

## **SHOWCASE PROJECT: NISSAN NORTH AMERICA: RECYCLING WATER USING ADVANCED FILTER STRATEGIES**

### **SOLUTION OVERVIEW**

Since the start of production in 1983, Nissan's Smyrna Vehicle Assembly Plant in Tennessee has built more than 11.5 million vehicles. The vehicle manufacturing processes include metal stamping, assembly, plastic forming, and painting.

The Smyrna plant's paint engineers were searching for ways to reduce water consumption, which is a key part of the manufacturing process. Before a vehicle is painted, it goes through multiple rinsing stages to remove excess phosphates. High-temperature, once-through rinsing water was discarded and treated at an onsite wastewater treatment facility before being dumped into the sewer. Clean makeup water from municipal and reverse osmosis sources replaced the used water in the rinsing baths.

The plant currently builds the Nissan Altima, Maxima, Pathfinder, Rogue and the Infiniti QX60. In late 2012, the Smyrna plant launched production of the all-electric Nissan LEAF, as well as the lithium-ion batteries that power the car. As of January 2016, the Nissan Smyrna Vehicle Assembly Plant and Battery Plant employees about 8,400 individuals. The site operates 24 hours of production per day, five days per week with weekend production scheduled as required.

### **SECTOR TYPE**

Industrial

### **LOCATION**

Smyrna, Tennessee

### **PROJECT SIZE**

6 Million Square Feet

### **FINANCIAL OVERVIEW**

\$638,000

### **SOLUTIONS**

An automated water filtration system was identified as a possible solution to eliminate the once-through rinse water. The identified water filtration system utilized a fabric filter to continually remove contamination from the rinse water which allows the water to be reused in the rinse process instead of being sent to the drain. A filtration system maker, K Factor Filter, loaned equipment to Nissan for

several months to test in different manufacturing stages at the Smyrna plant. The initial equipment trials began in July 2014 and filter equipment was installed incrementally over a two-year period in four vehicle rinsing stages prior to painting: two pre-cleaning stages and two stages for removing excess phosphates. Trial results showed that the automated technology delivered highly efficient washing and filtration of pre-treatment water, allowing contaminated used water from the rinsing stages to be recycled.

Due to the success of the pilot project, Nissan invested in water filtration upgrades for the four manufacturing systems. Total cost of the system was about \$640,000 with the capital expenditure making up about three-quarters of those costs and operational/labor costs making up the remaining quarter. Smyrna's plant engineers bundled and incorporated the projects into the company's capital expenditure plan in April 2015. Nissan expects the project to pay for itself in two years.

Prior to the installation of the K-factor Filters, Nissan incorporated water savings into the company's corporate-level Key Performance Indicators. This helped draw attention to the importance of implementing water saving projects, such as the filtration system. The installation of the new filtration system contributes significant savings to Nissan's overall water reduction efforts and, along with other projects, has helped Nissan reduce absolute water consumption by 9.8% from FY2014 to FY2015. This absolute reduction has occurred despite the installation of new water-using processes. Furthermore, the water reduction efforts have contributed to Nissan reducing the required water usage to produce a vehicle by 48% over the past 5 years. Savings for the Smyrna plant's rinsing system have been even greater: both system water use and system water cost have fallen by more than 65% from FY2014 to FY2015, from 81 million gallons to 28.1 million gallons and roughly \$491,000 to \$171,000, respectively.

## **OTHER BENEFITS**

The new filters have helped the Smyrna plant mitigate phosphate sludge production and carbon emissions. As the fabric filter in the systems become saturated with contaminants, old filter fabric is automatically cycled out of the system and replaced with new fabric to ensure that rinse-water quality is continuously being maintained at appropriate levels. The continuous removal of rinse-water contaminants improves water consistency and quality which also helps Nissan with product quality and meeting environmental compliance. Additionally, the automated equipment needs less personnel oversight which allows the plant's operators to focus more on their core responsibilities on a day-to-day basis.

One of the other side benefits of the new filtration system is that it improved the Smyrna plant's onsite water treatment facility's capacity. Additionally, due to the success of the equipment at the Smyrna location, the filtering technology was also loaned for testing to Nissan's Canton plant in Mississippi. Nissan's corporate team in Japan is currently working with the Smyrna site lead to deploy the technology across other plants. The project was nominated for Nissan's internal Paint Best Practices and the annual Tennessee Chamber of Commerce in Industry's Environmental and Energy Award.

**Annual Energy Use**

**Annual Energy Cost**

**Energy Savings**

**Cost Savings**

