SHOWCASE PROJECT: NISSAN NORTH AMERICA: NEW PAINT PLANT

SOLUTION OVERVIEW

The new paint plant at Nissan's Vehicle Assembly Plant in Smyrna, Tennessee is 40% more energy efficient than its predecessor. The new plant was designed and constructed with energy efficiency as part of the specification. It replaces a vehicle paint plant that had been in operation since 1981.

Since the start of production in 1983, Nissan's Smyrna Vehicle Assembly Plant has built more than 10,000,000 vehicles. 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.

Paint System 4 is now one of three paint systems at the Smyrna site, which collectively account for approximately 70% of the total energy consumed by the Smyrna plant. Attention to detail and innovation in this portion of the process can produce a significant reduction in vehicle manufacturing intensity.

SECTOR TYPE

Industrial

LOCATION

Smyrna, Tennessee

PROJECT SIZE

250,000 Square Feet

FINANCIAL OVERVIEW

Project Cost: $200 Million

SOLUTIONS

Nissan applied continuous improvement in the operation of the original body-on-frame paint plant, including many kaizens, which are low and no-cost improvement opportunities, and small capital projects. These incremental innovations helped Nissan improve performance and grow through one of the most severe recessions in decades. Nissan's new paint plant is now delivering a 40% reduction in total energy use for body-on-frame painting.

In 2010, a bold initiative was launched to replace the old body-on-frame paint plant with a new, more energy efficient one. The new paint plant makes use of the latest technological innovations, resulting in a more efficient, flexible and productive plant.

Nissan deployed innovative energy-saving technologies and processes including:

- **Application of a “3-Wet” process**: Ovens typically represent 30% of electrical power use and more than 40% of the fuel use in paint plants. A “3-Wet” paint process allowed for the removal of a costly high temperature oven bake step.
- **Compact spray booth design**: Typically, spray booths use more than 30% of total electric power and 35% of the fuel use in a paint plant. The new paint plant utilizes a compact design that yields a significant reduction in energy use.
- **Re-circulation of air**: The energy cost associated with Nissan’s spray booth has been reduced through recirculation of 75% of the booth air in prime, base, and clear zones. This limits the amount of outside air that must be conditioned resulting in significant energy savings.
- **Lower temperature phosphate process**: Metal surfaces are pretreated before painting is performed in the phosphate line to protect the metal surface against corrosion. The phosphate bath in the new paint plant operates at a lower temperature resulting in additional energy savings.
- **Variable Frequency Drives (VFDs)**: Fan and pump motors are controlled by variable frequency drives. These drives optimize motor speed to match load requirements.
- **White polyvinyl chloride (PVC) roof**: The roof is made of white PVC roofing systems that absorb less sunlight than conventional dark-colored roofs. Absorbing less sunlight means a lower surface temperature, which reduces heat gained through the roof and saves electricity used in the plant’s air-conditioning system.
- **Chilled water plant design**: The plant requires a supply of chilled water year round to control the humidity of returning booth air. Two existing water-cooled chillers were repurposed at the new plant in lieu of the initially proposed air-cooled chillers. The use of repurposed equipment results in capital cost savings and energy cost savings for the life of the project.
- **Dedicated natural gas hot water generators**: Smaller natural gas hot water generators are utilized instead of large steam boilers. Dedicated hot water boilers serve individual processes. Each process uses only what it needs, when it is needed.
- **Sub-metering of energy sources**: An energy management system using sub-metering was implemented to track energy used in different paint processes and to benchmark the energy intensity of the paint process. These sub-meters provide valuable feedback for operations and maintenance staff.

OTHER BENEFITS

The construction process followed an eco-friendly approach. Management of construction site waste and recycling of onsite materials were included as project requirements, with 72% of identified recyclable commodities (e.g., wood, metal, concrete, cardboard, masonry, and co-mingled waste) being diverted from the landfill, accounting for approximately 4,060 yards of material. Controlling utilities usage during each phase of construction was also a priority. Metering was utilized to track

construction site activities and plant startup.

Temporary construction trailers were required to have a number of important environmental features, including ENERGY STAR®qualified HVAC appliances, occupancy sensors, automatic hand dryers, programmable thermostats, energy-efficient lights, and white roofing. The new paint plant has also reduced Volatile Organic Compound (VOC) emissions by 78% compared to the prior paint plant.

The new paint plant will significantly contribute to Nissan’s global carbon reduction goals of the Nissan Green Program (a 20% reduction of CO2 emissions in 5 years), ENERGY STAR plant certification, the DOE Better Buildings, Better Plants Challenge goal and Superior Energy Performance (SEP) Platinum certification.

Annual Energy Use
(Source EUI)

Baseline(2010)
1

Actual(2013)
0.6

Energy Savings
40%

Annual Energy Cost

Baseline(2010)
1

Actual(2013)
0.63

Cost Savings
37%

Employees polish the roof of a new Nissan vehicle

Employees work on a new Nissan vehicle