

IZADI-NANO2INDUSTRY (GA-686165)

Pilots for industrial production of nanomaterial enabled improved performed products for automotive, construction and agricultural machinery sectors

Dr. Cristina Elizetxea, TECNALIA IZADI-NANO2INDUSTRY Project Coordinator

> Industrial Forum IMAGINENANO Bilbao, March 14-2018



Horizon 2020

Overview:



Main Objective:

In **IZADI-NANO2INDUSTRY** Injection moulding, Casting and Coating manufacturing processes will be improved by nanotechnology to enable industrial scale production of new performance-enhanced components





Strategy:

- **IZADI-NANO2INDUSTRY** aims at contributing to overcome the barriers that nano-materials are currently facing to get introduced in the market based on "*Safe by Design*" Strategy.
- Technologies based on nano-reinforced materials, nanotextured surfaces and nanostructured-coatings have been implemented in three innovative PILOTS:
 - **TRIBONANO:** Thermal Spray Technology for Nanostructured Coatings by Solid State Deposition
 - *HARDCAST:* New Gravity Casting Process for Nano-Reinforced Metal Parts
 - **ESTCRATCH:** Innovative Injection Moulding Process for Nano-Reinforced and Nanotextured Plastic Surfaces
- Proposing new added-value products to OEMs and solutions to the European Automotive, Construction and Agricultural Machinery sectors.



TRIBONANO Pilot:



Nanostructured Powders Producer



Technology Provider



Early Adopter







TRIBONANO Solutions:

Nanocermet Micropowder:

Micrometer sized powders with nanocrystalline microstructure for improved tribological performance components:

- ductility and toughness enhancement
- improved sinterability
- increased resistance to tribological and environmentally assisted damage
- increasing strength and/or ductility with increasing strain rate
- potential for enhanced superplastic deformation at lower temperatures
- faster strain rates







TRIBONANO Solutions:

Solid-State Deposition Process through Cold Spray Technique

- Suitable for spraying temperature-sensitive materials such as nano-structural and amorphous materials, oxygen-sensitive materials and phase-sensitive materials
- Some common problems with traditional thermal spray methods, such as high-temperature oxidation, evaporation, melting and gas release, are minimized or eliminated
- Possibility of producing dense, pure, thick and well bonded deposits of many metals and alloys
- Not direct manipulation of nanoparticles
- Greener alternative (no combustion) comparing to other thermal spraying and plating technologies
- Suitable for spraying sensitive materials such as nanostructured and amorphous materials
- Cost-effective process that can compete with the currently used ones







HARDCAST Pilot:



Nanostructured Powders Producer



Technology Provider



Early Adopter





nano2industry

HARDCAST Solutions:

Nanoreinforcements for improved metal castings:

Smart **master-pellets** containing large amounts of nano-reinforcements able to improve the base cast material in terms of wear resistance, mechanical strength or damping properties:

- 30% increased tensile properties in comparison with standard material
- The material allows lightweight concepts:
 - Possible changes in the design of current components to reduce thickness and weight.
 - Possibility of substituting current steel or ADI components
- Suitability for a large number of applications
- Avoidance of most environmental issues related to the incorporation of nanomaterials
- Same way of use as any other products or raw materials, without safety or handling concerns.
- Easier dispersion and wettability of the nano-reinforcement in the metallic matrix.
- The incorporation of special nanoparticles in the cast iron avoids the use of traditional coating or deposition after the casting process and the use of lubricants during parts operation,







HARDCAST Solutions:

New gravity castings process for nano-reinforced metal parts:

• Completely safe process, similar to the ones currently used in the foundries where nanometer size powders are not handled:

For **small percentages** of nanoreinforcements used, no stirring devices are needed

For **higher percentages** of nanoreinforcements used, stirring devices would be necessary to allow the complete fusion with the rest of the liquid metal that it is not possible in the limited time of the pouring.







- Robust casting process allowing homogeneous structure and properties of the nanoreinforced components.
- Industrial machinery with increased mechanical efficiency and reduced pressure losses
- Suitability to most common stirring systems



ESTCRATCH Pilot:





ESTCRATCH Solutions:

Optimized materials for nano-reinforced Injected Thermoplastics:

PMMA nano-compounds with better resistance to scratch:

- Best possible light transmission (92 % at clear grades) ٠
- Good chemical resistance
- 100% recyclable environmentally friendly ٠
- Polishable to remove small surface scratches
- High mechanical strength, surface hardness and abrasion resistance
- Very good weather resistance
- **Optimum mechanical properties**
- High heat deflection temperature
- Good flow / melt viscosity
- Class-A Surface (without painting)
- **Economic production**
- Less weight
- Freedom of design







Izadi Nanobatch

ESTCRATCH Solutions:

Enhanced Aesthetics and Color Effects for Injection Molded Plastic Parts:

• Production and supply of nanotextured mould inserts able to provide Diffractive/Plasmonic aesthetics finishes to plastic part directly during the injection moulding process



Inserts for diffractive gratings (angle-dependent colour)



Insert for plasmonic colour effects (angle-independent)

- Reduction of production phases and costs as the parts are made in a single step and several decoration and labelling processes can completely be removed.
- More green manufacturing process due to lower energy consumption, less transportation and increased recyclability as parts consist of fewer materials.
- Nanostructured surfaces developed can also be used to add other functional effects to a plastic surface such as anti-reflection, self-cleaning, increased wetting and reduced friction.





More Information:



Project Coordinator

Project Scientific Coordinator

Cristina Elizetxea Ezeiza cristina.elizetxea@tecnalia.com

tecnalia J Interior

Malder Garcia De Cortazar maider.garciadecortazar@tecnalia.com

tecnalia)

http://www.izadinano2industry.eu



