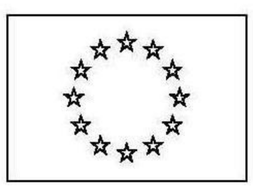
Enterprise and Industry

"EnginEurope"

For a thriving European Mechanical Engineering industry in the 21st century

Report and Recommendations of the "EnginEurope" High-level Discussion Group



European Commission

The EnginEurope Report

This report was prepared as follow-up to the Commission Communication "Implementing the Community Lisbon programme: A Policy Framework to Strengthen EU Manufacturing - towards a more integrated approach for Industrial Policy" - COM(2005) 474 final of 5.10.2005

This Communication identified the mechanical engineering industry as one of the key sectors in manufacturing that merit a policy dialogue analyzing future strengths and weaknesses and anticipating how any weaknesses could be addressed in the longer term.

The EnginEurope report was written by a team of experts under the chairmanship of Prof. Fritz Klocke, Head of Fraunhofer-Institut für Produktionstechnologie IPT, Aachen, Germany.

Staff of the Enterprise and Industry Directorate-General of the European Commission participated in the work, but the report does not necessarily reflect the opinion or position of the European Commission.

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A great deal of additional information on the EU is available on internet. It can be accessed and used through the EUROPA server (http://europa.eu).

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For a thriving European Mechanical Engineering industry in the 21st century

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1 Foreword

Günter Verheugen
Vice-President of the European Commission

Industrial production - manufacturing technical items from the smallest pieces to large complex systems - is of major importance for Europe, and Europeans are particularly good at this. The mechanical engineering industry is one of the core sectors of our industrial production with more than 24.500 companies, most of them small and medium sized, offering employment for more than 2,6 million Europeans. Many sectors of our economy depend - directly or indirectly - on the efficiency and the competitiveness of manufacturing companies. Therefore, the competitiveness of the European mechanical engineering industry is an essential pillar of the competitiveness of European industry.

Still, the interest of locating manufacturing facilities in Europe is constantly put to the test. The need to increase competitiveness is felt by many companies as a must. Comparatively high costs, an ever increasing need for innovation due to shorter product cycles, more demanding customers and environmental challenges, and the changes stemming from globalisation are formative driving forces.

To succeed in such a dynamic and challenging environment requires that we take a critical look at the way we are doing business. We need to analyse all aspects of the industrial value chain and come up with effective strategies that embrace all levels of decision-making: From the day to day management in companies to the global political frameworks to which our economy is tied. There is a clear need for framework conditions that enable companies, in particular small and medium-sized companies, to understand change and carry out the necessary adaptations effectively.

The new industrial policy has already contributed to setting a stable and predictable framework which allows companies to anticipate change and to succeed in spite of the increasing international competition. This policy

will be developed further along the needs of industry and society in the forthcoming mid-term review of industrial policy, in particular by bringing together the key challenges of competitiveness, climate change and energy security.

Manufacturing has a vital role to play in securing Europe's future prosperity. There is no way back to the old days of protectionism and subsidies. Politicians don't create jobs. But we can create the right framework for industry to thrive. Our strategy includes a range of new tailor-made initiatives to make our industries attractive for investment and job creation.

EnginEurope, a high level discussion group, has been such an initiative which helps us to better understand the present strengths and weaknesses of the mechanical engineering industry in Europe. It will enable us to plan a course of actions aimed at further strengthening the position of this leading European industry in the future.

This report is the result of the work of EnginEurope which was established in late 2005 and which comprised representatives from industry, academia, trade unions, Member States and the European Commission. Four key areas have been intensively discussed: access to markets, employment and skills, research and innovation and a strategic industrial and technological base.

This report provides very important input how to better address the challenges of globalisation, not only with regard to the mechanical engineering industry, but also for the wider debate which takes place under the heading of the Strategy for Growth and Jobs.

I am very grateful for this succinct report and I consider it an excellent starting point for a productive debate between policy makers in the European Institutions and in the Member States, and the stakeholders in the mechanical engineering industry. I am looking forward to the next months and years when we will jointly undertake to preserve and strengthen the position of the European mechanical engineering industry.

2 Introduction

2.1 Facts and Figures

European Mechanical Engineering has today developed into a multi-technology industry. The time when Mechanical Engineering products were “simply” machines is a thing of the past: today the products of the Mechanical Engineering industry lie at the heart of all production systems, combining machinery, electronics, software and services into the complex production and processing systems on which all industries depend to progress, to innovate and to produce.

The Mechanical Engineering industry is the enabling industry which from any physical prototype delivers a product to the market, be it mass- or niche-market, be it consumer or investment product.

This requires a broad range of competences to provide customised solutions from the ultra light to the ultra heavy, from nano to macro, from slow to fast, from cold to hot, from a clean to a dirty environment or product, from the simplest to the most sophisticated.

Therefore, the manufacturing and industrial future of the EU requires the competence of a Mechanical Engineering industry, which

- contributes to the function and production of products by components and machines,
- provides solutions to supply cost efficient quality products where and when the market requires them,
- drives innovation through integration and intelligent interaction of various low-, medium- and high-tech technologies and software.

The Mechanical Engineering industry must therefore be considered as the key enabling industry for all other manufacturing sectors (see examples on the next pages).

Mechanical Engineering is one of Europe’s largest industry sectors with a share of some 8% of total EU manufacturing output. It is also one of the largest employers with some 24500 companies (mostly SMEs with more than 20 persons) employing 2.6 million people. With 41% of the world market, Europe is the world’s largest producer and exporter of machinery (see Table 1). Mechanical Engineering is an essential pillar of the industrial fabric of Europe.

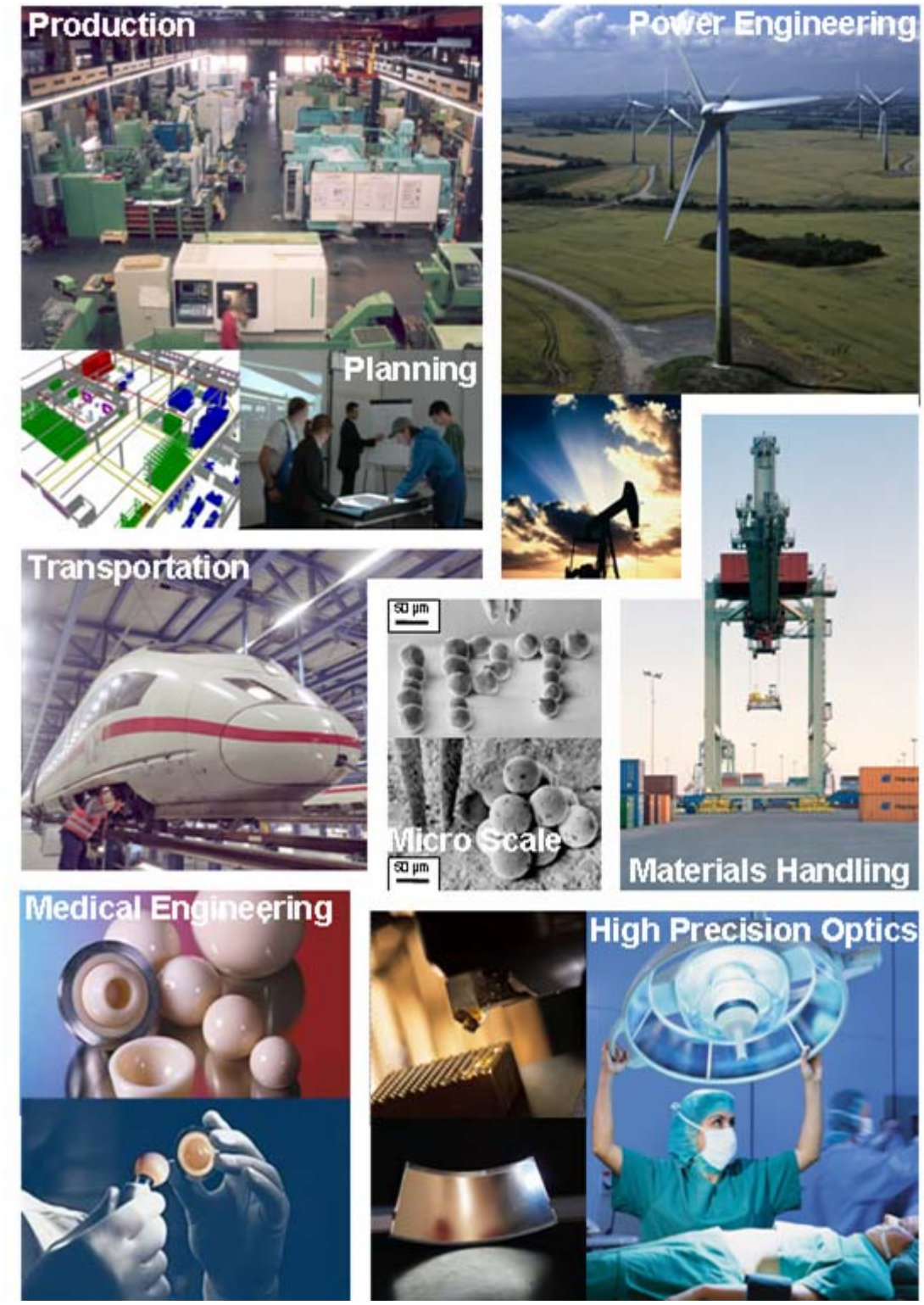
Contribution to total industrial value added	approx. 10%
Number of companies (all sizes)	24 500
Number of employees	2.6 million
Total volume of sales	€ 420 billion
Share of production sold within the EU	66%
Main producers and their share of European output:	
Germany	39%
Italy	16%
France	11%
United Kingdom	9%

Table 1: Main facts and figures on the European Mechanical Engineering sector at a glance

Mechanical Engineering is not only one of the largest industry sectors in Europe. As the supplier to other industries of the technologies that give them the necessary competitive edge, the Mechanical Engineering industry underpins the innovation potential of the European economy as a whole. Mechanical Engineering is the driver for productivity for all major industries, such as food production, textile, furniture, automotive, shipbuilding, materials handling, agriculture, construction, transportation, chemicals, medical equipment, electronics, aerospace, defence, etc..

Consequently, European Mechanical Engineering is central to the total supply and value chain of all industries. In addition, this industry is a significant consumer and provider of materials produced by the primary industries and increasingly a consumer and provider of services. Moreover, Mechanical Engineering provides not only the equipment but also the skills and knowledge for improving existing processes and for developing new products in other. It enables Europe's successful industries to innovate.

The performance of all industries is dependent
on a highly efficient European Mechanical Engineering sector.


Production
Power Engineering
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Micro Scale
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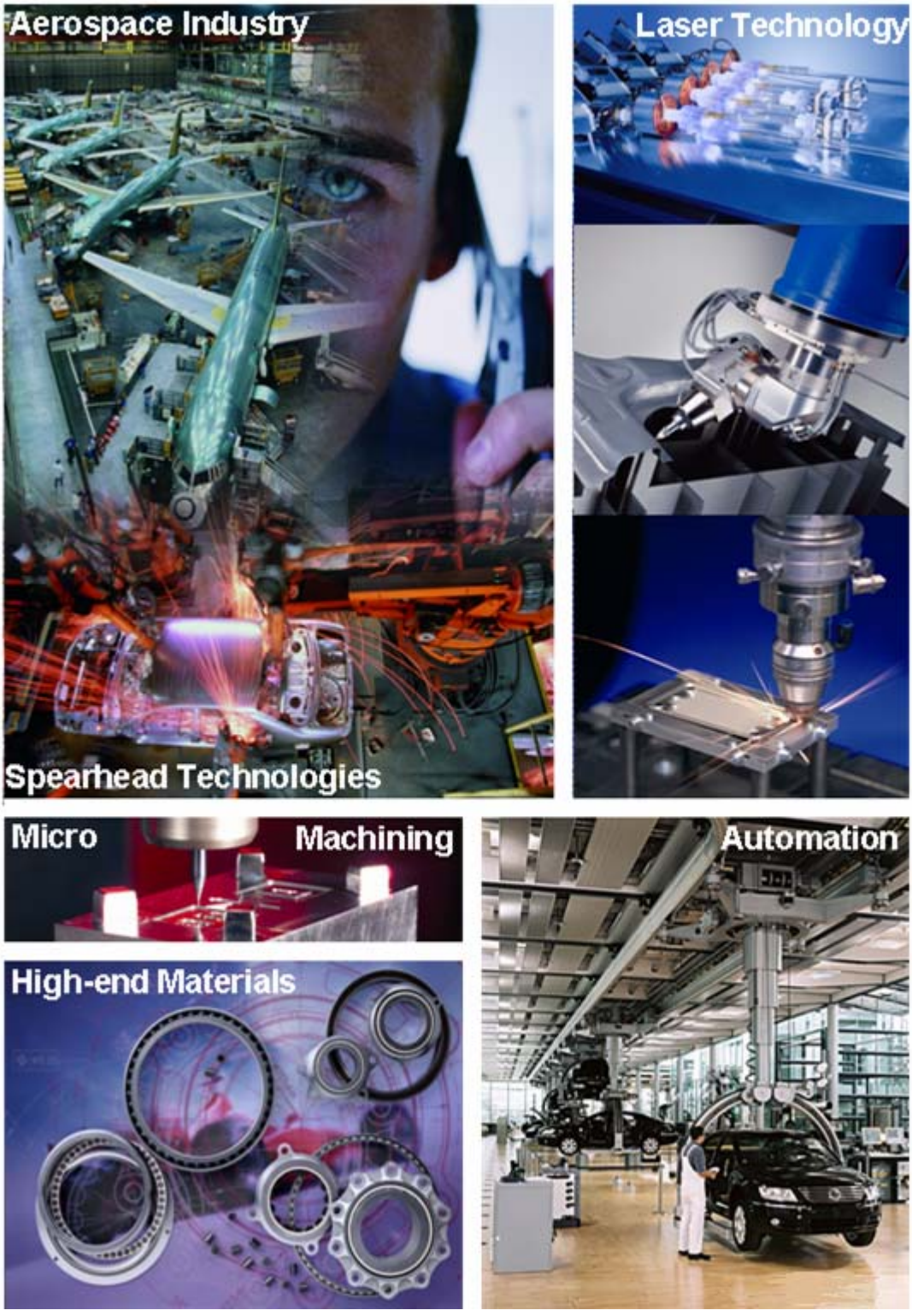
Materials Handling
Medical Engineering
High Precision Optics


Aerospace Industry
Laser Technology
Spearhead Technologies
Micro
Machining
Automation
High-end Materials

The present report has been drawn up by a high-level group initiated after discussions between the industry and the European Commission. It has brought together stakeholders in the European Mechanical Engineering field. It was agreed to call the group EnginEurope to symbolise the fact that Mechanical Engineering is the driver for innovation and enabler for all other European manufacturing industries, which produce goods.

The European Mechanical Engineering sector underpins the prosperity and welfare of European society.

A strong and developing European Mechanical Engineering sector will, therefore, have a multiplier effect, generating growth and employment in many sectors in the economy, not least through exports where the sector provides the highest value added of all economic sectors in the EU.

A SWOT analysis of the framework conditions of the European Mechanical Engineering sector will help to identify measures needed to maintain the excellent position also in the future.

- Strength
  - Experience and top class reputation
  - Broad technology basis
  - Availability of good infrastructure
  - Entrepreneurship
- Weakness
  - Risk averse mentality
  - Fragmented European markets
  - Low labour mobility
  - No sense of urgency, resistance to change
- Opportunity
  - To develop a policy agenda for the future
  - To enhance technical leadership
  - To really focus on integration of the internal market
  - To provide top class education
  - To pioneer development for all industry
- Threats
  - Globalisation has only begun
  - Asymmetric conditions for trade in spite of WTO framework
  - Aging population, lacking in dynamism and unwilling to change

SWOT analysis of the framework conditions of the European Mechanical Engineering sector

European Mechanical Engineering is ready to shape the future.

However, in order for the sector to remain competitive and flourishing, it is essential that the challenges it will face in a longer term are identified and addressed now. The analysis and recommendations included in the present report aim to pinpoint future weak points of the European Mechanical Engineering industry and to suggest recommendations on how these could be addressed in the coming years. These recommendations are addressed both to regulators and to the industry itself – both employers and employees.

As Mechanical Engineering is highly interrelated with all other industries, there are many needs which are in common with other industries; there are also however specific issues for the European Mechanical Engineering sector.

2.2 Executive Summary and List of Recommendations

This report has been drawn up by a high level group, consisting of stakeholders in the European industry. It deals which the major challenges which will affect the European Mechanical Engineering sector to 2015. These include:

- Creating a strategic industrial and technological base, including a better regulatory framework for competition and technology transfer;
- Improving access to export markets, including IPR issues;
- Ensuring employment and top class technical education to satisfy the need for skilled staff;
- Boosting research and innovation.

These main subjects were discussed in detail and target-oriented recommendations were developed for

- European Institutions,
- Member States and
- Industry.

This report aims to provide a solid basis for all those responsible for initiating and developing policy proposals and appropriate follow-up actions.

You will find hereafter a summary of the recommendations. These are then set into context and developed in more detail in the following chapters of the report.

Strengthening the Strategic Industrial and Technological Base in Europe (Chapter 4.1)

Recommendation

- The European Commission, Member states and stakeholders should jointly develop a coherent strategy on how to maintain a strong industrial base leading to high employment in the European Mechanical Engineering industry based on the following recommendations.

Completing the Internal Market, conquering external markets and protecting IPRs (Chapter 4.2)

Full completion of the internal market

Recommendations to the European Institutions

A well functioning European internal market is absolutely essential for the European Mechanical Engineering Industry to reach scale. Therefore, it is essential to:

- Make the internal market for products and business services efficient.
- Promote identical regulations/standards everywhere.
- Ensure fast and coherent EU-wide implementation.
- Avoid overregulation and over complex regulation (simplification, better regulation, cost efficiency).
- Harmonise and improve worker protection legislation which impact products.
- Benchmark EU regulations with regulations in other countries regularly.
- Address the issue of complicated and disparate tax systems.

Recommendations to the European Commission

Specifically the European Mechanical Engineering Industry requests:

- Develop and implement a European Company Legal Format especially designed for SMEs (the "Think small first" principle really needs to be applied).
- Improve coherence and coordination of the work of the European institutions, with a view to maintaining a clear policy focus on competitiveness and employment.

Recommendations to the Industry

- Use identical regulations/standards everywhere.
- Promote the removal of de facto/private non-tariff trade barriers.
- Promote the free flow of products, components and services.

Safeguard the Access to External Markets

Recommendations to the European Commission

In line with the general industrial requirements take a tougher stance to defend the rights of Europe's Mechanical Engineering industry:

- Developing the WTO framework without reaching damaging compromises should be the focus.
- Failing this, zero to zero agreements for the products of the Mechanical Engineering sector should be the target.
- Market economy status should only be granted to countries which strictly observe the international regulatory framework (including especially TRIPS-IPR issues).

Specifically the European Mechanical Engineering Industry requests:

- Promote European standards worldwide to become international standards.

Recommendations to the Industry

- Create a basis to provide to the Commission data and analysis on trade problems.
- Stakeholders in industry should significantly improve their collaboration and data input to the EU authorities to support decision-making based on facts and science.

Fight Counterfeiting Globally

Recommendations to the European Commission

Europe has long lost its cost leadership; therefore defending its technical leadership is pivotal. Here the focus must be:

- To have a strategy of no compromise on IPR in the area of trade negotiations.
- To broaden the system of the "EU-IPR-Helpdesk".
- To develop a joint IPR strategy common to the Commission as a whole.

Specifically the European Mechanical Engineering Industry requests:

- Establish a balanced and affordable patent system in Europe.
- An increased expert and official EU Member States' representatives' network with links to local authorities, which can provide companies with support and assistance in key problem countries.

Recommendations to the Member States

- Improve IPR enforcement at national trade shows and exhibitions.
- Participate in a network of national EU states' embassies and EU delegations to support industry in priority countries on IPR issues.
- Make IPR part of the obligatory curriculum in technical education.

Recommendations to the Industry

- Identify to customs authorities the source and markings of counterfeited products to help them with enforcement.
- Register IPR in all relevant markets.
- Besides enforcing IPR, initiate and promote campaigns that evidence the superior performance and quality of original products versus their counterfeits.

Ensuring Employment by educating and attracting Skilled Staff (Chapter 4.3)

Recommendations to the European Commission

Without top class education and young skills there is no future. Technical innovation needs highly educated and creative engineers. Technical, methodological and organisational innovation do result in increased quality of life.

- Place a stronger emphasis on implementing the Bologna process.
- Collect and communicate best practices in the field of education from Member States, industry and academia.
- Create a good framework and environment for innovation.

Recommendations to the Member States

- Engage in promoting the image and value of studying technical disciplines.
- Embrace technical innovation, emphasise opportunities rather than risks.
- Develop new solutions to facilitate and support life-long learning.
- Promote teachers' pivotal role in conveying industry-positive attitudes to their pupils.
- Modernise the curriculum at high schools to adapt it to demands of a highly developed society.
- Promote the recognition and remuneration of primary and secondary school teachers teaching maths and science.
- Ensure industry access to highly qualified staff regardless of origin.
- Lay a strong emphasis on the recognition of professional qualifications across Europe (strong mobility of workers, facilitate mobility, meta system needed to link the systems in the member states – qualification framework).

Recommendations to the Industry

- Engage with Member States' authorities to provide input on future needs for skilled staff.
- Provide continuous and systematic training for employees.
- Utilise the knowledge and skills of employees in setting up continuous educational programmes.
- Continue efforts to enhance the image of the industry so as to attract young people to the industry.
- Provide the environment for innovation through good work organisation.

Boosting Research and Innovation (Chapter 4.4)

Safeguarding high quality of science and improving the transfer of knowledge
Bridging the financing gap from development to a market product

Recommendations to the European Commission

To ensure future competitiveness, R&D needs a solid and sufficient regulatory environment and financial basis.

- Benchmark R&D financing practices between countries.
- Develop a vision which takes into account the supply and value chains of the industry's clients and suppliers.

Specifically the European Mechanical Engineering Industry requests:

- Stimulate sufficient innovation financing at European level and work towards the development of a European wide large venture capital market.
- Coordinate the elimination of the downside cost of failure (including avoiding unfair competition in this area).
- Ensure that the EU's Competitiveness and Innovation Programme (CIP) is operating close to the needs of companies.

Recommendations to Member States

- Achieve targets according to Lisbon strategy and provide a milestone plan.
- Establish internationally competitive taxation for R&D to support the necessary increase of R&D spending in industry.
- Allow industry, especially SMEs, to significantly design the build up of research programmes.
- Stimulate sufficient innovation financing at national level and support the creation of a European wide large venture capital market.
- Reduce the downside cost of failure.

Recommendations to Industry

- Increase investment in R&D and set-up a technological roadmap of the key road blocks.

Improving R&D funding instruments
Reducing bureaucracy of research programmes

Recommendations to the European Commission

An easy access for stakeholders in industry, especially SMEs, to research programmes is vital.

- Highlight "Production Technologies" in the NMP R&D programme.
- Reduce bureaucracy by simplifying the two-stage application and evaluation procedure under the EU's 7th Framework Programme for Research and Technological development ("FP7").
- Reduce geographical requirements for participation in EU research funding.

Specifically the European Mechanical Engineering Industry requests:

- Implement, through fiscal policy, a simple and more generalised support system for SMEs undertaking research and developing innovative products.
- Establish one distinctive topic in future EU research programmes for the Mechanical Engineering sector.
- In addition allocate to the Mechanical Engineering sector a distinct research programme for each sub-programme except in the field of humanities.
- Ensure that the sub-programme "Collaborative research" is open for companies with 250 to 1000 employees.
- Adopt simpler administrative requirements for participation of SMEs under FP7.

2.3 Group Members

Director-General Heinz Zourek of the European Commission's DG Enterprise and Industry established the high-level discussion group EnginEurope in 2006. The group brings together representatives of 6 Member States, industrialists, trade union representatives, academics and of course the European Commission. The group is chaired by Professor Fritz Klocke, Head of the Engineering department of the Aachen Technical University (RWTH).

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Klaus-Jürgen Exner Ministry of Economics and Technology, Germany

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Ivan Faucheux Ministry for Economy, Finances and Industry, France	Ulf Zumkley Ministry for Economic Affairs and Technology, Germany	Matti Pietarinen Ministry of Trade and Industry, Finland
		
Brian Greenwood Department of Trade and Industry, UK	Adrian Harris ORGALIME, EU	Yvon Jacob Fédération des Industries Mécaniques, France
		
Massimo Goldoni Goldoni S.p.A. (CEO), Italy	Hardy Koch European Metalworkers' Federation, EU	Prof. Eckart Kottkamp Hako Holding GmbH & Co., Germany

 Stig Gustavson KCI Konecranes, Finland	 Françoise Le Bail Deputy Director-General DG Enterprise and Industry, European Commission	 Heinz Zourek Director-General DG Enterprise and Industry, European Commission
 Maria Spiliopoulou European Commission	 Didier Herbert European Commission	

3 Mechanical Engineering – The Engine for Innovation in Europe

3.1 Strategic Importance of Mechanical Engineering as an Enabler

A STRATEGIC INDUSTRY

Mechanical Engineering is a strategic industry: it is a high added value, knowledge intensive sector which supplies all other sectors of the economy with the machines, production systems, components and associated services, as well as technology and knowledge they need to produce, distribute and innovate. Mechanical Engineering provides not only the equipment, but also the skills and knowledge for improving existing processes and products and for developing new products, often by combining several technologies to provide customised solutions. In short, this is the enabling industry which provides the production means and technologies for all other industries as well as for consumers in a number of areas.

A DIVERSIFIED INDUSTRY COVERING A WIDE RANGE OF SUBSECTORS

Mechanical Engineering is not a homogeneous but a very diversified industry which covers a wide range of subsectors, including: lifting and handling equipment; machine tools; woodworking machinery; non-domestic cooling and ventilation equipment; pumps and compressors; machinery for mining, quarrying and construction; bearings, gears, gearing and driving elements; taps and valves, engines and turbines; agricultural and forestry machinery; machinery for textile, apparel and leather production; machinery for food, beverage and tobacco processing; machinery for paper and paperboard production; industrial furnaces and burners; environmental technology equipment (energy production, water and waste water treatment equipment, air cleaning equipment, etc.), machinery for metallurgy, productronic and microtechnology, embedded software and automation, power transmission engineering, surface technology, logistics, robotics, etc..

A STRATEGIC DRIVER FOR SPEARHEAD TECHNOLOGIES

Due to the fact that Mechanical Engineering has evolved to become multi technology engineering, it is a strategic driver for the industrial application of many spearhead technologies, such as biotechnology, informatics, material technology and nanotechnology.

3.2 Convincing Facts and Figures

WORLD LEADER IN PRODUCING AND EXPORTING MACHINERY

With 41% of the world's market, Europe is the world's largest producer and exporter of machinery, significantly outperforming both the USA and Japan. These countries have seen their output in this sector decline in the last ten years, while in the EU output has risen. It is therefore an area in which Europe excels and this industry should

therefore be considered as a flagship industry in the framework of the EU's growth and jobs agenda.

LARGEST TRADE SURPLUS TO THE EU ECONOMY

Mechanical Engineering provides the largest trade surplus to the EU economy of any sector, some 78,9 billion euros in the EU-25 in 2004. It is therefore vital for the sector to remain competitive and flourishing, so that it can contribute as a motor of growth in the EU's economy.

AMONG THE LEADING INNOVATING INDUSTRIES

Mechanical Engineering is the key supplier of technology and capital investment goods to all other industries and sectors: the EU industry is particularly strong in the area of customised machinery and niche markets, which is central to the innovation capacity of all other sectors of the economy. It is also vital to the capacity of all sectors of industry to provide high added value, thereby helping other strategic sectors of industry to achieve a competitive advantage that offsets many of the handicaps Europe may face in areas such as labour costs, energy prices and regulatory burden. With increasing global competition, the life cycle of many products, including that of capital goods, has become shorter, requiring ever more investment in research, development and innovation in order for European industry to keep its place as world leader in many areas. Mechanical Engineering is a leading industry at the level of filing of patents which is an indicator for innovation.

AN INDUSTRY OF ENTREPRENEURS

Despite the considerable weight of the Mechanical Engineering sector in the EU economy, the industry is essentially driven by entrepreneurs: companies are predominantly family owned SMEs, confronted with the particular challenges that such enterprises, many of which are also global businesses, face. They are accustomed to acting decisively in a risky and complex international environment, while at the same time taking particular responsibility for their employees at home. Mechanical Engineering therefore epitomises the spirit of entrepreneurship.

A MAJOR AND CONSISTENT EMPLOYER

Mechanical Engineering is not only one of Europe's largest industry sectors, with a share of some 8% of total manufacturing output in 2005, but also one of the largest employers with some 24500 companies, providing some 2.6 million people in the EU-25 with, for the most part, highly qualified jobs. Employment in the industry, notwithstanding the present lack of growth in the EU's internal market, has remained relatively stable over the last 10 years: consistent, if moderate, long term growth in output, productivity improvements and a vigorous export performance on world markets lie at the root of this success. The potential for further growth, both in output and employment, is clearly there, if the framework conditions for companies operating in the EU are right and the industry enjoys the political support that it deserves.

HIGH GROWTH POTENTIAL

If the EU is to maintain its position and potential as one of the major economic and political forces in the world, it is essential that it develops a vision on how to create and maintain a strong European

manufacturing base in those technologies that will provide growth and jobs in the future, rather than on supporting sectors, which will, due to the process of globalisation or to policies developed at the level of the EU (e.g. energy policy), inevitably become redundant. Mechanical Engineering is an industry in which the vast majority of sectors does already provide growth and has the potential to generate future growth and jobs in the EU.

STRATEGIC ROLE RECOGNISED IN THE US NATIONAL SECURITY AGENDA

Whereas, for a time, many major manufacturing countries considered that manufacturing might shift painlessly to countries such as China, all the major economies are now aware of the strategic role that manufacturing plays: for example, the USA has recently evidenced the importance of Mechanical Engineering to the US economy including to its national security agenda: a provision included in the Fiscal Year 2004 USA "Defence Authorisation Act" provides an incentive to US-defence contractors to use US-built machine-tools in defence contracts. This is due to the fact that it is felt as critical to maintain an independent machine-tool capacity for security, defence and political reasons.

A HIGH VALUE ADDED INDUSTRY

Because of the customisation of the products and services that companies provide and the specialisation of EU manufacturers in niche markets, this is an industry, which unlike many other important industries, including many consumer products or many parts of the ICT chain, is unlikely to become "commoditised". Although the productivity of companies may not quite reach that of their counterparts in the USA, the value added that the industry produces both in the internal and on export markets means that it plays a crucial role in the EU's economy.

3.3 A Highly Innovative and Globally Active SME Industry

THE SPECIFIC CHARACTERISTICS OF MECHANICAL ENGINEERING REQUIRE SPECIFIC MEASURES

Given the strategic role that Mechanical Engineering plays in the manufacturing infrastructure and economy of the EU, at a policy level, it is essential to create the framework conditions which facilitate the industry's innovative capacity and growth in the EU. If many of the horizontal policy instruments being developed by policymakers will also serve Mechanical Engineering companies, there are specific areas where special focus is needed. These areas include:

- The size of Mechanical Engineering companies and the effects that this has on their capacity to access research and development financing both at EU level and in the capital markets, as well as to export markets.
- The entrepreneurial nature of these companies.
- The needs of these companies to develop and grow.
- Their increasing dependence on skilled personnel and on service income.

- The dependence of the sector of being a champion in the high value added and niche products markets.

These issues are examined hereafter in different contexts and proposed solutions are developed in this and in the other sections of the report.

4 How the Mechanical Engineering Industry can meet the Major Challenges – A String of Recommendations

4.1 Strengthening the Strategic Industrial and Technological Base in Europe

THE MECHANICAL ENGINEERING SECTOR IS DOMINATED BY SMES

The Mechanical Engineering industry has traditionally been an entrepreneurial sector dominated by SMEs. Compared to large companies, SMEs undoubtedly present advantages in terms of their often flexible and dynamic structures and their ability to service niche markets, whether these are geographically focused or specialised products markets.

NEW ECONOMIC SCENARIO REVEALS THE NEED FOR GROWTH

Nevertheless, if "Small is beautiful", structural changes, arising from the increasing integration of markets and the growing competition from the emerging economies, are putting significant pressure on existing industrial structures. In this new economic scenario, "size matters": it is usually much easier for large companies to take advantage of economies of scale, which allow them to compete on costs and to invest more heavily in research and innovation, increasing the added value of their products. Most of the leading edge development of technologies does take place in the larger Mechanical Engineering companies and therefore the opportunity to grow becomes a fundamental factor of success.

BASIC CONDITIONS PREVENTING EU COMPANIES FROM GROWING

There are many reasons why companies in the EU find it so hard to grow compared to their counterparts in countries such as the USA. These include a number of basic conditions:

- The level of taxation, which coupled with the complexity created by the very different systems across the EU and the insufficient rewards for entrepreneurs in relation to the personal risks they take, limits the incentive to develop their businesses in the EU.
- The complexity of the legal framework affecting companies, whether in individual countries in the EU or across the internal market, hinders the development of companies (e.g., the requirements for setting up a company are different in every country in the EU)
- The particular disincentives for SMEs created by the administrative complexity to which companies are subject. As the legal framework

at a EU level develops, so differences in transposition and interpretation of EU legislation between countries renders the task of expanding in the EU more complex.

- The particular attitude of EU regulators to the whole area of IPR where the Community regulatory framework gives the impression that the licensing of technology is, as a rule, a somewhat dubious process. This is not only inconsistent with economic reality but, more worryingly, may lead to a situation where licensors prefer to keep their technology for themselves or transfer it to licensees outside the EU where more flexible rules exist. Moreover, not enough attention is paid today to ensuring adequate IPR protection, an essential factor, for the growth of companies in exploiting innovative technologies on international markets and for financing their continued development.

Creating appropriate framework conditions for an industry of entrepreneurs

PROMOTE EASIER GROWTH OF COMPANIES

The European Union should facilitate growth for companies wishing to invest in different countries in the internal market by ensuring a greater real harmonisation of regulation and simpler possibilities for cross-border investment, including for setting up new companies (e.g. the European Private Company statute promoted by BUSINESSEUROPE and Orgalime). The Commission and Member states should ensure that only as much regulation as is really needed is introduced, that new regulation should lead to effective harmonisation, including in application rules and procedures and that these should be kept as simple as possible. A review with the aim of simplifying existing rules and regulations and their application should be implemented under the Commission's simplification programme.

SIMPLIFY THE TAXATION SYSTEMS

The "sacred cow" of simplifying the overly complex taxation systems, which render the life of entrepreneurs working across the EU unnecessarily difficult, needs to be tackled, at least with a view to achieving a harmonised tax base for corporate taxes. This is a task for the Member States and the Commission.

PROMOTE ENTREPRENEURIAL SPIRIT

The Commission and Member States should develop strategies to promote, already during the earliest years of education, the entrepreneurial spirit which is so necessary to the success of this industry.

SUPPORT FOR ENTREPRENEURS PREPARED TO TAKE HIGH RISKS

The Commission and Member States should actively pursue policies which allow entrepreneurs to develop and be rewarded for their entrepreneurial activities: more attention must in particular be paid to ensuring that risk taking and failure are not too severely sanctioned and that success can give rise to adequate rewards.

Moreover, at the policy level, the European Union needs to develop a vision on how to create and maintain a strong European industrial base in the enabling technologies, focusing on those areas of technology and manufacturing that will provide growth and jobs in the future, including in the service sector.

CONCLUSION

Major challenge

- Among the key factors for other industries (automotive, chemicals, food, defence etc.) to continue manufacturing in Europe are the competitive production technologies that Mechanical Engineering provides. Framework conditions for Mechanical Engineering companies must be improved so that they can continue developing competitive enabling technologies in Europe.

Recommendation

- The European Commission, Member states and stakeholders should jointly develop a coherent strategy on how to maintain a strong industrial base leading to high employment in the European Mechanical Engineering industry based on the following recommendations.

4.2 Completing the Internal Market, conquering external markets and protecting IPRs

Mechanical Engineering companies are very competitive also outside their domestic markets. With their highly innovative products and solutions, often tailor-made to fit the needs of the customer, they provide high added value and therefore have the competitive potential to remain successful on global markets. A properly functioning internal market and freedom of access to and investment in third-country markets is, as a consequence, of vital importance for this industry.

Full completion of the internal market

INTRA-EU TRADE PLAYS A SIGNIFICANT ROLE

Trade within the EU internal market plays a significant role in the industry. 82% of the market supply of machinery in the EU originates from production within the internal market. Of this 82%, 38% is covered by manufacturers in the company's own domestic market and 44% is bought in another EU country. An average European Mechanical Engineering company sells approximately two thirds of its products and services outside its own domestic market.

The abolition of customs and the progressive introduction of EU-wide requirements and standards, in particular in the area of technical

legislation, has provided European manufacturers with a substantial and expanded "home" base.

Nevertheless, companies still face difficulties in doing business in the internal market, often due to diverging, sometimes heavily diverging, regulatory requirements in different EU Member States. Problems experienced by companies concern product-related requirements, as well as more general framework conditions, including for example, administrative requirements.

THE SERVICE CONTENT OF THE TURNOVER OF MECHANICAL ENGINEERING COMPANIES WILL INCREASE

Europe is particularly strong in the area of differentiated Mechanical Engineering products. Products are therefore becoming increasingly customised, both at the level of its development, but also during their useful productive lifetime. As machinery becomes increasingly complex to design, build and maintain, so the service content of the turnover of Mechanical Engineering companies is rising and will continue to do so.

Mechanical Engineering is therefore an essential generator and user of services: the freedom for manufacturers to provide services in the internal market has to be ensured, without however resorting to standardisation or creating the conditions for unfair competition. This is essential for an industry which derives its competitiveness through providing customised products and solutions. Likewise, the availability of competitive input services, such as banking, logistics, insurance, etc., is important.

CONCLUSION

Major challenges

- Difference in national requirements for workers protection.
- Partially different regulations/standards in Europe.
- Differing legal requirements for setting up companies hinders the establishment of subsidiaries in other EU countries.
- The internal market, including services, still needs to be further developed and consolidated.

Recommendations to the European Institutions

A well functioning European internal market is absolutely essential for the European Mechanical Engineering Industry to reach scale. Therefore, it is essential to:

- Make the internal market efficient for products and business services.
- Promote identical regulations/standards everywhere.
- Ensure fast and coherent EU-wide implementation.
- Avoid overregulation and over complex regulation (simplification, better regulation, cost efficiency).

- Harmonise and improve worker protection legislation, which impact products.
- Benchmark EU regulations with regulations in other countries regularly.
- Address the issue of complicated and disparate tax systems.

Recommendations to the European Commission

Specifically the European Mechanical Engineering Industry requests:

- Develop and implement a European Company Legal Format especially designed for SMEs (the "Think small first" principle really needs to be applied).
- Improve coherence and coordination of the work of the European institutions, with a view to maintaining a clear policy focus on competitiveness and employment.

Recommendations to the Industry

- Use identical regulations/standards everywhere.
- Promote removal of de facto/private non-tariff trade barriers.
- Promote free flow of products, components and services.

Safeguard the Access to External Markets

EXPORTS OUTSIDE THE EU PLAY AN IMPORTANT ROLE

The European Mechanical Engineering industry is the largest producer and exporter of machinery in the world. The increasing success of EU Mechanical Engineering products is evidenced by the fact that its exports have grown faster than output in the last years. The most important export markets for the European Mechanical Engineering industry are the USA (19%), China (11%) and Russia (6%). In particular, the markets in China and Russia have been growing strongly in the last five years. Until 2020, the most important growth markets for the industry are expected to be in India, Malaysia, China, Thailand and Turkey. Among OECD countries, the USA and Canada will probably be those countries with the highest growth rates.

HEAVY DEPENDENCE ON OPEN MARKETS BOTH WITHIN THE EU AND IN THIRD COUNTRIES

The figures illustrate that EU Mechanical Engineering is heavily dependent on open markets both within the EU and in third countries. An open and fair international trading system is essential for the competitiveness of the industry. The strong export orientation of this sector requires free access to international markets. Particularly important is the access to dynamically emerging markets, such as Russia, India and China.

CONCLUSION

Major challenges

- Unequal access conditions to third country markets
- Strong efforts of major competing countries to implement their standards in emerging markets

Recommendations to the European Commission

In line with the general industrial requirements take a tougher stance to defend the rights of Europe's Mechanical Engineering industry:

- Developing the WTO framework without reaching damaging compromises should be the focus.
- Failing this, zero to zero agreements for the products of the Mechanical Engineering sector should be the target.
- Market economy status should only be granted to countries which strictly observe the international regulatory framework (including especially TRIPS-IPR issues).

Specifically the European Mechanical Engineering Industry requests:

- Promote European standards worldwide to become international standards.

Recommendations to the Industry

- Create a basis to provide to the Commission data and analysis on trade problems.
- Stakeholders in industry should significantly improve their collaboration and data input to the EU authorities to support decision-making based on facts and science.

Fight Counterfeiting Globally

CUSTOMERS REQUEST TAILOR-MADE SOLUTIONS

For European Mechanical Engineering companies, the development of tailor-made solutions for their customers is of vital importance. Mechanical Engineering products, systems and solutions are characterised by a high degree of creativity, invention and technical complexity. As a result, companies in the industry often achieve significant market share in niche markets.

PROTECTION OF INNOVATION IS CRUCIAL

The sector endeavours to protect its innovations through patents and, to some extent, through other intellectual property rights, such as trademarks, designs and models.

FIGHT COUNTERFEITING

However, counterfeiting is becoming an ever growing and very real threat to the competitiveness of Mechanical Engineering companies. Companies are not only affected by trademark piracy, but also and particularly by patent or designs and models right infringements. Unauthorised reproduction is a cross-border issue affecting the competitiveness of many companies. This requires concerted action both at a European and at an international level. In particular, SMEs, unlike large enterprises, often do not have the resources to fight counterfeiting. They also often lack experience when it comes to enforcing IP rights. This is why specific anti-counterfeiting measures, tailored to the needs of SMEs, are necessary.

REVIEW OF TECHNOLOGY TRANSFER REGULATIONS

The EU's own system for protecting IPR is both unduly complex and incomplete. For example, the Block Exemption Regulation for Technology Transfer Agreements (Reg. 772/2004) should be reviewed as part of the Commission's simplification strategy. The structure needs to be simplified and the market share approach should be abolished. In the meantime, the Commission should commit to an "open door policy" and agree to informal talks with stakeholders in order to provide clarification for technology transfer agreements when needed.

PROMOTE THE INTRINSIC QUALITY OF THE ORIGINAL VERSUS THE COUNTERFEIT PRODUCT DERIVED FROM LENGTHY EXPERIENCE OF THE ORIGINAL DEVELOPER AND PRODUCER

Moreover, it is necessary to raise awareness among potential buyers of counterfeits, particularly in so called "problem areas", with respect to the advantages of original compared to counterfeited products. Mechanical engineering products very often reflect long and in-depth experience of the manufacturer in solving specific problems. This practical experience, translated into products or even entire system solutions, cannot be provided by counterfeiters, who simply copy the trademarks, appearance and features of a product. Customers of the mechanical engineering industry must be aware of this intangible advantage which finally pays off when using the product.

CONCLUSION

Major challenges

- IPR are neither accepted nor universally respected.
- Counterfeiting erodes technological leadership.
- The European Mechanical Engineering industry is affected by trademark piracy, patent or designs and models right infringements.
- Complicated, as well as costly structures and procedures for granting of patents and for litigation in the EU.
- SMEs lack the resources to defend IPR.

Recommendations to the European Commission

Europe has long lost its cost leadership; therefore defending its technical leadership is pivotal. Here the focus must be:

- To have a strategy of no compromise on IPR in the area of trade negotiations.
- To broaden the system of the "EU-IPR-Helpdesk".
- To develop a joint IPR strategy common to the Commission as a whole.

Specifically the European Mechanical Engineering Industry requests:

- Establish a balanced and affordable patent system in Europe.
- An increased expert and official EU Member States' representatives' network with links to local authorities, which can provide companies with support and assistance in key problem countries.

Recommendations to the Member States

- Improve IPR enforcement at national trade shows and exhibitions.
- Participate in a network of national EU states' embassies and EU delegations to support industry in priority countries on IPR issues.
- Make IPR part of obligatory curriculum in technical education.

Recommendations to the Industry

- Identify to customs authorities the source and markings of counterfeited products to help them with enforcement.
- Register IPR in all relevant markets.
- Besides enforcing IPR, initiate and promote campaigns that evidence the superior performance and quality of original products versus their counterfeits.

4.3 Ensuring Employment by educating and attracting Skilled Staff

HEAVY DEPENDENCE ON SKILLS

As a leading supplier of innovative products and customised solutions, Mechanical Engineering companies depend heavily on having skilled staff at all levels – workers, supervisors, engineers, service staff, etc.

ELITE EDUCATION NEEDED

There is especially an urgent need to create absolutely top class education facilities for talented natural science and Mechanical Engineering students, with adequate funding which aims to match or exceed that of the top American and Asian elite educational institutions.

HIGH STANDARD EDUCATION FACILITIES

Europe must become an attractive place for the most talented, high calibre students. This requires a high standard of education and state-of-the-art laboratory equipment. To accomplish these goals, adequate tuition fees have to be raised and competition between universities should be encouraged.

EASE UP ACCESS FOR NON-EUROPEAN TOP CLASS ENGINEERS

To motivate also highly educated, first class non-European engineers to work within the European Mechanical Engineering sector, easy access and proper working conditions need to be there. The image of the industry is often poor and does not reflect either the reality of what Mechanical Engineering has become today, its world class leadership, its potential as an employer and its increasing innovation both for products and work processes.

SHORTAGE OF SKILLED WORKERS AND ENGINEERS

As Mechanical Engineering products become ever more complex and accompanied by an increasing service offering – so most companies expect an increasing demand for skilled staff at all levels in the coming years. Even today, the number of university graduates is generally too small to meet the demand of the industry. The trend towards early retirement is making the situation even worse. From 2010 onwards, demographic trends in Europe will further intensify the shortage of skilled workers and engineers.

TEACHERS' EDUCATION AND THEIR ROLE AS A MODEL EXAMPLE FOR YOUNG PEOPLE

In education, pupils take their teachers as an example to follow. Therefore, it is essential that teachers are aware of the importance of technology for society as a whole. Teachers play a vital role in promoting a positive and open-minded attitude of their pupils towards the Mechanical Engineering sector. However, today teachers in their own education receive only limited information on the jobs that industry offers and on the industrial environment in general. To overcome this issue, there is a clear need to revise the curricula of teacher training courses.

MISMATCH OF SKILLS NEEDS AND AVAILABILITY

While unemployment remains stubbornly high in many countries, at the same time Mechanical Engineering companies are desperately seeking high calibre apprentices, qualified workers, skilled technicians and engineers and researchers. This essentially arises from the fact that, in the increasingly hi tech environment of the industry, there is a mismatch between the skills that companies need and those that are available on the labour market:

- In the case of Germany a study by the VDMA Impulsstiftung from 2002, shows that there is a total annual demand for 5000 engineers in Germany and that the number of engineering students will not meet the medium term demand for engineers.
- A labour survey of Technology Industries of Finland evidences that the difficulties to recruit qualified staff have increased since 2004. At the end of 2005 recruiting difficulties were reported by 47% of companies. This shortage concerns professions that have topped

the list for over 10 years: welders, metal processors, mechanics and engineers.

Both the authorities and the social partners must work together to ensure the availability of the skilled staff which the industry will need to provide these services.

CONCLUSION

Major challenges

- The poor public image of the industry, which results I people not recognising the importance of this industry for the whole community.
- The shortage of skilled workers and engineers.
- The mismatch of skills needs and available skills on labour market.
- Skills shortage must recognised as a serious problem which needs to be dealt with on a national level.
- The diversity and disparity of qualifications nomenclatures and national certificates for various degrees.
- Education is not adapted to industry needs, e.g. there is a shortage of maths and engineering science teachers.
- Absence of elite education in natural and engineering sciences.

Recommendations to the European Commission

Without top class education and young skills there is no future. Technical innovation needs highly educated and creative engineers. Technical, methodological and organisational innovation do result in increased quality of life.

- Place a stronger emphasis on implementing the Bologna process.
- Collect and communicate best practices in the field of education from Member States, industry and academia.
- Create a good framework environment for innovation.

Recommendations to the Member States

- Engage in promoting the image and value of studying technical disciplines.
- Embrace technical innovation, emphasise opportunities rather than risks.
- Develop new solutions to facilitate and support life-long learning.
- Promote teachers' pivotal role in conveying industry-positive attitudes to their pupils.
- Modernise the curriculum at high schools to adapt it to demands of a highly developed society.

- Promote the recognition and remuneration of primary and secondary school teachers teaching maths and science.
- Ensure industry access to highly qualified staff regardless of origin.
- Lay a strong emphasis on the recognition of professional qualifications across Europe (strong mobility of workers, facilitate mobility, meta system needed to link the systems in the member states – qualification framework).

Recommendations to the Industry

- Engage with Member States' authorities to provide input on future needs for skilled staff.
- Provide continuous and systematic training for employees.
- Utilise the knowledge and skills of employees in setting up continuous educational programmes.
- Continue efforts to enhance the image of the industry so as to attract young people to the industry.
- Provide the environment for innovation through good work organisation.

4.4 Boosting Research and Innovation

EUROPEAN COMPANIES FACE A VARIETY OF COST HANDICAPS

In an increasingly competitive global environment, where companies, operating in Europe, face a variety of cost handicaps, it is essential to ensure that research leads to innovation and innovation to increased profitability and growth. European Mechanical Engineering companies are under extreme competitive pressure. Their competitiveness and their success on world markets stand and fall with their innovativeness. In order to meet global competition over the long term, they must constantly reaffirm their technological leadership.

MODERN INFRASTRUCTURE NEEDED

The EU and Member States must invest in modern and efficient infrastructure in order to provide the framework conditions needed by the Mechanical Engineering industry to develop its innovative capacities. Where public investment in large-scale infrastructure is involved, projects which drive research and innovation along the whole industrial chain should be given a priority.

Safeguarding high quality of science and improving the transfer of knowledge

FUNDING FOR MARKET-DRIVEN RESEARCH IN MANUFACTURING IS INSUFFICIENT

The focus of EU funding for research has increasingly shifted in recent years to improving European research infrastructures. As a result, funding for market-driven research in the field of manufacturing technologies, and in particular Mechanical Engineering technologies, is at present insufficient. However, to ensure future competitiveness, R&D needs a solid and sufficient financial basis, which must be benchmarked against the efforts made by the main trading nations and

competitors of the EU Mechanical Engineering industry. For example, special attention could be given to matching American spending through defence and space industry budgets. At the least, the Lisbon target of 3% GNP for research funding, is a target that needs to be achieved.

IMPROVE INNOVATION FRAMEWORK BY CLOSER INTERACTION BETWEEN SCIENCE, INDUSTRY AND GOVERNMENT

Growth and global competitiveness can only be achieved if the overall innovation framework is improved. The capacity to create new knowledge is important. But even more important is the capacity to apply this knowledge and turn it into new products. For this purpose, close interaction between science, industry and government is required. Demand-driven research and effective know-how transfer from science to beneficial and useful applications in industry must be established and encouraged by the EU's 7th Framework Programme for Research and Technological Development (FP7). In order to guarantee that research will finally provide significant economic benefits, research policy must be governed by a bottom-up approach. Research topics need to be defined by industry, rather than by public authorities.

TECHNOLOGY PLATFORMS HELP TO DETERMINE RELEVANT RESEARCH TOPICS

The creation of so-called "Technology Platforms", such as ManuFuture, whose task includes defining a strategic research agenda for a specific sector in order to highlight the real research and development needs of this sector, is a step into the right direction. If used appropriately, the results produced by the technology platforms can help the European Commission to determine research topics that are relevant for industry and, thereby, finally help to generate research results which are used and applied by industry.

RESEARCH AGENDA BY MANUFUTURE PLATFORMS

National and regional platforms and initiatives jointly driven by national industry federations, research organisations and national ministries, are today complementing the strategic research agenda provided by the ManuFuture Platform. This ensures that the process is close to industry and therefore to the market.

EFFICIENT ALLOCATION OF FUNDS

However, given the limited resources and the large number of competing technology platforms, the European Commission has the task to efficiently allocate the funds available. This allocation requires prioritisation according to criteria which serve the overall objective to create growth and jobs.

When defining priorities, the European Commission must predominantly take into account, first the high strategic importance of the Mechanical Engineering industry for the competitiveness of the entire economy, and secondly the relevance of the research topic for the industry.

Bridging the financing gap for innovations

GAP BETWEEN RESEARCH COMMUNITY AND INDUSTRY

The gap between the research community and the market-driven sector needs to be bridged by encouraging the development of closer industry-academia cooperation in a number of clustered science and technology parks and networks ("poles de compétitivité"), which will facilitate the uptake of the results by SMEs and allow the development of the dynamic networks which spur the creation of start-ups and drive innovation. It is therefore essential that public authorities, both at EU and national level concentrate investment in areas where the potential for development and growth is strongest.

INNOVATION FINANCING BY AN INNOVATION BANK OR EUROPEAN VENTURE CAPITAL MARKET

It is also essential to be able to move from research to development on a pilot scale and then to larger scale industrial production. This requires further investment, including for manufacturing R&D: there is often a gap between funding for research, on the one hand, and venture capital and normal commercial lending to operating entities on the other hand. There is clearly a need, in a number of countries, to establish some form of "innovation financing", perhaps in the form of an "innovation bank", providing longer term financing on commercial terms, and/or through an innovation fund which would assist in the structuring of finance of the phases from research to the pilot plant, and then the step up to commercial production. Furthermore, in the long run, the setting up of a real European wide venture capital market should be envisaged.

In Europe, innovative and venturesome entrepreneurs may easily be discouraged by often unduly high cost of business failure. It would be worth studying the effects of the United States Bankruptcy Code which, under the Chapter 11 filing, allows a troubled business to attempt a reorganisation and "emerge" from bankruptcy.

ESTABLISHING AN INTEGRATED APPROACH IN MANUFUTURE AND CIP

The recent focus of public authorities including the Commission on establishing an integrated approach to industrial research and innovation as evidenced in the proposed technology platforms, both European and national, and in the EU's Competitiveness and Innovation Programme (CIP) is welcome and essential.

CONCLUSION

Major challenges

- Lisbon targets for funding are far from being achieved.
- The strategic significance of European Mechanical Engineering for industry is not adequately reflected in the allocation of public funding.
- Too often the invention is European, but the practical result is developed and launched outside the EU.
- The cost of failure is often unduly high for the entrepreneur.

Recommendations to the European Commission

To ensure future competitiveness, R&D needs a solid and sufficient regulatory environment and financial basis.

- Benchmark R&D financing practices between countries.
- Develop a vision which takes into account the supply and value chains of the industry's clients and suppliers.

Specifically the European Mechanical Engineering Industry requests:

- Stimulate sufficient innovation financing at European level and work towards the development of a European wide large venture capital market.
- Coordinate the elimination of the downside cost of failure (including avoiding unfair competition in this area).
- Ensure that CIP is operating close to the needs of companies.

Recommendations to Member States

- Achieve targets according to Lisbon strategy and provide a milestone plan.
- Establish internationally competitive taxation for R&D to support the necessary increase of R&D spending in industry.
- Allow industry, especially SMEs, to significantly influence the design of research programmes.
- Stimulate sufficient innovation financing at national level and support the creation of a European wide large venture capital market.
- Reduce the downside cost of failure.

Recommendations to Industry

- Increase investment in R&D and set-up a technological roadmap of the key road blocks.

KEEP FUNDING MECHANISMS SIMPLE

One of the basic strengths of the Mechanical Engineering industry arises from the manifold integration of the specialised products and services of its SMEs into the supply and value chains of all industries. To keep a leading edge position in this highly dynamic environment, these SMEs must continuously and rapidly develop innovative processes and machines. They do not have time to waste on lengthy and complex administrative procedures for obtaining external funding. As a consequence SMEs do not participate in many publicly funded research programmes to the extent that would be necessary. It is

therefore important to find simpler systems both at a national and at an EU level.

General support schemes and national funding systems

Besides the specific support offered, for example through the 7th Framework Programme for Research and Technological Development (FP7), more general support should be offered at both national and EU level. Fiscal policy could play a helpful role in this context (e.g. tax breaks for companies which achieve a certain level of R&D expenditure; faster depreciation rates for risk investments.)

EXAMPLES OF BEST PRACTICE IN FUNDING FOR R&D LEADING TO LESS BUREAUCRACY

Among the most promising or already successful schemes which reduce the "cost" of publicly funded programmes for SMEs are some of the existing national schemes. These have chosen "indirect" ways to allocate money for R&D which are worth analysing as examples of best practice in member states, leading to simpler less bureaucratic systems:

- Germany is about to introduce a general research premium to be paid to a university or research institute which succeeds in winning a research contract financed by a company or a group of companies. The university or research institute will obtain funding for a part of the contract (e.g. 25%) and the commissioning companies will provide the rest of the funding. Companies and the research institute can freely decide upon research topics and the composition of the consortium. The system has the advantage that bureaucracy for application of funding will be reduced to a minimum and that research topics are defined by companies according to their needs and expectations. It would help to achieve the objective that research must be turned into marketable products or production processes and therefore into commercial success.
- The Netherlands has introduced a subsidy scheme for "Innovation Vouchers" financed by the government and approved by the EU authorities, whereby a SME enterprise can submit a research question to a knowledge institution on presentation of an innovation voucher. Such a system is close to the market, it provides a tangible incentive to those investing in innovation and it helps to improve knowledge transfer between SMEs and knowledge institutions.
- The UK Department of Trade and Industry (DTI) currently runs competitions twice a year inviting applications for grant funding towards collaborative research and development projects that target specific areas such as: Advanced Materials, Bioscience and Healthcare, Design Engineering and Advanced Manufacturing, Electronics and Photonics, ICT, Sustainable Production and Consumption. These competitions are designed to give the Mechanical Engineering industry the opportunity to form partnerships with other companies, academia and other research

bodies submit proposals for collaborative projects. In addition to that a special budget is dedicated for support to SMEs research projects.

It would be worthwhile considering whether such systems could also be applied at the level of the EU.

Improving existing EU R&D funding instruments

FP6: PRIORITIES DO NOT REFLECT THE STRATEGIC IMPORTANCE OF MECHANICAL ENGINEERING

The structure and priorities of the past Framework Programmes took little account of the needs of the Mechanical Engineering industry. These were only barely addressed, which led to a very scattered and dispersed approach for the industry as a whole. For example, of the seven thematic priorities in the EU's FP6, some were more relevant than others for the Mechanical Engineering industry. With this dispersion of the core activities of the Mechanical Engineering sector, companies were required to thoroughly study each programme in order to identify possible areas of relevance to their activities. For many, it was very difficult to recognise their core activities in the priorities of FP6.

FRAMEWORK PROGRAMMES: FOCUS ON RESEARCH IN PRODUCTION TECHNOLOGY

Furthermore, in both past EU Framework Programmes, as well as in the incoming FP7, within the specific programmes, "Production Technologies" - "Nanosciences, Nanotechnologies and Materials" have been combined. This grouping tends to focus funding on production technologies which act as an enabler for Nano and Material sciences. Production Technologies, however, are a research area of their own: this field will also cover a number of crucial items, for example, development of new industrial models and strategies, intelligent products and adaptable production systems and networks, high performance and energy efficiency. Therefore, it is very important to establish a good balance between the different sub-programmes, "Nanosciences, Materials and Production Technology". Considering the importance which Production Technology has for the competitiveness of European industry as a whole, it is essential that sufficient funding be reserved specifically for this sub-theme. For future programmes, it would even be highly desirable to concentrate such key enabling technologies under one distinctive topic. In addition, it would also be useful to specifically emphasise the Mechanical Engineering sector and the key role it plays in providing enabling technologies for other sectors in all sub-programmes of FP7. If these enabling technologies were made more visible, recognisable and addressable, innovative Mechanical Engineering companies would be more inclined to participate in European projects.

COLLECTIVE RESEARCH: SME DEFINITION IS TOO RIGID

"Collective Research" is still the preferred instrument of the Mechanical Engineering sector for participation in pre-competitive European research activities. However, a very important segment of Mechanical Engineering companies – the so-called "mid range companies" employing between 250 and 1000 employees – are practically excluded from this instrument because they do not fall under the EU's

definition of SMEs. This is counterproductive because it is these companies which make up the bulk of the innovative enterprises which are most likely able to play major role in European research programmes. They for the most part have an annual turnover of between € 40-150 million, of which we estimate some 3.5% is allocated for R&D. These companies are the real drivers of the innovative processes in Mechanical Engineering and the ones which are most likely possess sufficient R&D capacity to participate effectively in EU research projects. However, suitable research instruments are not available for this segment: "collective research" is dedicated to SMEs and the other instruments, such as integrated projects or networks of excellence, are too large and require financial and personnel resources beyond the capacities of mid-range companies.

FP 6: DIFFICULTIES IN ESTABLISHING CONSORTIA

The existing R&D funding instruments used under the EU's 6th Framework Programme (FP6) need to be improved in order to increase the participation of the innovative Mechanical Engineering companies. In particular, the often far-reaching requirements to set up pan-European consortia discourage Mechanical Engineering companies to apply for EU R&D funding. Instead of placing too much emphasis on the European dimension of a consortium, the European Commission should award funding depending on the innovativeness of the project and the chances to turn the results of the research into economic success and therefore jobs.

Reducing bureaucracy for companies

FP6: APPLICATION PROCEDURE IS VERY INEFFICIENT

The experience of FP6 showed that the development of project proposals was very costly and time consuming for the companies involved. The chances of obtaining funding was, moreover, very low (approximately 1 out of 10). The risk of wasting money and resources discouraged many innovative SMEs of the Mechanical Engineering industry from applying for research projects under FP6. Since it is a high priority of the European Commission to involve industry and particularly companies with high innovation potential in EU funded programmes, a significant reduction of bureaucracy is necessary under FP7. For this purpose, the instruments to be used under FP7 must be streamlined.

FLEXIBILITY OF CONSORTIUM SIZES AND COMPANY SIZE

In particular, more flexibility regarding consortia sizes, clear participation rules, and clear definitions of the objectives of the instruments are needed. Moreover, the European Commission must ensure that participation of companies across the value-creating chain is allowed, regardless of company size .

REFORMING THE TWO-STAGE PROCEDURE

A reduction of the administrative burden could be achieved by reforming the existing two-stage procedure:

- The first stage must be significantly simplified for the companies: applicants should no longer be forced to submit a 90-page

application form in the first stage. Instead a short (2-3 pages) but clear and convincing explanation of the economic objective of the project should be sufficient. On the basis of such a project description, the evaluators should be able to decide which proposals are suited for funding.

- The evaluators must make sure that not more than three proposals reach the second stage so that the effort to produce a comprehensive and detailed application is justified.

CONCLUSION

Major challenges

- No systematic correlation between EU Framework Programmes and the necessary Mechanical Engineering innovation requirements.
- Heavy bureaucratic burden and low success rate discourage companies from participating in EU funded research programmes.
- Inadequate EU definition of SMEs.

Recommendations to the European Commission

An easy access for stakeholders in industry, especially SMEs, to research programmes is vital.

- Highlight the Production Technologies in the NMP-programme.
- Reduce bureaucracy by simplifying the two-stage application and evaluation procedure under the EU's 7th Framework Programme for Research and Technological development ("FP7").
- Reduce geographical requirements for participation in EU research funding.

Specifically the European Mechanical Engineering Industry requests:

- Implement, through fiscal policy, a simple and more generalised support system for SMEs undertaking research and developing innovative products.
- Establish one distinctive topic in future EU research programmes for the Mechanical Engineering sector.
- In addition allocate to the Mechanical Engineering sector a distinct research programme for each sub-programme except in the field of humanities.
- Ensure that the sub-programme "Collaborative research" is open for companies with 250 to 1000 employees.
- Adopt simpler administrative requirements for participation of SMEs under FP7.

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