FP7 INFORMATION DAYs for Research PPPs on 11+12 July 2011

Template project ideas

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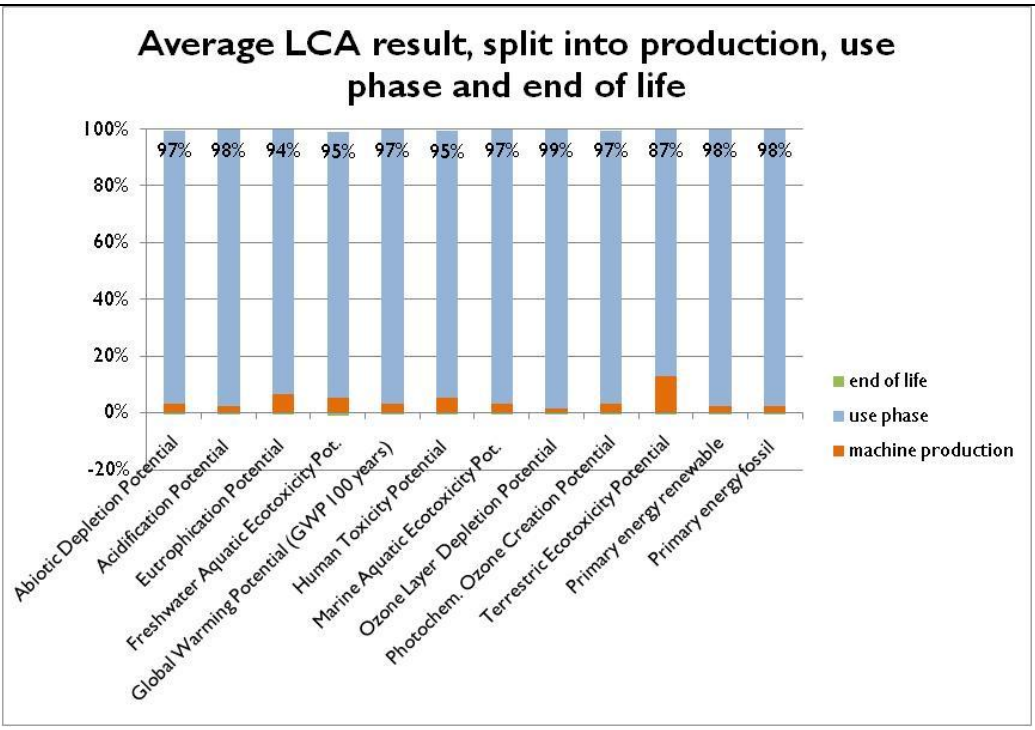
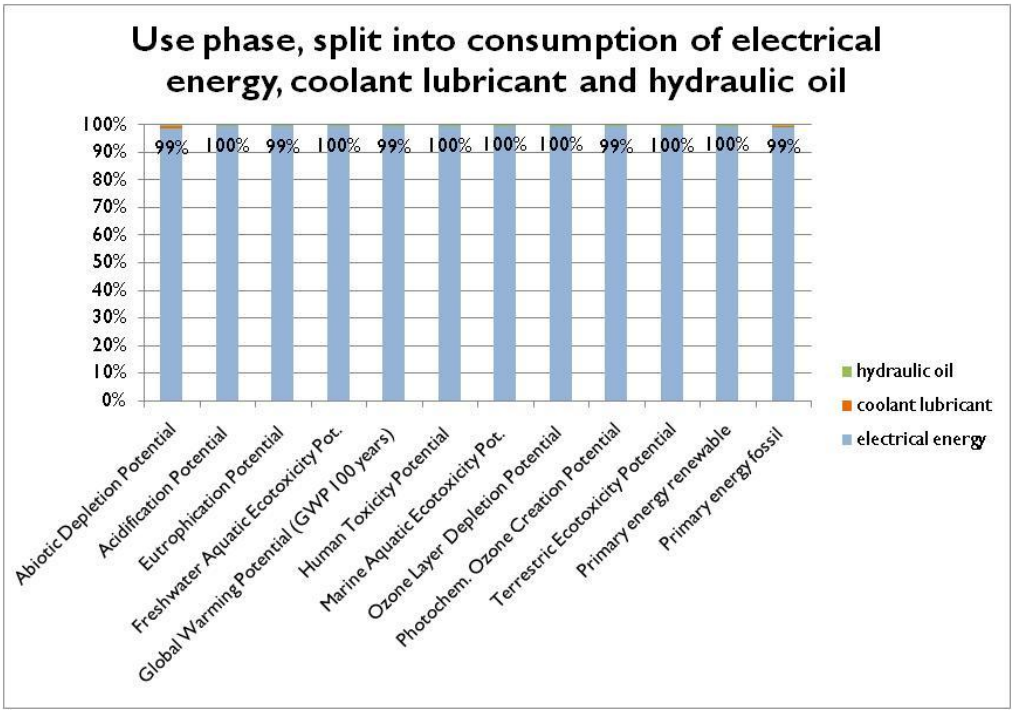
Project information			
PPP X Factories of the Future ❒ Energy-efficient Buildings ❒ Green Cars			
Topic/Title	**FoF.NMP.2012-1 Adaptive production systems and measurement and control equipment for optimal energy consumption and near-to-zero emissions in manufacturing processes**		
Project idea, objectives	Background On request of the European Commission, EPTA have carried out a research project which looks into the environmental impact of machine tools. EPTA represents the Environmental Engineers Consultancy firm. The results confirm that the machine tool sector can have a significant impact on the environment. Establishing a standardized and accepted methodology for the ecological design has, thus, become a crucial target for the industry. "Ecodesign" aims at improving the environmental performance of products throughout their life-cycle (production, use, and end-of-life) by systematic integration of environmental aspects at the early stage of product design. It is estimated that over 80% of all product related environmental impacts are determined during the design phase. A LCA (Life Cycle Assessment) has been carried out for machine tools on the request of CECIMO, in order to quantify their environmental performance. The Life Cycle Assessment (LCA) is an objective process which evaluates the environmental burdens associated with a product, process, or activity, by identifying the energy and materials used and waste disposed of. The assessment also has the function of evaluating and implementing solutions for environmental improvements. The results of the conducted LCAs show that the main impact on the environment is a result of the energy consumed during the use phase. The result is illustrated in the following diagrams, showing that more then 90% of the environmental impact is generated during the use phase:		



This diagram shows the LCA results over the entire life cycle as average from the 9 individual LCA studies



This diagram shows the LCA results of the use phase as average from the 9 individual LCA studies

However production of machine tool components should be investigated as well. It also needs a certain amount of energy (e.g. steel production, foundry,

	welding plants). In order to minimize this energy demand methodology for identification of the energy consumption division should be shaped. Adaptation of the production systems according to identified characteristics can lead to the improvement of energy consumption. The design of appropriate control equipment and its implementation into the machine tool systems are necessary to achieve significant improvement. <u>Objectives</u> In order to meet the targets of the reduction of CO2 emissions, the machine tool industry is seeking for a comprehensive solution which will be applicable for the whole sector. We need to reinforce the European leadership in knowledge driven methodology for improving the environmental reliability of machine tools. The objective of the project is to improve and optimize the environmental performance of machine tools and related machinery, as well as to identify a methodology of how to compare different machine tools with each other at first in terms of ecodesign. The industry needs a reliable and standardized assessment tool to indicate the quality of the performed ecodesign. Key performance indicators need to be identified. Such approach and developed tool can be also applicable for other industrial machinery. LCA does not allow to compare very different and complex products with each other. CECIMO's methodology is based on a modular approach, where the attention is being paid at first to individual modules and functions of a product. The modules can be introduced as for example functional modules. A recent research study shows that also a standardized calculation methodology of running costs related to the energy use is still lacking. There is also no system in place which allows different technologies of machine tools to be compared with each other in terms of their impact on environment and at the same time looking at their improved accuracy and reliability. Such knowledge should also be linked with general manufacturing processes in order to lead to holistic improvement of energy consumption of manufacturing. As the CECIMO research showed, the environmental impact of machine tools is mainly generated during the use phase while consuming electrical energy. Therefore, the project will emphasize this impact and special focus on these criteria will be paid. However, the goal is to develop a comprehensive measurement and control equipment, including the methodology for complex evaluation of machine tools which can also apply to other machinery. The control equipment should be suitable for a specific application. In order to achieve the best solutions the researchers will identify modules of machine tools and assign environmental potential values. In order to achieve it, several measurement techniques must be evaluated, as well as possible mathematical algorithms to investigate the most practical methodology for potential improvements. The target is to quantify the energy demand and consumption of the European Machine Tool sector and to define standards for energy – efficient machine design and usage. The development of a standard will be based on the industry's efforts within ISO to build up common guidelines for environmental friendly design of machine tools. It is important to set up a correct way of measurements applicable to complex products. The modeling will encompass material and components/ module properties and their variations to identify the impact of temperature, stress, and material used on the energy consumption. The research will include also possible

	sensors developments. The subject will provide an innovative method for knowledge capturing and intelligent models for details of design management. Subject for the research: • identification of methodology of modules (modular approach) • evaluation of the assignments of energy efficient improvement potentials for each module and identification and methodology of how values should be assigned to several modules should be set up. • identify key performance indicators of energy improvement potentials for each module • Evaluation of the best measurement techniques for the modules • Data acquisition software program development- a tool serving MT companies in collecting the energy consumption data on an anonymous base. The product will support the cross-disciplinary information sharing. Such software should facilitate companies in the collection of data and calculation of improvement potentials • Machine tool base case identification- best and least available technology • Best scenario identification • LCA evaluation for the appropriate management of the design • Evaluation of the procedure regarding the implementation and data transfer ensuring confidentiality while being open and having a transparent public information platform • Further development of a calculator and quantifying environmental aspects • Improvement of machining efficiency, Optimization of impacting factors, decrease of emissions in manufacturing processes (examples: the mass proportion, optimization of motor size) and assignments of the best scenarios The project aims at adapting the identification of energy efficiency to the needs of different technologies, mainly for the machine tool industry, but it should also be applicable to a large range of machinery for the benefit of energy efficient manufacturing processes. The research impact shall drastically improve the environmental reliability of machinery through the development of simulation techniques. They will be served by clear and easy to apply a methodology reinforcing the leadership of the industry on a knowledge driven platform. This will be achieved by setting up an appropriate engineering platform.
Partner search description **Type = Company/SME/Research organisation/university** **+ desired skills/knowledge**	
Partner 1	SMEs operating in machine tools and also other related machinery area
Partner 2	SMEs acting in the manufacturing area

Partner 3	Software developer
Partner 4	IMS scheme collaborators (SME and research)