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'Factories of the Future (FoF)' Public-Private Partnership

Preliminary ideas of areas to be covered by NMP in 2014

FoF.NMP.2014-1 Manufacturing processes for complex structures and geometries with efficient use of material – RTD, TRL 4-5, small

Scope:

In current market and technological context, mechanical products have to be designed and produced taking into account structural optimisation (which often involves complex structures and geometries) and economically efficient production (i.e. productive and flexible manufacturing). Automated manufacturing of complex geometries can be related to issues such as 3D structured, multi-layered and hybrid materials or the joint-free realisation of complex shapes. Moreover, newer constraints are coming from requirements of sustainability in production processes (resource and energy efficiency), both through additional regulations and through the increased materials and energy costs. The main aims in the manufacturing of complex structures are quality and productivity with minimum use of material and energy.

Three complementary approaches can be considered: Innovative resource-efficient manufacturing processes (through tolerance to recycling / remanufacturing or through first time right approaches), innovative energy efficient machinery, and developments in process control allowing both to cope with more recycling in the process and to increase output quality (i.e. reduce out-of-tolerance products that have to be refused).

Research activities should address all of the following research areas:

- Manufacturing process control and monitoring strategies based on integrated models of both processes and machines, with modules for resource and energy efficiency planning and monitoring, and with capability of selection of the best process and machine for the part to be manufactured.
- Innovative process concepts and tools for resource efficiency in complex geometries manufacturing.
- Innovative machinery improving resource efficiency from the current state of the art in complex geometries manufacturing.
- Remanufacturing and recycling, with novel or improved use of waste streams.

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. The proposals should cover both research and demonstration activities. Prototypes and pilot implementations in real industrial settings represent a clear added-value.

Funding scheme: RTD projects

Expected Impact:

- Reduction of at least 30% in the material usage pertaining to the manufacturing of complex structures and geometries when compared to current average values.
- Reduction of at least 30% in the overall energy consumption related to the manufacturing of complex structures and geometries when compared to current average values.
- Elimination of faulty manufactured parts by the adequate combination of integrated process-machine approaches with a continuous control of process parameters.

FoF.NMP.2014-2 Manufacturing of custom made parts for personalised products – RTD, TRL 4-6, SME-targeted

Scope:

The manufacturing of customised products requires the development of new strategies integrating design with manufacturing and incorporating appropriate control methodologies to ensure small or large lot quantities which meet the specifications. Examples include new custom made parts or spare parts on demand either to sub-divisions of sectors/products or personalised to an individual as well as unique identification marking of products. New manufacturing processes and machines will need to be developed which are flexible at the local level to meet specific consumer demand and mass customisation where rapid translation between different specifications is required. In order to address customisation, advanced manufacturing processes need to enable manufacturing of multi-materials or functionally graded materials as well as flexibility and rapid change. For all custom manufacturing, it is necessary to have quick realisation from design to production in one process step as well as economic production systems down to single and small lot sizes.

Research activities should be multi-disciplinary and address several of the following areas:

- Development and integration of advanced design and manufacturing technologies able to transform such new product-service data descriptions and protocols into manufacturing operations and processes exploiting.
- Development of new machines and processes integrating new multi-materials and nanotechnologies for the manufacturing of personalised parts and products.
- Seamless data integration across the process and supply chains for the fast production and distribution of custom made parts and products.
- Methodologies and tools for the management and running of effective value chains for the fast production and delivery of personalised products.

In order to ensure an efficient implementation and maximum impact of SME-related activities, the leading role of the participating SMEs with R&D capacities is expected. 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.

Prototypes and pilot implementations in real industrial settings represent a clear added-value.

Funding scheme: RTD projects

Expected impact:

- Increased capability to provide value added products/services and to rapidly follow the market dynamics by means of fast production and delivery of customised parts and products.
- Reduction by 50% in the lead-time for manufacturing one new custom part with respect to current values for same requirements.
- Cost reduction of personalised products manufacturing by 20%, by decreasing lead times in products and processes development and the time to market of customised parts and products by 30%.
- Reduction of waste parts and materials by 25%.

FoF.NMP.2014-3 Flexible production systems based on integrated tools for rapid reconfiguration of machinery and robots - DEMO, TRL 6-7

Scope:

Easy and fast reconfigurable machinery and robots are essential to answer to the increasing need for highly personalised and mass-customised products and to react to rapid changes in market demands. Smaller lot sizes and more product variations require a highly flexible production capacity. New tools are required to support more rapid and autonomous reconfiguration of production systems. Powerful tools addressing self-adjustment, correction, and control of individual machines and robots, the production system as a whole and the link with existing production planning and scheduling systems have been developed over recent years but integration and deployment of those tools require further R&D and demonstration. While the focus will be on demonstrating the tools on existing production capacity, R&D activities supporting the integration and scale-up are expected as well.

Ddemonstration activities should address all of the following areas:

- Integrated tools for the management of agile production systems as a whole (Manufacturing Execution Systems) and the fast reconfigurable individual machines and robots, optimising the changeover times and costs.
- Standardisation of the communication protocols and data structures fitting the plug and produce philosophy.
- Protocols for interconnecting the production system information with higher level plant management systems.
- Integration of automatic monitoring and optimisation of energy usage in the production system.
- Demonstration of the integrated solution in at least one existing production environment.

In order to ensure the industrial relevance and impact of the demonstration effort, the active participation of industrial partners, including SMEs, represents an added value to the activities.

Funding scheme: Demonstration projects

Expected impact:

- Enabling existing production systems to produce on average at least 50% smaller lot sizes and 50% more product variations in an economical way, as a result production will be demand driven and waste will be significantly reduced.
- Reduction of at least 30% of the set-up and changeover times and costs for existing production systems leading to a significant increase in production capacity.
- Reduction of average energy consumption by 5% through an optimised use of production capacity.
- Strong support for standardisation of communication protocols, data structures and tool connectivity.

FoF.NMP.2014-4 Global energy and other resources efficiency in manufacturing enterprises, RTD, TRL 4-6, Small

Scope:

The consumption of energy and natural resources often represents a major part of the cost of manufactured products. In addition, the increasing global competition as well the growing price of energy and other resources means that an increase of efficiency in the use of such resources can represent a competitive advantage for European manufacturing companies.

Savings in the consumption of energy and natural resources need to be considered at several different levels: incoming materials, machine level, the whole process, the whole factory and along the value chain. The development of new business models focusing on the collaboration of companies operating in the same value chain to increase resources and energy efficiency will bring interesting important cost savings in products. Inter-company cooperation can be further facilitated by geographic proximity (Industrial Symbiosis).

Research activities should be multi-disciplinary and address all of the following areas:

- Value chain's energy and resource data collection, modelling and integration in the decision making tools and procedures.
- Development and implementation of new value-chain approached oriented to reducing energy and resource consumption along the whole or a relevant part of the value chain including final users when possible and recycling or reprocessing companies.
- Clustering of factories, suppliers or any other company in order to implement common resources optimization or intelligent demand side management strategies. That may require the development of adapted Manufacturing Execution Systems (MES).
- To develop strategies for enabling energy characterisation of enterprises as a means for obtaining energy certifications coherent with the European Eco-design provisions.
- Development of detailed business cases, including economic, strategic and commercial analysis, of the business models developed during the project in at least 2 different industrial sectors.

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 full commercial scale.

In order to ensure industrial relevance and impact of the research effort, the active participation of industrial partners, including SMEs, represents an added value to the activities.

Projects are expected to use appropriate Life Cycle Assessment and Life Cycle Cost techniques in order to estimate the impact of the results of the project. Baseline values will be required.

Funding Scheme: RTD projects.

Expected Impact:

Each project proposal should target the following:

- CO_2 emission reduction for the product of at least 20% from cradle to grave.
- CO_2 emission reduction for the product of at least 30% from cradle to cradle.
- Product's Life Cycle Cost (LCC) reduction of at least 10% from cradle to grave.

FoF.NMP.2014-5 Developing smart factories that are attractive to workers – DEMO, TRL 6-7

Scope:

In a very competitive environment, manufacturing enterprises will need to be attractive to potential workers. This will require new thinking both on scheduling of work and design of attractive workplaces. The aim of this research priority is to demonstrate the operation of a real smart factory, in which image processing will allow for "knowing and recognising in the background" users gestures, their interaction among each other and provide them with on the spot knowledge needed for their respective tasks. By using Interactive displays and defined gestures it will be possible to allow for quick triggering of machine-man interaction. Workers will be reminded of fulfilling specific tasks and also decisions based on wrong assumptions can be quickly corrected, made available and thus lead to more open interoperability. While the focus will be on demonstrating the smart factory concept, R&D activities supporting the integration and scale-up are expected as well.

Demonstration activities should be multi-disciplinary and address all of the following areas:

- Methodologies and tools for efficient design or re-adaptation of production facilities based on co-evolving product-process-production systems considering simultaneously productivity aspects and the wellbeing of the workers and the environment, through the integration of technologies.
- New methods and technologies for an optimised use of workers' knowledge, to stimulate team interactions and to enhance work related satisfaction taking into consideration safety and ergonomics of the working areas.
- Integration of innovative production technologies supporting increased productivity and flexibility.
- Incorporating aspects linked to education and to attractiveness to youth: in-factory teaching, "factory-lab" concepts.

Attractive research will support manufacturing enterprises in Europe in their respective efforts for talents to be employed in attractive manufacturing jobs. Proof of concept in terms of at least one industrial pilot demonstrator should be delivered before the end of the project, convincingly demonstrating a solution to industrial needs.

In order to ensure the industrial relevance and impact of the demonstration effort, the active participation of industrial partners, including SMEs, represents an added value to the activities.

Funding scheme: Demonstration projects

Expected impact:

- In economic terms, an increase of 20% in productivity due to an increased commitment of people, better organisation of work, reduction of absenteeism in the workplace and by increasing the pool of potential workers through widening the skill profile.
- In social terms, an improvement in the working conditions in factories and in the attractiveness of the working environments for the right-skilled people.
- Work satisfaction of employees within the factories of the future.
- Strengthened global position of European manufacturing industry through the introduction of the new technologies.

FoF.NMP.2014-6 Innovative product-service design using manufacturing intelligence – RTD, TRL 4-5, Small

Scope:

Manufacturing intelligence requires a high integration of (ICT-based) engineering tools and secure middleware solutions that facilitate easy, ubiquitous (e.g. Cloud-enabled) and fast sharing of product and process information/knowledge across the entire lifecycle. Today's ever faster product lifecycles and ever higher quality requirements necessitate manufacturing engineering capability that is able to exploit to the maximum the concurrency of product and service engineering with immediate, cross-disciplinary feedback loops to relevant shop floor knowledge.

Research should aim at developing open, multi-disciplinary and holistic product-service engineering environments with the following features:

- Collaborative management of engineering knowledge and its multi-directional exchange between product design, service design and manufacturing, enabled by rapid search for design functionality and reusability.
- Tools and methodologies to effectively involve customers and suppliers across the value chain.
- Multi-disciplinary search, simulation and optimisation of designs.
- Quantification of overall (time-to-market) improvements and reduction of the lifecycle CO_2 footprint of new products.

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.

Funding scheme: RTD projects.

Expected impact:

- Improved time-to-market for European manufacturers.
- Improved sustainability across the entire product-service lifecycle.
- New and better product-service offerings addressing customer needs.
- Increased support for open standards targeting security and interoperability of shared engineering data.

FoF.NMP.2014-7: Support for cluster activities of FoF PPP projects – Coordination action

Scope:

Clustering of project activities, according to objectives and addressed themes, is an effective way to stimulate the achievement of project results and to exploit synergies. This clustering approach could bring about additional benefits through cross-fertilisation (e.g. reporting of technological progress; exchange or licensing of IPR; joint standardisation efforts) and identification of value chain elements required for industrial success. The final target is to tackle the bottleneck for the deployment in Europe of new and promising technologies, in order to foster innovation in products and their manufacturing and the sustainability of the European industrial economy.

The coordination actions shall aim in particular to the active clustering of existing activities under the FoF PPP.

Funding scheme: CSA

Expected impact:

- Speeding up the industrial exploitation and take up of the results of FoF PPP projects.
- The stimulation of networks and alliances for further RTD and industrial innovation in the addressed technology and application areas.
- Additional added value beyond the original scope of the FoF PPP projects by exploiting synergies and sharing best practice
- Increased public presence and awareness of FoF PPP activities.
- More effective execution of activities of common interest, such as IPR management and standardisation.

Preliminary ideas of areas to be covered by NMP in 2015

FoF.NMP.2015-1 Industrial technologies for advanced joining and assembly processes of multi-materials – DEMO, TRL 6-7

Scope:

Multi-material design of components and structures provides an opportunity to develop products which are able to operate under more exigent requests demanded by market and society such as increased strength-to-weight ratio, multifunctionality, highly aggressive environments and low carbon footprint. By smart use of adequate joining technologies, and the incorporation of multi-material design into the assembly chain, the final product performance can be improved. This is particularly relevant when high cost, scarce or hazardous materials are involved. But joining can also lead to loss of the performance that materials offer in their final product form due to the introduction of modifications in composition and properties or geometric distortion.

Therefore, improved, new or hybrid joining and assembly processes need to be developed for specific combinations of designs and materials in order to overcome the mentioned limitations. Technologies to be addressed can be welding processes, bonding using adhesives, mechanical joining or any other joining process. Formulation of new adhesives is excluded from the scope of the topic. The novel joining integration capabilities will feature a high degree of process automation and quality control and they will make use of sustainable manufacturing practises. Assembly and disassembly efficiency, product quality, recycling and cost targets will also be considered. While the focus will be on demonstrating the technologies, R&D activities supporting the integration and scale-up are expected as well.

Demonstration activities should focus on all of the following priorities:

- Joining and assembly processes that will lead to maximise performance of the joints, based on a deep understanding of the cause-effect relationships as well as of materials process interactions.
- The implementation of numerical simulation techniques that will lead to a better understanding of the considered joining processes as well as product development along all its different phases.
- The development of high efficient, cost-effective and flexible surface condition solutions (e.g. surface modification, thermal treatments, gap avoidance) to provide joints with the maximum performance.
- The implementation and set up of reliable, efficient and automated non-destructive inspection techniques for joint quality evaluation, together with in-situ monitoring and control systems for critical variables of the joining operations that will guarantee reliable, robust and safe production conditions in industrial environments.

At least one prototype or pilot implementation in pre-industrial settings aiming at demonstrating the scalability should be delivered before the end of the project as a proof of concept. In order to ensure the industrial relevance and impact of the demonstration effort, the active participation of industrial partners, including SMEs, represents an added value to the activities.

Funding scheme: Demonstration projects

Expected impact:

Application of multi-material design to products through the developed joining and assembly processes will bring:

- At least 30% decrease in the consumption of high cost and critical materials.
- At least 30% improvement of the product performance, without increasing the final price.
- A higher level of automation and lower production times compared to current technologies.

FoF.NMP.2015-2 Sustainable product life cycle management focused on reuse, remanufacturing and recycling related to advanced materials – RTD, TRL 4-5, Small

Scope:

Modern high-tech products adopted in the electronics, medical and energy industries are made of advanced materials that are at present poorly recovered and reused. Such materials include advanced and rare earth metals, composites (long and short fibre), nano-materials and bio-materials as well as more conventional materials that are not today considered for reuse due to absence of data on reprocessed performance. Moreover, some of those advanced materials, identified as "critical raw materials", are subject to a high risk of supply interruption due to the low substitutability and recycling rates of the material itself.

This unsustainable scenario focuses attention on systemic solutions to design, manufacture, monitor, maintain, reuse, remanufacture and recycle these materials. This can on one side demand for new product design approaches (including end-of-life options, reuse and re-manufacturing aspects) with development of the built-in product 'smartness' (for ageing monitoring) and modularity (for improved reuse). On the other side it can also involve development of new production processes with improved resource efficiency or tolerant to substitute materials. The definition of substitute materials will also have to come with definition of adapted manufacturing processes, and the material waste from production should also be considered and used as a candidate resource (heat, energy or raw material resource).

Research activities should be multi-disciplinary and address all of the following areas:

- New methods and technologies for the replacement/reduction of critical raw materials (i.e. systematic identification and replacement/minimizing of equipment using such materials).
- New technologies and automation solutions for the effective separation and recovery of advanced materials.
- New equipment concepts, design and components for remanufacturing and recycling.
- Energy efficient solutions for recycling/material recovery.
- Systemic approaches for product lifecycle management.
- Generation and validation of new business models to improve economic viability of closed-loop life cycles.

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.

Funding scheme: RTD projects.

Expected impact:

- A significant reduction of energy consumption in manufacturing activities by 2020.
- A significant reduction in non-renewable materials through a combination of substitution, reuse, remanufacture and recycling of materials.
- Reduction of minimum 20% in greenhouse gases emissions from manufacturing activities.
- Reduction of waste generation by 10% minimum.
- Enabling the manufacturing of eco-products.
- Increase of above 20% in productivity rates.
- Clear illustration of possibilities for new safe and sustainable jobs creation.

FoF.NMP.2015-3 New product functionalities through surface manufacturing processes for mass production, RTD, TRL 4-5, Small

Scope:

New products with improved performances through functionalization of their surfaces and new approaches are needed to deliver high functionality and high-value products in Europe.

The use of physical processing techniques (additive manufacturing, laser, jet technologies, 3D printing, micromachining, microforming, photon based technologies, PVD, etc) or chemical processing (CVD, sol-gel, wet chemistry, electro-chemical, etc) will enable the European Industries to design products with improved performance by providing them with dedicated functionalities. Examples for approaches to reach those new functionalities are: surface modifications, functional texturing and coatings, enabling improved performance, embedded sensing, adaptive control, self-healing, antibacterial, self-cleaning, ultra-low friction or self-assemblies.

The scaling-up of the processes for multifunctional applications has to be addressed in the proposals to ensure a wider field of new application areas and new industrial products, leading to the implementation of those technologies into the mass production.

Research activities should be multi-disciplinary and address all of the following areas:

- New design functionalities achieved through surface modifications, by means of physical and chemical approaches, that introduce micro and nano scale modifications at the part surface level, providing it with specific properties or capabilities.
- Novel manufacturing surface processes by hybrid processing methods or combining technologies, in order to achieve a cost-efficient and flexible production and to minimise the post-processing of the products. The proposed manufacturing processes should also address increased repeatability, processing speed and productivity aspects.
- Implementation of modelling tools to support the selection of the processing parameters that lead to the targeted surface modifications.

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.

The projects are expected to widely cover demonstration activities, including pilot implementations in industrial settings, and this will be likewise reflected in the evaluation. Screening of national/international standards, regulation and pre-normative research aspects and the need for standardisation activities for new or existing materials and processing methods is required.

The proposals should address as well the different environmental and sustainability aspects related to the surface manufacturing technologies.Projects are expected to address issues like energy savings, cost and waste reduction, and recycling that should be studied through Life-cycle Assessment.

Funding scheme: RTD projects.

Expected impact:

The developed initiative production functionalities should mean a remarkable impact for both producers and users, in the following terms:

- Novel approaches to the existing manufacturing methods and technologies, the impact should go well beyond that expected in on-going FoF projects on related topics.
- Cost increase related to these functionalities integrated into products should be up to a 10% with respect to the conventional products.

- Improvement in product performance above 20% in the targeted functionalities and increasing product life by 50%.
- Reduction of energy costs by 15% and reduction of waste and emissions by at least 25% during the processing, manufacturing and/or dismantling phases, reducing this way the carbon footprint in the manufacturing systems and processes.
- Progress beyond the state-of-the-art in the materials and processes standardisation.

FoF.NMP.2015-4 Symbiotic human-robot collaborations for safe and dynamic multimodal manufacturing systems - DEMO, TRL 6-7

Scope:

Immersive and symbiotic collaboration between human workers and robots is a key element to be addressed for the further automation of tasks and processes in the European manufacturing industry. It offers a solution to robot-reluctant industries where current tasks and processes are too complex to be automated or to offer a higher profitability. Currently novel methods for human-robot interaction have been proven in structured non-industrial environments. In order to enhance the introduction of robots on the shop floor in a real and industrial setting several issues such as noisy and chaotic environments, extreme working conditions and safety of humans at all cost, have to be dealt with.

In order to convince traditional industries with a low robot-penetration to move towards implementation of the use of robots, future human-robot-systems will have to be dynamic, intuitive, cost-effective and act safely in a shared fenceless working space.

Two key obstacles to overcome to facilitate the introduction of robots on the shop floor of robot resistant production plants are the safety of the worker and the symbiotic collaboration.

While the focus will be on demonstrating the multimodal manufacturing sytems, R&D activities supporting the integration and scale-up are expected as well.

Demonstration activities should focus on at least two topics of each of the two areas:

- Safety of the worker:
    - Innovative strategies for online safety monitoring
    - Development of intrinsically safe robot hardware on industrial scale leading to high power robots which are both safe and precise.
    - Safety during a mechanical failure of the robotic system during tight collaboration of humans and robots.
- Human-Robot interaction:
    - Intuitive and multimodal programming to allow robot systems to be rapidly and easily programmed without prior knowledge on robot systems, while still allowing for a cost-efficient deployment of the robotic system in a noisy, unstructured and industrial setting.
    - New methodologies for the initial planning and online dynamic replanning of the shared tasks
    - Innovative strategies to analyse real-time large amounts of sensor data.
    - New innovative, fast and cost-effective sensors for detection

All research activities must address certification issues from the start. The consortium should have a system integrator and end-users. In order to ensure the industrial relevance and impact of the demonstration effort, the active participation of industrial partners, including SMEs, represents an added value to the activities.

Funding scheme: Demonstration projects

Expected impact:

- Industrial-scale demonstrator of safe human-robot tight collaboration by sharing workspace and tasks, paving the way for potential improvements of the normative aspects.

- Increasing use of robot installation in traditional European robot-reluctant industries. In particular SMEs, manufacturing plants with highly manual processes and continuous production lines. Further improvement in robotics solutions deployment will contribute to higher employment as more manufacturing capacity will remain in Europe.
- Increasing industrial-readiness and adaptability of human-robot collaborating manufacturing systems by increasing the robustness of those systems for noisy and extreme industrial environments and by combining the flexibility inherent to humans with the enhanced potential of cooperative production systems.
- In order to allow a wide use of the newly developed robotic system in new production areas and sectors, a clear case for mainting reduced investment costs has to be made, including a return-on-investment study.

FoF.NMP.2015-5 Novel design approaches and predictive maintenance technologies for increased product life and reliability – DEMO, TRL 6-7

Scope:

Complex and expensive high-quality manufactured products such as turbines and combustion engines require novel design and reliability-centred maintenance approaches that are able to provide the required availability, reliability, maintainability, quality, safety and energy savings throughout the product lifetime. This may be achieved through self-learning, predictive maintenance systems designed into products to provide RUL (Remaining Useful Life) estimation from analysis of behaviour and operational parameters.

The aims would be to design optimum maintainability into products to improve safety and reduce costs by performing maintenance before failure occurs, to minimise the degree of intervention required and maximise availability. Predictive maintenance and cause-and-effect analysis techniques should be developed to aggregate and interpret data captured from products in the field and share the information between users. Reference models for prediction of product condition would assist in the scheduling of maintenance. The solution should include operator-friendly, built-in or portable user interfaces to give decision-makers an overview of maintenance needs.

While the focus will be on demonstrating the design approaches and maintenance technologies, R&D activities supporting the integration and scale-up are expected as well.

Demonstration activities should address all of the following areas:

- Methodologies and tools for design for maintainability and longer product life.
- Intelligent, self-learning, predictive maintenance systems designed into products.
- Predictive maintenance and cause-and-effect analysis techniques.
- Demonstrators of re-designed existing products or new products designed for maintainability, reliability and longer life.

The project must include two complex industrial demonstrators in real industrial settings to represent a clear added value. In order to ensure the industrial relevance and impact of the demonstration effort, the active participation of industrial partners, including SMEs, represents an added value to the activities.

Funding scheme: Demonstration projects

Expected impact:

- Increased efficiency through reduced failure rates, unplanned stoppages and extension of component life
- Improved environment through lower life cycle cost and reduced energy and material consumption
- Increased worker safety and accident mitigation

FoF.NMP.2015-6 Integrated design and management of production machinery and processes - RTD, TRL 4-6, Small

Scope:

Production quality significantly depends on the ambient conditions and the process parameters. Computational models capable of simulating the machine-to-part process not only can be used to predict manufacturing quality and productivity but, increasingly, to also compensate wear or partial damage through model-based control. Innovative machines and processes increasingly depend on model-based approaches, including the monitoring and control elements, throughout the whole machine lifecycle.

New integrated approaches are needed in simulation methods, tools and across hierarchical model layers requiring a cross-disciplinary collaboration between (predominantly SME) machine designers, industrial component suppliers, engineering software developers as well as making use of the process experience of manufacturers.

RTD and innovation activities should aim at developing and testing suitable model-based approaches for production machinery and at demonstrating the power of model-driven approaches for machine innovation through:

- The development of integrated and accurate simulation models and algorithms for model-based control of production machinery based on cross-disciplinary input and actual machine lifecycle parameters.
- Tool programming strategies that are easy to use and can be rapidly modified or re-adapted by workers on the machine.
- Demonstration of the reliability of model-based machines with respect to production accuracy/quality, maintainability and lifecycle return-on-investment (e.g. through an industrially scalable demonstrator).

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.

Funding scheme: RTD projects.

Expected impact:

- Productivity: Improved system adaptability and lifecycle costs less than 30 % for manufacturing system and process.
- New maintainability concepts based on predictive "(self-)maintenance" with machine reliability improved by 10 % (MTBF) and reduced maintenance costs by 20 %.
- In terms of environmental impact: Reduced waste and energy efficiency improved by 30 %.

FoF.NMP.2015-7 New technologies for modular, reconfigurable and reusable consumer products manufacturing and life cycle management - RTD, TRL 4-6, SME-targeted

Scope:

New consumer products will be more and more incorporating, seamlessly, intelligence and smart functionalities through advanced materials and embedded components. The integration of highly differentiated materials and components is a key requisite for flexible manufacturing of individualised consumer products. On the other hand increased integration of sophisticated ICT-based components and of advanced materials implies a rapid product obsolescence rate, and can thus introduce further pollution risks if reuse of products and/or components is not enhanced. Therefore reconfiguration and reuse of products, and related services, should be strongly developed. In order to face such new challenges new production techniques should be developed to enable in parallel the fast manufacturing, assembly and configuration of complex products as well as the products updatability and disassembly for reuse and end of life management. In particular, it should be possible to easily and effectively integrate products components which can be independently created and used in different production systems. All involved actors in the product life cycle, from manufacturers of basic products components to retailers and vendors up to the final customers, should be provided with the tools to reassemble and/or reconfigure the product or its components.

Research activities should address several of the following areas:

- Methodologies and tools for the fast reconfiguration and reuse of products and their components
- New production techniques allowing for a fast manufacturing, assembly and configuration of complex products
- Innovative methods and technologies for product's updatability, disassembly for reuse and end of life management
- Methodologies and tools for the development of assembly, configuration, disassembly and reconfiguration services along the whole consumer products value chain and along its overall life cycle including also the aftersales stage.

In order to ensure an efficient implementation and maximum impact of SME-related activities, the leading role of the participating SMEs with R&D capacities is expected. 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.

The projects are expected to cover demonstration activities, including pilot implementations in industrial settings, and this will be likewise reflected in the evaluation. This topic is particularly suitable for collaboration at international level, particularly under the IMS scheme[1]. Project partnerships that include independent organisations from at least three IMS regions[2] are therefore encouraged.

Funding Scheme: RTD projects

Expected impact:

- Reduction of time to market of new products/services by 50%.

[1] 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

[2] The current member regions of IMS are the European Union, the United States of America, Korea, Mexico and the EFTA states of Norway.

- Cost reduction by 50% by decreasing lead times in product-services development and configuration.
- Reduction of environmental impact by 50% thanks to modular reusable components and final products.