Omco Group

Glass moulds produced faster and less expensively using modern multi-sensor metrology

Nikon Metrology laser scanner cuts project approval from 2 weeks to 24 hours

Omco Group, the largest manufacturer of glass container moulds in Europe is leading the way within its industry by using laser scanning to digitize customers' bottle designs, shortening the lead-time from receipt of order to delivery of the finished moulds. Manufactured by Nikon Metrology, a pioneer in 3D laser scanning and part of the renowned Nikon group, the digital line scanner is fitted to a coordinate measuring machine (CMM) in one of Omco's seven mould shops, located in the north east Romanian town of Iasi.

Intended for mass production of glass bottles and jars, the cast iron moulds are sold mainly to fast moving consumer goods (FMCG) manufacturers and their supply chains in the beverage, food, pharmaceutical, cosmetics and tableware industries. Anyone reading this will almost certainly have consumed a soft or alcoholic drink from a bottle produced in an Omco mould, as just a few well-known users are Coca-Cola, Pepsi Bottling Group, Heineken, Carlsberg, Absolut Vodka, Bacardi and many châteaux in Champagne and elsewhere.

Glass container producers face tough consumer demands as well as rising energy costs and increased competition from alternative packaging, notably plastics. As a consequence, glass mould suppliers have to meet exacting customer requirements for top quality and short lead-times, whilst maintaining competitive prices. One way that Omco achieves these objectives is by adopting new methodology near the start of the mould manufacturing process, in which its new Nikon Metrology laser scanner plays a central role.

The first stage in a contract is for Omco to input a customer's design details, which may include decoration and perhaps also lettering that has to be superimposed on a bottle's curved surface. Such bespoke data arrives as a drawing or electronically as a DXF file. Staff at the Iasi facility processes this information and machines a sample of the bottle using CNC equipment such as a DMG / Mori Seiki machining center, a Doosan lathe and a Baublys engraver. The result is a physical facsimile of the intended bottle from which an epoxy resin copy is made.

In the next step, conventional practice and the process route driven by the laser scanner differ significantly, as Alexandru Geantă, Quality Manager at Omco's Iasi site, explains. "Historically, we sent the resin model to the customer for approval, most often by air due to the

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> *Alexandru Geantă, Quality Manager at Omco*

urgency of such projects. However, flying a package from Romania to Argentina, for example, took several days door-to-door and the model then had to be evaluated and passed off at the other end. Overall, it used to take up to 14 days to receive any changes needed to the design plus the go-ahead to start producing the set of moulds.

"Now, we simply scan the resin facsimile from several angles on the CMM using the LC50Cx scanner mounted in a Renishaw PH10M motorized indexing head. The resulting point cloud data, an exact digital copy of the physical model, is reduced in size to around 80 MB by converting it into IGES format. This is sent electronically to the customer and can be opened on many different CAD platforms. Turnaround is much faster, as approval is usually received the same day, or in 48 hours at most. In an alternative scenario, we use the laser scanner right at the start of a project to reverse-engineer a sample bottle sent to us by a customer which no longer has drawings and / or CAD data of the design. The scan data is emailed as an IGES file directly to the customer for approval, so there is no need to make a resin facsimile."

Mr Geantă went on to explain that the customer is interested not only in the visual appearance of the design but also its exact dimensions. The latter are more easily extracted from digital data than by measuring a sample or model. If any small changes are needed to a dimension or indeed to the design itself, these are communicated quickly by email or over the telephone.

It is the ability to compress the front-end of the mouldmaking procedure that allows around two weeks to be saved. When approved by the customer, the IGES file is loaded into a Delcam CAD/CAM system at the Iasi factory and cutter paths are generated and post-processed for CNC machining the moulds. Inspection and assembly of the mould set then takes around four weeks, so total lead-time is reduced by one-third, which translates into a considerable commercial advantage in this competitive business.

Not only is time saved but cost is also taken out of the approval procedure, as air freight charges to customers worldwide are avoided, often cutting expenditure by thousands of Euros.

Mould volume checked to ensure correct glass usage

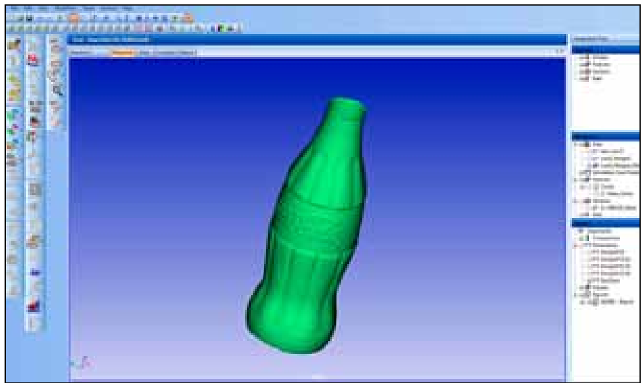
Additionally, the scanner provides an alternative and more convenient method for calculating the volume of glass in a bottle or jar that a mould will make. Traditionally, this is done by sealing the base of the preliminary mould and seeing how much water is needed to fill the cavity. LC50Cx scan data taken from the mould after it has

The LC50Cx digital line scanner on the CMM inspecting a resin model of a Coca-Cola bottle.

LC50Cx digitizes nearly all surfaces including reflective material

Programming the scan path is done by teach-and-learn

Final inspection throughput of a glass bottle mould is tripled by using CNC multi-sensor CMM.



Instead of flying the resin model to the customer the electronic 3d surface data is delivered electronically in seconds.

been machined is so accurate that the volume can be calculated precisely from the virtual model.

The importance of these measurements cannot be overstated. The preliminary mould produces a small, solid glass parison (a pre-shaped mass of glass) that is blow-moulded to produce the bottle. Measuring parison volume is critical, as too little glass might lead to the bottle breaking and too much would result in enormous wastage of glass during subsequent mass production.

Interestingly, mould volume calculation was the test that Omco gave to several metrology system suppliers before placing the order. Mr Geantă said that from the mould data supplied, which was for producing a baby food jar, the volume results achieved by Nikon Metrology were spot on. None of the other potential suppliers could achieve an acceptable level of accuracy and one calculation was 30 per cent too large!

Final inspection is three times faster

The same CMM platform is used for quality control of all individual mould components after manufacture, complementing SPC (statistical process control) on the shop floor. Omco, which is accredited to the ISO 9001:2008 quality management system, derives significant savings in final inspection thanks to Nikon Metrology's CAMIO software, which enables a programmer to produce a fully automatic measuring cycle directly from a part's CAD model, quickly and easily. A touch probe mounted on the Renishaw PH10M indexing head feeds back the 3D data of each point as the cycle is executed.

Castings from either of Omco's two foundries in Belgium and Slovenia are CNC turned and milled to produce the mould halves, but many other components also go into mould sets, such as blanks, baffles, blow heads, thimbles, funnels and distribution plates. This increases the total number of parts that need inspecting to between 30 and 100, depending on the size and complexity of the customer's blow moulding equipment.

Previously, ever since the Iasi operation was set up at the end of 2005, conventional metrology equipment such as micrometers and vernier calipers had been used to measure the parts manually. The pre-existing CMM on site used a fixed touch probing head and could not complete the measurements automatically, so would have taken even longer to do the job. Therefore operators would spend an entire 8-hour shift inspecting typically 30 mould parts each by hand.

Now, 100 pieces per shift can be inspected on the CMM with one operator, so there is a three-fold reduction in labour in the metrology department, again helping to keep down the cost of mould production. Between 10 and 20 critical dimensions are measured on each part in cycles ranging from two to five minutes, and some 80 per cent of mould components undergo such inspection. Batch size ranges from one or two test pieces through normally 40-off to exceptionally 150-off.

Mr Geantă, continued, "Apart from speed and cost reduction, a further advantage of automated inspection is increased accuracy and elimination of human error.

It is easy for a hand gauging instrument to slip in use and with a tolerance of ±10 microns on a 30 mm diameter mould, for example, such a measurement would be invalid.

Customers also like the wealth of metrology data that is now available. Even if they do not request all of it – perhaps just 15 critical dimensions from 20 pieces – they have the reassurance that comprehensive information is within reach."