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465.	AEAT	Please find attached the final report for a study on the UK Machine Tools market prepared by SKM Enviros on behalf of Defra's Market Transformation Programme (MTP), which supports Defra's Sustainable Energy using Products (SEUP) team. .... The objective of the study was to identify a baseline or reference scenario of UK energy consumption due to machine tools. You'll notice that a few key recommendations are made, I list these below for convenience: 1. Consider reducing the scope of products covered under any potential measures down to metal working machine tools only, as they comprise the most significant energy consumption, at least within the UK machine tools market. It is also believed that the reduced product scope would serve to make the assessment more transparent and simpler to interpret. 2. Consider increasing the number of base cases from five to eleven, in order that a more representative assessment of (metal working) machine tools is achieved. We hope that the outputs of this report will help inform the work of the preparatory study team.	SKM Enviros Report evaluated and referenced extensively in the revised Fraunhofer reports (relevant sub-chapters: 2.1.1, 3.2.1, 4.1.3, 4.1.4) The findings regarding power consumption of the UK stock is not taken into account when revising our reports as the UK report is based on a very drastic sales decrease in 2003, which is not plausible according to our insights, and discredits the whole UK power consumption model Reducing the scope of the study is against agreements made with and requirements defined by the EC Number of base cases has been increased from 5 (point of reference: first draft of task 5) to 9, which is already exceeding the contractual obligations.
466.	CTME	**Task 7** Since CTME (www.ctme.es) we would like to inform about available LCA-based documents regarding the supply chain methodology. This information shall be included on page 16, in the paragraph "A screening Life Cycle Assessment", in Task 7, if you deem it appropriate. Nowadays, there are common and harmonized calculation rules, so-called Product Category Rules (PCR) within the framework of the International Environmental Product Declaration System, EPD®system (www.environdec.com). The PCRs enable transparency for the EPD-development and also comparability between different EPDs based on the same PCR. The international EPD®system is a member of the Global Type III Environmental Product Declarations Network (GEDnet) and cooperate to achieve the GEDnet objectives. The International EPD® System has the ambition to help and support organizations to communicate the environmental performance of their products (goods and services) in a credible and understandable way. In this context, the PCRs are vital for the concept of environmental declarations and climate declarations. The International EPD®system is: offering a complete programme for any interested organization in any country to develop and communicate EPDs according to ISO 14025, and supporting other environmental declaration programmes (i.e. national, sectorial etc.) in seeking cooperation and harmonization and helping organizations to broaden the use of their environmental declarations on an international market. The international EPD®system is based on a requirement to use internationally accepted and valid methods for life cycle assessment (LCA). This requirement makes it possible to identify and focus on the most significant environmental aspects in a holistic perspective which leads towards continuous improvement. Another requirement of the international EPD®system regards the aspect of critical review, approval and follow-up by an independent verifier. You can download an example of environmental Product Declaration for milling machines in http://www.environdec.com/en/Detail/?Epd=8174 Focusing on machine-tools, there is a specific document for the assessment of the life-cycle environmental	Adaptation of task 1 and task 7

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		performance of UN CPC 44214 "Machine-tools for drilling, boring or milling metal", PCR 2012:2 v1.0. The document identifies the requirements and guidelines that must be taken into account in further LCA studies and in the environmental communications of products coded as CPC 44 214 (United Nations Statistics Division) and how LCA data should be calculated. PCR describes the harmonised LCA-rules for data collection, methodology, calculations, presentation of the results, use scenarios, definition of background data for upstream processes, system boundaries and cut-off criteria, functional unit, and so on. Of course, this methodology can be extrapolated to the rest of products, defined as machine tools, taking into account The General Programme Instructions and the PCR Basic Module for CPC Division 44 Special-purpose machinery.	
467.	CTME	Task 1 I would like to inform you about specific activities developed for the machine tools sector within the context of The International EPD® System, which could be included in the point 1.3.4 International Activities in the Task 1 Report-Definition, in future revisions, if you deem it appropriate: • In August 2011, two EPDs for a range of Bed-Type milling machines, whose builder is N.C. Manufacturing S.A. (Nicolás Correa S.A. Group) – Spain, were published under The International EPD® System. CTME developed the LCA studies in accordance with the standards UNE-EN ISO 14040 and 14044: 2006 series. (http://www.environdec.com/en/Detail/?Epd=8174). • Also, in January 2012, the product category rules CPC Subclass 44214: Machines-tools for drilling, boring or milling metal v1.0 was published. It was prepared by Nicolás Correa S.A. Group and CTME. It is based on our extensive experience in environmental assessment of capital goods -we developed our first LCA of a milling machine in 2005- and our current knowledge acquired in the simultaneous development of LCA studies of 16 milling machines, according to the ISO 14040 series of standards. In a totally altruistic manner and beyond the scope of the project, CTME opted for the transfer of this knowledge and we develop a document to identify the requirements and guidelines that must be taken into account in further LCA studies and in the environmental communications of products coded as CPC 44 214 (United Nations Statistics Division). (http://www.environdec.com/en/Product-Category-Rules/Detail/?Pcr=7945).	Adaptation of task 1 and task 7
468.	EUROMAP	**Task 7** We think that it is misleading to treat plastics and rubber machinery in task 1, concluding they are not machine tools, and then to discuss them again in task 7. This gives the impression, that plastics and rubber machinery are more relevant for the study than other "related machinery". Also the section 7.1.6.2 does not fit under the title “policy” where measures are discussed. Therefore we strongly recommend deleting section 7.1.6.2 completely. Plastics and rubber machinery are treated sufficiently in task 1.	Technical aspects addressed in task 7 now shifted to the screening chapter for plastics and rubber machinery in task 1
469.	CECIMO	**Task1 Definition** Page 7 CECIMO recognises that the definition of machine tools for the purpose of the study has been modified taking into account CECIMO’s official definition. Still CECIMO disagrees with the general definition: *[…]* The official metalworking machine tool definition according to CECIMO nomenclature is as follows: “A metalworking machine tool is a power driven, not portable by hand, powered by an external source of energy, designed specifically for metalworking either by cutting, forming, physico-chemical processing, or a combination of these techniques”. As communicated earlier, this is a definition accepted by the industry and used for the biggest European machine tool exhibition EMO. Such separated definition including only machine tools for metalworking needs to be reflected as a separated definition in the general definition of machine tools. This also needs to be reflected in the executive summary. We	As the scope of the study is broader than metal working machine tools only an overarching scope of the study needs to be defined, which also meets the specifics of the other sectors. Hence, the wording slightly deviates from CECIMO’s official definition, but with respect to metal working machine tools, both, the study’s and CECIMO’s definition are almost synonymous. No changes in the report.

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		would like to draw your attention to fact that the future standard ISO 14955-1 will use a more restrictive definition of machine tools not including woodworking machines as well as welding equipments.	
470.	CECIMO	We disagree on including in the definition that a machine tool is “transportable”;	”Transportable” is part of the overarching definition of “machine tools” as it was explicitly intended to cover products, in operation at changing locations, but parts or the whole assembly are floor standing (i.e. welding equipment) or fixed to any other fixed installation (e.g. table top devices). Products portable by hand (“devices, which are completely carried by the operator when in use”) are explicitly excluded.
471.	CECIMO	[Page 52 Table 1-14] „Power consumption“ , „energy consumption“ and „energy (total)“ should be replaced by the terms “electricity consumption” to have coherence in unit values.	Done
472.	CECIMO	[Page 53 Table 1-15] The values are given in [TWh], while in Table 1-14 page 52 all values are expressed in kwH. The data should be indicated in a homogenous order to allow comparison, and energy should be expressed in Petajoules, not in kWh/TWh.	Table 1-15 adapted, but distinction of kWh and PJ remains: end energy throughout the study is stated in Wh, whereas primary energy is stated in J, corresponding also with MEEuP and related calculation schemes.
473.	CECIMO	[Page 53] *Data for 2008 and 2009 is provided in Table 1-15 with electricity consumption of 1.135 TWh in 2008 for the industry in EU-27, thereof 163 TWh for sectors machinery and transportation equipment, which are those, where metal working machine tools are used, and 28 TWh in sector wood and wood products, covering woodworking machinery. Machine tools in these sectors should consume significantly below 50% of the total energy consumption in these sectors (rather 10-30%), as a major share of electricity is used for thermal processes, infrastructure, material handling, surface treatments and coatings etc.* Comment: The plausible consumption assigned to metalworking machine tools should amount to 16.3 – 48.9 TWh, and not 75-110 TWh. There is discrepancy between the implied consumption of metalworking machine tools- CECIMO estimation based on information provided in the table 1-15 (as provided by Fraunhofer Institute) is 16.3 – 48.9 TWh based on the following calculation: 163 TWh * 10% or 163 TWh * 30%. The Fraunhofer Institute“ s estimation, which is based on table 1-14, provides the following information: 75-110 TWh. Clarification as regards the differences needs to be included in the study itself. The electricity consumption calculated by Fraunhofer must be realistic, i.e. correspond to the available, official statistics. The control of the electricity savings achieved by the machine tool industry will be checked in the future against the numbers from the official statistics. Any percentage target for electricity savings based on wrong and overestimated electricity consumption would be harmful to the machine tool industry.	It is agreed, that there is a discrepancy between the electricity consumption calculated with a bottom-up approach (as in table 1-14) and a top-down approach (based on table 1-15). This discrepancy cannot be resolved at this stage of the study.
474.	CECIMO	**AnalysisTask 2 Economic and Market** [Page 3]	Findings of task 2 overrule screening in task 1, disclaimer added in task 1, reference in

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		…3,5 million metal working machine tools, thereof 750.000 CNC machine tools… Comment: Task 1 mentions 2-3 millions of metalworking machine tools, which seems plausible.	table 1-14
475.	CECIMO	[Page 5-6] *From the 2009 figures different scenarios are possible:…* Comment: Production for 2010 and 2011 is available; scenarios should be updated accordingly. Although we see the recovery in production, the growth is driven by Asian markets, where the demand is growing much faster than in the EU. A clear distinction between production and consumption (market) needs to be applied. The study relies on the stock estimation, which is more linked to the consumption than to the production.	Only 2010 data available yet through Eurostat. New Annex now compares our forecasts with these new data, but overall data model remains unchanged, as differences (related to total stock figures, although not for 2010 sales figures) is marginal. For this study consumption in the EU27 is most relevant (what enters the EU27 market?), not production going abroad.
476.	CECIMO	[Page 8] *The World Machine Tool Output & Consumption Survey by Gardner Publications, Inc. (see Table 2-1) shows global market shares of EU countries in terms of production of machine tools per country: Largest producer in 2008 was Japan…* Comment: The description refers to 2008 while the table shows 2009 and 2010 data.	corrected
477.	CECIMO	[Page 10] *…Looking at the production and consumption data for metal processing machine tools for the years 2001-2008…* Comment: 2009, 2010 and 2011 data is available	No update needed, no changes to major trends.
478.	CECIMO	[Page 10 table 2-3] CECIMO 2011 production amounted to 21.161 million Euros.	added
479.	CECIMO	[Page 25 – table 2-9] A split into NC and non-NC is needed. 65.046 Euros per unit is a very high price for non-NC and very low for NC.	Not needed here as “consumption” is much more relevant than “production”, which is listed in this table but is only a calculatory figure for the consumption stock model later on, where a split CNC / non-NC actually is provided.
480.	CECIMO	[Page 35 Table 2-13] Zero level of installed stock is not correct and difficult to interpret. This applies to hydraulic and non-hydraulic presses (1995) bending, folding and straightening machines (1995 and 2009), even though the Footnote 20 is correct. CECIMO advises to put the estimated number of installed machine tools where currently zeros appear. The footnote should say then that the number is estimated because of a change in the nomenclature.	replaced by “not applicable”, footnote amended accordingly
481.	CECIMO	[Page 38 Figure 2-5] The figure indicates that there are more than 3.5 Mln installed metalworking machine tools in 2008 while we can read in the table 1-14 of Task 1 that there is 2-3 Mln stock of metal working machine tools. The study needs to be revised and the numbers corrected/synchronised.	Findings of task 2 overrule screening in task 1, disclaimer added in task 1

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482.	CECIMO	[Page 68 table 2-29] [Page 44] *… These assumptions result in a stock development of metal working machine tools as depicted in Figure 2-7: The total stock will reach 2.8 million units by 2020 and will remain on this level also in 2025. The share of CNC machine tools will slightly exceed 800.000 units, but complexity and productivity of these will increase further.* Comment: Table does not correspond with the description and chart provided on page 44. The stock should decline from 3.5 million to 2.8 million, while in the table it is growing.	Table revised accordingly
483.	CECIMO	**Task 3 User Requirements** [Page 8] *Although there is some evidence that eco-design and eco-performance is a growing marketing aspect … it has to be concluded that the mainstream industry is not yet following that trend.".* Comment: The Fraunhofer Institutes study has named and listed the last developments and energy efficient relevant actions undertaken by the machine tool industry. CECIMO can see that there is understanding that energy efficiency became a trend which the machine tool industry follows. Relevant information is communicated to the end users. Still the above presented conclusion seems to be left unchanged after the last development and findings of the study. As agreed during the 3rd stakeholder meeting, CECIMO calls for modification of this statement.	statement modified: *Eco-design and eco-performance is a growing marketing aspect (this has been indicated by the well frequented workshops and events on energy efficiency of machine tools in 2010), but energy saving measures are mainly driven forward by large-scale producing branches such as the automobile industry. Major enterprises implement life-cycle oriented energy saving measures increasingly, whereas SME remain reserved and sceptical due to indistinct financial benefit of eco-solutions.* list of "initiatives with respect to energy efficiency" completed (according to presentation: 3rd stakeholder meeting): *2011: The Association of Italian Manufacturers of Machine Tools, Robots, Automation Systems and ancillary products UCIMU developed the label "Blue Philosophy"; "Blue Competence" is operated by VDMA and addresses mechanical- and plant construction.* *2012: "Blue Competence" is operated by CECIMO and addresses metal working machine tool manufacturers and their suppliers throughout Europe.*
484.	CECIMO	**Task 4 Assessment of Base Case** [Page 10] In the study it is specified that the application related approach takes into account the application environment including number of shifts. In order to be able to compare the assessment of base cases it is essential to use for the input data the same number of shifts for all investigated base cases. It is of high importance as the use of the machinery depends on the end user and not on the manufacturer itself. In our understanding, any conclusions based	Base Cases are meant to reflect production reality wherever possible, to allow an assessment of the total impact of individual market segments and the market as a whole. Use patterns (and thus typical shift models) are an essential part of this assessment,

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		on these investigations are rather to address the manufacturer then the end user, therefore the assessment of base cases should be performed in a way which takes into account only tasks manufacturer can have impact on. Number of shifts is outside of such action. Misuse of the input data can lead to misleading conclusions.	regardless whether a manufacturer has an impact on these. Normalisation of the use phase is not foreseen by the methodology.
485.	CECIMO	**Task 5 Addressing the Best Available Technology and 'not yet' Available Technologies** [Page 6] *There are some approaches, which address non-energy related improvements, including media consumption, mass reduction, and productivity increase* Media consumption, mass reduction, and productivity increase is significantly related to the energy use. CECIMO agrees with the statement that "Eco-design solutions have to consider conditions of application" CECIMO agrees that "Feasibility and sustainability of any option has to be assessed carefully for the intended application"	No changes required
486.	CECIMO	[Figure 5-14]: EDM benchmark workpiece layout Please include as a source of the information CECIMO (please see Cecimo comments on Fraunhofer study_201104)	Text revised accordingly.
487.	CECIMO	[Figure 5-15] Please include as a source of the information CECIMO (please see Cecimo comments on Fraunhofer study_201104)	Text revised accordingly.
488.	CECIMO	[Figure 5-16] Please include as a source of the information CECIMO (please see Cecimo comments on Fraunhofer study_201104)	Text revised accordingly.
489.	CECIMO	**Task 6 Improvement Potential** CECIMO agrees with the statement that "There is no single option with huge environmental potential". Some conclusions are made for groups of machine tools while other conclusions specify to which group they refer. This could be still improved to receive clarity of the findings.	Task 6 stringently follows the base case structure and provides findings and conclusions per base case, which to our understanding already reflects best the specifics of the machine tools archetypes assessed. No adaptations.
490.	CECIMO	CECIMO draws the attention of Fraunhofer Institute that all available and used for the Fraunhofer Institute study data are coming and represent state-of-the-art European manufacturers, while there is a range of imported products which environmental quality level is unknown. It must be concluded that any recommendation for measures as regards to the machine tool industry must take into account this situation not to harm the European economy and ensure equal level playing field.	Text added in chapter 6.1
491.	CECIMO	**Task 7 Policy and Impact analysis** CECIMO very much agrees that the final judgment, whether an option is suitable for a given application would remain with the machinery developer.	No changes required
492.	CECIMO	[page 28] CECIMO agrees with the statement that there is no clear indication, that an energy efficiency label could provide the required by end user information. Moreover: The energy efficiency labeling is not a suitable option for metalworking machine tools for several reasons, namely: • it is not supported by an ISO standard for measures • it makes comparisons between machines with different technical characteristics • the mentioned criteria is correct for B2C products, where the final task is simple and defined • it doesn'tt take into account specific customization and requirements to satisfy the end users needs • it can create confusion and misuse for non- technical stakeholders	Text amended accordingly

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		• taking into account the customization of the products which leads to meeting the specific requirements given by the end user, labeling is not a suitable tool and does not meet the need of the customer	
493.	CECIMO	[Page 28] *Furthermore, the long use time of machine tools results in a high number of inefficient machine tools (particularly in the non-NC segment) being in operation also for the midterm future.* On the contrary- if a machine can be in use for a long time and taking into account the upgrading tendencies, the environmental footprint of such machines should be considered more energy efficient than any other product which after a short use period of time needs to be replaced.	Statement added as a footnote. Comment might be correct for some cases, but a detailed analysis of this aspect (lifetime vs. energy efficiency) has not been undertaken yet.
494.	CECIMO	[Page 30] CECIMO agrees with the statement that Minimum environmental performance criteria on the component / module level could be defined, if an environmental performance can be correlated with a distinct technical performance, hence sub-assemblies / components could be regulated, whereas “functional modules” but also complex physical modules do not qualify for setting such minimum performance criteria.	No changes required
495.	CECIMO	**Additional remarks** Although the study states that indeed in case of metalworking machine tools the productivity aspect is of crucial importance as well as the fact that machine tools are customized products, we are missing reflection on this aspect in the study itself. The methodology of the study does not allow including this aspect in the assessment.	See task 5 where the aspect “productivity” is addressed as one of the major efficiency measures. In Task 7 the aspect productivity is addressed repeatedly and in particular by the discussion about the reference unit for any consumption figure (time period, test cycle, test workpiece), which could reflect productivity, if the product output is made the reference unit. However, it is right, that no dedicated productivity benchmark could be identified by the study.
496.	CECIMO	In addition to that, machine tools are business to business products which include the purchase of machine tool services like maintenance, training, upgrades. It is not only the product itself. This is still not reflected in the study.	Importance of services for energy efficient use is agreed, but can hardly be tackled by policy measures except one: Financial support for related upgrades, retrofitting, training (paragraph added in 7.1.3)
497.	CECIMO	Another important aspect is that there are improvement potentials which we do not know today but which will become available in the future. This goes together with innovative spirit of the sector and it will have enormous impact on the cutting of energy consumption.	Text revised accordingly.
498.	CECIMO	updated extended results of CECIMO **SRI inquiries for investigation on energy saving potential for several measures applying in the machine tool design for**: - Inquiry on cutting machine tools - Inquiry on Servo presses and mechanical presses - Inquiry on Hydraulic presses The attached document consists **of summary of all the answers including those submitted last year. However the current** data base **has been extended by** contribution of 12 manufacturers working within cutting machine tool technology. In total, manufacturers which contributed are located in Czech Republic, Germany, Spain, Italy, Switzerland, France and Austria.	New data for cutting machine tools documented now in a new sub-chapter in task 5, and referenced in a footnote in 6.1.1.1.

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499.	IK4-Ideko	**Task 5 – Page 16** *A further possibility to reduce weight is the use of polymer concrete structures for machine beds. Compared to steel structures they offer favourable characteristics in terms of stiffness, heat conductivity and damping.* The use of polymer concrete in machine beds does not reduce the energy consumption during the use phase because machine bed is steady part of the machine. Impact of manufacturing of machine is well known as having a reduced impact in life cycle cost. Moreover, the specific elastic modulus (Youg modulus / density) of mineral casting is smaller than those of steel and spheroidal graphite cast iron and similar to that of grey cast iron. Underlined sentence is not correct, and the rest is arguable and design-dependant	Stiffness as favorable characteristic deleted. Clarification added that the discussion concerning environmental impact refers to the manufacturing phase.
500.	IK4-Ideko	Task 5 Table in page 17 The full table is very arguable and sometimes, not true Stiffness is equivalent to Young modulus. Mineral casting: 40-60Gpa Grey cast iron: 110-130GPa Spheroidal graphite cast iron: 175GPa Steel: 210GPa So, it is not true that stiffness of mineral casting is very high compared to metals. Dampening: it is true that it has better specific dampening than metals, but all studies demonstrate that dampening of machines comes from links between parts, and not from specific damping of structural materials (Koenigsberger and Tlusty, 1971). Slocum (Slocum, 1994) explains these damping properties of joints by the effect of micro-slidings in the interface. Thermal stability: the only objective and relevant parameters of thermal behaviour of a material are specific heat, conductivity, density and coefficient of thermal expansion. Fast or slow reaction can be obtained based in the design (mass), and can be good or bad depending on the applications and the boundary conditions. Design freedom: As a matter of fact there are design restrictions. Volumes cannot be too compact, there has to be a balance between volume and surface, because curing of resins is an exotermic process, and, thus, there could be damages if the heat cannot be dissipated, even ignition could be produced. Thickness of walls is also constrained by the grain size and britellness of material. And last, tensile stresses have to be avoided or reduced drastically since the resistance is really small. Lead time is much longer in cast iron than in welded steel in general, even if these aspects are very dependent on technologies employed and logistic aspects.	Figure 5-5 revised accordingly
501.	IK4-Ideko	Task 5 page 19 *The results of the LCA study followed (based on Eco-Indicator99) for comparison of the current steel welded structure and the polymer concrete alternative are presented in Figure 5-6, and clearly confirm polymer concrete as a far more eco-friendly solution than the current welded-steel solution* Is this relevant to the objective of the study? The effect of manufacturing impact in the whole life cycle of machine tools is accepted as negligible according to all studies. In Task 1 report it is even noted that "The screening of machine tools properties against environmental parameters as listed in Annex I of the ErP Directive indicates highest relevancy of energy consumption in operational and non-operational modes, and a moderate relevancy of lubricants' consumption, ease for reuse and recycling, extension of lifetime, waste generation related to the use phase (production waste), emissions to air (saw dust, welding fume...)" Also, CECIMO, Concept Description for CECIMO's Self-Regulatory Initiative (SRI) for the Sector Specific	Indeed, manufacturing as such is much less relevant than energy consumption in use, but in case of polymer concrete one single measure might have a similar effect than any of the numerous incremental energy consumption improvement options. Therefore it is a viable technical option. Furthermore, other stakeholders explicitly insist on considering such options as well. No changes required

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		Implementation of the Directive 2005/32/EC (EuP Directive), 2009 demonstrates this asertion. If this is accepted, mineral casting is not a BAT nor a BNAT.	
502.	IK4-Ideko	Task 5 page 39 *Energy optimized engineering of the machinery:* *More strategies* Use of pressure boosters: Minimize element's working pressure and use pressure boosters on elements where higher pressure is needed.	Text revised accordingly
503.	IK4-Ideko	Task 5 page 39 *Efficiency can be improved by:* *• Treating air to the minimum required standard* *• …* One more efficiency improvement strategy: • Use of differential manometers or element service indicators for filter element status monitoring in order to reduce pressure losses.	Text revised accordingly
504.	IK4-Ideko	*Task 5 – page 41* *More strategies:* • Pressure reduction / air cut-off on non-productive time: Generally, low pressure is enough for maintaining sealing systems etc. when the machine is turned off or in stand-by state. • Sectorization of the pneumatic circuit: All the pneumatic circuit is not operative while the machine is producing. Sectorizing the circuit will allow shutting-off those pneumatic elements that are not working and thus reducing/eliminating the leaks of those elements.	Text revised accordingly
505.	IK4-Ideko	Task 5 – page 42 *Air ejectors: Air ejectors with a Venturi-type nozzle deliver the same performance with up to 30 per cent less air*. Not only fitting Ventury-type nozzles but optimizing blowing distance, pressure and impact pressure and radius.	No changes required
506.	IK4-Ideko	*Task 5 – page 42* *More strategies:* - Vacuum systems: Using Venturi-type nozzles with correct operating pressure at minimum time will use 20% less air. When using this systems with control valves the air consumption reduces to 92%. - Variable speed compressors: Adaptation of the speed of the compressor to the pneumatic requirements of the process. - Start/Stop system for compressors: Electronic controlled start/stop strategies for compressors which are not necessary for completing the task because of low air demand.	Text revised accordingly
507.	IK4-Ideko	**Task 6** – Page *Furthermore, for simplification measures are not listed here, for which very high implementation costs have been stated, which constitute a basically changed processing concept (e.g. Minimum Quantity Lubrication)* If the system/rules/standard developed is not able to process radical changes, is it appropriate?	"radical changes" are permissible, but the directive explicitly excludes measures, which impose excessive additional costs No changes required
508.	IK4-Ideko	**Task 7** – Page 8 *For some applications further media are relevant, such as* *• Pressurized air / vacuum consumption* *• Cooling lubricant consumption*	Yes, also (significant) resource consumption other than energy is relevant under ErP No changes required

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		• *Welding gas consumption* Is this relevant to ErP Directive? I assume it is only as far as presurizing air and pumping coolant and gas consume energy, but only because of that. From my point of view, this is not clear.	
509.	IK4-Ideko	**Task 7** – Page 14 Therefore a standardised life cycle costs calculation, including electricity and media costs should be provided by the machinery manufacturer, unless the purchaser specifies a life cycle costing scheme of his own. The only standard available currently is VDMA Einheitsblatt 34160:2006, for which VDMA also provides a comprehensive Exceltools for calculation If this "only standard available" is referring to the life cycle cost analysis, I think ISO 14040 should be mentioned. I consider ISO 14955 should be mentioned, even if it is still under preparation.	ISO 14040 and ISO 14955 do not cover Life Cycle Costing, these standards are referenced elsewhere in the report in a suitable context. No changes required
510.	IK4-Ideko	**Task 7** – Page 22 *Taking the amount of material removed as a basis to assess cutting machine tools would incentivise machine tools with a high removal rate at low accuracy.* Yes, this is true, but the user will keep care for the rest of requirements of the machine. A machine which is able to remove more material with the same amount of energy is more efficient than other consuming the same energy but at lower material removal rate. The directive has to aim at incentivizing these efficient machines.	Wording revised.
511.	CETOP	new proposal (respectful of all available technologies included pneumatics) for the paragraph 5.1.5.1. Clamping devices: Clamping tools can be designed e.g. as hydraulic or pneumatic or electro-mechanical clamping devices. Which technology the machine tool manufacturer chooses depends on several factors e.g. dimensions and weight of the work piece. Other aspects are the reliability or the durability reached by applying maintenance measures. Electro-mechanical as well as hydraulic or pneumatic systems can be optimized e.g by avoiding the energy consumption in idle conditions. For hydraulic systems this can be done by storing energy e.g. in accumulators or by using load sensing pump systems (see numerous options mentioned in chapter on hydraulics).	Following another round of discussions with CETOP and VDMA Fluidtechnik finally a consensus for a revised wording of the part on clamping devices in 5.1.5.1 was achieved. Text revised accordingly.
512.	VDMA Fluid Power / Power Transmission	**Task 4: Report – Assessment of Base Case** After our estimations the following data has to be corrected as follows: Page 38-39 Table 4-16 Pos. nr. 222 To auxilliary material 1 consumer amount is less than 10 liters/year. (cooling fluid) Pos. nr. 224 To auxilliary material 3 consumer amount is less than 25 liters/year.	Consumption of hydraulic oil has been adapted accordingly, that of cooling lubricants not, see newly introduced footnotes
513.	VDMA Fluid Power / Power Transmission	Page 46 Table 4-20 Zeile 224 Pos. nr. 224 Expected amount is 100 kg/year.	It is assumed, that this comment refers to hydraulic oil consumption, which is already included in the row above (108 kg). Text added for clarification.
514.	VDMA Fluid Power / Power Transmission	If there is no data available do not use the number zero, replace by "no data". For example page 103 Table 4-58: 28413350	Replaced by "not applicable"
515.	VDMA Fluid Power / Power Transmission	**Task 5: Report – Technical Analysis BAT and BNAT** Page. 34 5.1.6.1 Introduction In the field of hydraulic systems, several products featuring environmental improvements are already placed in the market. Either on-off mode or variable speed drive can be used to reduce the energy	Text and diagrams revised accordingly

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		consumption of those systems. ~~A Japanese manufacturer of hydraulic and electric systems78 developed hydraulic units specifically for metal working machine tools, which incorporate optimized electronic motor control functions and causes low heat dissipation.~~ Deriving from case study results for a NC milling machine and a machining centre, two thirds of the overall energy consumption compared with a conventional pump could be saved.79 The characteristic power consumption for both machine tools is depicted in Figure 5-9 and Figure 5-10. As the illustration indicates (especially Figure 5-10), major savings are achieved by reducing the base load~~, which is principally due to the variable speed drive of the motor. To leverage the effects of saving benefits, some hydraulic units are additionally equipped with idle stop functions in which the pressure level is maintained. According to the manufacturer, the power consumption is reduced by 95 % compared with a conventional pump.80~~ Replace diagrams with the figures delivered by Mr. Scheidt, Hydac International for the VDMA Fluidpower (European Company). Since many companies offer technologies which lead to less energy consumption it is not necessary to cite a japanese manufacturer.	
516.	VDMA Fluid Power / Power Transmission	Page 40 5.1.6.3 Pneumatic Modules/Systems Pneumatic Cylinder with optimized drive surface and Pneumatic Cylinder with multiple chambers are both BNAT and therefore should be shifted to the paragraphs BNAT. 5.2…	To maintain the structure of Task 5, the option is not shifted to BNAT, but explicit reference is added.
517.	VDMA Fluid Power / Power Transmission	Page 41 **Using exhaust air:** …. Given the complexity that this approach adds to the machinery design, and the limited energy savings which could be achieved in theory (no realisation of such a system is known as yet)~~ this option will not be evaluated further.~~ Should be shifted to BNAT 5.2 because this technology is not yet available on the market.	To maintain the structure of Task 5, the option is not shifted to BNAT, but explicit reference is added. Due to low appliance in industry, it remains justified that this option will not be evaluated any further
518.	VDMA Fluid Power / Power Transmission	Page 42 **Blow Guns:** Blow Guns are versatile in their usage and commonly used to clean components and surfaces. Having the Blow Gun fitted with a Venturi-type nozzle delivers the same performance with ~~with up to 30 per cent~~ less air. **Air ejectors:** Air ejectors with a Venturi-type nozzle deliver the same performance with ~~up to 30 per cent~~ less air. From our point of view it cannot be estimated up to which percentage less air is necessary.	Source of percentage value: Festo Text added: “The VDMA states that the reduced use of air cannot be assessed exactly.”
519.	VDMA Fluid Power / Power Transmission	Page 48 **Vegetable oils as lubricants~~and hydraulic fluids~~:** Under the reformulation of additives, chemical and genetic modification, vegetable oils (e.g. canola oil, coconut oil, olive oil, palm oil, soybean oil, etc.) may substantially substitute petroleum-based lubrication ~~and hydraulic~~ fluids in the long run.109 ~~According to a comment by CETOP vegetable oils are not suitable for hydraulic systems in machine tools as the oil will be hardened after a short time of use because of the high temperature.~~ The chapter is for cooling lubricants, see also comment 458 given by CETOP.	Text revised accordingly.
520.	VDMA Fluid Power / Power Transmission	Page 67 5.1.12.4 Hydraulic-free machining centres 3rd paragraph In one specific case ~~The~~ the shift from a hydraulic system to all-electromechanical results in energy savings of 4 % for ~~the~~ this machining centre and the technical adaptation does not result in additional costs.161 It is argued, that	Text revised accordingly

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		machinery internal electromechanical clamping systems might be limited by work space constraints, compared to hydraulic systems which can be placed external to the machine tool, thus not limiting the work space. This might be a decisive criterion in certain applications. Furthermore, optimised hydraulic systems with e.g. two-way pilot valves, which permanently maintain the required pressure, result as well in power savings, if coupled with appropriate power management measures. Thus, measures to reduce power consumption in idle times of hydraulic systems and components is key to achieving significant energy savings also with hydraulic systems, which leads to the conclusion, that hydraulic-free machine tools cannot be considered as Best Available Technology per se, but the specific application scenario and required performance has to be considered with due care. In particular for applications, where the higher achievable body force of hydraulic systems is essential, hydraulic-free machine tools are not an option at all162, and safety requirements of ISO 13849 partly cannot be met by electrical clamping devices and other electrical components. It has to be emphazised that the energy savings are only for this special case and cannot be generalised.	
521.	VDMA Fluid Power / Power Transmission	**Task 7: Policy and Impact Analysis** Page 17 Measure is in conflict with another measure with a higher impact (e.g. implementation of an electrical drive ~~a variable speed drive pump for a hydraulic system~~ which simultaneously could be replaced by ~~an electrical one~~ a variable speed drive pump for a hydraulic system), correlation to be explained. Alternatively: Implementation of energy efficient axis-drive which simultaneously could be replaced by counter weight balance.	Text revised accordingly
522.	VDMA Fluid Power / Power Transmission	Page 24 The Blue Competence initiative recently was extended to the European level for metal working machine tools, operated now by CECIMO. On the German level, initiated by VDMA, this initiative covers many more sectors than only metal working machine tools, ~~namely also~~ e.g.[7] add fluid power, plastics and rubber machinery, … List is outdated. E.g. Fluid Power and plastics and rubber machinery are within the VDMA Blue Competence initiative; please see the webpage http://www.bluecompetence.net	Text revised accordingly
523.	HYDAC	wie in der letzten AK-Sitzung bei VDMA abgestimmt, sende ich Ihnen zwei Graphiken, die die Energieeinsparmöglichkeiten bei der Verwendung von einer Speicherladeschaltung im Abschaltbetrieb aufzeigt, im Vergleich zum drucklosen Umlauf. Die Betrifft Punkt 5.1.6.1 s.u. Ich bitte Sie dies entsprechend zu Berücksichtigen und die Graphiken 5-9 und 5-10 zu ersetzten.	Text and diagrams revised accordingly
524.	BFPA	5.1.6.3 – page 40 - **Pneumatic Cylinder with multiple chambers:** Multiple chambers in pneumatic cylinders are useful if multi-purpose processes are at hand. In this regard, the adequate chamber will be selected according to how much lifting force is required for the operation. At the moment, the implementation of this measure is hampered due to a shortened product life which needs to be solved at first. Accordingly, the option is to be considered a best not yet available technology. This paragraph needs to be modified as the statement referenced is false. Amend paragraph:	Text revised accordingly.

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		"Multiple chambers in pneumatic cylinders are useful if multi-purpose processes are at hand. Selecting a duplex or triplex actuator where a double or triple piston arrangement offers twice – three times the normal force from the operating pressure allows for pressure reduction."	
525.	BFPA	5.1.6.3 – page 41 - **Pressure reduction (system)**: Inclusion of localised pressure boosters Amend paragraph: "Dependent upon the application, a reduction of the system air pressure level by e.g. 1 bar can reduce air consumption without unwanted performance losses. Targeting a pressure reduction to the majority of equipment may allow the use of a pressure booster to smaller air consumers at higher pressure requirements (for example pneumatic clamps)."	Text revised accordingly, also see comment 502.
526.	BFPA	5.1.6.3 – page 42 - **Blow Guns:** Multi stage Venturi guns should be added. Amend paragraph: "Blow Guns are versatile in their usage and commonly used to clean components and surfaces. Having the Blow Gun fitted with a Venturi-type nozzle delivers the same performance with up to 30 per cent less air. Using multi stage Venturi-type nozzles can operates at 150% efficiency."	Text revised accordingly.
527.	BFPA	5.1.6.3 New paragraph – **Materials**: Proposal to highlight choice of material and optimised light weight design Add paragraph: **Materials**: "Ensure the component weight is taken into account when sizing a system. Heavier components can have the effect of oversizing a system	Text revised accordingly.
528.	JMTBA	**Task 7** - Page 5 of 52 1st line "10% less energy-consuming than in 2010" is a target by which the manufacturer should work. But it is very difficult target for the machines to whom energy efficiency has already been raised.	This "10%" calculation is meant as a theoretical target for the industry as a whole; how such a target would be allocated to individual manufacturers would be up to the signatories of a voluntary agreement
529.	JMTBA	**Task 7** - Page 14 of 52 21-29th line Question: Concerning the circulation of life cycle costs, VDMA Einheitsblatt 34160:2006 is shown as the only standard available currently. In the future, will this standard become a calculation standard common in Europe?	To be decided by the policy makers or signatories of a voluntary agreement. We only indicate, that there is such a scheme for harmonized LCC, but this does not mean LCC will become mandatory.
530.	JMTBA	**Task 7** - Page 20 of 52 8th line ~ 23rd line of Page21 Though common test workpieces have been described in this item, we think that a very difficult problem. Even if each manufacturer in each country collects the machining data by different workpieces, the consumer and industry can be expected to be confused.	Comment added as a footnote.
531.	EWA	4.1.3.9 - page 56 - §4 200A * 23,8V = 4,8 KW Change 4,8 W to 4,8 KW	done
532.	EWA	5.1.10.1 - page 52 - Table 5.7 The values given in the table 5-7 are only applicable to arc welding equipment. The resistance welding equipment can not be compared (see Task 4 table 4-85) as the transformer used is designed by its thermal performance in	Text revised accordingly

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		order to allow very short welding time with very high welding current. Change table title to: Table 5-7: Typical Efficiency Levels of **Arc** Welding Power Sources And reference to it: Table 5-7 lists typical efficiency levels of **arc** welding power sources	
533.	EWA	5.1.10.1 - page 52 - Sentence before Table 5.7 IEC 60974-1 is under maintenance review (including annex M). Annex has been introduced in IEC 60974-1:2005 edition. Change last sentence prior table 5-7 to: Note that the standard for measuring welding power source efficiency **has been published in 2005** (Annex M of IEC 60974-1 ed.3).	Text revised accordingly
534.	EWA	5.1.10.1 - page 53 - 2nd sentence Next § after Table 5.7 Information given in this clause are only applicable to arc welding equipment. Furthermore the best achievable efficiency may be obtained at maximum welding current, at 60% or at 100% duty cycle welding current, depending of technology used. Change 2nd sentence to EWA estimates the maximum achievable efficiency for **arc welding power source** might be 90%.	Text revised accordingly
535.	EWA	5.1.10.1 - page 53 - Next § after Table 5.7 The best achievable technology is not applicable to all welding process type. For example, TIG, Plasma, some new MIG low energy process are using AC welding that request an additional conversion DC/AC in the power source. Another example is resistance welding where transformer is designed by thermal requirement of short welding cycle and not at maximum current at 100% duty cycle. Add a new paragraph with: **Such efficiency increase will not be achievable for:** **- AC arc welding power sources that needs a second DC/AC converter (additional loss) to reduce frequency of the current intrinsically delivered by the inverter power source to a frequency compatible with the welding process;** **- resistance welding power sources that are designed in accordance with the thermal requirement of short welding cycle (typically below 1 second) and not for maximum current at 100% duty.**	Text revised accordingly
536.	EWA	5.1.10.1 - page 54 - Last sentence Depending of the temperature of the power source, the fan may be on during idle mode (see definition in Table 7-2) in order to reach cold state before the next welding period. The fan automatically stops at cold state. Change to: Air-flow cooled welding units can feature a fan, which is switched off, when equipment is in idle mode **and at cold state**, which allows reduced power consumption in this mode[124].	Text revised accordingly
537.	EWA	5.1.10.2 - page 54 - Table 5.8 As indicated in the text that refers to table 5-8, the values are only applicable to ARC welding equipment. Change table title to: Table 5-8: Heat Transfer Rates of **Arc** Welding **Processes**	Text revised accordingly
538.	EWA	5.1.10.3 - 1st bullet list Main source of gas consumption is the bad maintenance of gas circuit, e.g. leakage, damaged hoses, old hoses.	Text revised accordingly

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<table>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><th>No.</th><th>Stakeholder</th><th>Comment (justification for change)</th><th>Response / implemented changes</th></tr>
<tr><td></td><td></td><td>Add new item :
<u>- periodic test to detect leakage and periodic change of hoses to respect life time</u></td><td></td></tr>
<tr><td>539.</td><td>EWA</td><td>6.1.3 - page 22 - Option 1
The value given in Option 1 are only applicable to Arc welding DC power source
Change to:
Option 1: <u>Arc welding DC</u> Power source efficiency …</td><td>Text revised accordingly</td></tr>
<tr><td>540.</td><td>EWA</td><td>6.1.3
page 22
Option 1
The values given in Option 1 are related to Best Achievable Technologies that may not be achievable for all welding processes. Welding power source shall respect LV Directive (Safety transformer), EMC Directive (Harmonics Filter) and spatter loss reduction (high speed electronics –See 5.1.2.4) which requirements limit the Best Available Efficiency.
These values should be replaced, as required by ErP Directive by the best-performing products and technology available on the market, and compared to EU-27 estimated installed stock.
This solution does not change the target of Option 1 that is to replace all non efficient technology by BAT (inverter) and reduce the scope of necessary exemption (see Task 7 note 17 page 30).
See table attached for market evaluation:
<table>
<tr><th>Sales by EWA members</th><th>Mean Effiency</th><th>EWA Sales 2009</th><th>EWA Sales 2010</th><th>EWA Sales 2011</th><th>2012 EU-27 installed stock estimation</th></tr>
<tr><td>Inverter 1~</td><td>78%</td><td>20%</td><td>24%</td><td>23%</td><td>20%↗</td></tr>
<tr><td>Inverter 3~</td><td>83%</td><td>39%</td><td>47%</td><td>51%</td><td>20%↗</td></tr>
<tr><td>Thyr. Or Chopper 3~</td><td>73%</td><td>7%</td><td>6%</td><td>4%</td><td>16%↘</td></tr>
<tr><td>Transfo 1~</td><td>68%</td><td>7%</td><td>1%</td><td>1%</td><td>10%↘</td></tr>
<tr><td>Transfo 3~</td><td>73%</td><td>27%</td><td>22%</td><td>21%</td><td>33%↘</td></tr>
<tr><td>Rotating type</td><td>45%</td><td>0%</td><td>0%</td><td>0%</td><td>1%↘</td></tr>
<tr><td>Total</td><td></td><td>100%</td><td>100%</td><td>100%</td><td>100%</td></tr>
<tr><td>Ponderate efficiency average</td><td></td><td>77%</td><td>79%</td><td>79%</td><td>75%</td></tr>
</table>

Change to:
… <u>85% (BAT for inverter) instead of an average of 75% (average of EU-27 installed stock).</u></td><td>Table added in 4.1.3.9
Calculation of option 1 adapted as proposed (which leads to a slightly higher savings potential as the step from 75 to 85% means a higher power consumption reduction than from 80 to 90%), sensitivity analysis adapted as well</td></tr>
<tr><td>541.</td><td>EWA</td><td>6.1.3 - page 22 - Option 3
Depending of the temperature of the power source, the fan may be on during idle mode (see definition in Table 7-2) in order to reach cold state before the next welding period. The fan automatically stops at cold state.
Change to:
Option 3: Idle power consumption of less than 10 W is achievable when the fan has automatically stopped and</td><td>Text revised accordingly</td></tr>
</table>

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		realized for e.g. stud welding equipment.	
542.	EWA	7.1.1 - page 9 - §3 IEC 60974-1 is under maintenance review. The current stage of IEC 60974-1 ed.4 is Final Draft International Standard. Change to: **IEC 60974-1 ed.4 (FDIS)**	Text revised accordingly
543.	EWA	7.1.4 - page 30 - §4 Such efficiency level is only achievable by arc welding power source. Resistance welding power sources are designed by thermal requirement and are not designed for a 100% duty cycle. Change to: Energy efficiency of **arc** welding power sources[17] (at the rated output at 100 % duty cycle)	Text revised accordingly
544.	EWA	7.1.4 - page 30 - §4 AC arc welding power sources will not achieve the 3~ requirement. The ban of the less efficient and more bulky transformer type power supplies at stage 1 will be achieved with a further allowance of 5% (6% of 2010 market). Change Stage 1 to: - **70%** for single phase power sources **and AC welding power source**. - **75%** for three phase power sources	Text revised accordingly, footnote added to explain the change
545.	EWA	7.1.4 - page 30 - Note 17 AC welding power source, Resistance welding power source may not reach required efficiency). Change to: It remains to be verified, whether these values are achievable for all types of welding equipment or whether certain applications might need an exemption **(e.g. Resistance welding, AC welding power source…)**	Thresholds now proposed for arc welding only, less stringent requirements for AC, therefore adapted footnote not needed anymore.
546.	EWA	7.1.4 - page 31 - §5 AC arc welding power sources will not achieve the 3~ requirement. The ban of the all bulky transformer type power supplies at stage 2 will be achieved with a further allowance of 5% (29% of 2010 market). Change Stage 2 to: - **75%** for single phase power sources **and AC welding power source.** - **80%** for three phase power sources	Text revised accordingly, footnote added to explain the change
547.	EWA	7.1.4 - page 31 - §6 AC arc welding power sources will not achieve the 3~ requirement. The ban of the less efficient inverter type power supplies at stage 3 will be achieved with a further allowance of 5% (80% of 2010 market). This still allows a savings potential larger than 10% as the mean average efficiency is 75% for 3~ power sources. Change Stage 1 to: - **80%** for single phase power sources **and AC welding power source.** - **85%** for three phase power sources	Text revised accordingly, footnote added to explain the change
548.	EWA	7.1.4 - page 31 - §7 Depending of the temperature of the power source, the fan may be on during idle mode (see definition in Table 7-2) in order to reach cold state before the next welding period. The fan automatically stops at cold state. This idle state power consumption value can only be achieved for power source module without any necessary	Text revised accordingly

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No.	**Stakeholder**	**Comment (justification for change)**	**Response / implemented changes**
		option for interfacing with a full automated process. This value is applicable to power source module alone. Change to: Idle state power consumption of welding power sources **module at cold state**	
549.	EWA	7.8 - page 40 - 3rd line of Table Depending of the temperature of the power source, the fan may be on during idle mode (see definition in Table 7-2) in order to reach cold state before the next welding period. The fan automatically stops at cold state. This idle state power consumption value can only be achieved for power source module without any necessary option for interfacing with a full automated process. This value is applicable to power source module alone. Change to: Idle state power consumption of welding power sources **module at cold state**	Text revised accordingly
550.	UBA	**Overall remarks & conclusions:** Energy consumption during use phase is indicated as the overwhelming environmental impact. Non-energy aspects, however, are dealt with only in a very scattered way. While there is little doubt on the importance of energy consumption, the study should cover non-energy aspects in a structured way in dedicated chapters along the entire structure of the preparatory study. Particularly in task 4 to task 7 the technical specialities for the base cases should be illustrated, improvement options elaborated and the environmental impact be assessed. On this basis, conclusions should be drawn in task 7. In case the consultants decide not to elaborate much on the non-energy aspects it should be made very clear at all relevant positions (e.g. in summaries and in charts on life cycle impacts) that non-energy aspects are not considered in the detailed analysis.	Text added in 5: "Deriving from analysis in prior tasks, the environmental impact of consumables does not compete sufficiently enough with the impact resulting from energy consumption, so that a dedicated chapter is not necessary and would deflect from the more urgent issues. Also see Task 1, Figure 1-9; Table 1-27. Additionally, the major share of BATs referred to in solution 6 also reduce the impact of consumables (Dry machining, MQL, etc.)" Text added in 5.1.7 (BAT for increase life cycle) and 5.2.2 (strategies for reduction lubrication) The solution "increase of life cycle" and the detailed consideration of the reduction of consumption of cooling lubricant is not practicable. The users often work with centralized systems therefore the focus of the solutions are concepts for the reduction of cooling lubrication in process.
551.	UBA	Task 7 should focus on potential regulations as Implementing measure. Whereas task 7 makes good and reasonable suggestions, it remains difficult to extract a draft working document from that task. The consultants should describe more clearly, how a potential regulation could be structured regarding scope, requirements and timelines. This would avoid misleading interpretation by stakeholders, help the Commission to prepare a working document and streamline the discussion in the political process.	An implementing measure is only one option among others (including a voluntary agreement or even no policy measure at all, if the overall impact is considered non-significant). Hence, the decision for a measure depends on several other aspects (including also filling major gaps in standardization) to make any of the policy options work, which hinders drafting a working document solely on the technical and

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			economic evidence provided by the study. Drafting a working document requires some political decisions, which are beyond the scope of the study.
552.	UBA	Whereas for the base cases improvement options on a modular basis are described, task 7 should answer the question whether and to what extent mandatory minimum requirements could be elaborated for components of the machine tools. These could be simple generic requirements avoiding that environmentally very poor performing components are used.	Minimum requirements on the component level rarely can be stated, as this might hinder overall machinery improvement or has minor effects in numerous applications. The only identified mandatory requirements are those already addressed in the report are those for welding units and a newly introduced one on pump systems. Furthermore, as generic requirements numerous declaration requirements are already mentioned.
553.	UBA	Task 4 - page 35 - consumables In the entire chapter 4, but particularly chapter 4.1.3. (use-phase) and 4.1.4 (end of life) non-energy aspects should be dealt with systematically. This means that consumables should be described in quality, quantity, their material flows and potential releases to the environment should be described and environmental impact should be assessed.	Text substantially revised and extended throughout task 4
554.	UBA	4 - page 36 - Hydraulic oil Hydraulic oil is mentioned under “consumables” since it has to be replaced regularly. Regarding the environmental impact, however, only the production related impact is considered. Leakages during use as well as the disposal of used oil is not considered.	Text revised in 4.1.3 and 4.1.3.1 in particular
555.	UBA	4 - page 36 - Lube oils, cooling fluids and other consumables Lube oils are only mentioned, but not reflected on. Cooling fluids are not discussed. Since these are relevant in the following subchapters on the base cases, information should be given and taken into account in the subchapters.	Cooling lubricants and lubrication oils vary for each base case and depend on process parameters. The subchapters of each base case name relevant consumables. Additional environmental assessment is now provided for Base Case 1, which is the most relevant one in terms of lubrication oil and cooling fluids consumption. Reflection of other environmental criteria in the use phase is added in 4.1.3.1.
556.	UBA	4.1.3 - page 36 - Travel distances Assumed travel distances vary strongly between base cases. For some these are considered “0”, for others 10.000. Since these refer to travels of service staff, the “0” seems unrealistic. For reasons of clarity and readability an introducing paragraph on the issue of travel could be added.	It is confirmed, that travel distances were not applied coherently. New data is now entered, which reflects better the servicing reality.
557.	UBA	4.1.3 - page 37 - oil in pressurized air Is oil in pressurized air taken into account? E.g. what happens with the oil in case of decompression ?	Oil in pressurized air is not taken into account. Pressurized air is usually supplied from a centralized system and is therefore not in the

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			scope of these study.
558.	UBA	4.1.3.1 - page 38 - Lube oil, cooling fluid and hydraulic oil, Water consumption for process lubrication It would be helpful to give info not only on the quantity, but also the quality of the oils and cooling fluids as well as the material flows (collecting, treatment, discharge, ...). On this basis an assessment of environmental impact should be given. This likewise applies to the other base cases.	Quantity, quality of the oils and cooling fluids and material flows vary for each base case and depend on process parameters.
559.	UBA	4.1.3.2 - page 46 - Auxiliary material in Table 4-20 (hydraulic press brake) The nature of the auxiliary material in Table 4-20 should be given in the text.	Done
560.	UBA	4.1.3.4 - page 47 - Consumables in non-numerical controlled metal working machine tools Reference to auxiliaries in table 4-22 should be given.	Done
561.	UBA	4.1.4 - page 57 - End-of-life What happens to the consumables in the machine tool at the end of life? Could e.g. refrigerants with a high GWP be released?	No environmentally relevant refrigerants are used in machine tools. Typically only water, occasionally with some additives to avoid fouling, is used in closed loop systems; for workpiece cooling synthetic or mineral oil based lubricants are used (sprayed etc.), but these are not comparable to refrigerants used in air-conditioning or refrigeration products.
562.	UBA	4.1.4.1 - page 58 - Refrigerant More details on the refrigerants would be welcome (type, GWP). Is the assumption that no losses occur during use-phase and end-of-life realistic? Would the refrigerants be relevant if assumed to be completely released to the atmosphere? In ENTR 6 the consultants made assessments with different loss scenarios and came to the result that refrigerants play an important role.	Text revised accordingly: A closer examination of leakage or similar possibilities of material release is not carried out, because refrigerants do not pose a specific environmental risk. Assumption of no losses are realistic.
563.	UBA	4.3 - page 68 - Base cases environmental impact assessment It remains unclear to which extend consumables have been taken into account. (For CNC laser cutting machine tools consumption of N_2 is discussed, for other base cases a similar discussion is missing. Since information on consumables in chapters 4.1 remain unclear (see above), chapter 4.3. leaves this questions as well. In case consumables are not covered systematically (which seems to be the case), this should be clearly stated in the titles of the figures illustrating the environmental assessment along the impact categories (Figures 4-6 to 4-20)	Substantial additional analysis is provided now to cover in the Base Case assessments also non-energy related impacts.
564.	UBA	4 - page 128 - Table 4-85 the selection of the base case 9 remains unclear. What is meant by “process specifics” regarding resistance welding?	Choice was based on market relevancy. Footnote added to explain some of the differences.
565.	UBA	Task 5 - Consumables It surprises that consumables are not addressed in a dedicated chapter. (solution 5 gives some considerations, but remains again energy focused).	Deriving from analysis in prior tasks, the environmental impact of consumables does not compete sufficiently enough with the impact resulting from energy consumption, so that a dedicated chapter is not necessary and would deflect from the more urgent issues. Also see Task 1, Figure 1-9; Table 1-27. Additionally, the major share of BATs referred to in solution 6 also reduce the

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			impact of consumables (Dry machining, MQL, etc.) No change required.
566.	UBA	5.1 - page 12 - Shorten processing time Shortening processing time is given as a major option for energy savings. Question: This only helps, if machines are powered down when not processing. Is this power management common practise?	Shorter processing time does not necessarily mean longer non-productive times, but could also result in higher throughput. For market share of power management features see analysis of this option in task 5, but there is no data available, how power management settings might be changed by operators. No change.
567.	UBA	5.1.2.3. - page 17 - Polymer concrete Could polymer concrete pose a problem at end-of-life?	Recyclability is problematic – as already commented in the report at the end of 5.1.2.3
568.	UBA	5.1.7.1 - page 44 - Lubricants In metal working industry almost all machine tools need lubricants. In earlier tasks, however, little info on these lubricants. “The following technologies show how energy savings can be achieved in this field”. Unfortunately no discussion on the lubricants.	See comment 565. Environmental facts about lubricants have been stressed in Task 1, p. 89. No change required.
569.	UBA	5.1.8 - page 49 - Cooling system Cooling only considered as energy aspect. Other aspects: e.g. refrigerants used?	See comment 565. No change required.
570.	UBA	Task 6 - page 14 - improvement potential for laser cutting machines According to industry experts further improvement potentials for laser cutting machine tools are rather marginal. This conclusion is astonishing, since laser cutting is a rather new technology.	Fraunhofer is not aware of any major improvement option, leading to further significant savings, hence we have no reason to question this statement
571.	UBA	Task 7 - page 6 - structure of task 7 The consultants should consider to start task 7 with considerations given in table 7-6 and table 7-7. It is difficult to deduce options for minimum requirements in potential regulations from task 7, although many necessary elements seem to be given.	Tables 7-6 and 7-7 are an outcome of the detailed discussions on the pages before, therefore the order is not changed, but the findings compiled in these tables are now included in the introductory executive summary
572.	UBA	7 - page 6 - overall relevance The criteria usually are applied for elaborating the workplan. Since the Commission had launched the study it can be assumed that it considers the product group as relevant.	It is explicitly the task of the contractors to verify the workplan study findings in light of the much more detailed preparatory study. Hence, we are obliged to reflect on these criteria.
573.	UBA	7 - page 5 - Summary: Savings with VA It is assumed that a voluntary agreement could deliver a 10% saving from 2014 onwards. The ground for this assumption remains unclear and seems very weak. Given that VAs by nature do not cover the entire market and participation and performance remains on a voluntary basis, this assumption seems unrealistic when compared to assumptions made for other measures (in the range of <5%). This discrepancy makes the VAs appear advantageous over regulations in the policy scenarios.	As long as no draft VA is available, likely saving targets indeed are purely guess-work. It is the intention here to provide a purely hypothetical scenario, “what if in average 10% improvement is targeted”. If other targets are set (e.g. 5%, 20%) the outcome

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			would vary proportionally.
574.	UBA	7 - page 4 - Availability of test measures Lack of measurement standards seems to be a major problem. This, however, applies likewise for a VA as for regulations. In similar situations the Commission nevertheless suggested a regulation and in parallel gave a mandate to the standardisation bodies. It has to be admitted, however, that the wide variety of machine tools and applications pose a challenge to standardisation. A carefully designed regulation could nevertheless stimulate development of measurement methods and harmonisation of information.	Agreed, no changes required
575.	UBA	7.1.1 - page 9 - Utility and media consumption metrics Table 7-1 seems to be a good starting point for information requirements. Would additional information make sense (e.g. kind of treatment of abrasive materials; kind and quantity of refrigerants; etc).	Major difficulty: Most consumable consumption (abrasive materials, need for cooling) depends on process specifics (type, thickness of material, geometry etc.), not on machinery design, which largely hinders harmonized declaration requirements.
576.	UBA	7.1.1 - page 13 - Power management How could a generic requirement on component level be designed? Given the consideration on the limits of verification by market surveillance and belated modification (page 14), an approach based on declared availability of power management in the components could be applicable. The consultants should give a rough cost-benefit analysis.	Suitable wording included now. For cost-benefits see assessments in tasks 5 and 6, but no detailed analysis for this specific aspect can be provided as it depends on very individual design choices.
577.	UBA	7.1.1 - page 14 - Information requirement Information requirements seem to be a very valuable step forward. Although the missing reference point is highlighted we encourage to further develop this approach and ask the consultants to suggest options for mandatory information requirements. (Ideas are in the text but not compiled as option for a regulation)	References provided to clarify potential information formats.
578.	UBA	7.1.1 - page 15 - Information Would it be helpful if the control panel menu features level of refrigerants and status of oils in the system. in order to identify losses.	Option added
579.	UBA	7.1.1 - page 16 - Screening LCA Any LCA-based approach – like PCF – has to face the same problem regarding the wide variety of machine tools and their application as described in the prep study. Therefore it has to be underlined that PCF can only be a reasonable approach when clear and homogenous assumptions can be made (this seems to be difficult particularly for the use phase).	Agreed, therefore the PCF approach is followed only for a rather “simple” sub-group, namely light stationary wood working tools, and in no way for all machine tools No changes required
580.	UBA	7.1.2 - page 19 - Reference for specific requirements Could the following be an option for mandatory information requirements: the manufacturer clearly defines and describes parameters / assumptions. For critical assumptions (e.g. number of work pieces per hour) he delivers a sensitivity analysis. An additional option would be that the manufacturer makes a calculation tool available for own calculations (e.g. in internet).	7.1.2 already lists the required references for any such information provision. A sensitivity analysis would be even more challenging to provide as this would not only require the definition of one test workpiece / cycle etc., but also alternatives to these and to undertake related measurements. A calculation tool would require the development of parameterized calculation models, i.e. a machinery simulation, which would indeed allow a customized calculation

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			but requires extensive parameter testing for each machine tool individually. Footnote added.
581.	UBA	7.1.3 - page 23 - Relation VA to IM It seems legally highly questionable if a signature to a voluntary agreement would have the consequence that a mandatory regulation does not apply to the manufacturer.	Agreed, this question has to be assessed by the legal service of the EC and depends on the formulation of an IM
582.	UBA	7.1.3 - page 26 - Energy labelling Stated that machine tools not covered by the Energy Labelling Directive. Strictly speaking this is not true, since the Ecodesign- and the Energy labelling Directive have the same scope. However, no delegated regulation has been developed for machine tools yet.	Confirmed, report revised accordingly
583.	UBA	7.1.4 - page 32 - Tables 7-6 and 7-7 The tables 7-6 and 7-7 give an overview over options. This overview would be helpful either at the beginning of task 7 and / or in the summary.	Content of these tables copied to the executive summary
584.	UBA	7.1.7 - page 37 - summary of possible requirements The table is very welcome. Regarding the scope it would be helpful to have clear definitions (e.g. copy-paste from task 1) and if applicable exemptions. Furthermore more details on the requirements would be helpful This would help drafting a working document.	Reference to definitions provided in task 1 added Providing more details on the requirements is acknowledged as a legitimate request, but this would require i.e. a formulation of the design checklists in detailed and unambiguous way, which is beyond the feasibility of this study and should be subject to standardisation
585.	UBA	7.1.7 - page 37 - summary of possible requirements deriving from our remarks above the list could be extended regarding non-energy aspects if applicable (as result of analysis, e.g. on oil extractor, filters installed, reservoirs for cooling and lubrication liquids, possibility of swarf material separation for easier recycling, separation of swarf material and cooling liquid). Furthermore requirements on component levels should be added if applicable.	No further effective options on the component level, given the fact, that a detailed technical analysis of all relevant sub-components could not be provided.
586.	EPTA	**Task 6:** It is noted on page 19 that there are possibilities to use cast iron instead of aluminium for the tables and that the induction motors have the potential for efficiency improvements. Whilst these statements are true, the impact for the purchaser / user is, as noted, a less versatile (heavier) and more costly product. We believe that the report significantly underestimates the true cost impact in stating that the purchase price will rise by €25.	Purchase price raise for more efficient motor of 25€ was stated by EPTA initially, cast iron vs. aluminium is now addressed based on literature data. Uncertainty stated in the analysis.
587.	EPTA	In addition, it should be noted that motor efficiency is currently the subject of EuP Lot 30 preparatory study and motors for these products are expected to be in scope.	Footnote added
588.	EPTA	We concur with the statements made on page 49 of the report which say: The additional costs for more efficient motors do not pay back over the expected lifetime and that there is a (user) disadvantage to material change if the weight increases.	No changes required
589.	EPTA	**Task 7:** It is noted on page 16 that an EPTA working group drafted a procedure for measuring the PCF of light stationary / power tools. In fact this procedure only covers hand held portable power tools. In addition, it is in it's early stages and under development especially for the use phase.	Report amended accordingly

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		Whether this can be used for light stationary remains to be seen but our biggest concern remains the understanding of this concept by the purchaser. We look forward to the outcomes of the Environmental Footprinting initiative by the EC and the review of product labelling being carried out currently. As you say on page 28, the actual impact of such a label can hardly be forecasted. In fact we have concerns that the cost of calculating the PCF and the cost of product labelling, when passed on to the purchaser may not be accepted by them.	
590.	PTW	Figure 7-2 Sie haben in Ihren aktuellen Report ein Bild von unserer Maxiem-Homepage. Dieses Bild stellt ein Relikt aus den Anfangstagen von Maxiem dar und sollte lediglich die Themen Energieeffizienz und Werkzeugmaschine verbinden. Nicht beabsichtigt war hier die Einführung eines Energieverbrauchlabels und sollte daher auch nicht in diesem Zusammenhang gebracht werden. Auch die Ergebnisse aus dem Projekt widersprechen der Einführung eines Labels. Daher möchte ich Sie bitten diese Abbildung aus dem Report zu nehmen. Ich habe auch soeben die Homepage überarbeitet, so dass hier auch keine Unstimmigkeiten mehr entstehen. Die aktuell enthaltenen Grafik können Sie gerne verwenden.	Figures deleted, comment on project findings added.
591.	ECOS	**Task 1** we are concerned that the best-performing products or technologies available on the market, at the international level, have not been mentioned in Task 1. Existing third-country legislation, such as the Minimum Energy Performance Standards (MEPS) in Japan or the Energy Star scheme in the US have should be included. If this is not possible at this stage, at least reference should be made to the absence of these in Task 1.	It is not the objective of task 1 to identify "the best-performing products or technologies available on the market, at the international level", BATs and BNATs (in an international level) are covered extensively in task 5. Now included: Energy Star for computers, Japanese tax reduction scheme, relevant Japanese MEPS where already included in the report right from the beginning.
592.	ECOS	**Task 6** **Non-energy aspects not sufficiently covered** ENTR Lot. 5 is considered as a high priority group, according to the third criterion in the Ecodesign Directive concerning the significant potential for improvement in terms of environmental impacts. Besides the high potential for energy saving during use, the non energy environmental aspects should be identified including: reducing the weight or volume of a product, using recycled materials, reducing emissions, extending the product's minimum guaranteed lifetime or ensuring upgradeability, reparability or easy recycling by reducing the number of materials used, using standard components or providing easy access to valuable components. If this is not possible at this stage, it should be clearly stated that the non energy impacts have not been taken into account. More specifically, assuming a full compliance with RoHS and WEEE, has led to totally neglecting end of life (EOL) impacts. Suggesting that 85% of a product is recovered, is a wrong assumption, since it neglects the collection rate (between 20% and 35% at EU level).	See tasks 3-6: • Reducing the weight or volume of a product: reduced weight of moving parts is addressed in task4, but a general measure to reduce the weight of machine tools could not be identified, as mass / weight is important for the mechanical characteristics and performance of a machine tool. • Using recycled materials: Dominating material used for machine tools is steel (see BOMs in task 4), which stems from the typical mix of primary and secondary ferro materials • Lifetime and upgradeability:

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			Machine tools already feature particularly long lifetimes, are usually remanufactured at end of life, and repairability (rather serviceability) is already an important feature as service is provided by the manufacturers typically • Recyclability: Dominating materials are ferro alloys, which still have a high recycling value at end of life and thus are recycled (there is no known example of landfilling of machine tools), disassembly is eased by serviceability • 85% recovery: Machine tools are B2B products and collection rates are in no way comparable with those for WEEE (By the way, RoHS and WEEE do not apply for most of the products in scope of this study)
593.	ECOS	For this particular product group, special attention should be paid to EOL, due their increased dimensions and the amount of material used (several tonnes and a lot of different types of material). Treatment of material/substances is not exhaustive. Although the use of Environmental Product Declarations under ISO 14025 would be too far fledged, a move towards them could be beneficial. This could contribute towards proper dismantling and recovery of the materials or even better, promote upgradability rather than outright rejecting end of life treatment.	See above. There is nearly no evidence, that EoL of machine tools is critical, but see discussion on polymer concrete for machine beds (task 5): Whereas polymer concrete has a lower production impact than the steel it replaces, it rarely can be recycled for machinery purposes (downcycling). However, there is no LCA available to assess the option machine bed made of polymer concrete (which has an impact on productivity as well!) versus steel construction from cradle to cradle.
594.	ECOS	Concerning costs, it is very unclear how these have been calculated; only energy costs during the use phase has been taken into account. This product group presents significant potential for improvement in terms of its non energy impact through Ecodesign without entailing excessive costs. The following points should be taken into account and included in the study: • reducing the weight or volume of a product, using recycled materials, reducing emissions • extending the product's minimum guaranteed lifetime (e.g. extension of tool lifetime, easy recycling of electronics or closed-loop recycling in use) • ensuring upgradeability, reparability or easy recycling by reducing the number and amount of materials used, using standard components or providing easy access to valuable components	See above. The only valid point is the tool lifetime, but this depends on the tool material and technology, not machinery parameters and thus cannot be addressed with design measures targeting at the machinery. However, compared with the material consumption for the machine tool as such the material for the tools is negligible (but is a cost issue)

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595.	ECOS	**LLCC and BAT** There should be a close relation between efficiency and costs when calculating LLCC, since less scrap implies less environmental burden, which leads to lower cost. The absolute amount of materials used for manufacturing or the absolute consumption of energy and material used for the operation of these machine tools (such as cooling agents, lubricants or tools), as well as End of Life aspects, depend on the individually intended function of the machine tool. Specifically, the shortcomings in the study concern the way LLCC is calculated since no parameters related to the efficiency of the machine are considered. For example, when an electric drive is used instead of a hydraulic one, the LLCC calculations only take into account the costs of the components and don't consider the improved performance gain. Such parameters, should be taken into account and if not, this should be clearly stated in the study.	LLCC calculations do include energy savings and energy efficiency. Not included are differences in machinery material and EoL as these have not been related to any relevant improvement potential (see above). The statement is wrong, that an electric drive improves the performance of a machine tool compared to a hydraulic one. See extensive discussion of this option in task 5.
596.	ECOS	**Ranking of each option change by LCC** In the earlier proposal from CECIMO concerning a Self-regulatory Initiative (SRI), which is repeatedly cited for the 1st base case (CNC machine centre), several figures are contradictory – see below (table 6.1): *e.g.* *"regenerative feedback inverter: saving potential :0.5% (task 6)/10% SRI* *"400v inverter ….." : 1%(task 6)/15% SRI* *" High efficient gear unit" : 0,5%(task 6)/40% SRI* ... [tables deleted]	Actually, there is no contradiction: The Base Case assessment reflects the savings potential having in mind the total machinery's energy consumption, whereas the SRI data refers to the efficiency gains for this specific component only. Logically, the data stated in the SRI table is much higher. Furthermore, the Base Case data originates from assessments by manufacturers and is the more recent data.
597.	ECOS	**BNAT: include further technical solutions** The analysis is rather poor since a considerable amount of other measures arising from basic research have not been taken into account and should be included in the study. These include: Technologies to increase energy efficiency: ➢ 88% of the motor drives are not electronically controlled today. Out of these some 50% can be equipped with variable speed drives (VSD) to achieve energy savings of up to 50%, during partial load . The savings potential from the use of power electronics [1]is estimated as follows: - 20-30%: Traction drives using power semiconductors, e.g. recuperation of braking energy. - 30-40%: Motor control using inverters. - 30-40%: cooling, using intelligent compressor control.	Motor technology and VSD is addressed actually by one of the solutions discussed in length in task 5, and taken into account in task 6. Although there is no data on the number of motor drives electronically controlled in machine tools today, it is very likely that it is much higher than the 12% stated by ECOS, which actually refers to a publication about discrete manufacturing and not particularly machine tools. Recuperation of braking energy is taken into account as one option in task 5 and 6 (and already largely applied in CNC machine tools). The stated savings for "cooling" in the original source read "Air conditioning", which is not a function typically found within a machine tool. As the stated technologies are state-of-the-art they should not be covered under BNAT, although some future (not yet quantifiable) potential still exists.
598.	ECOS	➢ The base load on machine tools can use up to ¾ of the total power consumption, leaving ¼ for the process	Basically confirmed.

[1] "ICT and Energy Efficiency The Case for Manufacturing", Recommendations of the Consultation Group, Office for Official Publications of the European Communities - Luxembourg, 2009

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		itself. An optimisation of waiting/start-up times has a savings potential of 10-25%.	Appropriate power management is considered BAT, not BNAT and listed there already, and addressed as such in the policy options.
599.	ECOS	➢ Structural light-weight construction with gradient materials has enormous potential	Light-weight material already addressed under BATs. No evidence for "enormous potential"
600.	ECOS	➢ Detection of the beginning and end of down times, intelligent monitoring, system diagnosis and auto-correction should be implemented.	This is part of the power management option under BATs in task 5 already
601.	ECOS	➢ Life time extension strategies for products or product components based on **disassembly and remanufacturing/refurbishment** oriented business models, including **product service systems (PSS)**, should be considered.	This is common practice already (including leasing) – no substantial further improvement potential to be expected
602.	ECOS	➢ In order to achieve energy savings, intelligent controls are needed. At the machine tool level, ICT controls are situated within the CNC system monitoring the machine status and controlling various machine functions. A selective use of support systems, like cooling, chip removal or exhaust units allows cutting down on secondary energy consumption without affecting the function of the machine tool.	This is part of the power management option under BATs in task 5 already
603.	ECOS	➢ Selective switch-off or modulating the power supply in the primary process systems, based on intelligent machine status determination, would allow for further reductions.	This is part of the power management option under BATs in task 5 already
604.	ECOS	Innovative and light weight materials for less energy consumption · Aluminum foam in high work volume Milling Machines can achieve 40% motor power reduction in Y- and Z-. Different variations were implemented in frame-design parts (fully-foamed beams, sandwich design welding designs). The first tool machine deploying aluminum foam, the "MIK RON HPM 1850U", is already established on the market (The Metal Foam Center Chemnitz located at the Fraunhofer Institute for Machine Tools and Forming Technology).	Example cited now in Task 5, but claimed power savings could not be verified (BAT, not BNAT, as market introduction was already back in 2004)
605.	ECOS	· **Carbon-compounded plastics (CCP):** The KVB (Institute for Design and Compounds Engineering) at the Chemnitz University of Technology develop and manufacture machine parts made of CCP material which also includes hexapod-design supports, main spindles of tool machines, spindle casing for gear tooth grinding machines, casings, grinding machine tables, and equipment racks.	Already included in Task 5
606.	ECOS	Machines with "minimum quantity lubricant," or MQL The cost of coolant is approximately 15 percent of the life-cycle operational cost of a machine process. Already the costs for disposal of coolants are higher than the initial cost of the coolant, and these are still rising. As a result of all of this, coolant in wet machining operations is a crucial issue of economic importance. An alternative, machining with "minimum quantity lubricant," or MQL, is gaining acceptance as a cost-saving and environmentally friendly option in place of some wet machining processes.	Environmental assessment of coolants addressed in task 4, improvement measures outlined in task 5 already.
607.	ECOS	Review of design (Re-design) To facilitate the repair, dismantling, reuse, upgrading and recycling, and by introducing the concept of modularization of sets. This modularization takes into account: · Ease of repair; · Easy disassembly, considering the decommissioning at the end of life, but also the reuse of modules for future upgrading and modernization of the machine tools; the ability to maintain beyond the life cycle of the product its structural components, which are the bulkiest and consume most energy, for recycling	As remanufacturing/ refurbishment is already common practice, there is no evidence, that modularization could lead to further significant improvements, besides mobility

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		purposes or material recovery.	
608.	ECOS	**Task 7** It is obvious that the machine tool sector, which are typically characterised by SMEs, lacks the direct incentive to significantly improve the energy efficiency of their products.	Disagreement: partly energy efficiency is requested by customers, frequently energy efficiency is also related to productivity, hence there are incentives, but it is agreed, that there are not enough incentives to explore the full energy savings potential.
609.	ECOS	**We therefore support the introduction of legally binding requirements** as opposed to a self regulation initiative.	No changes required
610.	ECOS	Moreover, **generic (specifically on non energy related environmental aspects) and information requirements** (such as the GWP of refrigerants) should be included, which will in turn allow for the further collection of information. This will be instrumental for the revision of this measure, since it will serve as the basis for setting further requirements reflecting market evolution.	Statement added under information requirements, but GWP of refrigerants is not an issue.
611.	ECOS	The possibility of issuing a mandate to standardize certain Ecodesign parameters should be also explored. A robust measurement method should be set, such as the standard that is currently developed in ISO TC 39.	No changes required
612.	ECOS	**In conclusion, a holistic approach for machine tools should be further highlighted in the study**, including environmental impacts other than energy consumption. Resource efficiency and recyclability has to be promoted in the design phase by reducing the amount of raw materials used, regulate the production of consumables whilst ensuring at the same time the maximum recycling potential for machine tools.	Aspects other than energy consumption are now addressed more in detail throughout the study. Recyclability is not seen as a relevant field for improvements.