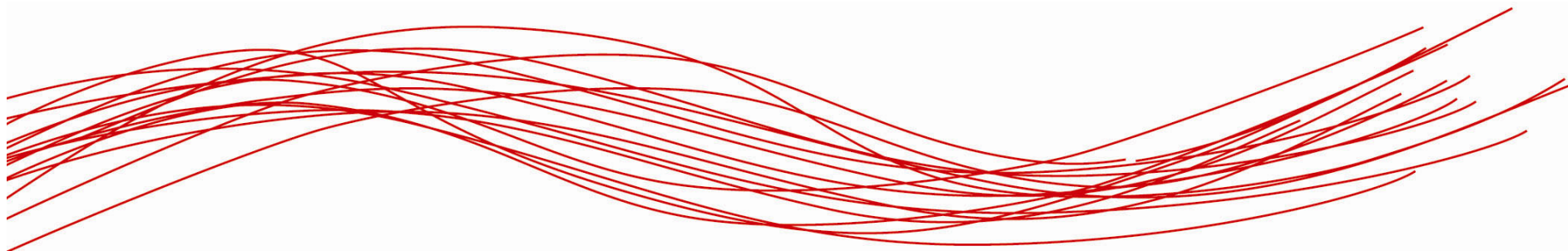


PPP FoF NMP Call Topics in WP 2011



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FoF.NMP.2011-1 The eco-factory: cleaner and more resource-efficient production in manufacturing

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FoF.NMP.2011-1 The eco-factory: cleaner and more resource-efficient production in manufacturing (1/4)

Technical content/scope: The Eco-Factory, focusing on the innovation of critical manufacturing processes, requires multidisciplinary scientific expertise to support the knowledge-based eco-engineering of manufacturing processes and **to foster the use of advanced sustainable technologies inside the factory**. This involves process simulation and modelling, process life-cycle assessment and benchmarking of different options, the development of new manufacturing technologies and **the improvement of the green performance** of current manufacturing.

Cleaner and more resource-efficient production in manufacturing implies the application of an integrated environmental protection strategy to manufacturing processes aiming at increasing the overall efficiency of production systems by the decrease in the use of resources and **energy**, and in emissions and waste treatment and recycling at the point of use.



FoF.NMP.2011-1 The eco-factory: cleaner and more resource-efficient production in manufacturing (2/4)

Technical content/scope: In the manufacturing chain, an integrated and **holistic approach** is proposed aiming at:

- **Preventing environmental pollution**, i.e. waste production and resource and energy dissipation, throughout the production site operation, by evaluating the global burden to the eco-system and **by developing efficient industrial process control, planning and scheduling** (e.g. using sustainability oriented decision support systems for the optimisation of the manufacturing processes along the whole value-chain).
- **Reducing global resources consumption, in particular energy usage**, by developing and evaluating alternative manufacturing technologies to replace existing resource-intensive manufacturing processes, including tools for modelling resource consumption, developing standards for such models and strategies to maximise the output against resource consumption.
- Developing **multi-objective process simulation optimisation methodologies**, enabling a more sustainable, efficient and competitive manufacturing of high added-value products.
- Integration of **monitoring tools based on Key Performance Environmental Indicators** and **either local or remote smart components** that collect and process information about the product's whole ecological footprint, and reconfigure the production parameters.

FoF.NMP.2011-1 The eco-factory: cleaner and more resource-efficient production in manufacturing (3/4)

Technical content/scope: The Eco-Factory also requires innovative **management methodologies** including fast integration of advanced technologies and **new business strategies for greener production**.

In order to deliver breakthrough research with major impacts on competitive and sustainable manufacturing, the Eco-Factory approach must involve an **integrated, cross-sectoral and interdisciplinary team**, including large industrial groups and SMEs as well as technological and socio-economic expertise, ensuring a **fast innovation transfer from R&D to industrial applications** (including SMEs).

The projects are expected to cover **demonstration activities**, including pilot implementations in industrial settings. In order to ensure the industrial relevance and impact of the research effort, **active participation of industrial partners** represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.



FoF.NMP.2011-1 The eco-factory: cleaner and more resource-efficient production in manufacturing (4/4)

Funding Scheme: Large-scale integrating collaborative projects.

Expected impact: Increase in competitiveness and sustainability of manufacturing processes, by advanced design options and guidelines for the manufacturing of new greener products with tailored properties, e.g. using additive manufacturing to decrease waste. Strengthening the environmental performance of the eco-factories by reducing resource consumption, energy and waste by at least 20%. Improving the development and access to markets of innovative environmental technologies, helping SMEs adapt to emerging market needs and protecting and creating new job opportunities. Knowledge of new scientific, technical, economic and social factors to support European policy development and the standardisation and definition of eco-labelled processes and products.



FoF.NMP.2011-2 Cooperative machines and open-architecture control systems (1/3)

Technical content/scope: The transformation of traditional production line concepts to **non-hierarchical agglomerates of autonomous and mobile manufacturing units** is a key technology for new European production models. Moreover, **open architecture** for manufacturing systems implies easier integration and networking of the control systems of equipment modules and will result in enhanced production performance. Novel approaches in these domains shall encompass the life cycle of the production systems from the development of generic manufacturing **ontologies, methods and tools for the development of co-operative production systems** to integrated engineering systems, characterised by **intelligent** monitoring and control systems, **predictive performance solutions** and a **high level of re-configurability**. Research activities on human-machine interface (HMI) for enhanced integration of the human workforce in working environment may also be included.



FoF.NMP.2011-2 Cooperative machines and open-architecture control systems (2/3)

Technical content/scope: Research and development needs to focus on the application of **agent control technologies**, e.g. Holonic/Evolvable Manufacturing Systems or Service Oriented Control Architectures for autonomous manufacturing components as well as methods and strategies to **update the design and performance** of manufacturing units during their life cycles. R&D projects should lead to **multi-sectoral** system solutions and address the current limitations in specific manufacturing domains. The projects are expected to cover **demonstration activities**, including pilot implementations in industrial settings. In order to ensure the industrial relevance and impact of the research effort, **active participation of industrial partners** represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.



FoF.NMP.2011-2 Cooperative machines and open-architecture control systems (3/3)

Funding Scheme: Small or medium-scale focused research projects.

Expected impact: The research efforts will demonstrate the feasibility and technological advantage of the new European factories of the future in traditional and emerging industrial sectors. Results will stimulate important innovations in production technology and **enhance industrial work environments**, especially in traditional sectors including food and agro-industries. The technology developed will drastically improve the international position of European manufacturers with respect to their openness to adopt new manufacturing processes and product innovations.



FoF.NMP.2011-3 Robots for automation of post-production and other auxiliary processes (1/4)

Technical content/scope: In the future the scope of application of robots will tremendously increase as far as their **autonomy and affordability**, enabling industrial and service robots to carry out more **complex life-cycle oriented jobs**, e.g. those which need to be carried out after the product has been delivered to its customer or other auxiliary tasks during the production process itself. This may, for example, include **recycling and dismantling, inspection, repair, maintenance or other re-configuration tasks** and more in general post-production automation tasks, as well as the auxiliary processes in the production chains. However, today's systems are too rigid (i.e. designed for specific applications), they are rather expensive and often unusable in physical conditions where humans can not easily get to (e.g., under water, small spaces, or dangerous locations) or cover efficiently (e.g. large structures).



FoF.NMP.2011-3 Robots for automation of post-production and other auxiliary processes (2/4)

Technical content/scope: Therefore, manufacturing operations with robots in areas that are traditionally human-intensive and not automated would require enhanced capabilities of man-machine cooperative approaches. To successfully perform complex tasks over the entire product life-cycle in a very open task spectrum, strict requirements with regard to **higher degrees of adaptability, scalability, flexibility and dependability** must be linked with **capabilities associated with natural intelligence and perception** (e.g. identification and manipulation of unknown component geometry), skilled work reasoning, as well as sophisticated motor abilities, in order **to cope with incomplete or non up-to-date information** about the parts and the production settings.



FoF.NMP.2011-3 Robots for automation of post-production and other auxiliary processes (3/4)

Technical content/scope: The automation of ancillary processes in production will extend over several inspection, disassembly, treatment and manipulation tasks, and demand for multi-task planning of processes and action in dense structures, strategies for sequencing and choice of treatment, repair and replacement. Semantics, reasoning, learning and planning methods will also be needed.

The projects are expected to cover demonstration activities, including pilot implementations in industrial settings. In order to ensure the industrial relevance and impact of the research effort, active participation of industrial partners represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.



FoF.NMP.2011-3 Robots for automation of post-production and other auxiliary processes (4/4)

Funding Scheme: Small or medium-scale focused research projects.

Expected Impact: Most relevant industrial sectors are in capital intensive investment goods (e.g. construction, energy and aeronautics), but the results developed can be applicable to other products having high life-cycle costs. Full life-cycle services are envisaged such as in-field servicing, repair, refurbishing, upgrading, and associated services such as inspection, monitoring and recycling. At the same time, the use of robots in complex manipulation tasks in other industrial sectors will be made possible by the availability of cost effective and flexible automated solutions. The new robotised systems offered should be able to extend the service life and/or improve the operational efficiency and functionality of the product, while at the same time reducing the overall life-cycle costs.



FoF.NMP.2011-4: High tech solutions in the production processes for customised, green, safe and healthy consumer products (1/5)

Technical content/scope: The market trend towards customised, green, safe and healthy consumer products requires a new generation of production systems. Industrial production capacity will need to be able to respond to an increasingly turbulent and uncertain demand for highly-customised products, whose complexity is constantly increasing. Compared to the past, customers demand higher quality, quicker delivery times and shorter product lifecycles. All this requires high flexibility and the permanent adaptation of machines, process equipment and production systems to evolving products and processes, with special consideration for applications in traditional industries.

Customisation of products will range from product technical performance to integration of advanced product functionalities and modification of product features oriented towards specific consumer needs and requirements, such as comfort, health, well-being and safety.



FoF.NMP.2011-4: High tech solutions in the production processes for customised, green, safe and healthy consumer products (2/5)

Technical content/scope: Sustainability of products and production processes also has to be addressed, considering their overall life cycle, from conception and design through to disposal and recycling, by means of novel Life-Cycle Assessment methods and tools. Such new technologies will have to be fully integrated in future production solutions, in order to successfully satisfy several aspects of personalised products, from increased customer interaction regarding trends and new requirements through co-design solutions to new agile, fast and eco-effective manufacturing processes performed by new generation of machines, tools, and supporting systems (in areas such as internal logistic or production scheduling).



FoF.NMP.2011-4: High tech solutions in the production processes for customised, green, safe and healthy consumer products (3/5)

Technical content/scope: The integration of new high-performance and eco-compatible materials for personalised green customer products also needs to be addressed.

High-tech production solutions for personalised green, safe, and healthy customer products are particularly crucial for all those sectors where a very high level of customisation is required in terms of technical performance and functionalities of individual products. The developed technologies shall be demonstrated through pilot production with reference to specific needs of target groups, such as children, people with disabilities, the aged or the overweight, and addressing particular market segments and applications (e.g. healthcare, food, sport, leisure and fashion).



FoF.NMP.2011-4: High tech solutions in the production processes for customised, green, safe and healthy consumer products (4/5)

Technical content/scope: SME-dedicated Collaborative Projects are specifically designed to encourage SME participation in research and innovation representing the complete value added of the targeted sectors. The projects are expected to cover demonstration activities, including pilot implementations in industrial settings. In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.



FoF.NMP.2011-4: High tech solutions in the production processes for customised, green, safe and healthy consumer products (5/5)

Funding Scheme: SME-targeted collaborative projects

Expected impact:

The global market for consumer goods is expected to increase significantly in the next decade. Societal concerns on consumer health, safety and well-being should be strongly addressed, as well as sustainability of consumer goods and their manufacturing processes. A new generation of consumer products and production systems is thus expected to both exploit the potential of high value-added European manufacturing industries and significantly improve the consumer life-style through green customised products and processes.

For European SMEs operating in such sectors these innovations are crucial to maintain and increase their role in future turbulent markets, considering that the consumers' expectations in terms of health, safety and eco-friendliness are strongly changing due to ageing and globalisation phenomena



FoF.NMP.2011-5: Towards zero-defect manufacturing (1/4)

Technical content/scope: Nowadays, manufacturing industries very frequently operate in data-rich environments. On the one hand, product quality is increasingly characterised by multiple geometric specifications of complex product's shape (e.g. in automotive, white-goods and aerospace industries). On the other hand, the quality process is to a greater extent associated with process data gathering. In fact, moving the attention from product data to process data allows to extend quality monitoring and optimisation strategies also to short-run production (e.g. small-lots, customised manufacturing).

From the system viewpoint, **data collection, data presentation and root cause reasoning** needs to be developed to **allow continuous monitoring of the performance of the different process stages to master propagation of defects within or between processes and increase the robustness of processes.**





FoF.NMP.2011-5: Towards zero-defect manufacturing (2/4)

In these scenarios, traditional “Six-Sigma” approaches can no longer help to achieve zero-defect manufacturing, given their limitation to simple data sets (invariant and independent data over time). Those methodologies have to be improved **by controlling the process parameters in real time** (in the relevant parameters field) and **by the use of pre-processing prognosis and proactive controls** on processes, production systems and sub-systems integrated in the production lines/cells. This includes the **application of sensors** for process diagnostics, monitoring and visualisation. The integration of **cognitive systems** will enable the development of **intelligent and self-optimising machines** for “zero-defect” manufacturing, with **increased process capability** (of $C_{pk}=2.0$ or higher) thanks to **new strategies for data-rich quality monitoring, control and optimisation.**



FoF.NMP.2011-5: Towards zero-defect manufacturing (3/4)

From the hardware viewpoint, **multi-resolution data-gathering devices are foreseen to integrate intelligence into the machining process** after appropriate integration. Thus, new cost-efficient tools for quality monitoring and optimisation with multi-resolution, multivariate and auto-correlated data have to be developed. The research in this area will focus on:

- system approaches for **monitoring and data processing of dimensional fluctuations**
- efficient **simulation** tools and methods to **predict the machining system behaviour** which can be utilised for efficient operation planning to be combined with in-process monitoring
- innovative solutions for **intelligent manufacturing systems, in support of customising and build-to-order strategies**
- extensive **integration capabilities** in production equipment of intelligent, autonomous, and self-adaptive devices (integrated, self-powered sensors and actuators) **at low cost** for process monitoring, control and quality management



FoF.NMP.2011-5: Towards zero-defect manufacturing (4/4)

The projects are expected to cover **demonstration activities, including pilot implementations in industrial settings**. In order to ensure the industrial relevance and impact of the research effort, **active participation of industrial partners** represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.

Funding Scheme: **Large**-scale integrating collaborative projects.

Expected Impact: The development of **innovative solutions** for zero-defect manufacturing is of strategic relevance for Europe, especially in the domains of parts manufacturing with conventional technologies such as machining, cutting, forming, coating and others. The **reduction of losses** by extensive quality control and the **increase of efficiency** in manufacturing are expected in many industries, in particular in the traditional sectors.



FoF.NMP.2011-6: Manufacturing chains for nano-phased components and coatings (1/4)

Technical content/scope: Recent research results and high-tech solutions demonstrate the potential and the maturity of nanotechnology to be applied in **large scale (bulk and surface), high volume and low cost applications.** The integration of high-performance nano-intermediates is considered one of the most promising economic opportunities of industrial nanotechnology. The use and integration of these materials and components will enable a **new generation of products with new functionalities**, create new market opportunities and improve competitiveness. The challenge for industry is to develop **new industrial-scale processes for nano-structured high-performance materials and to integrate them into existing or new micro/macro-manufacturing chains.**





FoF.NMP.2011-6: Manufacturing chains for nano-phased components and coatings (2/4)

Technical content/scope: The **research focus** should be on new and intelligent **platforms, equipment and tools**, which enable the processing and the integration of nano-materials in new or existing micro/macro-manufacturing chains. The structuring of materials at the nano-scale introduces new functionalities for e.g. optical or sensing. The aim is to manufacture **new functional micro-macro devices, products and systems** in a competitive way by integrating nanostructures and exploiting the potential and advantages of nano-phased materials. The projects are expected to **develop/upgrade appropriate high-throughput, cost-efficient processes** (e.g. extrusion, moulding, sintering, lithography, imprinting or surface deposition) **for the integration of novel nano-materials into new products, exploiting the specific characteristics of those materials and the advantages of high-volume mature manufacturing technologies.**





FoF.NMP.2011-6: Manufacturing chains for nano-phased components and coatings (3/4)

Technical content/scope: The **manufacturing chain** shall include intelligent manufacturing solutions like on-line monitoring and quality inspection systems in order to ensure efficiency, reliability and high product quality. Proposals should provide for adequate **operation conditions in terms of cleanliness and environment, health and safety (EHS) requirements** and aim for eco-friendly manufacturing routes to encourage energy saving, cost and waste reduction, and recycling.

The projects are expected to cover **demonstration activities, including pilot implementations in industrial settings**. In order to ensure the industrial relevance and impact of the research effort, **active participation of industrial partners** represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.



FoF.NMP.2011-6: Manufacturing chains for nano-phased components and coatings (4/4)

Funding Scheme: **Large**-scale integrating collaborative projects.

Expected Impact: **Improvement of the technological base** of the European manufacturing industry through new innovative processes and equipment for high-throughput, cost-efficient production of nanostructured components and/or devices for future applications in e.g. optics, electronics and/or lighting.

Projects are expected to provide **substantial innovation in industry and market perspectives** and to contribute to **competitiveness, sustainability and employment** in the **medium** term, enabling competitive and sustainable industrial production of new, high added-value products and components based upon nano-materials for **cross-sectoral applications**.



FP7 Information

EU research:

<http://europa.eu/comm/research>

Information on the Research PPPs

http://ec.europa.eu/research/industrial_technologies/

Research programmes and projects:

http://cordis.europa.eu/fp7/home_en.html

Thank you for your attention!

