



## Facts

### Challenge

Develop a new way of Direct Metal Laser Sintering (DMLS) that is suitable for the physical properties of gold.

### Solution

Successfully establish a new technology capable of series production offering a high degree of design flexibility.

### Results

- Optimized: specially built laser optics and raw material
- Sustainable: less raw material required
- Creative: completely new possibilities for designers
- Together: DMLS as a service resulting offering a high degree of design flexibility.



*Post-processed and polished cufflinks made of 18 ct yellow gold, designed by Digital Forming (Source: CPM).*

## Glittering Prospects with Additive Manufacturing of Gold



e-Manufacturing Solutions

## EOS technology will change the economics of making watches and jewellery

### Company profile

Cookson Precious Metals (CPM) is a leading supplier of fabricated precious metals in Europe, a supplier of gold, silver, platinum and palladium alloys, wire, sheet, tubing, coin blanks and casting grain. Cookson is also a major precious metals refiner with London Bullion Market Association Good Delivery status.

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In 1964 Miss Moneypenny answered to James Bond that the only gold she knew was the kind one wears on a finger. Despite Moneypenny's dedication to 007, when asked in 2012 her answer may have been slightly different: Firstly, she may have realized after almost 50 years that her love will remain unrequited and secondly due to the remarkable, technology-driven progress that has been made in Direct Metal laser sintering (DMLS) that enables goldsmiths to think and create outside the box. When it comes to designing jewelry, designers can take advantage of the most innovative technology. Well beyond the limits of traditional metal craftsmanship, additive manufacturing of gold has made it to maturity.

The driving force behind this major step forward was Cookson Precious Metals (CPM), one of the world's most recognized experts in terms of provision of precious metals and related services. The company's efforts in research and development have done much to help designers and manufacturers reach the next level of gold processing. As laser sintering became more and more established, the British technology company decided to pick up the gauntlet and apply the process to precious metals – with success: Now jewelry designers and watchmakers can use CPM's services to transform their golden ideas into reality by means of 3D printing.

### Challenge

CPM literally had to square the circle: Using a layer-adding manufacturing technology that keeps the layers invisible while using a tricky base material. The nature of the challenge lies in the specific physical properties of the raw material itself. "When you

put on a piece of gold jewelry, it almost immediately takes on your skin's temperature, a result of its ability to conduct heat. It's easy to imagine what a laser beam would do when directed at gold: the material is literally vaporized," explains David Fletcher, European Product Manager at CPM. "We

couldn't simply adapt existing manufacturing methods as we were breaking new ground."

The excellence of the laser sintered material is essential for producing high quality jewelry. Only if the part meets the demanding requirements will the final article have a smooth

*Additive manufactured ring designed by Nervous System made of 18 ct yellow gold (Source: CPM).*



finish once the polishing is done – naturally, a premise for customers when deciding to buy. As the physical properties of gold itself cannot be changed, CPM pursued an holistic approach to make gold DMLS possible. Not only the raw material was examined for optimization, but also the manufacturing process itself including the contributing hardware supplied by EOS.

### **Solution**

With CPM's vast knowledge of gold processing and EOS' proven track record in laser sintering, CPM finally squared the circle. The result is a mature technology for processing gold on the basis of data provided by CAD software to create a piece layer-by-layer. The combination of accurate laser optics with an extremely high resolution and a special ingredient in the powder raw material are what makes the difference. Laser parameters have been developed specifically for the processing of gold. The power of the laser beam permeates the raw material quicker than usual which is key to keeping the overall temperature at a lower level. „We can't provide any further details at this point for confidentiality reasons," adds Fletcher with a grin.

Of course, the new approach also enhances the appearance of the final piece. When it comes to avoiding visible layers, the new method does not take a back seat to traditional craftsmanship. Be it jewelry or watches, the outcome is full density parts with no porosity. There are no air pockets nor any undesirable structures, the physical appearance is completely pure. "The hardware provided by EOS has definitely been vital to the success of the project," explains Fletcher. „No special tools are required nor is there a need to make any wax models. The electronic data are converted directly to parts, one of the many advantages of this technology."

### **Results**

A key benefit of gold DMLS is the possibility of reducing raw material consumption. In addition structures can be built to specifically include cavities, resulting in reduced cost and lighter weight pieces. Another key advantage is the high degree of flexibility for designers. The use of the EOS technology simply eliminates all obstacles that existed so far both in terms of styling and structure. Jewelry designers used to be limited when it came to complex twisted pieces. Either there was no chance of achieving the required quality or the piece could not be created at all. Such limitations no longer exist.

Even with a sophisticated approach like additive manufacturing, designers do not have to become experts in the technology. „Although DMLS does need data input generated by software, the systems are easy to use. Thus, designers can focus on their craft instead of IT," says Arno Held from EOS. Lisa Harouni, co-founder and CEO of the 3D software house Digital Forming, attests to the benefits of laser sintering for her company: „By leveraging EOS technology, we have been able to create an opportunity for consumers to co-design and individualize products in a way that has never before been widely available. Thanks to (CPM) the creations of highly complex and intricate designs, are now available in a variety of precious metals. We started testing the process with our software and the results are amazing."

Beyond that, CPM and EOS envisage the technology having a broad application across the full range of design and manufacturing environments, including mass production. Be it custom-made pieces or batch fabrication, this unparalleled choice of gold jewelry should not be reserved solely to agents of her majesty's secret service.

*"We couldn't simply adapt existing manufacturing methods, since it was important to avoid any influence on the manufacturing process. The laser sintering hardware provided by EOS was vital to the success of our project. By joining forces we were able to create a production method that enables jewelry designers to break new ground without making any concessions. In addition to reaching new heights of design, we reduced the use of raw material and can now provide an eco-friendly and highly creative gold laser sintering service to jewelry designers."*

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