

Laser technique to treat coatings

Michael Rege* outlines a laser technique that is especially useful for treating coatings on glass moulds.

In 2010, Chpolansky started to treat coatings on cast iron or bronze base metallic surfaces using a laser technique especially useful for glass moulds.

The coating areas aimed at were areas in contact with hot glass (1300° to 1600°C) and more particularly (joining zone), the ring and the neck.

The aim is to make these coatings on cast iron and bronze, using the laser beam technique to decrease Thermally Affected Zones (TAZ) and promote thermal properties of the part maintained.

Coating is performed under three different techniques in existing prior art:

- Spray Gun is the traditional method but is known to give random results;
- The TIG Process uses rods but is expensive and is not adapted to moulds coating; and
- Plasma Transferred Arc (PTA) technique, currently preferred, in spite of its lack of reproducibility.

The laser technique is known within the industry, but has never been used to coat glass moulds.

Scientific doubts

The laser technique permits the use of a controlled beam, with a small dimension and high energy density. It is possible to master the speed and the quantity of filler metal to fuse so the surface of deposit on the mould is constant. Nevertheless, the restrictions linked to laser beams with a high voltage include limited impact, and the positioning of the focalisation point is hard to control.

There are also uncertainties with regards to the moulds coating application, including: The metallurgical behaviour of the filler metals (nickel, cobalt) on lamellar or spheroidal cast iron cupro-aluminium; the constraints linked to the diverse geometrical shapes of the moulds; accessibility of the laser torch; and constraints linked to course speed.

Laser coating

A hardfacing application with a laser process required three years of feasibility study and parameters research for cord realisation. Chpolansky now has plenty of know-how on the application of laser coating to moulds. The company filed a patent application in June 2011, and is now ready to partner with glass and mould makers to develop the application within their companies.

The advantages of using a laser include:

- Coating precision
- Realisation Speed
- Mould temperature before and after
- Small ZAT thickness
- Weak dilution weak

- Thermal treatment
- Over thickness (small and controlled)
- Time saving in terms of machining
- Constancy in deposit quality

In current coating processes, seams create important TAZ. For a joint plane seam this zone, called hot, creates clips on glass thickness. Therefore, the seam is plated and brittle under impact. The thickness on joint plane is two times less than at the opposite end. Homogenised mould thermals permit new possibilities for bottle shapes and lightening, with added economical benefits.

The use of the laser technique permits the manufacturer to make moulds coating according to shapes and accessibilities, depositing only the necessary quantity by laser: 50 gr, by PTA: 400 gr. for a mould. The time it takes to coat a mould with PTA is 12 minutes, in contrast with an estimated 2 minutes using a laser.

Our research shows that application by laser can reduce the TAZ to small and controlled thicknesses, while maintaining a perfect link without dilution.

Coating centre

Given the results of our trials, Chpolansky will build a coating centre for hardfacing glass parts, and more specifically for cast iron, bronze and steel neck rings. The centre will be operational in April 2014.



*Michael Rege, General Manager of Alloys Department at Chpolansky, France
Website: www.chpolansky.fr

