Transforming the current non-flexible and cost intensive forming processes into a rapid and agile manufacturing process.

More information at www.inmaproject.eu
Asymmetric Incremental Sheet Forming (AISF)

The INMA project aims at developing an intelligent knowledge-based flexible manufacturing technology for titanium shaping that will lead to drastically reduce current aircraft development costs incurred by the fabrication of complex titanium sheet aeronautical components, with a minimal environmental impact. In particular, this project aims at strengthening the European aircraft industry competitiveness by transforming current non-flexible, cost-inefficient forming processes into a rapid, lean and green process.

This innovative process, based on asymmetric incremental sheet forming (AISF), will transform the way many titanium sheet aeronautical components that can be found mainly in the pylons, nacelles and engine areas are manufactured today.

Asymmetric Incremental Sheet Forming is based on the localized plastic deformation of the blank under the action of a punch tool which follows a continuous and numerically controlled path. Basic equipment includes a clamping system for the blank, the punch tool and a CNC system (milling machine, robot) to move the tool along the programmed path.

Project objectives

§ Development of the AISF process for titanium through the generation of experimental data about adequate parameter windows, tool specifications and tool paths for cold, hot and large scale forming.

§ Implement and validate numerical AISF process models that will provide reliable prediction of the forces, strains and shape deviations resulting from cold, lean heated and large scale forming.

§ Characterize titanium formability limits, including the definition of specific and inexistent testing and evaluating procedures, as well as its post-forming metallurgical, mechanical and chemical properties under cold and hot AISF.

§ Implement and validate an intelligent KB AISF process model that will serve to correct the forming tool path in order to compensate shape deviations appearing when no die is used.

§ Develop heating procedures that will allow tackling hot AISF operations at minimum cost and energy consumption without compromising other relevant issues such as efficiency and reliability.

§ Apply and validate the developed technology through the fabrication of aircraft and aeroengine realistic pilot demonstrators.