PPP FoF NMP Call Topics in WP 2013

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Research PPP FOF Info-Days 9&10 July 2012
FoF.NMP.2013-1 Improved use of renewable resources at factory level  
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FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site  
Roberta.SALONNA@ec.europa.eu
FoF.NMP.2013-4 Innovative methodologies addressing social sustainability in manufacturing

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FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments

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FoF.NMP.2013-6 Mini-factories for customised products using local flexible production

John.CLEUREN@ec.europa.eu
FoF.NMP.2013-7  New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation

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FoF.NMP.2013-8  Innovative strategies for renovation and repair in manufacturing systems

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FoF.NMP.2013-9  Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets

Neophytos.NEOPHYTOU@ec.europa.eu
FoF.NMP.2013-10  Manufacturing processes for products made of composites or engineered metallic materials

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FoF.NMP.2013-11  Manufacturing of highly miniaturised components

German.ESTEBAN-MUNIZ@ec.europa.eu
FoF.NMP.2013-1 Improved use of renewable resources at factory level (1/5)

Technical content/scope: A more efficient use, at factory level, of material and energy resources, while at the same time ensuring high productivity rates, has become a key issue for a sustainable manufacturing sector. In this regard, a more extensive integration of technologies related to renewable energy and material resources and an optimal re-use of air, water and scrap (or other waste) along the lifecycle of factories may become a valuable complement to current strategies for resources efficiency. The resources consumed in the production processes, including air and water, should be minimised and the energy efficiency should be optimised in a continuous and iterative manner. This novel approach would allow European manufacturing companies to take a qualitative leap towards environmentally neutral factories where the production processes and systems will move towards reduced ecological footprints (e.g. near-to-zero carbon approaches), whilst ensuring competitiveness.
FoF.NMP.2013-1 Improved use of renewable resources at factory level (2/5)

This strategy demands new concepts and solutions at factory level, both for existing and new production plants. Research activities should be multi-disciplinary and **address all** of the following areas:

- Methodologies and tools for **eco-efficient design or re-adaptation of production facilities** based on co-evolving product-process-production systems including the integration of technologies for energy scavenging and recovery.

- Seamless integration of renewable **energy harvesting in production systems** for high productivity and maximum energy efficiency in the factories.

- Simulation and optimisation tools for **assessing both environmental and economic costs** linked with the use of renewable materials and energy resources, as well as technologies for energy recovery with reliable predictive analytics to guide decision-making.
FoF.NMP.2013-1 Improved use of renewable resources at factory level (3/5)

**Standardisation**, regulation and pre-normative research aspects should be considered. Proof of concept in terms of at least one **demonstrator** should be delivered before the end of the project, excluding commercially usable prototypes (2006/C323/01), but convincingly demonstrating scalability towards industrial needs.

In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners, including SMEs, represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.

The proposals should cover both **research and demonstration activities**. Prototypes and pilot implementations in real industrial settings represent a clear added-value. Whilst there is no lower or upper limit on the requested EU contribution, the target is that proposals allocate **around 50%** of the total eligible costs of the project (excluding management costs) to **demonstration activities** and this objective will be taken into account in the evaluation under the criteria S/T Excellence and Impact.
FoF.NMP.2013-1 Improved use of renewable resources at factory level (4/5)

Projects are expected to use appropriate Life Cycle Assessment techniques in order to estimate the impact of energy efficiency and improved use of renewable materials and energy resources on the price of final products. Projects are also expected to generate knowledge to support European policy development and promote standardisation (at national or international level).
FoF.NMP.2013-1 Improved use of renewable resources at factory level (5/5)

**Funding scheme:** DEMO-targeted collaborative projects.

**Expected impact:**
- In economic terms, **reduction of 20% in the total lifecycle costs** of factories with respect to conventional factories of similar productivity rates, due to an increase in energy efficiency and improved use of renewable resources.
- In environmental terms, a major step **towards zero-carbon footprint** manufacturing systems and processes, with drastic reduction of total lifecycle environmental impacts.
- Strengthened global position of European manufacturing industry through the introduction of the new technologies related to an improved use of renewable resources and contributions to international standardisation.
- Strong support for **eco-labelling policies** and standardisation.
FoF.NMP.2013-2 Innovative re-use of modular equipment based on integrated factory design (1/4)

Technical content/scope: Current markets and customer demands impose quick changes in terms of product models, with smaller lot sizes and increased variety. Moreover, with increased customisation, multiple similar products are produced in small lots in a shared production line as a result of just-in-time production. Therefore, for the economic sustainability of the production systems, an innovative re-use of modular equipment based on integrated factory design methodologies needs to be addressed. This requires a cost-efficient and modular approach for production systems, with a higher standardisation level regarding production equipment and components, allowing a highly flexible and reconfigurable production in the long term.
FoF.NMP.2013-2 Innovative re-use of modular equipment based on integrated factory design (2/4)

Research activities should address at least the first two of the following areas:
- Proactive **modularisation and re-use strategies** for the development of the future machinery and production systems and their integration in old, new or renewed factory facilities.
- **Innovative factory lay-out design techniques** able to integrate new approaches to leverage all potential synergies between the concurrent design of plant and processes, taking into account best practices for de-manufacturing, dismantling, recycling and value-chain extension.
- **Flexible, low-cost assembly/disassembly solutions** to aim at a high market penetration with those solutions by the machine component suppliers and systems integrators, by developing low weight and mobile solutions (e.g. flexible grippers), as well as systems (e.g. automation, vision and control) for their seamless integration in factories.
FoF.NMP.2013-2 Innovative re-use of modular equipment based on integrated factory design (3/4)

Standardisation, regulation and pre-normative research aspects should be considered. Proof of concept in terms of at least one demonstrator should be delivered before the end of the project, excluding commercially usable prototypes (2006/C323/01), but convincingly demonstrating scalability towards industrial needs.

In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners, including SMEs, represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.

The proposals should cover both research and demonstration activities. Prototypes and pilot implementations in real industrial settings represent a clear added-value. Whilst there is no lower or upper limit on the requested EU contribution, the target is that proposals allocate around 50% of the total eligible costs of the project (excluding management costs) to demonstration activities and this objective will be taken into account in the evaluation under the criteria S/T Excellence and Impact.
FoF.NMP.2013-2 Innovative re-use of modular equipment based on integrated factory design (4/4)

Projects are expected to use appropriate Life Cycle Assessment techniques and to generate knowledge to support European policy development and promote standardisation (at national or international level).

**Funding scheme:** DEMO-targeted collaborative projects.

**Expected impact:**
- **Cost reduction of around 30%** due to re-use of existing modular equipment when setting-up production systems for new product variants.
- **Set-up and ramp-up time reduction of around 30%** for new or retrofitted plant designs.
- At the end-of-life stage, a step contribution towards a 100% reuse of production system components in new life cycles.
- Strengthened global position of European manufacturing industry through the introduction of the new technologies related to an innovative re-use of equipment based on integrated factory design and contributions to international standardisation.
FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site (1/6)

Technical content/scope: The workplaces of the future will give much more importance to the human dimension. Putting people at the centre of future factories will provide a stimulating environment for the employees, and make the most from their knowledge, skills and cultural background, in particular through life-long learning and training. Those new workplaces should effectively be integrated into the social (e.g. urban/rural) environment in order to sustainably respond to the needs of the citizens (e.g. quality of air, level of lighting and noise, traffic congestions, etc) and, at the same time, provide extended services to the workers in terms of safety, accessibility, inclusiveness, efficiency and work satisfaction.

This approach would lead European manufacturing industry to make a qualitative leap towards new people-centred and knowledge-based production workplaces which take into account the constraints of the work force, for example those of aged workers. The workplaces of the future should, therefore, be based on methodologies for enhancing flexible, safe and smart production where adequate levels of automation are applied, while maintaining a level of employment with highly satisfied and skilled workers and, at the same time, ensuring competitiveness.
FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site (2/6)

This strategy demands new concepts and solutions at factory level, both for existing and new production plants. Research activities should be multi-disciplinary and address several of the following areas:

- New approaches to integrate the European factories of the future in their social (urban/rural) environment including urban transport, parking, shopping and entertainment centres, support to families, etc.

- New methods and technologies for an optimised use of workers’ knowledge and cognitive capabilities (e.g. for data acquisition, transmission, handling and post-processing), for the stimulation of team interactions and to enhance work related satisfaction, in order to achieve a more human centred and safe workspace, e.g. through the use of knowledge management and decision making systems which are better designed to access, capture and share know-how.
FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site (3/6)

- New methods and technologies for enhanced cooperation of the human operators and the production systems (e.g. Human Factors Engineering), in a safe, flexible and dynamic way, to carry out tasks interactively. New models for human/system integration taking into account the skills, capabilities, and knowledge of the human operator early in the production system design process. New methods and technologies for efficient human/human interaction and team collaboration, to enhance joint decision-making and team-based efficiency.

- New approaches related to safety and ergonomics of the working areas by the optimisation and personalisation of working environment parameters (e.g. indoor/outdoor lighting, temperature, and humidity) and the integration of advanced safety systems, taking into account worker’s age, experience and physical condition, and workers interactions.
FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site (4/6)

- Methodologies and tools for people-centred production to guarantee an efficient transition from current to future worker task/role definitions and multi-skilled involvement of individual workers with expanded responsibility in broader sets of operations (e.g. maintenance, logistics, and quality control).

Screening of existing national/international standards (e.g. safety regulations) and of the needs for new standards is required. Other standardisation, regulation and pre-normative research aspects should also be considered.

In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners, including SMEs, represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact. The projects are expected to cover demonstration activities, including pilot implementations in industrial settings, and this will be likewise reflected in the evaluation.
FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site (5/6)

This topic is particularly suitable for collaboration at international level, particularly under the IMS\(^5\) scheme. Project partnerships that include independent organisations from at least three IMS regions\(^6\) are therefore encouraged.

**Funding scheme:** Small or medium-sized collaborative projects.

**Expected impact:**
- In **economic terms**, an increase of above 20% in the productivity rate due to an enhanced use of human resources, reduction of costs related to accidents and occupational diseases, reduction of absenteeism in the workplace and by increasing the pool of potential workers through widening the skill profile.

- In **environmental terms**, a more friendly integration of the factory in the social environment, with drastic reduction of total environmental impacts.
FoF.NMP.2013-3 Workplaces of the future: the new people-centred production site (6/6)

- In social terms, a reduction in the number and severity of work accidents and diseases, an improvement in the working conditions in factories and in the attractiveness of the working environments for the right-skilled people due to knowledge-based ergonomic approaches to manufacturing.

5 IMS (Intelligent Manufacturing Systems) is an industry-led, global, collaborative research and development programme, started in 1995 as the world’s only multilateral collaborative R&D framework: www.ims.org

6 The current member regions of IMS are the European Union, the United States of America, Korea, Mexico and the EFTA states of Norway and Switzerland.
FoF.NMP.2013-4  Innovative methodologies addressing social sustainability in manufacturing (1/3)

Technical content/scope: In order to ensure the social well-being of people in the factories of the future, there is a need to redefine the human role in manufacturing.

New forms of interaction between process, machinery and human beings need to be addressed in such a way that future factories can be operated profitably, and at the same time provide a stimulating environment for the employees, and make the most from their skills and knowledge through life-long learning. On the basis of these new interactions, manufacturing jobs need to be re-defined and re-engineered and new roles for people in the factory need to be introduced. Cross-discipline studies are needed in order to explore profitable business approaches where the social element in sustainability can be a key factor to ensure midterm economic success while maintaining a high level of employment, even in a period of crisis.

Those business approaches may require an adaptation of organisational structures and management strategies to take into account social sustainability requirements.
Innovative methodologies addressing social sustainability in manufacturing (2/3)

Developments in this area are expected to lead to:

- **Work satisfaction of employees** within the factories of the future.
- New **profitable business approaches** benefiting from the relevance given to the importance of social sustainability.
- **Sustainable use of human capital** (e.g. staff knowledge) in the factories of the future.

Within this context, this **Support Action** should deliver an assessment of relevant past and current activities **in Europe (and worldwide)** towards the achievement of social sustainability in manufacturing, a set of recommendations on **how social sustainability can be measured and enhanced**, a definition of what is necessary to support this in terms of research, i.e. a future research roadmap on relevant S&T themes, a definition of the conditions in a factory and /or in society that are favourable for this purpose, and a relevant pilot case.
FoF.NMP.2013-4 Innovative methodologies addressing social sustainability in manufacturing (3/3)

Additional eligibility criterion: The requested EU contribution must not exceed **EUR 500 000**, and the project duration must not exceed **18 months**.

Funding scheme: Coordination and Support Actions (Support actions). No more than **one** support action will be funded.

Expected impact:
- **Improved understanding** of the current situation and future perspectives for social sustainability in European manufacturing.
- **Improved synergy** among stakeholders around Europe, and community building for future take-up actions.
- Facilitation of a **structured approach to promote social sustainability** for the European factories of the future.
- **Improved production and consumption strategies** in line with the societal challenges foreseen by the Europe 2020 strategy.
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (1/7)

Technical content/scope: New product-services go nowadays beyond the physical and service oriented concept, since they are designed in order to be always connected, self-learning, adapting and intelligent. In order to generate economic growth, manufacturers should focus on delivering solutions for customer needs rather than simply products (or product-services) for their customers. Therefore, new business opportunities will be generated when providing increased added-value to users by integrating personalised innovative functions into traditional and high-tech products.
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (2/7)

This business challenge can be addressed by embedding more and more knowledge in highly-personalised innovative product-services (i.e. the so-called Meta Products). These novel products are expected to be self-innovative and become smarter while ensuring simplicity for users. They will be upgradable through software applications or hardware module enhancement, which extend their lifespan, and reduce the environmental impact. In addition, they will provide improved value-added services for a wide range of users, but with personalisation aspects so as to consider individual demands. Meta Products will therefore require the use of new, interoperable, self-organising and collaborative design methodologies and systems. Product development should take place through a collaboration within the product ecosystem, involving multiple companies and actors, in order to offer the high-value personalised product-services to users.
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (3/7)

On the other side, new product design and development is fully linked to the concurrent design of the related manufacturing processes, equipment and facilities, including plant lay-out. This need has a strong influence on several aspects related to the life-cycle of both the product and its manufacturing processes (e.g. costs, production, disposal, environmental footprint). Meta Products will be capable of providing advanced service solutions along the whole customer value chain (from the product acquisition to the product dismissal), integrating personalised design, sustainable production, efficient distribution, after sale services, as well as foreseen recycling and re-manufacturing. Cost-effective design solutions with high potential in terms of eco-design content (i.e. minimal footprint impact along the product life-cycle) leading into a new technological cycle (i.e. cradle to cradle concept), should aim at the simultaneous life-cycle optimisation of product-services and related processes.
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (4/7)

Research activities should focus on several of the following areas:
- Methodologies and systems for cross-sectoral collaborative design (e.g. 3D drawings, simulation models) enabling the seamless connection and use by all the stakeholders (e.g. product designers, service providers, users) involved in the Meta Product life cycle.
- Collaborative design tools to support the development of Meta Products based on Service Oriented Architecture (SOA). They should be able to connect the design of the product hardware with the development of the software related to the embedded services, based on open source software applications.
- Novel approaches for embedding knowledge into product-services (e.g. use of smart materials, tracking systems, sensing and interacting technologies) in order to add more personalised innovative functions into traditional and high-tech products.
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (5/7)

- **Embedded tools for product adaptability** to enable Meta Products to store usage behaviour and utilise the data to re-organise the embedded services. Feedback mechanisms should be integrated within the tools and should provide the data to the networked companies involved in the design, manufacturing and service-related operation of the Meta Products.

- **User-oriented simulation systems** (e.g. virtual reality, reverse engineering) for product-service modelling and production-related decision-making approaches (e.g. requirements identification by means of the demand market and user-perceived quality analysis), covering the needs all along the life-cycle.
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (6/7)

Standardisation, regulation and pre-normative research aspects should be considered. Proof of concept in terms of at least one demonstrator should be delivered before the end of the project, excluding commercially usable prototypes (2006/C323/01), but convincingly demonstrating scalability towards industrial needs.

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

Projects are expected to use appropriate Life Cycle Assessment techniques and generate knowledge to support European policy development and promote the standardisation (at national or international level).
FoF.NMP.2013-5 Innovative design of personalised product-services and of their production processes based on collaborative environments (7/7)

Funding Scheme: Large-scale integrated collaborative projects.

Expected impact:
- **Increased ability** to rapidly follow the market dynamics by means of fast production and delivery of personalised final products
- **Cost reduction** of around 30% by decreasing lead times in product/process development.
- Set-up and ramp-up time reduction for new processes and plant designs (30%).
- Reduction of around **40% in the environmental footprint and the resources consumption** during the production and use phases of the Meta Products, together with an increased use of more environment-friendly materials.
FoF.NMP.2013-6 Mini-factories for customised products using local flexible production (1/5)

Technical content/scope: Product customisation on functional and aesthetic aspects is a common trend to different market segments (e.g. fashion and interior furnishing, sport and leisure, metal working, bio-medical and safety-related products). Advanced production equipment and innovative systems are needed to enable ultra-fast and cost-effective manufacturing of fully customised products on the spot and exactly at the required time. Innovative production solutions should be developed to bring manufacturing operations closer in time and space to the final customer, eventually exploring the possibilities of moving from batch to continuous flow manufacturing. In addition, new factory concepts need to be developed, such as on-site factories or factories-in-a-container, which provide instant manufacturing and customisation services locally, for example in retail environments or utilisation sites.
FoF.NMP.2013-6  Mini-factories for customised products using local flexible production (2/5)

Those mini-factories, addressing adaptation to customer needs at or near the point of sales or use, will be characterised by fast ramp-up, small environmental footprint and reusability, and will be easy to handle and to set-up. Those production systems should also include new technologies for supply chain management, product distribution and direct end-user interaction.

Research activities should focus on some of the following areas:

- **Scale reduction** and **increased flexibility** of production systems in order to satisfy the special requirements of the local flexible mini-production units, which have to show a competitive advantage compared to the traditional larger factories in terms of space, complexity and operator skills.
FoF.NMP.2013-6 Mini-factories for customised products using local flexible production (3/5)

- Adaptive control and auto-configurable automation systems for local flexible production with high customisation capabilities, where manufacturing operations and sequences need to accommodate to the highly unpredictable customer demands.
- New and integrated product/process engineering solutions, including CAD-CAM systems, able to automatically adapt product features to specific customer demands and accordingly configure processes and machines for local production.

Standardisation, regulation and pre-normative research aspects should be considered. Proof of concept in terms of at least one demonstrator should be delivered before the end of the project, excluding commercially usable prototypes (2006/C323/01), but convincingly demonstrating scalability towards industrial needs.
FoF.NMP.2013-6 Mini-factories for customised products using local flexible production (4/5)

In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners, including SMEs, represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.

The proposals should cover both research and demonstration activities. Prototypes and pilot implementations in real industrial settings represent a clear added-value. Whilst there is no lower or upper limit on the requested EU contribution, the target is that proposals allocate around 50% of the total eligible costs of the project (excluding management costs) to demonstration activities and this objective will be taken into account in the evaluation under the criteria S/T Excellence and Impact.
FoF.NMP.2013-6 Mini-factories for customised products using local flexible production (5/5)

Funding scheme: DEMO-targeted collaborative projects.

Expected impact:
- Increased ability to rapidly follow the market dynamics by means of fast production and delivery of customised final products.
- Reduction of the time to market by 50%.
- Cost reduction (around 30%) by decreasing lead times in product and process development.
- Reduced environmental impact per produced unit compared to traditional larger factories.
- Set-up and ramp-up time reduction (around 30%) for new processes and plant designs of the mini-factories.
FoF.NMP.2013-7 New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation (1/5)

Technical content/scope: The future factory environments for manufacturing, and **IN PARTICULAR assembly/disassembly** operations and **auxiliary processing SUCH AS** lifting and moving of heavy goods, will radically improve by integrating new forms of interaction between process, machinery and workers in such a way that future factories can be operated profitably and make the most from employees’ knowledge and skills. Hybrid production systems, where **robots physically interact with humans**, need to ensure an **intuitive and safe cooperation** among them and an enhanced awareness of the work conditions and the constraints imposed by the factory environment.
FoF.NMP.2013-7 New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation (2/5)

A new generation of production systems (e.g. machinery AS WELL AS industrial and service robots) will maintain the competitive advantage of the European manufacturing sectors. Future machinery and robots will be based on intelligent features, increasing flexibility in a totally safe environment, enhancing the use of this advanced equipment in a cooperative way with their human operators (machine/robot-human and machine/robot-robot interactions), AS WELL AS on self-learning functionalities that allow them to be aware of the current and future tasks.

Research activities should FOCUS on AT LEAST THREE of the following (FIVE) areas:

1. Technologies for a reliable and safe machine/robot-human and machine/robot-robot interactive cooperation in applications where the equipment provides power, repeatability and extended work-space while the human operators provide accuracy, flexibility and problem solving capacity.
FoF.NMP.2013-7 New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation (3/5)

2. Methodologies for the improved **planning of shared tasks**, based on analysis and simulation of real-time collaboration at the production site and by the user-friendly programming of complex tasks, using information from factory sensor networks, and taking into account the constraints from factory environments in **pre-defined automatic or semi-automatic assembly/disassembly** operations, e.g. (FOR EXAMPLE) using advanced real-time augmented reality in complex operations.

3. Novel methods of programming for **fast-teaching** and **guided-learning** in order to adapt robot work tasks dynamically during operation to the **changeable production requirements**, e.g. (FOR EXAMPLE) in hybrid assembly of serial products such as automotive, white goods, airplanes, where frequent changes of production require regular updates of the assembly tasks as well as adjustment of workplaces, fixtures and tools.
FoF.NMP.2013-7 New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation (4/5)

4. Technologies on mobile robots for improved intra-factory logistics, based on enhanced safe navigation in non-structured environments. Dynamic planning methodologies, coordination control and path re-configuration strategies, taking into account wireless communication, in a safe interaction with operators HAVE TO BE ADDRESSED.

5. The human-robot safety features, enabling production operation in workspaces shared with humans without separating safety fences or in direct human-robot operations, should lead to advances in the certification of the related production systems working in industrial environments and in the characterisation of risks and safety systems.
FoF.NMP.2013-7 New hybrid production systems in advanced factory environments based on new human-robot interactive cooperation (5/5)

Funding Scheme: Large-scale integrated collaborative projects.

Expected impact:
- Increasing use of robot installations in manufacturing. Today, only some 15% of robot automation potential is being exploited. Further improvement in robot exploitation will contribute to higher employment as more manufacturing capacity will remain in Europe.
- Increasing adaptability of advanced factories by combining the flexibility inherent to humans with the enhanced potential of cooperative production systems, maintaining reduced investment costs and allowing a wide use of those systems in new production areas and sectors, particularly SMEs.
- Promotion of equal opportunities on the shop-floor in terms of gender, age and skills, due to less physically demanding jobs in manufacturing and improved working environment and including accessibility for programming and use.
FoF.NMP.2013-8 Innovative strategies for renovation and repair in manufacturing systems (1/5)

Technical content/scope: Extending the life AND performance of manufacturing equipment AS WELL AS designing for re-use/upgrade OR ease of renovation (including functional/technological upgrade) and repair requires innovative methodologies which may include Life Cycle Assessment (LCA) and smart devices based on ICT or advanced materials. Design and manufacturing of plant and equipment which integrates renovation, refit and repair strategies (including upgrade for the enhancement or lifetime extension of equipment) AS WELL AS increased ability to track equipment use SHOULD BE SIMULTANEOUSLY ADDRESSED to optimise the life cycle of production systems.
FoF.NMP.2013-8 Innovative strategies for renovation and repair in manufacturing systems (2/5)

Research activities should **FOCUS** on **SEVERAL** of the following areas:

1. **Renovation and repair** approaches for **manufacturing** plant and equipment **INCLUDING** the **design** phase and **life-cycle evaluation**.

2. **Use of EXISTING smart devices** and systems based on ICT or advanced materials in the **renovation** and **upgrade** of **EXISTING** structures.

3. **Repair, upgrade, re-manufacturing and re-assembly processes** (including replacing modules by less energy-consuming ones) in the **in-situ renovation** of infrastructures.
FoF.NMP.2013-8 Innovative strategies for renovation and repair in manufacturing systems (3/5)

4. Systems providing (self) monitoring and diagnostic tools to manage plant and equipment usage and addressing maintenance/renovation/repair or substitution needs.

5. Mathematical methods and algorithms for failure mode detection and component degradation assessment.

6. New engineering methodologies and supporting tools for machinery recovery and re-use approaches for substituted components.

Standardisation, regulation and pre-normative research aspects SHOULD BE considered. Proof of concept in terms of AT LEAST ONE demonstrator SHOULD BE delivered before the end of the project, EXCLUDING commercially usable prototypes (COM 2006/C323/01), but convincingly demonstrating scalability towards industrial needs.
FoF.NMP.2013-8 Innovative strategies for renovation and repair in manufacturing systems (4/5)

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

Projects are expected to use appropriate Life Cycle Assessment techniques and to generate knowledge to support European policy development and promote standardisation (at national or international level).
FoF.NMP.2013-8 Innovative strategies for renovation and repair in manufacturing systems (5/5)

Funding Scheme: Large-scale integrated collaborative projects.

Expected impact:
- In terms of economic sustainability, reduction of around 20% of renovation and repair costs, through a better condition-based monitoring and condition-based substitution and repair.
- In terms of environmental sustainability, recovery of at least 80% of the substituted materials for its re-use.
- In terms of social sustainability, eventual elimination of hazardous materials and renovation of out-dated plants and structures.
FoF.NMP.2013-9  Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets (1/6)

Technical content/scope: In order to remain on the leading edge and to extend their shares in future global markets, European companies need to offer new user-oriented higher value-added solutions, with appropriate global service infrastructures. Moreover, the decreasing lifecycle times of products and the increasing number of variants require the design and operation of assembly plants and production networks that are fully flexible, i.e. capable of switching production from one model to another to meet the fluctuating and diverse demand. Therefore, advanced holistic concepts for technology-based business approaches are needed, in order to help European global enterprises to dynamically operate at multiple locations around the world in a volatile economic environment, taking into account local resources such as commodities, energy, labour, etc. Such global business approaches should include emerging technologies and innovative manufacturing systems and methods, in order to enable European companies to offer their customers a broader variety of affordable products and an extended range of services.
FoF.NMP.2013-9  Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets (2/6)

These innovative concepts should provide a fast and efficient response to market variations and should be easily adaptable to the requirements of other industrial sectors. They should support the transition of a European manufacturing enterprise from a traditional product-based approach to a global-minded approach, in which a complex network of actors (mainly SMEs) is able to provide a customised product-service solution to each final customer in the global market. Such a global approach should define standardised formats and interfaces, models and procedures for planning and running fast, integrated, flexible and scalable manufacturing related activities for product-services, using a global supply chain.
FoF.NMP.2013-9 Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets (3/6)

Research activities should focus on all of the following areas:
- Technological concepts to address economic and risk assessment in order to support decision-making in the early design of the manufacturing systems, in particular for the integration of new complex technologies in the factory.
- Interactive, model-based decision-making processes for business management, able to assess the impact on performance of alternative configurations of the network of actors involved in the global supply chain for product-services and related production systems.
- Methodologies and tools to manage the co-evolution of products-services and the related production systems in the framework of innovative business approaches.
FoF.NMP.2013-9 Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets (4/6)

Screening of existing national/international standards (e.g. safety regulations) and of the needs for new standards is required. Other standardisation, regulation and pre-normative research aspects should also be considered.

Projects are expected to use appropriate Life Cycle Assessment techniques and to generate knowledge to support European policy development and promote the standardisation (at national or international level).

In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners, including SMEs, represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact. The projects are expected to cover demonstration activities, including pilot implementations in industrial settings, and this will be likewise reflected in the evaluation.
FoF.NMP.2013-9 Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets (5/6)

This topic is particularly suitable for collaboration at international level, particularly under the IMS\(^5\) scheme. Project partnerships that include independent organisations from at least three IMS regions\(^6\) are therefore encouraged.

**Funding scheme:** Small or medium-sized collaborative projects

**Expected impact:**
- Cost savings of around 30% in production due to improved scheduling and to more robust manufacturing methods.
- Higher reactivity to customer needs around 40% as result of real time adaptable business approaches which include proper legislation monitoring.
FoF.NMP.2013-9 Advanced concepts for technology-based business approaches addressing product-services and their manufacturing in globalised markets (6/6)

- Increased robustness of the supply network around 30%.
- Product-services and their manufacturing processes which are more environment-friendly at global scale.

5 IMS (Intelligent Manufacturing Systems) is an industry-led, global, collaborative research and development programme, started in 1995 as the world’s only multilateral collaborative R&D framework: www.ims.org
6 The current member regions of IMS are the European Union, the United States of America, Korea, Mexico and the EFTA states of Norway and Switzerland.)
FoF.NMP.2013-10 Manufacturing processes for products made of composites or engineered metallic materials (1/5)

Technical content/scope: Products made of composites or engineered metallic materials are becoming more popular in many industrial sectors due to the increased capabilities of design techniques which are able to simulate material properties with a high level of accuracy and, therefore, to optimise the exploitation of their improved properties. Increasingly challenging demands continue arising from market and society in terms of better functional properties, weight reduction, cost decrease, compact design, and minimal carbon foot-print. Composites and engineered metallic materials are now used in many products, either as standalone components or embedded reinforcements in order to locally provide their specific performance in terms of enhanced mechanical properties. An extensive use of such materials leads to significant product improvements that cannot be achieved with the traditional metals or polymers.
FoF.NMP.2013-10 Manufacturing processes for products made of composites or engineered metallic materials (2/5)

However, the processes for manufacturing such products require a better understanding and further optimisation in order to ensure the required quality for the specific applications and a high productivity rate for cost-efficient manufacturing. Production technologies for composites and engineered metallic materials include casting, forming, removal and additive processes related to 3D metals, sandwich materials, multi-materials, new metallic alloys, thermoplastics or composite laminates.

Research activities should focus on several of the following areas:
- Innovative methodologies and technologies for manufacturing which are capable of producing and post-processing new engineered metals and composites taking into account the needs for specific applications.
FoF.NMP.2013-10 Manufacturing processes for products made of composites or engineered metallic materials (3/5)

- **Systems and devices to monitor and optimise the process parameters** for these new materials to be produced and post-processed at industrial scale.
- New technologies for **joining and assembly of multi-materials components** (e.g. metal/composite, polymer/composite, and engineered metallic/composite) based on enhanced understanding of the material-interface behaviour at micro/nano scale.
- **Characterisation and testing techniques** to evaluate the performance (e.g. quality, throughput rate, robustness) **of the manufacturing processes** for products made of new materials.
- **Development of product repair technologies** and methodologies to assess the repair feasibility of the manufactured product and to ensure repeatable, safe and certified repair procedures.
FoF.NMP.2013-10 Manufacturing processes for products made of composites or engineered metallic materials (4/5)

- **Recycling technologies** and routes that guarantee a minimal environmental foot-print of the products made of the new materials at the end of their life.

Screening of existing national/international **standards** (e.g. safety regulations) and of the needs for new standards is required. Other standardisation, regulation and pre-normative research aspects should also be considered. Proof of concept in terms of at least one **demonstrator** should be delivered before the end of the project, excluding commercially usable prototypes (2006/C323/01), but convincingly demonstrating scalability towards industrial needs.
FoF.NMP.2013-10 Manufacturing processes for products made of composites or engineered metallic materials (5/5)

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

**Funding scheme:** Small or medium-sized collaborative projects.

**Expected impact:**
- *Higher utilisation of advanced materials* in products with improved performance without a cost increase.
- *Decrease in raw materials and energy consumption* by at least 20% during the processing, manufacturing and/or dismantling phases.
- *Reduction of waste and emissions* (e.g. fumes, chemicals, dust, hazardous materials) by at least 30% during the processing, manufacturing and/or dismantling phases.
Technical content/scope: Product miniaturisation requires a good understanding of the intended application, the scale-related property variation, the manufacturing methods and the material behaviour. Miniaturisation has been an increasing trend in the last 15 years because of the drive for minimisation of energy and materials use in manufacturing processes, the increased need for redundancy, the requirements of faster and more energy-efficient devices, and the enhanced functionalities (such as selectivity and sensitivity).

Micro-fabrication techniques are widely exploited by the semiconductor industry, which has invented many micro- and nano-scale manufacturing methods. These methods could be regarded, in general, as potential techniques for the miniaturisation of components in many other industry sectors. However, they are mostly addressing a particular class of materials and 2D surfaces with specific features, and are highly sophisticated and expensive (high cost of ownership).
FoF.NMP.2013-11 Manufacturing of highly miniaturised components (2/6)

Alternate manufacturing technologies are currently needed to overcome the challenges of volume production of miniaturised components or sub-components made of a wide range of materials (e.g. metallic alloys, composites, ceramic and polymers). These techniques should be cost-efficient and flexible in terms of both the shapes of the features and the materials being used. In order to reach this objective in a competitive way, the upgrading of appropriate high-throughput and cost-efficient processes like conventional forming, moulding, imprinting and surface deposition processes, or new integrated process chains, will be needed. New materials pose new challenges for cost-efficient manufacturing in order to shape, handle and assemble complex structures that can involve macro-micro-nano scale features and may require the analysis of the micro-structural behaviour of materials and its interaction with the production process.
Research activities should focus on at least three of the following areas:
- Processing techniques for miniaturised components made of a wide range of materials with different properties (e.g. thermo-responsive, piezoelectric, or phase-change materials), in order to achieve a flexible and high-throughput production.
- Integration of multiple material combinations and smart materials for the sensing and actuation technologies.
- Merging the top-down and bottom-up approach in order to go into parallel and/or continuous manufacturing.
- Novel on-line monitoring and quality inspection systems in manufacturing of highly miniaturised components, in order to ensure efficiency, reliability and high product quality.
FoF.NMP.2013-11 Manufacturing of highly miniaturised components (4/6)

Projects are expected to address issues like energy savings, cost and waste reduction, and recycling that should be studied through Life-Cycle Assessment.

Projects should show substantial improvements in the manufacturing of components at the micro and nano-scale in terms of cost/performance balance (e.g. lower costs per integrated function), accuracy and reproducibility by providing the appropriate cost-efficient and reliable manufacturing technology.

Screening of existing national/international standards (e.g. safety regulations) and of the needs for new standards is required. Other standardisation, regulation and pre-normative research aspects should also be considered.
FoF.NMP.2013-11 Manufacturing of highly miniaturised components (5/6)

Proof of concept in terms of at least one demonstrator should be delivered before the end of the project, excluding commercially usable prototypes (2006/C323/01), but convincingly demonstrating scalability towards industrial needs.

In order to ensure an efficient implementation and maximum impact of SME-related activities, the leading role of SMEs with R&D capacities will be evaluated under the criteria Implementation and Impact: the coordinator does not need to be an SME but the participating SMEs should have the decision making power in the project management; and the output should be for the benefit of the participating SMEs and the targeted SME dominated industrial communities.
Funding Scheme: SME-targeted collaborative projects.

Expected impact:
- Improved high-throughput and/or highly flexible and cost-efficient processes for micro/nano-manufacturing of components for application areas such as tools, electrodes, solar cells, consumer products, and communication and medical devices.
- Scaling up of micro-production processes from lab-scale to an industrial scale for multifunctional applications such as in medicine, energy, transport and electronics.
- Further progress on micro/nano-manufacturing towards intelligent, scalable and adaptable systems, enabling the cost-efficient, competitive and market-demand-targeted production, ranging from small/medium volumes to high throughput and thus facilitating the access to target markets characterised by small or growing volumes.
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:

Thank you for your attention!