

# The University of Manchester



## Agenda for Excellence

**To make The University of Manchester, already an internationally distinguished centre of research, innovation, learning and scholarly inquiry, one of the leading universities in the world by 2015.**

# School of Mechanical, Aerospace and Civil Engineering

Precision Machine Design  
 On Machine Measurements  
 Robustness and Reconfigurability  
 Micro- and Nano-Metrology  
 Actuation and Sensing  
 Process Planning Systems (Manufacturing Feature  
 Recognition, Optimum Toolpaths, etc.)  
 Process Control , Process Modelling & Product Quality  
 Improvement  
 High Speed, Micro and ECM/EDM Machining  
 Laser Materials Processing  
 Micro-fabrication

# Re-configurable Autonomous Machines for Zero-defects products.

- New self-adaptive machine structures based on mechatronic concepts.
- Mechatronic knowledge-based intelligent modules.
- Integrated process control with in-process characterisation.
- Intelligent manufacturing equipment.
- Development of tools for integrated/embedded optimised system.
- Securing work envelope, high dexterity, high stiffness ...etc.
- Maintenance and system Management.
- Room for Educational Application.

**Call identifier:** *FP7-NMP-2007-SMALL-1*

- **Deadline:** For Small or medium-scale focused research projects - first stage:  
04 May 2007 at 17.00 (Brussels local time)

Adaptive production:

**NMP-2007-3.2-1 Rapidly Configurable Machines and Production Systems:**  
For Small or medium-scale focused research projects

**NMP-2007-3.2-1 Rapidly configurable machines and production systems**

**Technical content / scope:** The main objective is to create radically new, self-adaptive machine structures with online self-optimisation based on mechatronic concepts. The knowledge-based intelligent modules can feature multi-layer control, sensing and actuator structures with a high level of redundancy which guarantees a high level of reliability and allows optimal performance of a production system under different conditions. Innovation lies in moving from current 'assembled' sensor, actuator and control system architectures towards mechatronic knowledge-based systems. The research should initially focus on the development of "adaptronic" modules and interfaces and their integration in intelligent manufacturing equipment through the development of active intelligent components (integrating, as appropriate, sensors, actuators, control, mechanical structures); development of tools for integrated/embedded optimised system configuration based on mechatronic modelling and simulation with respect of the resulting performance (including damping characteristics, working envelope, etc.). Deliverables include (i) tools and methods for an adaptive, mechatronic manufacturing system and components modelling, set-up and use; (ii) prototype adaptronic modules and applications of their usage in machines and production systems.

**Funding scheme:** Small or medium-scale focused research projects

**Specific features:** Proposals are expected to be industrially led and to include component manufacturers and OEMs (Original Equipment Manufacturers) for ensuring market take-up of the new technologies. Proposals are also expected to take into account relevant standardisation and interoperability issues.

**Expected impact:** New generation of products helping European instrument manufacturers and machine builders to stay ahead of the competition. Reduction of time needed for reconfiguration and maintenance, yielding a significant increase in productivity for small batch production. Better process control allowing a considerable reduction in resources consumption (both energy and raw materials).

## Partners:

Already a few: UM, Ideko, Fidia, UST,  
RolceRoyce

### Expertise required:

In-process inspection

Mechatronics

Multi-layer controls

Intelligent Control

Robotics

System Management

# Comprehensive Instrument with Complementary Fabrication aspects, Characterisation and Processes Monitoring @ nanoscale.

## Targeted Objectives:

- Integrated Equipment to fabricate products and devices by material removal process at nanoscale.
- Complementary operations for end-products and devices secured by in-situ bottom-up processes e.g micro-assembly.
- Complete characterisation and analysis of the processes and product nano-features.
- Real time monitoring of operations at nanoscale with process self correction capability.
- Force feedback and automated manipulation.
- Handling and packaging of products.
- Configurable platform for multipurpose activities
- Performance and Cost

*Potential Applications: Micro-electronics, Opto-Electronics, Biotechnology,*

# NMP-2007-1.2-2 Equipment and methods for nanotechnology (collaborative SMEs)

## NMP-2007-1.2-2 Equipment and methods for nanotechnology

**Technical content / scope:** Equipment and methods for characterisation and operations at the nanoscale are needed in order to explore and exploit size dependent phenomena with the aim of developing innovative materials, products, devices and processes or enhance quality control systems. The research projects should focus on the development of instrumentation and methods for measurement, analysis and operations at the nanoscale to characterize nano-features with improved resolution and/or increased sensitivity, based on novel approaches or novel combinations of approaches. This is a particular challenge when the feature sizes approach the 10 nm range or beyond. The equipment developed should be capable of working accurately, reliably and reproducibly and it is intended to meet the performance and cost requirements at research laboratory level. Accordingly, the proposed projects should aim at developing tools, namely instruments and/or methods and/or their combination, including novel software both for measurement and analysis, and data handling – as appropriate. The projects should represent a clear step ahead of the state-of-the-art. Significant technical applications are on-line and off-line characterisation and operations at nanoscale e.g. characterisation and quantification of measure of novel functionalities and performance, handling and treatment of samples or positioning at atomic level.

- **Funding scheme:** Collaborative projects targeted to SMEs
- **Specific features:** SME dedicated collaborative projects are specifically designed to encourage SME participation in research and innovation representing the complete value added of the targeted fields. Research and innovation activities need to be covered by the projects. In each project, at least 35% of the EC contribution is expected to be allocated to the participating SMEs. The projects will be led by SMEs with R&D capacities but the coordinator does not need to be an SME. The participating SMEs should have the decision making power in the project management. The output should be for the benefit of the participating SMEs and the targeted SME dominated industrial communities. Additional activities other than research could be included as appropriate, such as metrology, pre- and co-normative activities like the development of (certified) reference materials, safety issues, specific education modules or the analysis of existing and required regulations.
- **Expected impact:** (i) New or improved equipment; (ii) support to the development of new nanotechnology-based products and industrial processes, to their tailoring of properties and reliability.

# Partnership

**SME(s)** involvement + Academics

Expertise required:

- State-of-the-art nanofabrication methods.
- Micro-robotics for manipulation at nanoaccuracy.
- Characterisation tools and techniques.
- Real time Inspection techniques.
- Process control understanding & modelling.

Cost: €15-20 M.

Current Partners: UM, UW, Veeco, NPL, ...

# Contact

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