

DIGITAL MATERIALS FOR THE AUTOMOTIVE INDUSTRY

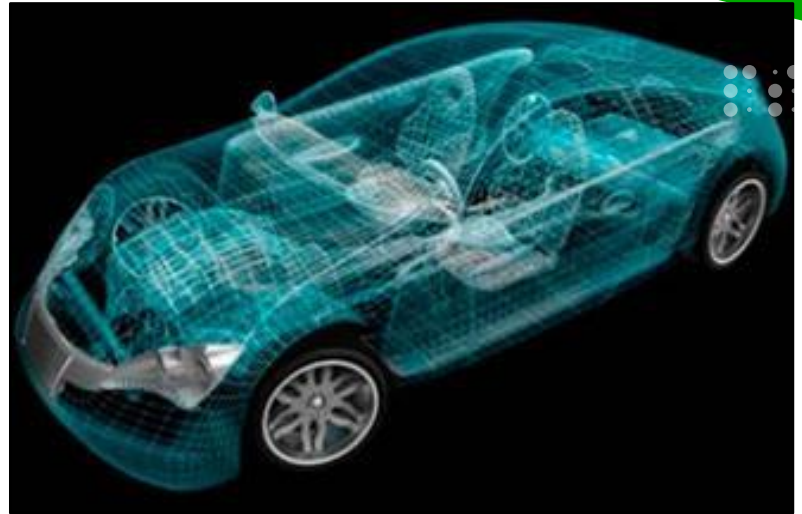
The DiGiMAT European Project is working to develop Smart solutions to connect process data and materials characteristics to achieve a **new generation of cast iron materials for the automotive industry.**

- **High Yield strength grade: HS420/250 DiGiMAT grade.** This new grade with **Yield Strength higher than 420 MPa and hardness below 250 HB will allow to design and develop lighter components.**
- **High Machinability DiGiMAT Grade.**

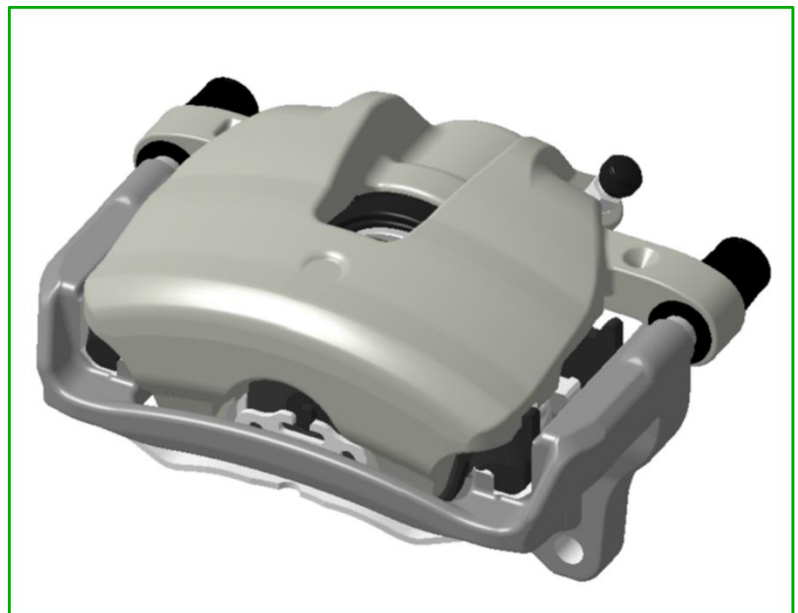
Weight reduction, optimization of material and reduction of the machinability time are key factors to improve the energy efficiency and environmental impact of automotive industry, casting technologies being one of the main manufacturing technologies applied by this industry.

The DiGiMAT European project, lead by **Veigalan Estudio 2010 S.L.U.**, and participated by the **Azterlan-BRTA**, research and Technology Centre and the **AAPICO Portugal** and **Continental Teves** companies, has developed a digital architecture that permit to create a new generation of customized materials, also named after “**Digital Materials**”, based on data analysis, on information process and on communication and information technologies.

DiGiMAT project is focused on the **new brake system with improved HS420/250 anchor and high machinability housing components** (both critical components of any brake system) that will be produced under controlled manufacturing conditions at AAPICO Portugal, conditions defined by AZTERLAN and online checked by the smart Digimat system installed in the cast iron foundry shop of AAPICO and validated in test benches of Continental Teves.



LOOKING AFTER A MORE EFFICIENT AND
SUSTAINABLE AUTOMOTIVE INDUSTRY



The DigiMAT consortium estimates that the new solutions will develop the 35 % of the European iron foundry market and 10 % of the global iron foundry market in the upcoming 5 years.

The project consists in developing the studies to create an improved materials with the desired characteristics. That way, the conventional manufacturing processes will join the advanced 4.0 industries to acquire, storage, process and analyze the data and the most significant process parameters.

MAIN TARGETS



- Launch of the intelligent DigiMAT module to develop algorithms that connect process and material characteristics to achieve a new generation of digital materials.
- Provide melted iron products with easy machining characteristics and more competitive with a cost reduction of 3 %.
- Increase global market rate by 3 %.



- Development of final components that are 3.5% lighter and at least 9 % less energy consuming.
- Weight reduction will permit producing cars and other kind of vehicles with a higher energy efficiency while minimizing the weight and also the manufacturing costs.



- Intelligent manufacturing will permit achieving custom products and mass produced products.
- The technologies and tools born after this proposal will offer opportunities to employ highly qualified professionals.
- The novel technology has potential applications in other industries such as aluminum foundry and steel foundry.

PROJECT COORDINATOR



Veigalan Estudio 2010 S.L.U.
www.veigalan.com

MAIN PARTNERS



Azterlan Metallurgy Research Centre
www.azterlan.es



AAPICO Portugal
www.aapico.com



Continental
www.continental-automotive.com

Main innovations achieved

DIGIMAT SMART MODULE FOR DEVELOPMENT OF TAILORED MADE GRADES.

Product data analysis based on statistical control tools and process adjustment based on human decisions is improved by “A digital prediction modelling based on the best combination of some mathematical models such as Artificial Neural networks, Bayesian Networks, Naïve Bayes, etc.”

METHODOLOGY FOR REAL TIME PROTOCOL APPLICATION.

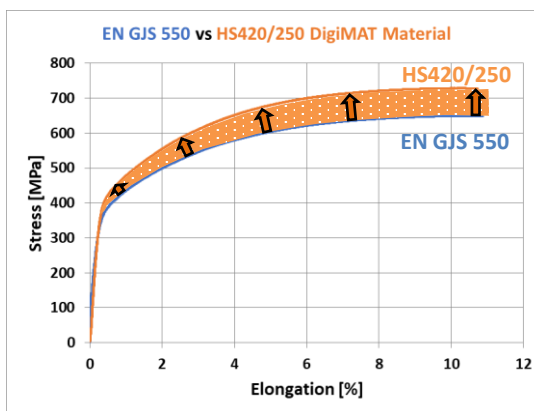
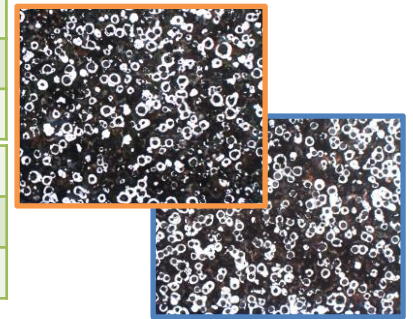
Decision system is based on expert people and after data analysis is improved by “on-line intelligent system that allows to forecast the results and if unexpected deviation occurs, the new established actuations protocols are applied”.

CAST IRON PRODUCT WITH HIGHER MECHANICAL PROPERTIES.

Existing cast iron manufacturing grades allows significant variation ranges in mechanical properties and thus high security coefficients are applied in the design phase of the components; are improved by “New cast iron grades with tailored made mechanical properties and with a reduced variation range”

New HS420/250 DigiMAT grade Specification			
Rp _{0,2} (MPa)	Rm (MPa)	A (%)	HBW
> 420	> 650	> 7	190-250

Material Specification EN GJS 550			
Rp _{0,2} (MPa)	Rm (MPa)	A (%)	HBW
> 370	> 550	> 5	190-250



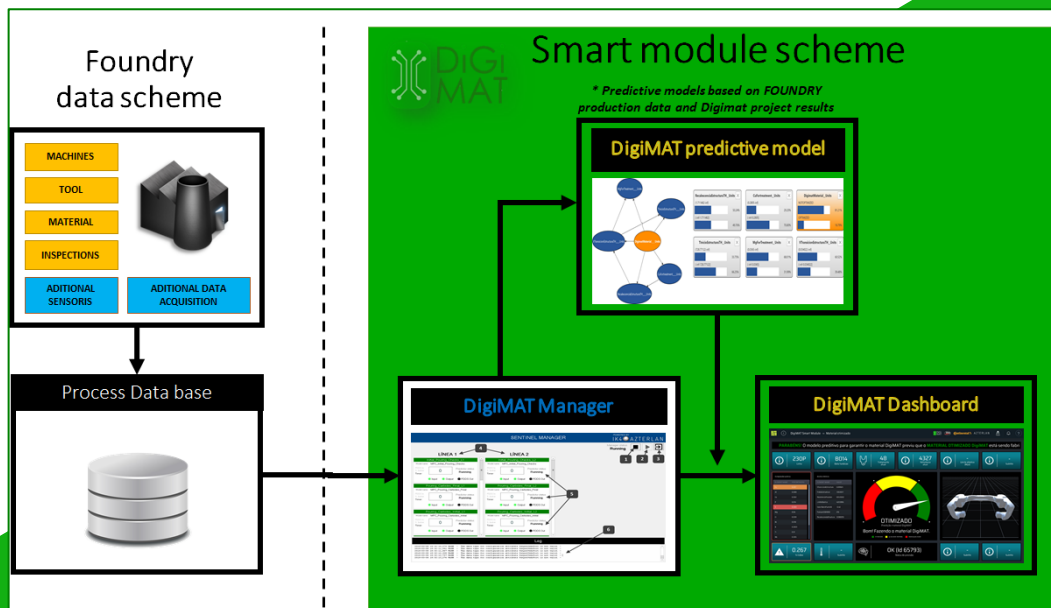
New HS420/250 DUCTILE IRON GRADE with Yield strength higher than 420 MPa. (>13% improvement)

New Lightweight solution

Many processes and product variables affecting machinability are unknown nowadays. In addition, machinability measurement is a difficult task.

Thanks to DigiMAT the “expert knowledge on main process variables and product characteristics affecting machinability is defined and controlled by the SMART DigiMAT module. A significant improvement in machinability was observed at Continental facilities.

MAIN exploitable results achieved



- R1** The smart module for digital materials manufacturing
- R2** Actuation protocols and specific controls for tailor-made digital materials implementation.
- R3** Digital material 1: Cast iron grade with higher mechanical performance (High Yield Strength) and the relevant manufacturing route.
- R4** Digital material 2: Cast iron grade with improved machinability, and the relevant manufacturing route.
- R5** Improved brake system, based on the new lighter anchor and cost-effective housing.

- The DigiMAT project will have a high impact in all the partners of the consortium, and it is expected a cascade impact on the EU industry, having its main influence on automotive sector.
- The project will have direct impact on different applications initially where ductile iron and specific parameters are desired such as yield strength or machinability. Thus, different automotive components are related, and several European iron part manufacturing processes and end-users will receive a significant impact.