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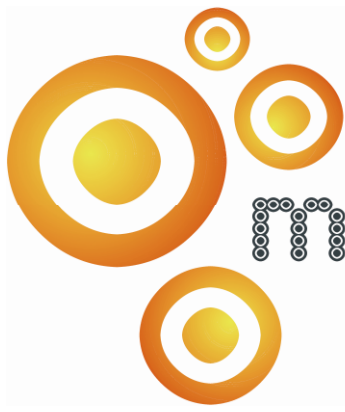
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HIPERSINT: Combining high density and dimensional precision: next step for PM steels

PROJECT DESCRIPTION

Ferrous Powder Metallurgy (PM) accounts for 70% of the total number of engineering components produced by this technology. Being an important supplier to the car and transport industry these components are mass produced in continuous furnaces under controlled atmospheres and necessarily require a high degree of reproducibility coupled with consistent properties and dimensional precision. It has been pointed out [EPMA, European Powder Metallurgy Association] that PM is associated with the highest raw material utilisation (95%) and lowest energy requirement per kg finished part when comparing with casting, cold/warm extrusion, hot drop forging and machining. The competitiveness of PM is therefore generally achieved by ensuring high usability of the raw materials, decreasing machining and secondary operations to the minimum and selecting components of marked geometrical complexity. However, it is important to recognise that industrially achieving dimensional tolerances (as tight as 0.01 to 0.001 mm in some cases) by processing through the Press and Sinter PM route, has forced this industrial sector to produce powder and pressed components so that dimensional changes during sintering are next to zero. From research important gains have been reported, either, by high pressure pressing (risking tool damage and wear) or by allowing excessive shrinkage during sintering (thus causing shape distortion). Nevertheless, except for simple geometries and with certain materials, promising combinations of density, dimensional tolerances and economy have not yet been achieved.

The main objective of the project is, following the economic Press and Sinter route, combining the development of a high compressibility powder with extreme control on the amount of shrinkage by LPS during high temperature processing. To achieve this objective intensive research will be devoted to tailoring powders (particle size, chemistry, surface state,...) improving lubrication to reduce amount of lubricant used, adequately distributing by reaction and diffusion the sintering enhancer (Boron) and alloying elements, as well as microstructuring grain boundaries by controlling the eutectic reaction during solidification of the liquid phase so to obtain the desired distribution and type of solid phases as well as in-situ surface densification. The targeted innovation is therefore based on a radically different approach that will be explored aiming at obtaining a manufacturing method for PM products to gain further advances of this technology as research will be focused at obtaining cost-efficient PM steels with a final density superior to 7.4 g/cm³, with tight dimensional tolerances and improved properties thus allowing further advance of PM into new markets with more demanding applications.



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PARTNERS

Project coordinator: STADLER, Spain/Basque Country

Project partners: CHALMERS UNIVERSITY, Sweden

PROJECT DURATION AND TOTAL PROJECT COST:

Duration: 01/2011 – 12/2013

Cost: 1,580,000 Euro

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