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WTIA National Diffusion Networks
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SUCCESS STORY NUMBER MS05: LASER TRIMMING OF PLASTIC PANELS – Analysis of mirror contamination improves productivity for SA components manufacturer

SA Automotive Industry

The automotive industry is the largest single manufacturing industry in South Australia, producing 46% of cars made in Australia in 2005*. The SA Department of Trade and Economic Development, a sponsor of the WTIA NDNP, promotes a vibrant automotive components industry of about 40 firms.

Exacto Plastics in Adelaide, a Division of Nylex Automotive, is a major manufacturer of automotive components, including injection-moulded and blow-moulded plastic fuel tanks, inner door trim panels, consoles, and lower front and rear panels such as the one shown here.

*diode
laser
interacting
with
plastic
parts in a
fixture*



Trimming of components

A standard operation in the manufacturing cycle of these components is trimming of excess material around the periphery of the part. Trimming on relatively planar components can be done using single-action trimming dies in a pneumatic, hydraulic or mechanical press. However 3-D parts have traditionally required knife trimming, either by hand or using mechanically oscillated blades. Whichever way, this is arduous work.

Application of laser cutting

Robotic laser cutting is a viable option for trimming of plastic components, although this involves a very significant capital expenditure.

Exacto Plastics recently installed a state-of-the-art CO₂ laser cutting cell comprising a 6-axis industrial robot interfaced with two shuttle-action work-stations enabling simultaneous unloading of trimmed parts and reloading of untrimmed parts. This arrangement allows maximum utilisation of the laser cutting system.

*SA Fact Sheet www.southaustralia.biz

Although the laser cell performed the trimming operation to meet all the expectations of the manufacturer, a problem with maintaining mirrors for efficient laser cutting caused the Production Engineer to seek the assistance of the CSIRO/WTIA partners in the NDNP Medical Devices and Sensors Industry Sectoral Project.

Diagnosing the problem

The company found that the need to frequently change the precision polished copper mirror above the cutting nozzle was affecting productivity. The problem was costly in numerous ways:

- The down-time of the cell during changing and aligning the replacement mirrors;
- The diversion of key production personnel to service the cell;
- The high cost of having numerous spare mirrors and many more than would normally be required;
- Cost of re-polishing damaged mirrors;
- Reworking of parts which were not fully trimmed as the cutting efficiency waned.

The condition of several degraded mirrors was investigated using a CamScan MX2500 Scanning Electron Microscope (SEM) at CSIRO. Elemental analysis of debris and thin film coatings on the polished mirror surfaces was done using the Energy Dispersive Spectroscopy (EDS) and Wavelength Dispersive X-ray Spectroscopy systems (WDS) attached to the SEM.

The surfaces of all of the damaged mirrors had evidence of chlorine contamination in the form of a thin, continuous film.

The solution

The corrective action recommended was to install a fume (vapour) extraction system to capture volatilised material from the PVC material, so as to prevent the vapour from entering the cutting nozzle during the power-off periods of the cutting sequence. Implementation of this solution has helped Exacto Plastics maintain its position amongst Australia's leading automotive component manufacturers.

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