



H-DisNet

CASE STUDY NISSAN UK PAINT SHOP

WHAT ARE THE CHALLENGES FOR NISSAN UK?

Autobody paint shops are responsible for the highest energy consumption in the vehicle manufacturing process (about 40% of the total). This energy is mostly used to condition and supply the air to paint booths. Paint shop energy consumption reduction is the main challenge for NISSAN UK.

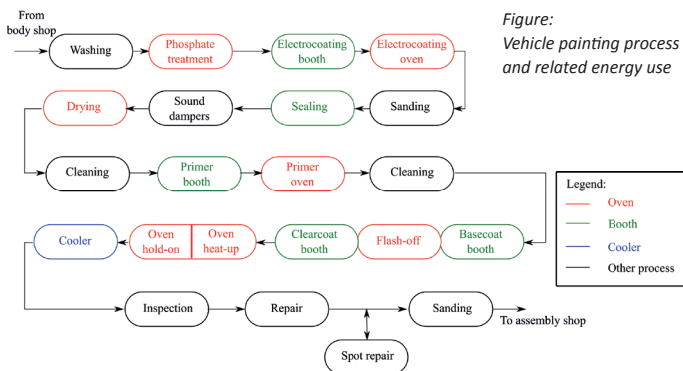


Figure: Vehicle painting process and related energy use

The temperature and humidity of the air supply to paint booths are a primary factor for paint quality, particularly for water-based paint, the evaporation rate of which is strongly influenced by these factors. The inability to deliver air in the correct range results in paint defects, requiring reworking and additional costs.

TEMPERATURE AND HUMIDITY REQUIRED WITH WATERBORNE CLEARCOAT/BASECOAT PAINT:

- Temperature = 23 ± 1 °C
- Relative humidity = $70 \pm 2\%$

Checking	Blistering	Collapse of inner layers
Relative humidity too low	Relative humidity too high	Relative humidity too high

Figure: Paint defects resulting from improper humidity control

WHAT ARE NISSAN UK'S OBJECTIVES?

Given the importance of final paint quality, optimal temperature and humidity control is an objective for NISSAN UK. Different heat sources are available (compressed air systems, VOC thermal oxidisers, etc.) that can be exploited to work a thermally-driven cooling technology, reducing paint shop energy consumption.

IS THE H-DISNET TECHNOLOGY A SOLUTION?

Currently, NISSAN UK employs two types of air supply units (ASU) for the different paint booths in the shop: a) 100% outdoor ASU, and b) air recirculated unit (ARU). Humidification/heating and dehumidification/cooling processes are needed on site.

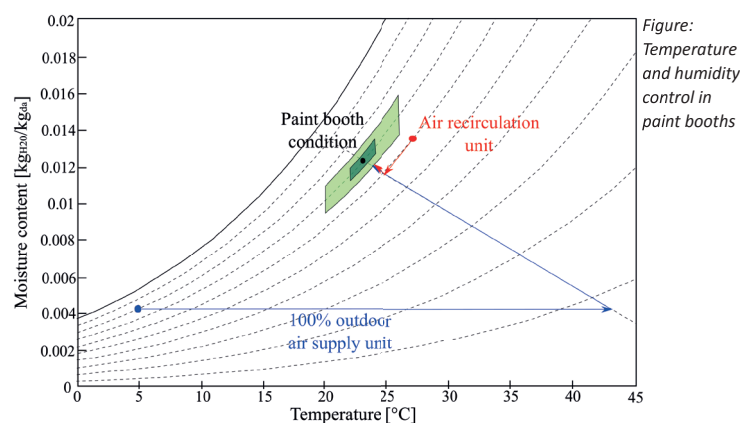


Figure: Temperature and humidity control in paint booths

H-DisNet technology can be used for the two processes on the psychrometric chart: exploiting the humidity desorption ability in the outdoor ASU (humidity content at NISSAN UK is lower than paint booth requirements during most of the year) and the absorption ability in the ARU. Additional heating/cooling may be needed and realised via a heater (hot water/electric) and evaporative cooling in the newly designed ASU.

RESULTS AND CONSIDERATIONS:

Preliminary analysis showed high beneficial effects for the technology in terms of energy savings for heating, humidification, cooling, dehumidification, and paint defects and avoided vehicle reworking.

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