Goldsmith goes high-tech

Laser granulation on a jewel set in gold.

A partnership comprising an Italian creator of jewellery and an Italian technological research centre, a Swiss supplier of precious metals, a German laser designer, and the Belgian subsidiary of one of Europe's leading microelectronics companies, backed by the Brite-EuRam Programme, has resulted in the successful completion of an innovative project: the use of laser beams in the precious metals industry.

Minuscule dots, in slight relief, allow the precious metal to "breathe" in a special way. This technique, known as granulation and rooted in prehistory, was used on jewellery and objects of metal from Mesopotamia, Mycenae, Crete, Etruria, etc. Then, about the year 1000, it disappeared almost completely. Maria Luisa Vitobello-van der Schoot, an Italian married to a Dutchman, has re-established this rare process which requires exceptional dexterity and makes it possible to create highly original pieces of jewellery. A creator of international repute, she has been running a small arts and crafts business in Milan known as DEFOP (Disegno E Fabbricazione Oggetti Preziosi) for nearly 15 years.

"When I started working for major international brand names interested in this knowhow, I realised that my business production costs were prohibitive, my production capacity derisory and the flexibility of my business vis-à-vis customer requirements totally unsuitable," she explains.

From cottage industry
to large-scale industry This was the moment when Ms Vitobello began to ask fundamental questions about the nature of her work and embarked on an adventure that was to take her into the world of technological research. She began to enquire about the potential benefits to the goldsmith's trade of the laser techniques that were then developing apace. Along with four partners - her own precious metals supplier, the Swiss firm Valcambi, the Centro Nazionale per la

Ricerca sui Materiali (CNRSM), the German laser designer, Rofin Sinar and the Siemens research centre in Oostkamp (Belgium), a specialist in microelectronics - she submitted a research project which was awarded E2 million in financial support under the EU's Brite-EuRam Programme, with the CNRSM acting as coordinator.

Precious metals specialists - who will be the end-users of this technology - and manufacturers have been working together closely since 1993. Valcambi prepares a series of gold and platinum samples: 20 alloys consisting of both polished and unpolished components. Rofin Sinar then sorts the samples into different groups before subjecting them to engraving, welding, cutting and laser granulation, depending on various parameters. The CNRSM analyses the effects of this technology on the various alloys. Siemens is developing a CAD/CAM system which integrates all the goldsmithing operations to be carried out by this new laser equipment in a single computerised installation, irrespective of the geometric configurations of the pieces to be produced.

Three years on, this research has reached the precompetitive stage: a multifunctional tool, highly innovative, capable of cutting and piercing precious metals, welding them without the addition of extraneous materials, and applying granulation and decorative engraving techniques. The advantages of this system over mechanical processes are legion. The cuts are more precise and reduce raw material losses, always something to be avoided. Laser welding can be automated for high-precision tasks, and the process is particularly clean. The very high cutting speed makes it possible to produce "haute couture" jewellery at industrial prices. Laser technology, whose strengths lie in its finenesse and flexibility, allows designers to create complex geometric figures and experiment with tonal effects - indeed, different alloys can be included in the same object, which was previously impossible at the granulation level. With the help of the Innovation Programme, a process for the technological validation of this new multifunctional laser system is to be developed, in such a way as to promote market penetration.

Adapting the technologies

Various laser technology applications in the area of goldworking.

Meanwhile, the implementation and success of this project have given Ms Vitobello other ideas. Through meetings and sectoral seminars organised under the Brite-EuRam Programme, she is constantly making new contacts and finding new opportunities to exchange information. In 1995, with the logistical support of the Milan's Innovation Relay Centre, FAST (1), she obtained financial backing of €200 000 for a CRAFT cooperative research project. This project brings together various SMEs specialising in gold-, silver- and platinum-working in Italy, France, the United Kingdom and the Netherlands, and also involves the Netherlands Research Institute TNO,(2) which has been given the task of overseeing the technological development of the project. Its aim is to transfer to the

domain of goldsmithing the techniques of plasma arc welding, which are used a great deal in the non-precious metals industry. A prototype, which should soon be followed up by a commercial-scale version, was launched in March 1997.

"Too many designers and producers in our sector still fail to understand that the new technologies are essential if we are to adapt to the realities of the international market. Speaking for myself, my enthusiasm over the potential impact of innovation on our work is growing all the time," Ms Vitobello concludes. This creative woman would also like to be a consultant. She is a fundamental believer in "transnational collaboration" and has proved it, once more, by launching the European Jewellery Technology Network, a network of 20 partners - SMEs, universities and research laboratories - interested in the new technological developments taking place in the jewellery sector.

(1) Federazione delle Associazioni Scientifiche e Tecniche
(2) Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek

Project Title:
Development and application of new process technologies and laser equipment for optimisation of product technologies in the field of precious metals and their alloys

Programmes:
Brite-EuRam 2

Contract Reference: BRE20289 - BE 5721

Project Title:
Plasma arc welding in the field of precious metals and their alloys

Programmes:
CRAFT / BRITE-EuRam

Contract Reference: CR152391/BRE21497

For more information on this project, go to the Cordis database Record 1-2-3-4