



CASE STUDY

AUTOMOTIVE PAINT LINE RINSE WATER REUSE

INDUSTRY
AUTOMOTIVE

APPLICATION
WATER REUSE

WATER SOURCE
PAINT LINE RINSE

YEAR INSTALLED
2016

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 Lawrence Berkely National Laboratory, p46

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 $\mu\text{S}/\text{cm}$ and the target conductivity for purified water was 300 $\mu\text{S}/\text{cm}$. 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!

ABOUT VOLTEA

Voltea's award-winning 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.



CAPDI® PERFORMANCE RESULTS

CapDI PERFORMANCE: ION REMOVAL

| 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

WATER RECOVERY SAVINGS

| | 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.

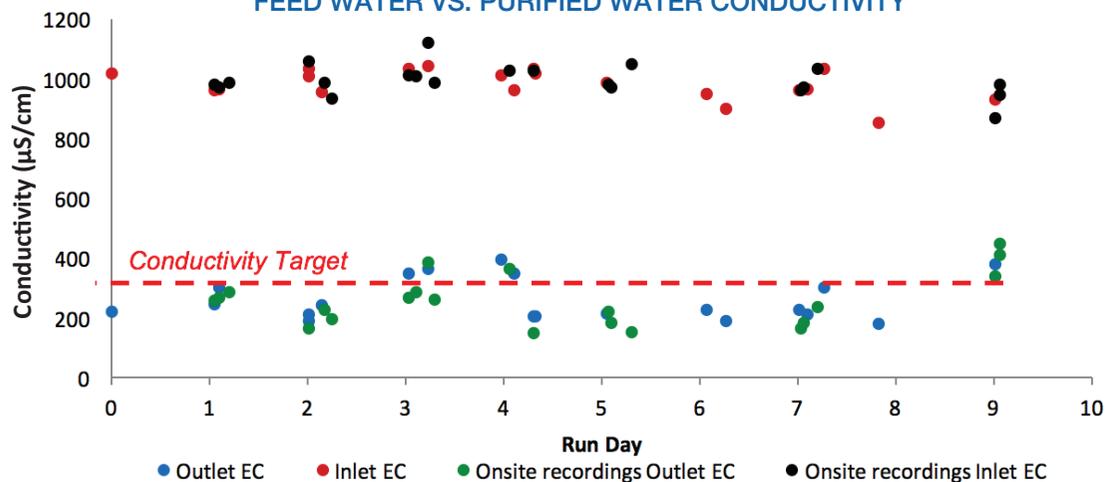
As shown in the adjacent table, Voltea's CapDI system achieved the water quality target and removed roughly **90%** of the metals, enabling cost effective water reuse.

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.

FEED WATER VS. PURIFIED WATER CONDUCTIVITY



Voltea *Unlocking the world's water potential*

INTEGRATOR: **PAPSCO**
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