Objectives

Modern production industry is forced to react on changes in 3 levels:
1. Production resources: Multiple production sites and dynamic customer’s requirements in different European regions induce a field of tension in which resources should be standardised adaptive. The project aims at a new generation of production resources which combines advantages of standardisation and specialisation;
2. Factory organisation: Using these resources reveal challenges in factory’s organisation. Modularized architectures are promising concepts for the future. The proposed project aims at applying them to European companies;
3. Plant engineering (PE): Information technologies like virtual-reality are suitable means to reduce time and improve planning results. The project aims at automatically configuring & controlling resource modules.
MPA-Methodology: The MPA-Methodology developed in the course of the project comprises a continuous set of procedures, methods and tools for - the design of production modules according to the particular industry’s objectives, modular production architectures and the derivation of scalable production systems, - the evaluation of alternative modular system solutions considering standardisation, flexibility and adaptability along the production system life-cycle, - strategies for migration from plant architectures of today to modular plant architectures of tomorrow. The MPA-Methodology adapts the concept of modular product platforms known from automobile design to the design of production systems. In order to increase production system flexibility and to extend its lifecycle, the system is decomposed into modules and platforms. While modules encapsulate the system constituents that are object to frequent changes within the system's lifecycle (i.e. product/ volume-specific constituents), platforms include the rather static parts of the system (i.e. location-specific constituents). This way, future changes of relevant parameters can be answered by exchanging or adapting dedicated modules. The methodology systematically supports the modular production engineering in four phases: analysis, design, evaluation and operation. At first, relevant change drivers for production systems and company-specific objectives are analysed. Based on that, production modules, platforms and reference architectures are generated. Therefore, change driver impacts and relevant system relations are represented in a dedicated model, the Production Structure Matrix (PSM). Systematic generation of alternative modularisation concepts is supported and the methodology provides a solution for the evaluation of these concepts in order to identify an appropriate degree of modularity as well as the right balance between specialisation and flexibility utilising scenario-based evaluation techniques. Finally, the method is complemented by a concept continuous improvement of MPA as well as a guideline that provides an approved migration strategies towards MPA. The method has successfully proven its practical applicability in multiple real-case production modularisation projects carried out by involved industrial partners in the course of the project. Its application has led to considerable savings in terms of investment, running cost, planning cost and time-to-job one. MPA-Software Tool: The MPA-Software tool has been developed in order to provide an advanced support to the (re-) designer and user of modular production systems.

The developed MPA-Software-Tool integrates existing successful ideas and new, innovative approaches to create a sophisticated support for the design of factories: The Standard Facilities Library (a central Object Oriented Data Base) stores all the information related with the plant for both the virtual environment and the emulation system. All relevant data, modularization and standardization information concerning the various elements (resources, structures, processes) are stored here. The database serves as an integrated interface for the various tool and methodology modules: the VRE and the Control and Emulation System. The Virtual Reality Environment (VRE) is an high fidelity 3D environment where the user can design a new, modular production site or modify an existing one in a simple and user-friendly
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The advanced agent-based manufacturing control and emulation system is linked to the VR-environment and thus enables to consider dynamic aspects within the system design or plant engineering process. The manufacturing control is based on the most recently developed technology in multi-agent manufacturing control systems and holonic manufacturing systems, thus reflecting the best and latest technology available. MPA-Resource Box: The MPA-Resource Box represents the results of the application of MPA-methodology and MPA-Software-tool at participating industrial partners. Factory Level: Modular factory building and configuration tool-kit (GIP, cf. result no. 478). Segment Level: Production Modules and modular Reference Architecture at machines manufacturer (Picanol, N.V. cf. result no. 793). Line Level: - Factory modules at automotive supplier (Behr Lorraine SARL, cf. result no. 649); - Design and control of modular production architecture (Robert Bosch España Fabrica Treto, cf. result no. 477); - Requirements and solutions for Modular Plant Architectures and elaboration of a factory configuration tool-kit (Becker GmbH, cf. result no. 1018). Workstation Level: Modular part feeding system for flexible assembly systems (Robert Bosch GmbH, cf. result no. 672.).

Fields of science

- engineering and technology > electrical engineering, electronic engineering, information engineering > electronic engineering > control systems
- natural sciences > computer and information sciences > databases
- natural sciences > computer and information sciences > software > software applications > virtual reality

Programme(s)

FP5-GROWTH - Programme for research technological development and demonstration on "Competitive and sustainable growth 1998-2002"

Topic(s)

1.1.3.-1. - Key Action Innovative Products, Processes and Organisation

Call for proposal

Data not available
CSC - Cost-sharing contracts

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