European Commission

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/ro-ckets

Potential areas of industrial interest relevant for cross-cutting KETs in the Manufacturing and Automation domain

This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

MA.2.2: Material/resource-efficient manufacturing processes

Scope:

To provide for material-saving production processes with improved material efficiency and recovery, flexible use of substitute materials, near-net-shaped concepts and / or additive manufacturing, remanufacturing, recycling, hybrid processes, better use of waste streams and processes interactions.

Demand-side requirements (stemming from Societal Challenges) addressed:

- Tackle the "secure, clean and efficient energy" as well as the "climate action, resource efficiency and raw materials" societal challenge

Demand-side requirements (stemming from market needs) addressed:

- Reduce energy consumption (resulting in savings over the conventional energy purchase for industrial end-users and in the overall reduction of the energy demand on a global scale)
- Reduce resources consumption including raw materials as well as water and other utilities required during production (resulting in savings over the conventional raw materials as well as utilities purchase for industrial end-users and in the overall reduction of raw materials as well as other resources (such as e.g. water) demand on a global scale)

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities):

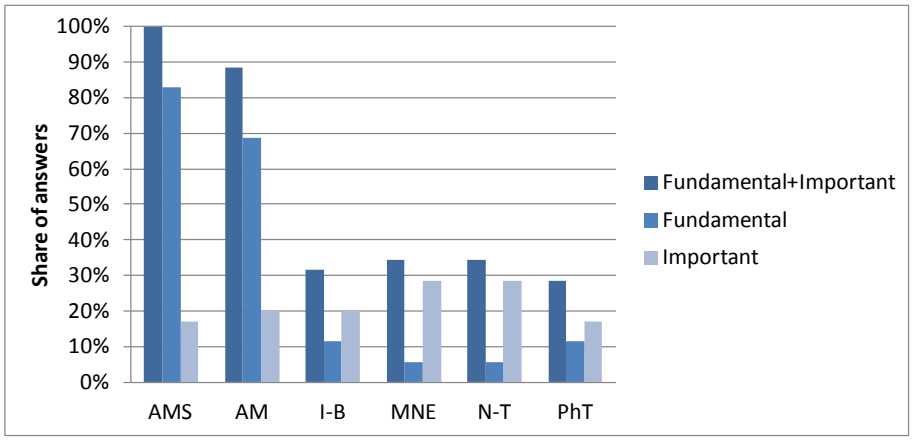
- Development of production solutions enabling low resource input, low emission, products tailored for different applications, surface treatments and functionalization, painting, coating and joining, development of compact processes, ensuring high process productivity while reducing environmental impact
- Save materials through new manufacturing approaches and material-saving production processes with improved material efficiency and enabling the (flexible) use of substitute materials
- Minimization of energy consumption during manufacturing through novel, new or regenerative (i.e. Low C,) energy supply, better use of waste streams through recovery, and efficiency improvements in manufacturing equipment (e.g. through flow speed)
- Demonstration of greater manufacturing efficiency whilst minimizing use of raw materials and energy consumption
- Reduction in the consumption of water and other process resources
- Increase of material efficiency by better understanding various material efficiency measures and their interactions among different manufacturing processes and/or industries

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of material/resource efficient manufacturing processes, building on material-saving production processes with improved material efficiency and recovery, flexible use of substitute materials, near-net-shaped concepts and / or additive manufacturing, remanufacturing, recycling, hybrid processes, better use of waste streams and processes interactions along with environmentally friendly surface treatments, functionalization, painting, coatings and joining.

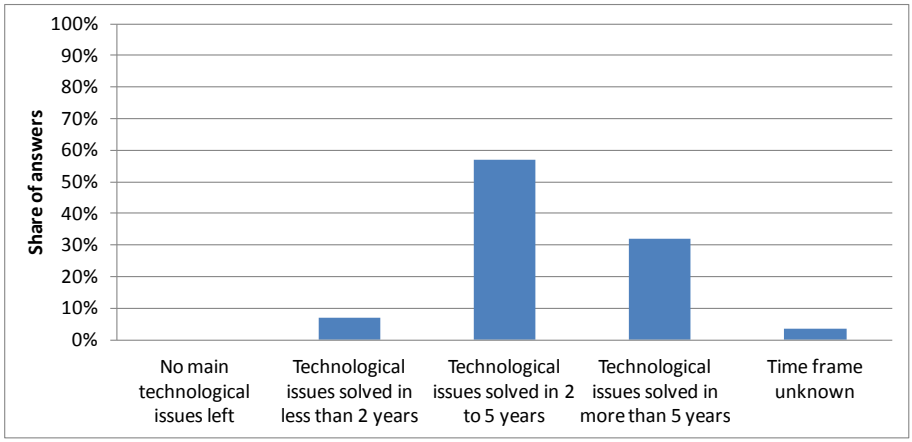
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of 2 to 5 years, yet consensus by experts indicates also greater periods being necessary:



Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the short term should be taken into consideration within this framework.

Additional information according to results of assessment:

- ***Impact assessment:***
  - Besides to reduce energy consumption, any manufacturing and process industries are also strongly incentivized to reduce their resources' input intensity due to the high share that raw materials as well as other resources necessary to the production (such as water) have in their total production costs.
  - This may be achieved by the introduction of new manufacturing / processing approaches allowing for intrinsic material-saving (including optimization of material consumption at the design level), a better use of waste streams through recovery of materials or other resources (such as water), and efficiency improvements in manufacturing or processing equipment.
  - The flexible use of substitute materials, near-net-shaped concepts and/or additive manufacturing, remanufacturing, recycling, hybrid processes, and a better management of waste streams either within the factory or through processes interactions can also be an opportunity.
  - All these approaches can translate into reduced resources consumption such as reduced raw materials input as well as water and other utilities required during production, which can result in savings over the conventional raw materials as well as utilities purchase for industrial end-users and in the overall reduction of raw materials as well as other resources (such as water) demand on a global scale.

- ***Results of patents scenario analysis:***
  - 11 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
  - Hence, no significant patent-related indicators can be reported in this field