

Session Title: Industry 4.0 and sustainability: applications and research about environmental, social and economic benefits from the fourth Industrial revolution

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Abstract

In the next years, Industrial Systems Engineering will face important changes on two main fronts: Sustainability and Industry 4.0.

As regards the first one, sustainable development has initially been defined as "the development that is able to satisfy the needs of current generations without compromising the possibility that future generations will be able to satisfy theirs". However, today the concept has evolved and consists of the virtuous balance between three pillars:

- **Social Sustainability:** the ability to ensure a condition of well-being (e.g. safety, health, education, justice, democracy) equally distributed within a system.
- **Economic Sustainability:** production and maintenance, within the territory, of favorable conditions for economic growth through a correct and effective exploitation of resources (e.g. enhancing the products and services of the territory, generating enough income and work to support the population).
- **Environmental sustainability:** protection of the planet through sustainable production and consumption models, responsibly managing natural resources and acting quickly on climate change, to support the needs of current and future generations.

To reach a sustainable development, the General Assembly of United Nations adopted the 2030 Agenda, composed by a list of 17 Sustainable Development Goals (SDGs) which must be reached by all countries of the world by 2030. Besides these premises, everyone is called to adopt sustainable practices: companies, in particular, are trying to reinvent them-self in order to move from a linear economy to a circular economy, implementing solutions that can make their products and processes more sustainable from an economic, social and environmental point of view.

In the meanwhile, industrial systems are also facing the Fourth Industrial Revolution: they are becoming more and more automated, interconnected and intelligent, thanks to the use of new technologies such as collaborative robots, additive manufacturing, virtual and augmented reality, big data analytics and cyber security, Internet of Things, simulation and cloud computing.

The 4.0 transformations have the potential to create value for companies and can bring significant improvements: those who want to be competitive on the market must implement new methods and tools to make plants efficient and productive. For example, in the production area, 4.0 technologies optimize the use of resources and minimize downtime through remote monitoring and predictive maintenance, increase labor productivity by automating manual labor, and improve the quality of services and products by exploiting the analysis of data produced in real time, but can also have the potential to dramatically influence social, economic and environmental sustainability of processes.

In this context of notable revolutions in technologies, this session aims to investigate, assess, and examine the challenges and opportunities of Industry 4.0 in relation to the three dimensions of Sustainability. Potential topics and research include, but are not limited to:

- Potential environmental benefits of Industry 4.0 (reduction of energy consumption, CO2 emission, wastes and scraps; Life Cycle Assessment studies applied to Industry 4.0 plants and machines)
- Social characteristics of Industry 4.0 (employment, organizational development; Social Life Cycle Assessment of 4.0 technologies)
- Economic sustainability of Industry 4.0 and its challenges (reduced set-up times, increased production flexibility, higher productivity and enhanced customization; Life Cycle Costing of Industry 4.0)