

Amorphous metals: a successful Tech Transfer from space to European industry

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ABSTRACT

Innovative materials and technology transfer represent effective tools to support product innovation. The amorphous metals case history is a key example of how mass market may benefit of technologies initially developed for space applications.

INTRODUCTION

The **MITT®** methodology - **M**aterials **I**nnovation and **T**echnology **T**ransfer - has been developed and adopted by MaTech since 2001 to define the guidelines that both large and SME may follow to search, identify and apply new materials and process technology into innovative products.

An new methodology to classify materials according to functional performances was also developed within the MITT.

AMORPHOUS METALS FOR THE EUROPEAN INDUSTRY

Amorphous metals is a family of innovative alloys that have a typical amorphous, disordered atomic structure. For this reason they are better known in the academic world as glassy metals.

The amorphous structure can be obtained by supercooling the special melt alloy, thus preventing the solidification from building the crystalline structure. Amorphous metals do not present grain borders and shows very specific characteristics: elastic elongation is about 2%, while most popular steels are in the area of 0,1%; surface hardness is also quite high, ranging from 600 Vickers and up to 2000 HRV when amorphous powder coatings are used. Strength to weight ratio may be more than double than conventional titanium; corrosion resistance is also very high.

The manufacturing process is one of the most interesting advantages of these material. As the thermal expansion coefficient is very low, amorphous metals can be injected in mould like

polymers obtaining net-shape components and thus definitely reducing machining costs.

Amorphous metals also exist as powders and wires for surface coatings, to be applied by HVOF, TWAS and TIG process. They show very high performances in low friction coefficient, high temperature, high abrasion application.

TECHNOLOGY TRANSFER CASE HISTORY

Amorphous metals alloy composition, manufacturing process and related machinery have been initially developed and patented by Liquidmetal Technologies and Caltech University in California, for space and defence applications. As the technology became available for civil applications in mid '00, MaTech started a long term Technology Transfer project to introduce the technology in the European and Italian market, as the only manufacturing plant was initially located in Korea.

In 2006 a joint venture between Liquidmetal Technologies and SAGA Spa, called LSI, has been founded and the first European plant has been started in early 2007 in Padova.

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EDUCATION

Master of engineering – Aerospace Engineering – University of Bologna, Italy –
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PROFESSIONAL EXPERIENCE

Project engineer – Ferrari Engineering Spa – Modena – 1994/96;
Project manager – Ferrari Auto Spa – Space Division – Modena 1996/98;
Project leader, Materials Research – Benetton Sportsystem Spa – Treviso – 1998/00;
Innovation & Research Manager – Benetton Group Spa – Treviso – 2000/01;
Production & Quality Manager – Rigomma – Venezia – since 2001;

Research manager - Italian Bobsleigh Federation – Milano – 1993/99;
Research manager - Federation Monegasque de Bobsleigh – Monaco – 1999/02;
Team manager - Italian Bobsleigh Federation – Milano – 2002/04;
Technical advisor – IOC – Lausanne – 1998/2002;

LECTURES AND TEACHING

University di Bologna, Tecnologia e Design (TV), IFOA (MI), Insula (VE), CATAS (UD),
Firenze Tecnologia (FI), Accademia Cignaroli (VR), CEUB (FC), Area Science (TS), Polo
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