDI showed that the paint line rinse water could be reused, allowing for lower city water consumption, while collectively reducing waste volumes and associated disposal costs.

SAMPLE	FEED	PURIFIED
Conductivity (µS/cm)	1,212	169
pH	5.5	5.8
Total Suspended Solids (mg/L)	2	< 1
Anions (ppm)		
Fluoride	75.9	40.8
Nitrite	381	43.5
Nitrate	355	39.2
Cations (ppm)		
Total Hardness (as $CaCO_3$)	2.6	0.343
Iron	0.5	0.013
Copper	0.3	0.022
Sodium	84.7	16.4
Aluminum	20.4	13.5
Zinc	185	16.7

Test data independently provided by Buckman Technical Services - Analysis - 7/22/16

	WEEKLY	ANNUAL
COST	$34,267	$1,781,884
USAGE	120,000 Gal	6,240,000 Gal

The above table represents the actual water savings for this installation, based on the cost of trucking the reject water from the site for disposal. This site operates 8 hours/day, 5 days/week, at a flow rate of 50 gpm. Trucked water charges are $0.23/gal + $500/truck at 14 trucks/week, without the CapDI treatment system.



PAPSCO FILTRATION

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CASE STUDY

REPUBLIC STEEL'S COOLING TOWER

INDUSTRY
STEEL MILL
APPLICATION
COOLING TOWER
WATER SOURCE
BLACK RIVER, OH
YEAR INSTALLED
2015

INTRODUCTION & PROCESS DESCRIPTION

Water is often a hidden cost of industrial sites and can contribute significantly to operational costs. Cooling towers are used to reject heat through the natural process of evaporation providing cooled water across a broad range of applications. Due to evaporative losses, the water remaining in the cooling tower becomes concentrated with dissolved solids that will lead to scaling and corrosion.

The traditional methods of scale and corrosion control are through dosing chemicals and blowdown - the act of discharging water at a high TDS level. This operation results in high volumes of water and chemicals being discharged to the environment. The quality of the water introduced to the cooling tower system is key to the efficiency of this process and the frequency of preventive maintenance intervals.

For this site, the Black River was the only viable water source. Republic Steel evaluated and rejected traditional and membrane treatment methods due to high operational costs and overall effectiveness on the water source.

VOLTEA'S CAPDI SOLUTION

Republic Steel selected Voltea's CapDI model IS36 as it required minimal pretreatment. With low energy consumption and minimal intervention, the forecasted operational costs were lower than any other technology evaluated. The customer's need for high quality water (lowest controlled TDS level) led to the selection and use of CapDI to treat river water as the feed source at this location.

PROVEN RESULTS

Installed at the beginning of the spring season, the CapDI system experienced extreme fluctuations in feed water quality. The run-off of salts from the local area at the end of winter resulted in the Black River conductivity varying between 400 and 1400 µS/cm, corresponding to 23 to 180 ppm chlorides with turbidity spiking up to 800 NTU. Despite the seasonal changes in feed water quality, the CapDI system operated after a simple conventional multi-media filtration. Average chloride, sulfate and phosphate levels were significantly above the targets set by the cooling tower manufacturer. Voltea's CapDI system was set to a fixed ion removal to meet the water requirements. The level of chloride ions in the treated water was decreased by 77%, and the concentration of sulfate and phosphate ions was reduced by 67%. Hardness and conductivity was reduced by 78% and 62% respectively.

ABOUT VOLTEA

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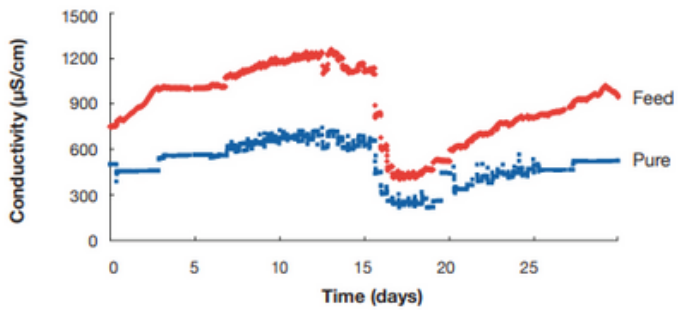
Voltea's CapDI technology is scalable and helps consumers and industry reduce water usage and save money.

CAPDI PERFORMANCE RESULT

SYSTEM CONDUCTIVITY

The system operation was improved by the implementation of dynamic control on the CapDI system, allowing it to constantly monitor and adjust performance. One month of continuously monitored data is shown in Figure 1.



Feed and pure water conductivity treated by CapDI

The use of CapDI technology with minimal pretreatment allowed Republic Steel to use a feed water source previously deemed unfit for the cooling tower. Additionally, the chemical free process enabled the site to discharge the concentrated effluent of the CapDI system directly into the river without having to secure an additional site permit for disposal.

WATER QUALITY*

Parameter	Avg. Black River	Requirements	Product Water
Chloride (ppm)	98.5	<50	22.5
Sulfate (ppm)	97.5	<50	32.5
Phosphate (ppm)	0.3	<0.2	0.1
Conductivity (µS/cm)	800.0	N/A	305.0
Hardness (ppm as CaCO3)	132.5	N/A	29.2

**Test data independently provided by CWM Environment Inc.*

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ROI FEATURE

UNILEVER – PRATAU, GERMANY
ROI PAYBACK: 7 MONTHS

Manufacturer Gets Quick Financial Payback from Waste Water Reuse Treatment Technology for Cooling Tower Make-Up

INTRODUCTION & PROCESS DESCRIPTION

Anyone who relies on cooling towers in the manufacturing process knows they usually face one or both of these issues:

- Low water efficiency
- High chemical usage

Unilever, which operates a margarine manufacturing plant with a cooling tower in Pratau, Germany, had an additional challenge — extraordinarily high water costs. As a result, water-related expenses were taking up an increasingly large share of the budget, and the company needed to find a solution quickly.
Fortunately, Unilever discovered the answer to its problems: a groundbreaking technology called CapDI — a solution it didn't even know was possible.

THE CHALLENGE: RELYING ON CHEMICALS

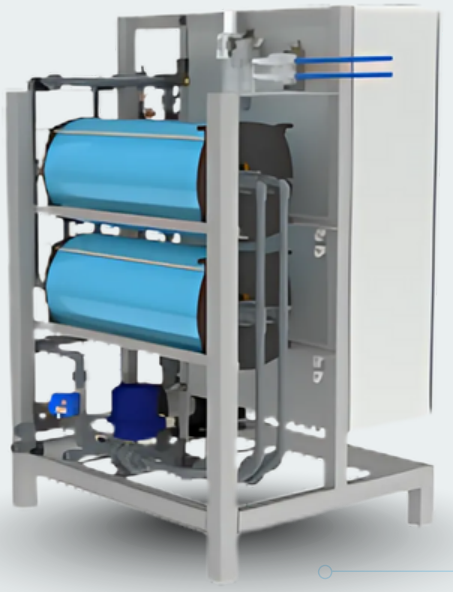
High local water costs, coupled with Unilever's extremely low water efficiency, were causing significant cost overruns. On top of that, the plant relied heavily on chemicals to treat the water. Cooling towers transfer heat, which causes some water to evaporate. The remaining liquid absorbs salts from the evaporated portion, leading to increased salt concentration. To counteract this, Unilever had to dose large amounts of chemicals. The chemical usage was so high that the company also had to pay to discharge the water to the municipality, as it required extensive treatment before it could be reused or released into surface water.
In search of a solution, Unilever evaluated standard water treatment options, including Reverse Osmosis (RO). However, RO presented additional concerns, such as equipment corrosion and potential structural damage to cooling operations. Finally, the company found a system that ushered its plant into a new era of water treatment.

VOLTEA'S CAPDI SOLUTION: ENVIRONMENTALLY RESPONSIBLE TECHNOLOGY

Unilever turned to Voltea's Membrane Capacitive Deionization (CapDI), a salt-free water purification technology that removes salt ions and total dissolved solids (TDS) using an electrical current.
An Industrial Series 2 (IS-2) System was installed on-site, which significantly reduced the volume of water consumed while cutting chemical usage and wastewater production—greatly lowering overall costs. By decreasing the salt content of the water before it enters the cooling tower, the system allows for higher cycles of concentration, further reducing overall water consumption.
With CapDI, Unilever now has the power to select the desired level of salt or TDS removal and maintain consistent water quality, thanks to Voltea's real-time remote monitoring and control capability. The tunability feature eliminates unnecessary steps in the treatment process while reducing the salt concentration in the discharge water.

VOLTEA INDUSTRIAL SERIES 2 (IS-2) SYSTEM

Every problem identified by the manufacturer prior to installation—including significant water waste and excessive chemical usage—was no longer a pain point.



THE RESULTS: FAST ROI & QUANTIFIABLE RESULTS

Unilever quickly saw results from its water treatment upgrade. In just over six months of operation with Voltea's IS-2 system, Unilever achieved an impressive ROI of $14,078 (€12,044) in savings.

Every problem identified by the manufacturer prior to installation—including significant water waste and excessive chemical usage—was eliminated.

A year and a half after installation, the company reported even more quantifiable results, including:

- 78% reduction in chemical consumption
- 60% reduction in salts
- 50% decrease in wastewater
- 26% reduction in fresh water consumption

This performance data has remained consistent since installation, with the CapDI system maintaining an average water recovery of 83%.
This disruptive technology met Unilever's every need, delivering high water efficiency with low operating costs, while also providing an environmentally responsible alternative.

CHEMICAL CONSUMPTION	SALTS	WASTEWATER	FRESH WATER CONSUMPTION
78%	60%	50%	26%

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ROI FEATURE

TOMATO FARMER - PUEBLA, MEXICO
ROI PAYBACK: $96,000 IN 8 MONTHS

Grower Saves Thousands with Innovative Water Treatment System

INTRODUCTION & PROCESS DESCRIPTION

Water salinity is a crucial factor in whether a plant can thrive or die, as high sodium levels can negatively affect plant quality and significantly reduce production. For growers, salinity levels must be precisely managed—but that's not always easy. Many municipal water systems or wells provide inconsistent salinity levels, and plants demand varying amounts of salinity at different growth stages.

One tomato and pepper grower in Puebla, Mexico, who relied on well water, faced severe financial pressure due to inconsistent salinity. The company was even forced to purchase seedlings from a third-party source because the water quality wasn't suitable for growing them in-house.
The grower needed better results from its water treatment system and, thankfully, found the perfect solution.

THE CHALLENGE: SPENDING ON SEEDLINGS

While integral to the economy, agriculture is also a major drain on Mexico's water resources, accounting for 77% of the country's total water withdrawal. This heavy demand often leads to severe water scarcity, which directly impacts salinity variability—making it even more difficult to secure the high-quality water needed for crop production.
Tomato seedlings are particularly sensitive to salinity, which is why this grower in Puebla was unable to produce seedlings in-house. The grower considered adopting a water treatment method that required the addition of chemicals to achieve the right salinity levels. However, this option was not environmentally responsible, would complicate the existing treatment process, and would also add significant costs.
As a result, the grower was forced to purchase seedlings from a third-party supplier at a cost of several hundred thousand dollars—a major financial burden in an industry with tight margins. If the grower could nurture its own seedlings, it would not only save money but also gain full control of the growing process.
It was time for a new water treatment solution.

VOLTEA'S CAPDI SOLUTION: TUNABLE WATER TREATMENT; CONSISTENT RESULTS

By choosing Voltea's Membrane Capacitive Deionization (CapDI), a salt-free water purification technology, the grower found a solution that met every need. CapDI provides a revolutionary way to treat water by removing salt ions and total dissolved solids (TDS) through an electrical current. The Industrial Series 12 (IS-12) System installed on-site includes a key feature essential to consistently achieving the ideal water quality and sodium levels: tunability. With tunability, operators can select the optimum ion removal rate for each crop, precisely removing and controlling TDS and sodium levels while retaining beneficial minerals.
For example, feedwater may contain 89 parts per million (ppm) of sodium. One crop might require sodium levels reduced to 21 ppm, while another at a different growth stage may require 51 ppm. Voltea's technology ensures consistent salinity levels regardless of the feedwater quality. System operators no longer need to spend time manually monitoring water concentration. CapDI automatically adjusts to variations in feedwater, delivering consistent, high-quality water output tailored to each crop's needs.

VOLTEA INDUSTRIAL SERIES 12 (IS-12) SYSTEM

The grower was shocked to find a solution that not only addressed water quality issues and reduced costs, but also required less time and energy to maintain.

THE RESULTS: IMPROVED WATER QUALITY; ANNUAL SAVINGS

In just eight months, the grower achieved a remarkable ROI. The use of Voltea's technology resulted in:

- $96,000 in savings
- 85% water recovery rate
- Reduced energy use
- Ideal salinity levels for each crop
- Lower maintenance requirements

Being able to adjust salinity levels and produce higher-quality water allowed the grower to achieve its original objective of growing seedlings in-house. The grower was surprised to find a solution that not only solved water quality issues and reduced costs, but also required less time and energy to maintain.

"It's truly a trouble-free piece of equipment," said a company representative. "There's no need for us to be there next to the system all the time looking after it — the IS-12 does all the heavy lifting for us. Not only is there reduced maintenance, but we now utilize water in an optimum way."

As demand for stricter water use controls increases, CapDI's environmentally friendly, tunable water treatment solution offers an innovative way to reduce water use while properly irrigating sensitive crops.

WATER RECOVERY

85%

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ROI FEATURE

AUTOMOTIVE PAINT LINE - OHIO, U.S.A.
ROI PAYBACK: 3 MONTHS

Automotive Plant Recovers 1.8 Million Gallons of Water Annually with Cutting-Edge Water Treatment Technology

INTRODUCTION & PROCESS DESCRIPTION

High water consumption is extremely common in the automotive industry, with nearly 39,000 gallons of water required to produce a single car.

An automotive plant based in Ohio, U.S.A., faced this challenge daily—manufacturing seven different vehicle models while generating millions of gallons of wastewater in the process.
The plant's very low water recovery rate was not only an environmental concern, but it was also costing the company hundreds of thousands of extra dollars each year in water treatment and labor.
The facility was ready to move away from its traditional, outdated technology and invest in a modern, innovative water treatment system that would quickly prove its value.

THE CHALLENGE: LOW WATER RECOVERY; HIGH COSTS

Automotive manufacturing—including paint and coating operations—requires extremely pure water, which meant the Ohio plant's incoming municipal water had to be heavily treated.
The facility considered standard treatment technologies, but none offered a sustainable, long-term solution for energy savings, cost reductions, and wastewater minimization.

With traditional chemical-based treatment methods, the plant faced very high operating costs and an extremely labor-intensive process that only added to the overall expense. Water quality would also need to be constantly monitored and adjusted depending on the incoming supply.

In addition, the chemicals used to treat the water made it unsafe for recycling, creating a large volume of wastewater that required extensive treatment before disposal.
The automotive manufacturer needed a simpler, more cost-effective solution to reduce wastewater production and decrease its reliance on city water.

VOLTEA'S CAPDI SOLUTION: DISRUPTIVE WATER TREATMENT TECHNOLOGY

It was time to implement a new water treatment method that would reduce the plant's workload, increase the water recovery rate, and lower overall costs.

Voltea's revolutionary Membrane Capacitive Deionization (CapDI)—a salt-free, chemical-free water purification technology—treated all wastewater by removing salt ions and total dissolved solids (TDS) through an electrical current.

The Industrial Series 12 (IS-12) System installed at the facility enabled the plant to reduce municipal water intake and decrease wastewater production. The technology lowered conductivity to levels equal to or better than city water quality, allowing the treated water to be recycled back into the pretreatment process. This saved the plant over one million gallons of water.

"Having Voltea's system in place has been greatly beneficial! We've been able to significantly improve our sustainability efforts while decreasing operating expenses."

ROI FEATURE | AUTOMOTIVE PLANT

This innovative technology stands out from other methods on the market because it tunably adjusts the feedwater regardless of its quality.
There's no need for operators to manually adjust the system to achieve the perfect water quality. Instead, they simply set the desired output quality, and the CapDI technology maintains that level automatically through self-monitoring.

THE RESULTS: IMPROVED SUSTAINABILITY AND SAVINGS

After implementing Voltea's CapDI technology, it didn't take long for the automotive plant to see impressive results, including:

- $100,000 in annual labor savings
- 1,875,000 gallons of water recovered every year

"Traditional water treatment methods were not only expensive, but extremely inefficient to operate," said the automotive executive. "Having Voltea's system in place has been greatly beneficial! We've been able to significantly improve our sustainability efforts while decreasing operating expenses. And the best part is, the technology helped us achieve all of that within just three months."
Making the switch to a cutting-edge technology allowed the world-class car manufacturer to produce and recycle world-class-quality water to match.

ANNUAL LABOR SAVINGS

$100,000

ANNUAL WATERRECOVERY

1.875M GAL

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VOLTEA WATER

ROI FEATURE

COFFEE SHOPS
ISTANBUL, TURKEY
ROI:

- **82% DECREASE IN WASTEWATER VOLUME,**
- **48% REDUCTION IN OVERALL PROJECT COSTS**

INTEGRATOR FOR GLOBAL COFFEE SHOPS REDUCES COSTS, BREWS HIGH-QUALITY COFFEE WITH NEW TECHNOLOGY

INTRODUCTION & PROCESS DESCRIPTION

Coffee is made up of 98% water, which makes consistent water quality essential for cafés and restaurants that want to be known for great-tasting coffee.

To achieve the perfect pour, water must contain a specific, controlled range of minerals. However, the only way to ensure the ideal balance of minerals from a municipal water supply is through on-site water treatment.

OSMO, an integrator in Istanbul, Turkey, knew this problem very well. It was using traditional water treatment methods such as Reverse Osmosis (RO) and water softeners for the world's largest coffee shop chain, but these methods were very costly and inefficient.

Fortunately, OSMO wasn't out of options. The integrator wanted something different—a disruptive technology that would not only deliver consistent, high-quality water, but also reduce maintenance and operating costs.

THE CHALLENGE: INEFFICIENCIES LEAD TO RISING COSTS

Hard water and an imbalance of minerals can cause coffee to take on flavors ranging from sharp and sour to flat and chalky—none of which baristas would want to use to describe their ideal cup. That's why high-quality water is the lifeblood of the coffee industry, making it possible for cafés and restaurants to deliver coffee within the much-desired Ideal Brew Zone.

OSMO relied on RO units, under-the-sink softeners, and other traditional technologies to try to achieve water quality within the Ideal Brew Zone. However, this approach presented several challenges that caused operating expenses to skyrocket.

Because water quality varied at each coffee shop location, every unit required constant monitoring to ensure consistent quality and taste for every cup of coffee, cappuccino, and espresso. OSMO staff had to regularly visit locations to test water, service the units, and make sure everything was running properly—efforts that cost significant time and money.

THE SOLUTION: TUNABLE WATER TREATMENT FOR THE PERFECT POUR

Voltea's point-of-use (PoU) system, DiUse, delivered a solution that checked every box for OSMO. The system runs on patented, salt-free CapDI technology, which removes salt ions and total dissolved solids (TDS) via an electrical current rather than relying on chemicals. This allows unrecovered water to safely return to the ecosystem while significantly reducing waste.

What truly set DiUse apart was its tunability. Once a desired reduction rate is set, DiUse self-monitors and automatically adjusts to account for any fluctuations in incoming water quality. This reduced service calls and associated costs, while freeing OSMO from the burden of constant monitoring. Each location could now rely on the same consistent, high-quality water to produce the perfect cup of coffee.

Even the coffee machines themselves benefited from CapDI technology. Reduced scaling meant fewer filter replacements, lower service costs, and less downtime for descaling. With Voltea's technology in place, OSMO could finally rely on both a consistent product and the long-term protection of its equipment.

VOLTEA'S POU SYSTEM, DIUSE

"Voltea provided a solution that was years ahead of other traditional PoE and PoU treatment methods, and helped us significantly cut back on water waste and overall costs while delivering the perfect cup of coffee to our customers, every time."
– Mehmet Beycan, OSMO

THE RESULTS: DECREASED MAINTENANCE ; REDUCED COST

Voltea's DiUse system delivered an impressive ROI, proving the technology to be a smart investment that would continue to provide value over the long term.
With the technology in place, OSMO saw:

- 82% decrease in wastewater volume
- 81% decrease in electrical costs
- 50% reduction in incoming water costs
- 48% reduction in overall project costs

"We believe in giving our customers the very best, so we're always on the lookout for the newest, most cutting-edge technology available," said Mehmet Beycan, Operations Manager at OSMO. "Voltea provided a solution that was years ahead of other traditional PoE and PoU treatment methods, and helped us significantly cut back on water waste and overall costs while delivering the perfect cup of coffee to our customers, every time."

WASTE WATERVOLUME	ELECTRICAL COSTS	INCOMING WATERCOSTS	OVERALL PROJECTCOSTS
-82%	-81%	-50%	-48%

VOLTEA'S DIUSE SYSTEM PRODUCED AN IMPRESSIVE ROI, PROVING THE TECHNOLOGY TO BE A SMART INVESTMENT THAT WILL CONTINUE TO DELIVER VALUE OVER THE LONG TERM.

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VOLTEA WATER

ROI FEATURE

COMMERCIAL LAUNDRY
ATLANTA, GA, U.S.A.
ROI PAYBACK: 6 MONTHS

Commercial Laundry Site Increases Water Recovery Rate with Disruptive Water Treatment Technology

INTRODUCTION & PROCESS DESCRIPTION

Commercial laundries rely heavily on high-quality water, as it's the key to keeping linens white and soft after every wash. Total Dissolved Solids (TDS)—including iron, manganese, calcium, alkalinity, and other dissolved salts—can shorten the lifespan of linens, causing them to gray if TDS levels rise above 750–1,000 ppm.

However, removing TDS can be costly due to the massive water volumes used in the laundering process, along with the large amount of wastewater produced.

One U.S. commercial laundry facility, limited by strict state regulations to an 8-hour daily work shift, faced immense pressure to find a solution that would increase productivity, reduce wastewater, cut costs, and keep linens pristine.

Fortunately, the site discovered a non-traditional water purification technology that allowed for longer work shifts while reducing total water consumption—making it easier to both meet water quality standards and stay compliant with regulations.

THE CHALLENGE: COSTLY STANDARD TECHNOLOGIES

Traditional desalination technologies such as Reverse Osmosis (RO) and Electrodialysis (ED/EDR) created more obstacles than solutions for the laundry site.

Without extensive pre-filtration, standard RO membranes quickly became clogged. In addition, these membranes are not tolerant to high temperatures, and upgrading to specialty membranes that can withstand higher heat is very expensive.

ED/EDR systems also require significant pre-filtration and will foul easily when used with laundry water.

Both of these traditional methods had another major drawback: they require water to be cooled before TDS can be removed, and then reheated for laundering. This not only wasted time, but also demanded more energy, driving overall expenses higher.

The site needed a more affordable and reliable solution—one that could maintain pristine linen quality while limiting discharge volumes.

THE SOLUTION: INNOVATIVE WATER PURIFICATION TECHNOLOGY

Voltea's Membrane Capacitive Deionization (CapDI) Technology proved to be the ideal solution for the commercial laundry site. An Industrial Series 4 (IS-4) System was installed to help the facility comply with regulations while effectively removing TDS.

This salt-free, chemical-free water purification technology removes salt ions and TDS via an electrical current and, uniquely, can operate on high-temperature water. This eliminates both the additional reheating costs and the extra time required by traditional desalination technologies.

With CapDI, the facility was able to operate longer and more efficiently, since the daily discharge limit of 1,000 ppm was never reached.

Minimal maintenance was required. The CapDI technology enabled remote and continuous water quality monitoring with fully automated operation. Employees no longer had to spend hours physically monitoring and adjusting the equipment—the CapDI system did it all in real time.

"Employees no longer had to spend hours physically monitoring and adjusting the equipment because the CapDI system did that for them in real time."

THE RESULTS: SIGNIFICANT COST SAVINGS AND LIMITED WASTE

Using Voltea's CapDI technology, the commercial laundry facility achieved a remarkable ROI and significant cost savings thanks to:

- Improved water reuse
- Energy savings through reduced water heating

By recycling water more effectively, the facility doubled its daily throughput without exceeding discharge permit limits.

Electro-deionization also ensured compliance with the high water quality standards required across industries such as healthcare, hospitality, industrial uniforms, and food & beverage.

"THANKS TO CAPDI, THE FACILITY RECYCLED WATER MORE EFFECTIVELY—DOUBLING ITS DAILY THROUGHPUT WHILE STAYING WITHIN STATE-MANDATED DISCHARGE PERMIT LIMITS."

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ROI FEATURE

KALIDA MANUFACTURING
Kalida, OH U.S.A
ROI PAYBACK: $37,000 ANNUALLY IN REPLACEMENT PARTS SAVINGS

Supplier for Major Auto Manufacturer Saves Thousands of Dollars with Disruptive Water Purification Technology

INTRODUCTION & PROCESS DESCRIPTION

As with most process water applications, high electrical conductivity (EC) was a common issue causing significant equipment damage.

Kalida Manufacturing, based in Kalida, Ohio, has been supplying high-quality parts to a major North American automaker for more than two decades. However, the facility was losing money due to components damaged by high EC levels in its water, which led to frequent downtime, increased maintenance, and higher operational costs.

In search of a solution, the manufacturer turned to a non-traditional water purification technology capable of tunable EC removal—a solution long needed but previously underestimated for its effectiveness.

THE CHALLENGE:DAMAGED EQUIPMENT LEADS TO HIGH COSTS

The feedwater running through both of Kalida Manufacturing's cooling loops had elevated electrical conductivity (EC) levels, which caused primary side components to leak current through the water, generate heat, and damage equipment.

This problem not only reduced operating efficiency but also led to increased maintenance and escalating annual costs.

- Feedwater EC ranged from 1,669 to 1,844 µS, well above the recommended maximum of 1,100 µS.
- The facility was spending an average of $37,000 annually on replacement parts.
- With no water filtration system in place, equipment continued to fail, burning out faster and forcing costly downtime.

Kalida Manufacturing needed a fast, reliable solution to bring conductivity under control and protect its operations.

THE SOLUTION:
CONTROL OF CONDUCTIVITY WITH INNOVATIVE WATER PURIFICATION TECHNOLOGY

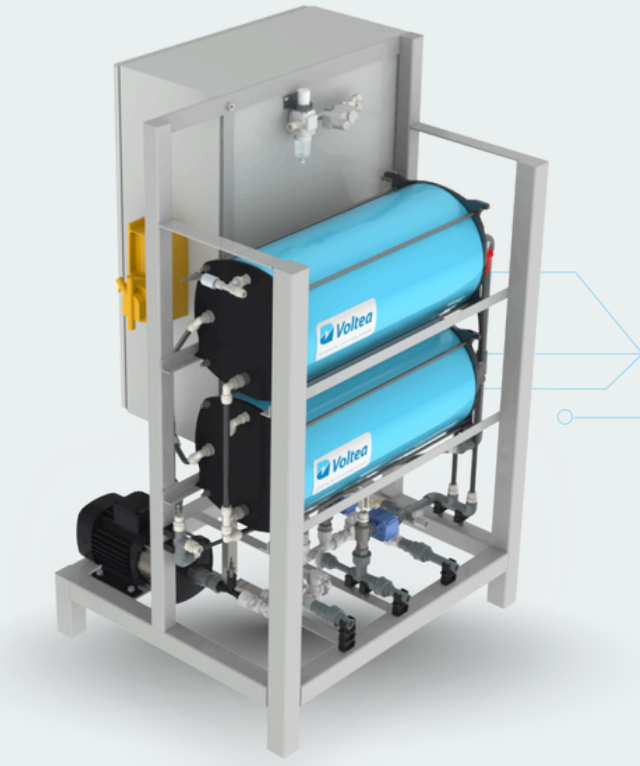
To gain control of conductivity levels in the weld equipment, Kalida leveraged Voltea's Membrane Capacitive Deionization (CapDI), a salt-free water purification technology that removes salt ions and total dissolved solids (TDS), or EC, via an electrical current.

Kalida installed an Industrial Series 2 (IS-2) System at the facility to produce controlled, high-quality water with low EC levels. This helped maintain equipment quality standards and significantly reduced downtime.

What sets Voltea's technology apart from other traditional water treatment methods is its ability to tunably remove electrical conductivity. The system can be adjusted to select the desired level of EC removal in order to ensure a consistent water quality output. Real-time monitoring and control capability also significantly reduces the need for maintenance. The technology can simply be turned on or off to produce high-quality water as needed.

VOLTEA'S INDUSTRIAL SERIES 2 (IS-2) CAPDI SYSTEM ON-SITE AT KALIDA MANUFACTURING

"We've had zero equipment failures due to EC issues in the water, which has not only saved us thousands of dollars, but has also significantly reduced downtime and overall maintenance. The technology has really impressed us."



THE RESULTS: MONEY SAVED, REDUCED MAINTENANCE

Kalida Manufacturing installed the CapDI IS-2 System in October 2017 and has since witnessed notable results, including:

- An average of $37,000 in annual savings
- Reduced damage to components
- Reduced downtime
- Decreased maintenance

Voltea's CapDI technology covered Kalida's two cooling loops and had an immediate effect on conductivity levels, dropping them well below the maximum recommended EC level and consistently holding them there.

"With CapDI, our equipment has been running more smoothly while the water in the cooling loops has not exceeded the conductivity limit," said a Kalida Manufacturing maintenance manager. "We've had zero equipment failures due to EC issues in the water, which has not only saved us thousands of dollars, but has also significantly reduced downtime and overall maintenance. The technology has really impressed us."

The maintenance manager added:
"We want to share this innovative technology with everyone who can benefit from tunable water purification for their industrial processes."

Lower conductivity levels helped to prevent side reactions from occurring, which would have otherwise caused damage to Kalida's equipment. More importantly, the manufacturing facility now operates much more efficiently and cost-effectively with CapDI installed.

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CASE STUDY

VOLTEA CERTIFIED PARTNER

CASE STUDY: HYBRID VOLTEA & RO SYSTEM FOR BRINE WATER IN TANZANIA

INTRODUCTION & PROCESS DESCRIPTION

At Voltea, your business and water needs inspire us. By uniquely integrating electromembranes and pressure membranes into a single advanced system, we maximize the benefits of both technologies. This synergy not only boosts economic efficiency, but also overcomes the technical limitations that might arise if each system were used independently.

THE CHALLENGE

Water treatment projects in regions such as Tanzania face significant hurdles:

- High infrastructure costs (CAPEX): Traditional pressure-driven systems require major upfront investment.
- Energy-intensive operations (OPEX): High long-term expenses from power-hungry processes.
- Fluctuating water quality demands: A need for flexible, real-time adjustment.
- Harsh operating conditions: Variable feedwater quality and wide temperature ranges.

These challenges required a solution that could deliver sustainable water treatment while remaining cost-effective and adaptable to changing conditions.

The Solution: Hybrid Membrane System

Voltea deployed a hybrid membrane system that combined the strengths of pressure-membrane technology with our proprietary CapDI (Capacitive Deionization) electro-membrane technology.

Key features of the hybrid system included:

- Low-pressure operation – significantly reducing capital costs.
- Tunability – enabling operators to adjust water quality in real time to meet immediate needs.
- Energy efficiency – minimizing both environmental footprint and long-term operating expenses.

CASE STUDY | HYBRID VOLTEA & RO SYSTEM FOR BRINE WATER IN TANZANIA

VOLTEA'S CAPDI TECHNOLOGY

At the heart of the system lies CapDI – a tunable and scalable deionization technology that removes dissolved salts from multiple water sources, including:

- Tap water
- Brackish groundwater
- Industrial process water

CapDI performs reliably across temperatures from 5–60°C (40–140°F) and handles challenging feedwaters with higher turbidity—all while requiring little to no chemical use. This ensures low environmental impact and sustainable operation.

THE RESULTS

The Tanzanian project demonstrated how hybrid membrane systems unlock new opportunities in water treatment:

- Reduced CAPEX through low-pressure design
- Optimized OPEX via energy efficiency and minimal chemical consumption
- Operational flexibility, with tunable water quality adapting to real-time demand
- Sustainability, by lowering environmental impact compared to conventional systems

CONCLUSION

The successful deployment of Voltea's hybrid membrane system with CapDI in Tanzania showcases the transformative potential of integrated membrane technologies.

By enhancing efficiency, cutting costs, and delivering sustainable water treatment, Voltea is redefining what's possible in the water industry.

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