

**INVITED SESSION SUMMARY****Title of Session:****Manufacturing technologies for material sustainability throughout the product life-cycle****Name, Title and Affiliation of Chair:**

Chair: Michele Dassisti, Polytechnic of Bari and AITeM (Italian Association of Mechanical Technologist)

Co-chair: Marcello Colledani, Polytechnic of Milan and AITeM (Italian Association of Mechanical Technologist)

Co-chair: Giuseppe Ingarao, University of Palermo and AITeM (Italian Association of Mechanical Technologist)

**Details of Session (including aim and scope):**

A relevant share of CO<sub>2</sub> emissions worldwide can be ascribed to material production: it consumes about 21% of the global energy demand and causes about 20 % of the global CO<sub>2</sub> emissions (Ashby, 2013). On the other hand, the global energy required for material production is dominated by a limited number of material categories: steel, cement, paper, aluminum and aggregated plastics (Gutowski et al, 2013).

Manufacturing processes play an active role at different stages of a product/component life cycle; namely production, use and recycle. At manufacturing stage, process scraps minimization as well as the proper manufacturing approach selection could lead to substantial material savings. Moreover, manufacturing processes could enable material to be reused at end-of life stage. A straightforward example are the solid state recycling approaches which are under the spot-light concerning the light alloys recycling (Paraskevas et al., 2014). The end-of life options, such us remanufacturing, reuse, repair, reengineering can be further effectively enabled by manufacturing technologies.

This is the essence of sustainable manufacturing. Sustainable manufacturing is a multifaceted concept sharing a common feeling but not a common meaning even within the scientific community. The 6 R's methodological frame (Reduce, Reuse, Recycle, Recover, Redesign and Remanufacture) provide a good reference to general criteria to pursue for a sustainable manufacturing. Nevertheless, solutions are not easy to descend from these standard criteria, unless technologies are available to support the 6 R's effort. The true challenge of a sustainable manufacturing is to set up manufacturing technologies to respond to these general criteria. Manufacturing scientist can play a dominant role in reducing the environmental impact of the materials. They are called to rethink the approach to technology and process design: What the solutions, approaches, decisional tools will support this sustainability challenge?

The aim of the session is to identify and broaden the role of manufacturing processes in reducing the environmental impact related to materials use. Authors are invited to submit papers within the scope of the following areas:

- Material efficiency through manufacturing process innovation;
- Material and resource efficiency at process level;
- Environmental impact analysis of manufacturing processes (including material life-cycle)
- Innovative processes and strategies for implementing 6R's approaches: Reduce, Reuse, Recycle, Recover, Redesign and Remanufacture.

*References*

Ashby MF. *Materials and the Environment* (2<sup>nd</sup> Edition). Butterworth Heinemann - Elsevier; 2013.

Gutowski T, Sahil S, Allwood J, Ashby M, Worrell E. *The energy required to produce materials: constraint on energy intensity-improvements, parameters of demand*. Phil Trans R Soc 2013; A 371: 20120003.

Paraskevas D, Vanmeensel K, Vleugels J, Dewulf W, Deng Y, Duflou JR. *Spark Plasma Sintering as a solid-state recycling technique: the case of Aluminum alloy scrap consolidation*. Materials 2014; 7(8): 5664-5687.

**Main Contributing Researchers / Research Centres (tentative, if known at this stage):**

**Michele Dassisti, Politecnico di Bari**  
**Marcello Colledani, Politecnico di Milano**  
**Paolo C. Priarone, Politecnico di Torino**  
**Giuseppe Ingarao, Università di Palermo**  
**Archimede Forcellese, Università Politecnica delle Marche**  
**Michela Simoncini, Università E-Campus**  
**Abdul Olabi, University of the West of Scotland**  
**Andrea Matta, Shanghai Jiao Tong University**  
**Hervé Panetto - University of Lorraine**

**Website URL of Call for Papers (if any):**

<http://www.aitem.org/sostenere-2/>

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