



Facts

Challenge

Economic production of patient-specific restorations made of a high-performance alloy.

Solution

Accurate and efficient manufacturing of crowns and bridges using an EOSINT M 270.

Results

- Economic: digital manufacturing saves time and money
- Premium: restorations are durable, capable and demonstrate consistently good quality
- Precise: units show constant accuracy
- Efficient: dental labs increase their product offerings and boost productivity



Digital Manufacturing: the laser fuses the metal powder layer by layer at 200 W and a temperature of 1400°C (Courtesy EOS GmbH).

Daily Turnout of Hundreds of Units – Digital Manufacturing Revolutionizes Dentistry



e-Manufacturing Solutions

# Argen is transforming the business model for its dental lab customers using industrial 3D printing by EOS

## Short profile

Argen is the largest dental-alloy manufacturer in the world. Founded 50 years ago in South Africa and now based in southern California, the company sells some 600 different dentistry products in more than 100 countries worldwide.

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When Paul Cascone, Senior Vice President of Research and Development at Argen, speaks to a potential dental lab customer, he always starts with the benefits of digital technology. "I tell them it can broaden their offerings, eliminate inventory, cut waste, and significantly boost their productivity," he says. Those advantages can be powerfully persuasive for the laboratories that are listening.

For years, manufacture of dental prostheses has been based on the lost-wax method, which has roots in 5,000-year-old investment casting techniques. In this approach, dentists rely on a moulded impression of the damaged tooth or teeth, a careful sequence of production steps and painstaking hand finishing—with remake rates high. But during the last decade, digital tools and technology have been cutting time and cost from workflows, enabling the dental lab business model to evolve towards greater efficiency and precision.

## Challenge

The transition to digital begins with the impression by which a physical mould of a patient's teeth serves as the starting point for a lost-wax casting. The digital equivalent is an image of the teeth taken in the mouth with an intraoral scanner. The resulting CAD (*Computer Aided Design*) 3D model can be used to create a restoration in several ways. One path is via a computer-controlled milling machine. In this subtractive manufacturing approach, the digital file of the model guides the cutting of either a solid

ceramic or composite-resin block into a prosthesis matching the shape of the teeth. While fast and often completed in a single visit, this technique doesn't create restorations that fit as precisely as those made using the traditional lost-wax method.

## Solution

A more precise and efficient digital-based path is Argen's branded process, referred to as selective laser melting. In this Additive Manufacturing (AM) process the CAD model guides production that adds on layers of material,

rather than cutting it off and throwing it away. The automated process starts with the system depositing a thin layer of metal powder onto a build platform. A laser, guided by the CAD model, then traces a cross-sectional outline of each patient-specific dental unit, melting and hardening the material into a 20-micron-thick layer. Then the build platform is lowered and the system distributes a new powder layer on top of the old one. This cycle is repeated, adding on layers one at a time, until the restoration is fully formed.



*This additively manufactured bridge is made from a proprietary high-noble alloy, developed by Argen. The material helps labs to further expand their product range and meet increasing demand (Courtesy Argen).*

The DMLS system's software also automatically labels each patient's unit and generates supports on the models prior to manufacturing. These hollow supports allow for easy removal from the build plate once the run is complete; during finishing, they are eliminated along with excess material

from each restoration. The unit is then shipped to the lab customer for bonding with ceramic. Slight cosmetic refinements can be carried out in the dentist's chair.

"We were one of the first US companies in the dental industry to use EOS technology," Cascone says. That was in 2007, and the system Argen purchased, after considering other AM processes, was an EOSINT M 270 by EOS. "We wanted to use the available CAD data to meet the need for strong, precise-fitting porcelain-on-metal restorations," he notes. "Our new DMLS system gave us the flexibility to manufacture the metal base."

Several types of metals—nobles, high nobles, and base alloys—are used widely by dental labs and dentists in the US. Argen decided to develop its own noble alloy which is suitable for EOS technology. They are now supplying labs with more than 100,000 restorations per year from their proprietary noble alloy. With this first success in hand, they developed an even more durable high-noble alloy.

## Results

The benefits of AM technology for laboratory customers are many: steps in the traditional workflow

can be skipped; virtually any geometry can be created; waste is reduced; the resulting restorations are accurate and as durable as those made with lost-wax casting; and, while fine detail can be captured in both the subtractive and additive processes up to certain limits, there is no added cost with AM for sculpting more complex tooth geometries.

"The Additive Manufacturing operation is straightforward and quite robust," says Cascone. "Quality is high, tolerances are constant, and the process is reproducible. Our lab customers are impressed, not only with the savings in time, but also with the consistency and accuracy of the product."

Using a DMLS system, Argen can manufacture at speeds of about one unit every two minutes—that's hundreds of units a day. "We recently added 40 new employees because of the expansion of our digital business," Cascone notes.

While industrial 3D printing has increased the company's product offerings, it is also boosting productivity for both Argen and its laboratory customers. Unlike traditional casting, where units are made one at a time, AM can

produce a variety of unique, custom restorations in a single run: the batch size is limited only by the dimensions of the manufacturing chamber; and associated software is used to optimise placement of multiple parts.

For the dental laboratory, taking the digital path can be a game changer, according to Cascone. In a small lab, a scanner can help them expand their product range. In a large production lab, the whole scale of the operation can be transformed. "A skilled technician using traditional hand operations can make about 20 units in a day," he explains. "If you take that same person and train them to use a scanner and software, output accelerates to 80 units a day. That's why labs are switching."

"With our selective laser melting services, we supply them with metals in an 'advanced form' that allows them to skip the old waxing and casting steps. They can now concentrate on the important aesthetic and functional aspects of applying the ceramic. This represents a change in their business model, but they're really excited about the change."

"Now we offer nobles, high nobles, and base alloys in the digital workflow, and we can make bridges of

different sizes from all three classes of metals. We're also gearing up to produce partial dentures and plan on dedicating an entire EOS system to that product alone." Staying at the cutting edge of dental methodology is crucial for Argen.

*"For a dental laboratory, taking the digital path can be a game changer. A small lab can expand their product range and in a large production lab, the whole scale of the operation can be transformed. EOS technology is straightforward and quite robust. The quality of the finished parts is high, tolerances are constant, and the process is reproducible."*

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