



**LIFE 4**  
GREEN STEEL



# LIFE 4GreenSteel



LIFE16-ENV-IT-231



## The Project

*The aim of the project is to demonstrate the feasibility to replace the traditional energy-intensive and material-consuming machining of wrought metals with a new and innovative High Density Powder Metallurgy (HDPM) technology for the manufacturing of high-performance steel components.*

*The Powder Metallurgy technology is a sustainable manufacturing process recognized as a green technology: the high mechanical and dimensional requirements for high performance steel could also be theoretically met by means of an innovative Die Wall Lubrication (DWL) compaction stage in combination with high-temperature vacuum sintering and thermochemical treatments.*

*This means to obtain a raw material utilization (metal powder) up to 95% manufacturing near net-shape components avoiding large scrap production (at least 50%) from machining technique.*

*Therefore, the general objective is the development of a (small) demo line able to prove the industrial practicability of the idea in order to spread the environmental, technical and economical advantages.*

*This, together with dissemination and networking activities, will lead to the main objective of the environmental policy and legislation development by means of the resource and energy efficiency resulting from powder metallurgy.*

## Environmental problem

*The environmental problem targeted regards the efficiency in use of raw materials and energy, combined with the removal of chemicals that have an impact on the environment and on human health in the production process of high density steel components. Moreover, more and more steel PM components from standard practice present recyclability problems due to the presence of alloying elements like copper.*

*A further environmental problem faced in the project is the elimination and/or drastic reduction of solid pre-mixed lubricants normally added to the metal powder in the standard practice; subsequently, they have to be eliminated with a specific burning step. This delubrication or debinding phase involves a thermal process that has a significant environmental impact.*





## Objectives and results

The project specific objectives are:

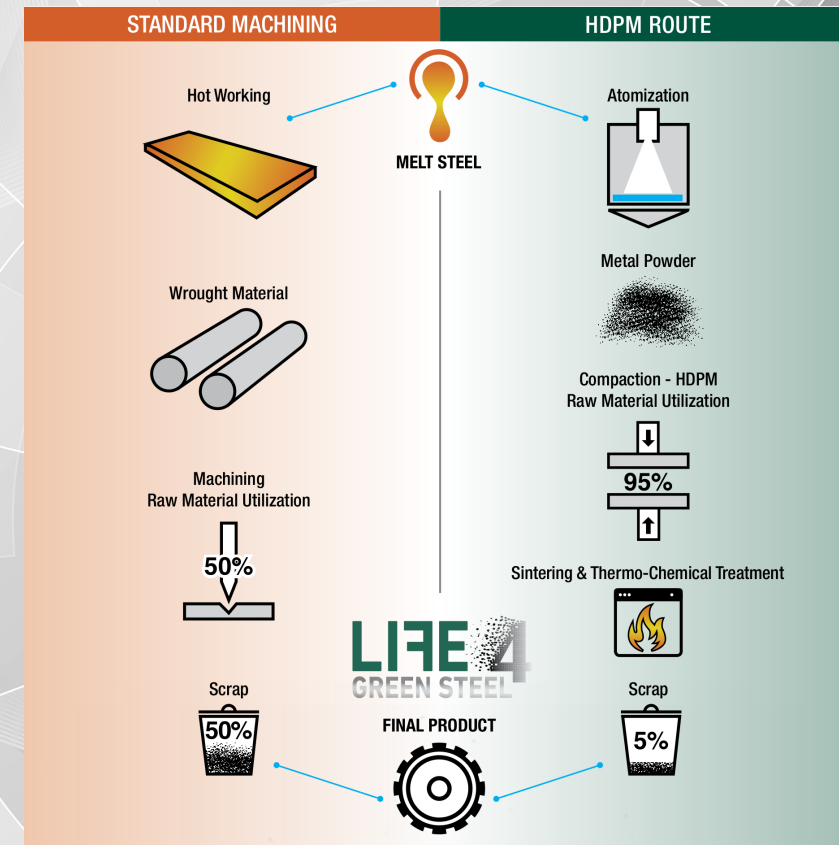
- develop an effective pressing system integrating DWL, to produce sintered steel parts having density greater than 7.3 g/cc and high dimensional stability
- develop a reliable case hardened profile of PM steel via LPC
- use a steel chemical composition avoiding harmful alloying elements (e.g nickel) or alloying elements which make the following recycling step difficult and ineffective (e.g. copper)

These will lead to environmental objectives like:

- guarantee energy and material saving through innovative HDPM, whose peculiarity is primarily its netshape capabilities and very high material use coefficient (95%) which minimize the energy inputs (machining determines a material use coefficient of 50% and generates environmental problems regarding the pollutant cutting fluid);
- strong reduction (more than 70%) of lubricant premixed with the metal powder (standard 0.8wt%) eliminating the burning stage, increasing the energy efficiency and solving the related emission problem

Expected results:

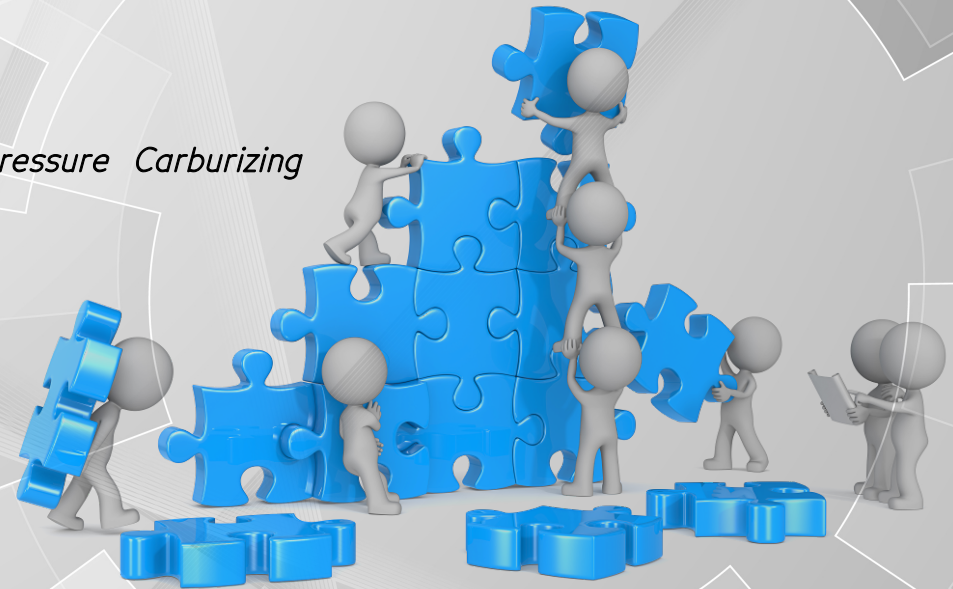
- High energy savings during producing and recycling (-50%)
- High raw material savings (-47%)
- Strong reduction in use of admixed lubricants (-70%) and fluid lubricants (-100%)
- Strong reduction in emissions related to lubricants (-70%)
- Strong reduction in CO2 emissions (-100%)



## Activities

Activities to be done:

- Study, design and development of a compaction press able to operate with the die wall lubrication system (DWL);
- Definition, design and manufacturing of an effective DWL deposition system;
- Study and evaluation of an efficient lubricant able to be deposited by DWL system;
- Design and manufacturing of simple and complex dies for the experimentations;
- Powder metallurgy alloy design, for steels without nickel and copper elements;
- Compaction Stage Tuning;
- Study and optimization of vacuum sintering conditions;
- Characterization of Sintered products;
- Study and design of effective case hardening profile via Low Pressure Carburizing (LPC);
- Characterization of Case Hardened component;
- Life Cycle Assessment;
- Dissemination and Networking.





## Technical progress

*The project started on July 1, 2017 and will have an estimated duration of 3 years.*

*The actions undertaken to date mainly concern the management aspects of the project, as well as the start of the first technical phases.*

*The project partners have established a management team and identified the strategic plans and practices to be implemented in order to achieve the expected results.*

*From a technical point of view, the partners have started work on the study of lubricants, lubrication methods, study of mold material, press specifications and the first activities of the design and construction of the press integrating the Die Wall Lubrication system.*

*As far as dissemination activities are concerned, the team realized the notice boards and the first paper-based dissemination materials, as well as this new section of the website dedicated to the LIFE project.*

## LIFE program

*LIFE is the EU's financial instrument supporting environmental, nature conservation and climate action projects throughout the EU. Since 1992, LIFE has co-financed more than 4500 projects. For the 2014-2020 funding period, LIFE will contribute approximately €3.4 billion to the protection of the environment and climate.*

*The European Commission (DG Environment and DG Climate Action) manages the LIFE programme. The Commission has delegated the implementation of many components of the LIFE programme to the Executive Agency for Small and Medium-sized Enterprises (EASME). External selection, monitoring and communication teams provide assistance to the Commission and EASME.*

*Informations: <http://ec.europa.eu/environment/life/>*

INFO

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