PROJECT DESCRIPTION

Title: Expanding the Horizons of Manufacturing: Solving the Integration Paradox (EHMAN)

Project description:

The project aims at the enterprise-wide modelling and optimization (EWMO) by the development and application of integrated modelling, simulation and optimization methodologies, and computer-aided tools for reliable and sustainable improvement opportunities within the entire manufacturing network (raw materials, production plants, distribution, retailers and customers) and its individual components. Such integrated approach, also incorporates information coming from the local basic control and supervisory modules into the scheduling/planning formulation, making it is possible to dynamically react to incidents occurring in the network components at the appropriate level of decision-making.

The use of an integrated solution will allow enhanced coordination and cooperation between network components by avoiding competition among them eventually leading to "local optima" and inefficiency associated to inconsistent isolated decisions at different levels. Such integrated solution approach will provide new structural alternatives, more efficient management policies, more economical design options, which can work in practice requiring fewer resources, emitting less waste and providing better responsiveness in dynamic market requirements and operational variations, thus leading to reduced cost, waste, energy consumption and environmental impact and also to increased benefits.

This will be achieved through the following R&D+i tasks:
- Development of advanced mathematical models & methodologies for integrated approach of the network design and planning problems, always under a multiobjective view, integrating production, financial and environmental aspects, risk and uncertainty.
- Development of detailed production scheduling at plant level for batch, continuous and discrete manufacturing for on-line scheduling that can be implemented in practice under real-time variations and uncertainty.
- Integrating the tracking system of the network dynamics within the holistic decision-making model by enclosing a model predictive control framework thus facilitating equivalent constraints handling at strategic and operational levels, and enabling adequate response to incidents for enhanced production sustainability.
- Development of suitable frameworks and algorithms for solving these problems in an efficient and integrated manner (disjunctive programming, Lagrange decomposition), and the corresponding software prototypes for their implementation, illustrating their applicability in several real-life multinacional industrial case studies involving typical manufacturing/distribution networks belonging to relevant production sectors.

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OTHER INFORMATION

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Facilities: Center for Process and Environmental Engineering - CEPIMA Research Group Facilities at the UPC Chemical Engineering Department.