



Final Meeting of the Technical Working Group for the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Fabricated Metal Products Manufacturing Sector

Brussels, 27-28 November 2017

Minutes of the meeting

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I. Opening of the workshop

The JRC opened the session and welcomed the participants.

The meeting agenda was presented (see Annex B) and agreed by the participants.

A short introduction on the Joint Research Centre (JRC) as a DG (Directorate General) of the European Commission was given. As the European Commission's science and knowledge service, JRC supports EU policies with independent scientific evidence throughout the whole policy cycle. More information: <https://ec.europa.eu/jrc/en>.

The TWG members introduced themselves and summarised their experience in environmental management and the fabricated metal products manufacturing sector (the list of participants is attached in Annex A).

Participants were informed that the meeting would be recorded and there were no objections to this.

It was agreed to use first names to refer to the different TWG members and the same convention is adopted in these minutes of the meeting when specific action points are noted.

II. Background and purpose of the meeting

Background session

Introduction

JRC introduced the framework of this work and presented the methodology followed for the identification of best environmental management practices (BEMPs) and the development of EMAS sectoral reference documents.

To help organisations improve environmental performance, the JRC identifies, evaluates and documents best practices in the improvement of environmental performance (BEMPs) for different sectors in close co-operation with the stakeholders concerned. To do so, the JRC follows the so-called frontrunner approach, i.e. it researches those techniques, measures or actions that are implemented by the organisations within each of the sectors addressed that are most advanced in terms of environmental performance in each of many areas, such as energy efficiency, resource efficiency and emissions from own operations, but also supply chain management (i.e. both direct and indirect environmental aspects are covered). A sectoral approach is used and BEMPs are developed / under development for 11 sectors. The fabricated metal product manufacturing sector is the 11th sector. So far, the identification of BEMPs, indicators and benchmarks has been completed for 8 sectors and sectoral reference documents have been already adopted by the European Commission for 3 of those sectors. Further information on the status can be found at: <http://susproc.jrc.ec.europa.eu/activities/emas/>

This activity is part of the European Commission's work to implement the EU Eco-Management and Audit Scheme (EMAS), a voluntary framework for companies and other organisations to evaluate report and improve their environmental performance. Within this framework, the EU decided in 2009 to promote best environmental management practice, by developing Sectoral Reference Documents. However, sectoral reference documents address and can be used by both EMAS registered and non-EMAS registered companies.

Besides best practices, sectoral reference documents contain other two important elements: environmental performance indicators and benchmarks of excellence. None of the three elements are compulsory to implement or use by any organisation, but are rather a source of inspiration and technical guidance, useful to both EMAS and non-EMAS registered companies. The EMAS registered organisations have an obligation to take into account the content of the sectoral reference documents, and demonstrate this to verifiers during the verification process, but are not obliged to implement any of the best practices, to use the indicators or to meet any of the benchmarks. Because of this, the documents have to be really useful and high quality; otherwise they will not be used.

For the fabricated metal products manufacturing sector, the work started in 2015. As a first step, VITO and SIRRIS with the support of Agoria, under contract with the JRC, produced a background report¹. The findings described in the background report were discussed during the kick-off meeting of this technical working group, which was held in September 2016 in Brussels². At the kick-off meeting, the technical working group agreed the scope, discussed each of the proposals of BEMPs from the background report (in some cases agreeing on its concept, in other cases requesting changes or the elimination of proposed BEMPs) and put on the table a number of different proposals of BEMPs.

The JRC, with the support of BiPRO, produced a draft Best Practice Report according to all this feedback and further interaction with individual TWG members on the basis of the Background report. The Best Practice Report was shared with the TWG members in advance of this final meeting.

Presentation on **Best Environmental Management Practices and the EMAS reference documents** (see annex C).

JRC presented the elements of the documents and gave the related definitions as well as some examples:

- Best Environmental Management Practices (BEMPs) are techniques, measures and/or actions that allow organisations to reduce their direct and indirect environmental impacts. They go well beyond common practice, but are fully implemented by best performers and are widely applicable. The TWG is responsible for assessing whether the practices identified refer to actual BEMPs, or are instead common, obsolete or emerging techniques. The TWG can also suggest further examples of 'frontrunners' (i.e. companies that go well beyond their peers in terms of environmental performance in a certain area) having implemented the different BEMPs identified.
- Environmental performance indicators, which can be quantitative or qualitative, allow organisations to measure their environmental performance in the field covered by each BEMP. The focus is on indicators that are already in use and environmentally meaningful; when outcome indicators are not feasible, indicators related to the implementation of certain actions can be used as a proxy.

¹ The background report is available on-line at: available on-line at:

http://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_FabMetProd_BackgroundReport.pdf

² The minutes of the kick-off meeting are available on-line at:

http://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_FabMetProd_KOM_minutes.pdf

- Benchmarks of excellence refer to a level of performance that is very ambitious but already achieved by frontrunners. Benchmarks of excellence are a measure of what is possible, under stated circumstances. Benchmarks are not targets, but rather a source of inspiration.

JRC also presented the implementation phases of the development process:

1. Desk research => Background report
2. Information exchange with the technical working group (TWG) => Best Practice Report
3. Adoption process => Sectoral Reference Document

✓ The **Best Practice Report** is intended to be a detailed technical guide that contains full details of the BEMPs. It is developed by the JRC in collaboration with the TWG, it is published by the JRC and will be available only in English. This is the document that companies interested in implementing best practices are recommended to consult.

✓ The **Sectoral Reference Document (SRD)** is a sort of short summary of the best practice report. It describes very briefly each of the best practices, their applicability and contains the identified indicators and benchmarks of excellence. This is the official document, adopted by the European Commission, published on the EU official journal and available in all EU official languages. This the official document that EMAS registered organisations and EMAS verifiers will refer to but can also be used by non-EMAS registered organisations who would like a short overview of all BEMPs in their own language (if this is not English).

Discussion:

- At the request of some TWG members, JRC explained that EMAS registered companies can and should choose their own indicators. This document provides inspiration on the techniques that may be applicable and on the indicators that can be used to monitor the environmental performance in relation to the implementation of those techniques. Not all indicators will be relevant for all companies.
- It was also clarified that the benchmarks aim to help companies to perform better by giving inspiration and a very rough estimation of improvement potential, and indicators and benchmarks are not intending to compare companies with each other.
- Some TWG members proposed taking out the cross-sectoral BEMPs (e.g. biodiversity, energy management, use of renewable energy) from the document for fabricated metal product manufacturing and have them in a separate cross-sectoral reference document. JRC explained that, so far, these BEMPs have been included in the different sectoral documents, tailoring their content as much as possible to each of the specific sectors. However, in the future, once the BEMPs will be presented and developed in an on-line tool, there may be the possibility of developing a common text for each of the cross-sectoral BEMPs and just add, where relevant, limited specific information (e.g. case studies) for each of the sectors where the best practice is applicable. This feedback can be taken into account in the on-going development of a new concept for identifying and presenting BEMPs.
- A TWG member proposed to base benchmarking on a theoretical calculation of the minimum impact of a product (Japanese Gentani approach) and by comparing the performance of manufacturing actual products with that theoretical minimum. JRC responded that the Gentani approach is mentioned in the first BEMP as a technique that a company can implement in-house, but EMAS is not aiming at assessing (and e.g. labelling) products and therefore the approach is not relevant for our benchmarking. EMAS and the BEMP/EMAS Sectoral Reference Documents are complementary to other EU

environmental policy and legislation (EU Ecolabel, Eco-design, Industrial Emission Directive, etc.).

Scope and structure of the EMAS SRD for the Fabricated Metal Products manufacturing sector

Presentation on the **Scope and the Structure** (see Annex C).

JRC presented the scope of the document as modified further to the kick-off meeting (including a broader range of NACE codes) as well as the final proposed structure of the document, where BEMPs are classified in three groups (cross-cutting BEMPs, optimisation of utilities and manufacturing BEMPs). With the exception of the minor changes to the scope figure detailed below, the scope and structure are now considered final.

Discussion:

- Land could be included alongside the other environmental impacts listed in the scope picture.
- The picture of the scope of the report, shared with the TWG in June 2017 (including 9 boxes in the manufacturing processes) describes better the activities and processes carried out by the sector than the picture in the draft Best Practice Report shared before the meeting, and TWG recommended to use that one in the final version of the report.
- The assembly process is a direct environmental aspect (as usually carried out in-house) and should be included as one of the manufacturing processes. JRC will modify the scope figure accordingly, but also explained that it is important that each company make their own assessment of which environmental aspects are direct and indirect, depending on the specific case. The same is valid for waste treatment; this is classified as an indirect environmental aspect in the scope figure because most companies deliver their waste to a third-party waste management company for its treatment. However, the in-house generation and management of waste is definitely a direct environmental aspect and the text accompanying the scope figure will clarify that it is considered part of the supporting processes.
- The terms yield, scrap and waste need to be used consistently and be better defined, either in the beginning of the report or in a relevant specific BEMP. JRC will take this point into account in the final version of the report.

State of play and meeting objectives

Presentation on **state of play and meeting objectives** (see annex C).

JRC presented in detail the different steps of the work, what was completed, what was expected for the meeting and what was to come after the meeting. The main purpose of the meeting was:

- agreeing upon Environmental Performance Indicators;
- agreeing upon Benchmarks of Excellence;
- validating the set of BEMPs, environmental performance indicators and benchmarks of excellence.

In addition, two targeted specific points (the applicability of each BEMP, and how to get the message out to the target group) would also be discussed.

Discussion:

- A TWG member commented that some BEMPs for which there was no agreement during the kick-off meeting are still proposed as BEMPs in the report. JRC responded that the selection and the content of the BEMPs of the best practice report, circulated prior to the final meeting, were based on the kick off meeting minutes. Where a clear decision was not taken at the kick-off meeting, the current proposals are based on the indication provided at the kick-off meeting and on further research and interaction with TWG members. JRC invited the TWG members to provide any further comment on the proposed BEMPs during the current final meeting and make sure to check the minutes from this (final) meeting, when circulated as draft, and send any remark to JRC at: jrc-emas-srd@ec.europa.eu.

III. Plenary discussion: reaching out to the target audience for the document and maximising best practice uptake

JRC explained that now that we are close to the finalisation of the technical work, it is important to think about the dissemination strategy for the best practices identified. JRC thus invited the TWG to have a very open discussion aimed at identifying the most suitable channels for dissemination, specifically for the fabricated metal products manufacturing sector. Several approaches were recommended by the different TWG members:

- Education: try to involve higher education institutions (e.g. universities) and accreditation bodies (e.g. for environmental professionals/environmental engineers).
- Trade associations at EU and especially national level: they already have a good network, know the companies and exist across Europe. However, the interest of trade associations for environmental best practices, and overall their proactiveness, appears to be very different across member states.
- Newsletters that environmental managers of companies receive already: e.g. ENDS (good channel to announce the publication of the report or any events organised).
- Relevant EU websites: e.g. news section of DG ENV and JRC websites.
- Involve companies that are clients of the fabricated metal products manufacturing sector: larger supply chain partners can help reach smaller companies. This approach seems more promising in some member states.
- Local/Regional governments as well as EMAS competent bodies and EMAS clubs: make this work known through their own existing communication channels (newsletters, events).
- Technology suppliers (i.e. those selling technical solutions or technical advice in areas identified as BEMPs): these could allow to present the work at industry fairs.
- United Nations organisations: they could use the BEMPs to inspire companies outside Europe.

On a more practical level, the TWG provided the following recommendations:

- Organising a launch event when the report is published and invite frontrunners to present and share their experience. Explore the potential to partner with sectoral associations to ensure high turnout and the spreading of the news.
- Writing articles/shorter texts to raise interest in the full report providing examples of frontrunners and focussing on the achieved economic benefits (e.g. information on operational costs and payback times for some of the BEMPs identified) to be disseminated via the different channels above. A lot of (small) companies associate EMAS and thus also the BEMPs with bureaucracy: show what is in it for them.

- Finding a good user-friendly format to present the best practices e.g. on-line website with short texts with pictures.

IV. Introduction to Environmental Performance Indicators and Benchmarks of Excellence

Presentation on **Environmental Performance Indicators and Benchmarks of Excellence** (see annex C).

JRC explained that the aim of indicators and benchmarks is to help the companies reduce their environmental impacts, not compare the companies against each other. Benchmarks of excellence aim to indicate the level of performance achieved by the top 10% performers in the sector in the specific dimension covered by each BEMP. However, the setting of benchmarks cannot be based on a large collection of performance data that is anywhere close to be statistically representative. Therefore the role of the TWG is absolutely key to validate the findings and confirm that the proposed benchmarks are both ambitious and already achieved by few frontrunners.

When a BEMP and/or a benchmark is only applicable in specific circumstances, these limitations need to be explained in the applicability section. Specific comments in this sense from the TWG members are very welcome.

V. Overview of the Best Environmental Management Practices (BEMPs) for the sector

All the BEMPs were briefly presented by the JRC. A short summary of each BEMP was also displayed on posters on a wall of the meeting room and the full description is available in the draft best practice report shared with the TWG in advance of the meeting.

Some TWG members highlighted the importance of clarifying the economic viability of all the presented BEMPs. The JRC explained that economic data was collected as much as possible, but, for some BEMPs, would benefit from extra information (all TWG members are invited to provide further examples and economic data). However, generally speaking, the economic viability is considered proven as long as the document gives examples of companies having implemented the technique at full scale (not only research/demonstration/pilot projects), as we can assume it makes economic sense for them.

After this overview, TWG members were invited to provide their input on all the BEMPs and, especially, on the proposed environmental performance indicators for each BEMP, using post-its for comments and new proposals and blue/red labels for showing agreement/disagreement on the posters displayed in the room. This input would have been debriefed later on in the meeting to ensure consensus can be reached in the most efficient way.

VI. Applicability of the Best Environmental Management Practices (BEMPs) throughout the sector

The applicability of all the BEMPs was discussed during an interactive session organised around a card sorting exercise where each BEMP would be assigned to (maximum) two of the following categories, representing the most important limitations to the implementation of each BEMP:

- The investment cost is a major limitation for the implementation of the BEMP
- The relatively long payback time is major limitation for the implementation of the BEMP
- This BEMP works well only for production of small series or prototypes
- This BEMP work well only for the fabrication of complex products
- This BEMP work well only for the production of large series
- The lack of technical knowledge/technical capacity (or the need to hire consultants) is a major factor limiting the implementation of the BEMP.

Additionally, a large poster to be filled in during the discussion was used to capture the most important points on two further dimensions:

- Applicability to SMEs
- Other specificities (e.g. specific alloys used, specific products or specific manufacturing processes) that can limit the applicability of each BEMP

A summary of the discussion on the applicability for each specific BEMP is given below.

Applicability of BEMP 2.2 Setting a framework for environmental policy and management

First of all, it was clarified that this BEMP is not about establishing an environmental policy and environmental management system (EMS) but about how to ensure these yield the highest environmental benefits by integrating in the company policy and management (including its EMS) key principles and the related implementation tools. Some TWG members asked to improve the description of the BEMP in this sense and distinguishing more clearly between the policy/principles level (i.e. life-cycle thinking, circular economy) and the operational level.

The BEMP is applicable to all types of companies in this sector, including SMEs. The main limitations to the applicability that were identified are:

- Lack of sufficient in-house technical knowledge.
- The need for staff training at all levels (and related budget).
- Market conditions: implementing this BEMP in companies whose customers/clients would reward their efforts is simpler and yields higher return of investment (ROI).
- The difficulty to calculate the ROI of implementing the elements of this BEMP. While costs tend to be clear, the economic benefits are all either hard to know or difficult to attribute to this BEMP. However these benefits exist. Apart from efficiency savings, integrating ambitious principles in a company policy can improve the company core business, e.g. when costumers are willing to pay extra for products from more sustainable companies, or when employees prefer to work for such companies.

Applicability of BEMP 2.3 Collaboration and communication along and across the value chain

The BEMP is applicable to all types of companies in this sector, including SMEs. The main limitations to the applicability that were identified are:

- Intellectual property or confidentiality issues.

- Lack of knowledge of stakeholders with whom to collaborate and on how to manage effectively external stakeholder involvement processes.
- Resistance to changes or insufficient change management capacity. This can be both a problem in-house and with customers (TWG members mentioned examples of customers that do not want to co-design an improved version of a component, even if this would save them money on top of reducing environmental impact).
- Length of the supply chain: this can limit the opportunities to work across the value chain.
- Market conditions: implementing this BEMP in companies whose customers/clients would reward their efforts is simpler and yields higher return of investment (ROI).

Applicability of BEMP 2.4 Energy management

The BEMP is applicable to all types of companies in this sector, including SMEs. One of the main limitations of implementing some elements of this BEMP as well as some of the energy saving actions that can result from implementing this BEMP is their low ROI. Pay back times are sometimes too long, even when the investment costs are low (e.g. for the installation of monitoring tools). Another limitation may be the lack of in-house technical knowledge, especially in smaller companies.

Applicability of BEMP 2.5 Environmentally and sound efficient management of chemicals

The BEMP is applicable to all types of companies in this sector, including SMEs. The TWG identified that the lack of in-house technical knowledge can be a barrier.

Applicability of BEMP 2.6 Biodiversity management

The BEMP is applicable to all types of companies in this sector, including SMEs. The TWG pointed out that it can be difficult to convince the management of the company to implement this BEMP, because it is not possible to calculate a direct ROI. This is due to the difficult quantification of direct benefits for the company. Acting for the social payback, although significant, requires the company to have a mature understanding of how this benefit them indirectly or a willingness to act for the good of the community.

Applicability of BEMP 2.7 Remanufacturing and high-quality refurbishment of high value or large series products and components (new title)

The TWG agreed that the scope of the BEMP had to be enlarged by also including refurbishment activities alongside full remanufacturing. The two terms (remanufacturing and refurbishment) can be clarified in the description of the BEMP:

- Remanufacturing: turning used products into products that meet the same quality standards as new products produced today.
- Refurbishment: used products get back their original quality standards (i.e. the quality standards that were in place when they were first manufactured, not the one of the same product produced today).

The TWG concluded that the BEMP is applicable to all types of companies in this sector, including SMEs and it is most suitable for two types of products and components: (i) large volume series and (ii) high value products/components.

It was agreed to modify the title of the BEMP to take into account these two clarifications of its scope.

Applicability of BEMP 2.8 Link to the relevant BREFs

This BEMP needs to be written in a way that it is applicable to all companies and especially to SMEs. Indeed, companies having large industrial installations falling under the Industrial Emissions Directive (IED) already have the obligation of reaching performance and emission limit values that are derived from the BREFs and therefore regularly take the content of BREFs into account. This BEMP thus make sense for companies having smaller industrial installations (such as most SMEs but also some larger companies), but, in order to be implemented by them, it must be more concrete than just saying that it is BEMP to follow up all relevant BREF documents. JRC will rework the BEMP in this sense and develop examples of significant environmental issues that are likely to be important also for small industrial installations (and are not covered by other BEMPs) by showing where relevant guidance on how to address them is available in the BREFs. In this way, this BEMP will be more user friendly.

Applicability of BEMP 3.2. Efficient ventilation

The BEMP is applicable to all types of companies in this sector, including SMEs. The payback times can be long, and it thus often constitutes a barrier. The economic feasibility is much higher in case of new or renovated production lines. Insufficient in-house technical knowledge can also sometimes constitute a barrier to (properly) implement this BEMP.

Applicability of BEMP 3.3. Optimal lighting

The BEMP is applicable to all types of companies in this sector, including SMEs. The economic feasibility is much higher in case of new or renovated production lines.

Applicability of BEMP 3.4 Environmental optimization of cooling systems

The BEMP is applicable to all types of companies in this sector, including SMEs. The economic feasibility is much higher in case of new or renovated production lines.

Applicability of BEMP 3.5 Rational and efficient use of compressed air systems

The BEMP is applicable to all types of companies in this sector, including SMEs. The economic feasibility is much higher in case of new or renovated production lines.

Applicability of BEMP 3.6 Treating waste water with mechanical vapour compression evaporators

This BEMP is generally not applicable to SMEs and small industrial installations, as certain scale (volume of wastewater) is needed to make the BEMP beneficial. The relatively long payback time can also be a major limitation to implementing this BEMP.

The current version of the BEMP needs to be improved to clarify the economic viability and the environmental benefits (with due consideration of the energy consumption associated with this technique and the possibility to reduce it by exploiting the waste heat). This should also be reflected in terms of applicability.

Action: **Lennart** to provide information and figures on the energy consumption of this technique (and, possibly, on analysis of economic viability and overall environmental benefits).

Applicability of BEMP 3.7 Use of renewable energy

This BEMP is applicable to all types of companies in this sector, including SMEs. There are geographical differences in the economic viability of this BEMP, e.g. different feed-in tariffs in case the electricity generated from renewables is provided to the grid. However, own energy generation can yield benefits in terms of reduced volatility of energy costs and the green credentials from using renewable energy can be positive to retain and attract customers even in regions where otherwise purchasing green electricity would appear as just a cost.

Applicability of BEMP 3.8 Rainwater collection

This BEMP is broadly applicable to all types of companies in this sector, including SMEs. The geographic location highly influences the relevance of the BEMP (e.g. because of rainfall levels, local water scarcity). In some regions, the technique is compulsory by legislation (for flood prevention and to reduce the use of ground water). On economic grounds, depending on the price of the water (tap water, surface water, well water) that would be substituted by rainwater, the BEMP will be more or less beneficial. In any case, the implementation costs are drastically reduced (and thus, the economic viability improved) if this BEMP is implemented at the time of building or renovating a manufacturing plant rather than retrofitted to an existing plant. In case of retrofitting, the building characteristics may also constitute a barrier to the implementation.

Applicability of BEMP 4.2 Selection of metal working fluids

The TWG concluded that the BEMP is applicable to all types of companies in this sector, including SMEs. However, the lack of in-house technical knowledge can sometimes be a barrier to its implementation, especially in smaller organisations. On economic grounds, the volumes of metal working fluids used need to be substantial or the efforts needed for the implementation of the BEMP may be higher than the savings.

Applicability of BEMP 4.3 Minimisation of lubricoolant consumption in metal processing

The TWG agreed that this BEMP is applicable to all types of companies in this sector, including SMEs. Lack of technical knowledge can be a barrier, but technology providers often offer this knowledge. As this BEMP deals with changing technology, it is more suitable for new or renewed installations rather than retrofitting on an ongoing process. Moreover, the applicability of the technique depends on the type of materials processed and is more suitable for small series.

Applicability of BEMP 4.4. Use metal working fluids for multiple operations

The content of this BEMP is too specific and narrowly applicable (e.g. especially to small series and in small systems) to be considered a BEMP on its own. It was thus decided to merge the content of this BEMP into BEMP 4.2 (Selection of metal working fluids).

Applicability of BEMP 4.5 Incremental sheet metal forming as alternative for mould making

The BEMP is applicable to all types of companies in this sector, including SMEs. The BEMP is most suitable for small series.

Applicability of BEMP 4.6 Reduction of standby energy use of metal working machines

The BEMP is applicable to all types of companies in this sector, including SMEs.

Applicability of BEMP 4.7 Maintaining material value for metal working residues

The title of this BEMP needs to be amended to make it clear that it deals with maintaining material value for residues of metal working processes, not only metal residues, but also emulsions...

The TWG agreed that this BEMP is applicable to all types of companies in this sector, including SMEs, but the volume of material working residues must be significant to ensure economic feasibility; therefore the BEMP is more relevant for the production of large series.

Applicability of BEMP 4.8 Additive manufacturing for complex equipment

The BEMP is applicable to all types of companies in this sector, including SMEs. Limitations of this technique are:

- Additive manufacturing is specifically suitable for small, high value series or remanufacturing/repair of high value components.
- The energy demand per unit manufactured can be considerably higher than other manufacturing techniques. Additionally, in some cases, depending on the specific additive manufacturing technique employed, special alloys or metal powders are needed. Although their use may be very resource efficient, their production may be associated with low yields and, therefore, high environmental impact. Appropriate use of LCA is needed to prove the overall environmental benefits of additive manufacturing for a specific application.
- A TWG member reported negative health effects associated with the use of some metal powders; this needs to be taken into account during the design process.

Applicability of BEMP 4.9 Multi-directional forging

The TWG agreed that the BEMP is applicable to all types of companies in this sector, including SMEs. However, the high investment costs of this BEMP are a major limitation to its implementation. Several companies also lack in-house technical capacity to implement this technique, leading to further costs.

Applicability of BEMP 4.10 Hybrid machining as method to reduce energy consumption

TWG members agreed that the BEMP is applicable to all types of companies in this sector, including SMEs. Lack of in-house specific technical knowledge needed to implement this BEMP can be a significant barrier. The approach is more suitable for new machines.

Applicability of BEMP 4.11 Machining of near-net-shape feedstock

The TWG considered that this BEMP is too close to common practice to be qualified as a BEMP and it was agreed to remove it.

Applicability of BEMP 4.12 Use of predictive control for paint booth HVAC management

This BEMP is only applicable to large installations, and therefore less suitable to SMEs. Lack of advanced technical knowledge and high investment costs can be a barrier to the implementation. Additionally, the BEMPs is most suitable for large series.

AOB

Some participants said they would be in favour to have a separated document on cross-sectoral BEMPs (e.g. on biodiversity, use of rainwater, energy management, etc.), so that these do not need to be developed in each sectoral document.

VII. Feedback session: proposals for Environmental performance Indicators

During this session, the JRC summarised the feedback provided on the posters for each of the BEMPs on the indicators (as well as, in some cases, the concept of the BEMP). On those basis, the TWG discussed the open points and reached consensus on the indicators as well as any further development needed for each specific BEMP.

2.2 Setting a framework for environmental policy and management

In the description of the BEMP two levels of management are mentioned together:

- The political level, with the envisioning (e.g. circular economy and life cycle thinking);
- The operational level, with the continuous improvement (e.g. lean management and stock reductions).

Some participants also found that setting up a policy would not be enough to be considered BEMP. Other participants warned that the text of the BEMP need to make clearer that this BEMP goes beyond what is mandatory in EMAS.

It was discussed that, as agreed at the kick-off meeting, this is an umbrella BEMP about the principles and related tools that trigger implementation of concrete actions (including those described in the other BEMPs). It is considered best practice in this sense. However, it was agreed that the description needs to be improved as follows:

- Distinguish better between the two levels of principles: present at the higher level life cycle thinking, circular economy and operational efficiency and for each of these present relevant action/tools/methods (which may include e.g. LCA, lean management)
- Ensure the text of the BEMP always go further than what is required under the EMAS regulation (also considering the new aspects brought in by ISO 14001:2015).
- Include inspiring examples of companies having taken action as a result of embarking on the principles mentioned in the BEMP (hints: Barco, Altas Copco, AW Europe).

The following indicators were agreed by the TWG:

- Resource efficiency (kg finished products/kg of material input (alternatively: kg waste produced/kg input materials in case the kg finished products are not known).
- Mapping of material flows and their environmental relevance (Y/N).
- On-site energy use (kWh / kg finished product or manufactured part).
- Scope 1, 2 and 3 CO₂-emissions (kg CO₂ equivalent / kg finished product or manufactured part).
- Water use (l water / kg finished product or manufactured part)

REMARK for the functional unit in the denominator of the different indicators used to express the finished products: the output (expressed in the indicators as *kg finished product or manufactured part*), can be expressed in different ways: numbers of parts, kg of products, etc. depending on the type of products and their homogeneity/heterogeneity. Companies can choose suitable metrics to express the output. This point is relevant across the different developed BEMPs of this report and will be made in a footnote.

2.3 Collaboration and communication along and across the value chain

The following indicators were agreed by the TWG:

- Percentage of goods and services (% of the total value) which are environmentally certified or with a demonstrably reduced environmental impact
- Systematic stakeholder involvement with a focus on improved environmental performance (e.g. in product design, improved supply chain environmental performance, sustainable sourcing, cooperation for improved waste management) (Y/N)
- Use of by-products, energy or other resources from other companies (kg materials from other companies / kg total input; MJ energy recovered from other companies / MJ total energy use)
- Purchase of second-hand machines or use of machinery from other companies (y/n)
- Amount of packaging waste (kg packaging waste / kg finished product or manufactured part)

The following aspects can be reflected in the description of the BEMPs:

- Packaging is an important area in which working along the value chain can yield clear benefits. By communication and collaboration with the upstream and downstream partners, packaging material can be reduced or replaced with returnable/reusable packaging. Distances and logistic are important aspects to take into account.
- Structured stakeholders meetings can help put in practice the systematic stakeholder involvement in improving environmental performance.

2.4 Energy management

The description of this BEMP should make it clearer that it is not having general energy management (e.g. as already part of EMAS or according to ISO 50001) that is BEMP, but rather making the best use of energy management. The following elements could be included or made more prominent in the BEMP:

- Importance of advanced (continuous or periodic, depending on processes) energy use monitoring with breakdown at process level;
- focus on analysis and actions taken as a consequence rather than just data collection;
- energy flow mapping (also seen against installed capacity);
- consider the possibility of including information on the use of multivariable regressions for energy management (to eliminate variables such as changes in product portfolio or climate).

The following indicators were agreed by the TWG:

- Energy use per manufactured product (kWh / kg finished product or manufactured part)
- Energy monitoring system at process level (Y/N)

2.5 Environmentally and sound efficient management of chemicals

The following indicators were agreed by the TWG:

- For individual chemicals used, amount of chemical applied (kg / kg finished product or manufactured part)
- For individual chemicals used, amount of classified chemical applied (kg / kg finished product or manufactured part)
- Amount of (hazardous) chemical waste generated (kg / kg finished product or manufactured part)

The TWG mentioned that it is very important to monitor chemical use at the level of individual chemicals (not several chemicals together). The aim is to focus on the most important chemicals (first).

2.6 Biodiversity management

The following indicators were agreed by the TWG:

- Number of projects collaborations with stakeholders to address biodiversity issues
- If located in or adjacent to protected areas: size of areas under biodiversity friendly management in comparison to total area of company sites (%)
- Inventory of land or other areas, owned, leased or managed by the company in or adjacent to protected areas or areas of high biodiversity value (area, m²)
- Procedure/instruments in place to analyse biodiversity related feedback from customers, stakeholders, suppliers (Y/N)
- Plan for biodiversity friendly gardening in place for premises or other areas owned, leased or managed by the company (Y/N)
- Total size of restored habitats and/or areas (on-site or both on-site and off-site) to compensate for damages to biodiversity caused by the company (m²) in comparison to land used by the company (m²).

The TWG asked JRC to check whether some of the wording used in this BEMP (e.g. improving throughout the value chain + own operations, public reporting about the company's efforts and results) should be avoided or presented differently given that these are true for all other BEMPs (at least in the cross-cutting chapter, if not beyond).

2.7 Remanufacturing and high-quality refurbishment of high value or large series products and components (new title)

The scope of this BEMP needs to be modified as discussed in the applicability session and reflected in the new title. The aspect of the business models needed for remanufacturing and of (eco)designing products in the first place to allow remanufacturing (with the aim to increase the number of products with remanufacturing capabilities, but also the number of possible remanufacturing cycles) can also be given more relevance in the BEMP description. The following case studies could be investigated and, if relevant, included: TVH; Atlas Copco.

The following indicators were agreed by the TWG:

- For each product group for which remanufacturing is introduced:
 - o Percentage of raw material used for remanufacturing compared to producing a new product (kg of material to remanufacture / kg of material for new product)
 - o Percentage of CO_{2e} emissions associated with remanufacturing a product compared to producing a new one (CO_{2e} emissions remanufacturing / CO_{2e} emissions new product), specifying if scope 1, 2 and/or 3 are included.

2.8 Link to relevant Reference Documents on Best Available Techniques (BREFs)

The following indicators were agreed by the TWG:

- Consideration of relevant BATs

Some participants think the current formulation of the BEMP is not helpful because it is too complex for SMEs to check the whole content of one or several BREFs. JRC will redevelop the description of this BEMP by listing some of the more relevant examples of content that companies (including SMEs) from fabricated metal product manufacturing should consult in BREFs e.g. techniques to reduce emissions of VOCs, variable speed drive motors and pumps (also to be cross-linked from energy management BEMP), etc.

3.2 Efficient ventilation

The following indicators were agreed by the TWG:

- Effective air volume extracted from the building (m^3/hour , m^3/shift or $\text{m}^3/\text{production batch}$)
- Demand driven ventilation system (Y/N)
- Energy use for ventilation per m^3 building (m^3/hour , m^3/shift or $\text{m}^3/\text{production batch}$)
- Energy use to heat or to cool the air used for ventilation per m^3 building (m^3/hour , m^3/shift or $\text{m}^3/\text{production batch}$)

The safety aspects, and the potential trade-off between safety and energy efficiency, need to be acknowledged in the applicability section of the BEMP.

3.3 Optimal lighting

The following indicators were agreed by the TWG:

- Use of daylight wherever possible (Y/N)
- Share of the lighting controlled by sensors (motion sensors, daylight sensors) (%)
- Energy use of lighting equipment ($\text{kWh}/\text{year}/\text{m}^2$ of lighted floor)
- Installed lighting power (kW/m^2 of lighted floor)
- Share of LED/low-energy light bulbs (%)
- Average efficacy of luminaires throughout plant (lm/W)

JRC will check the word “luminaire” and if necessary change by “light fitting”.

The following case studies could be investigated and, if relevant, included: Solatube, Econation.

3.4 Environmental optimisation of cooling systems

The following indicators were agreed by the TWG:

- Total equivalent warming impact (TEWI) of the cooling system (CO_2 equivalents)
- Global warming potential (GWP) of refrigerants used (CO_2 equivalents)
- Energy use for cooling (kWh/year ; kWh/kg finished product or manufactured part)
- Water use (tap water / rain water / surface water) for cooling (m^3/year ; m^3/kg finished product or manufactured part)

3.5 Rational and efficient use of compressed air systems

The following indicators were agreed by the TWG:

- Air leakage index
- Electricity use per standard cubic meter of compressed air delivered at the point of end-use (kWh/m^3) at a stated pressure level.
- Share of the machines with automatic closing of the compressed air delivery pipe when the machine is not in use.

JRC will investigate the possibility of referring to the standard ISO 1217C (Displacement compressors -- Acceptance tests) in the description or as an additional indicator.

Some participants highlighted the limitations of the air leakage index indicator as formulated in the report. In fact, for example, the more pressure drop is accepted in the system before the compressor switches-on, the less the compressors switch-on when all compressed air users are switched-off. The air leakage index is therefore a suitable indicator of the level of leakages only

when the same compressed air system is tested over time (e.g. every few weeks or months) or when identic or very similar installations are compared (i.e. under the same operating conditions and system layout). The JRC will make this aspect clearer in the text of the BEMP and will also underline the importance to carry out the test for the calculation of the index over the same time span (e.g. 8, 12, 24 hours) in order to ensure comparability.

3.6 Treating waste water with mechanical vapour compression evaporators

The following indicators were agreed by the TWG:

- Energy use of the waste water treatment system (kWh per tonne of treated waste water)
- Use of chemicals for waste water treatment (t/year)

The content of the BEMP need to be improved according to the elements discussed during the applicability session and, specifically, looking further into energy use and energy savings aspects. It should also be made clearer whether this is BEMP only in certain conditions (e.g. high load-low volume? Types of contaminants?)

3.7 Use of renewable energy

The following indicators were agreed by the TWG:

- Share of electricity from renewable sources (self-generated or purchased) out of the total energy use (%)
- Share of heat from renewable sources out of the total heat use (%).

The following aspects can be included in the text of the final version of the BEMP:

- References to "verified additionality" should be removed and the text of the BEMP should be harmonised with the Renewable Energy Directive and the renewable energy BEMP for car manufacturing.
- For many companies, public image is the main driver for switching to renewable energy, but this does not work very well in B2B like most companies in this sector.
- There are regional difference on how countries give (or give no) support to renewable energy, which strongly impacts economic viability.
- Energy exchanges between companies can be mentioned with reference to the BEMP on collaborations along and across the value chain.
- Heat recovery from industrial processes is not dealt with in this BEMP (it is not renewable heat) but it is already covered in the BEMP on energy management.

3.8 Rainwater collection

The following indicators were agreed by the TWG:

- Share of rainwater use on total water use (%)

The text of the BEMP can be enriched taking into account the following points:

- Include information on how to calculate the capacity of the collection system, taking into account meteorological circumstances.
- Examples (including from locations where rain water collection is not compulsory by law) and economic information need further development.

4.2 Selection of metal working fluids

TWG members proposed that in the description of the BEMP a clarification is added on the definition of the metal working fluids and what they consist of e.g. lubricants, coating fluids, etc. TWG members also pointed out that there are lubricants that are solid or applied electrostatically.

The following indicators were agreed by the TWG:

- Total amount of metal working fluids purchased per year (kg (or l)/year)
- Total amount of recovered metal working fluids per year (kg (or l)/year)
- Number of different metal working fluids used in the company (total number of metal working fluids)
- Consumption of MWFs per manufactured product (kg (or l)/ kg finished product or manufactured part)

4.3. Minimisation of lubricoolant consumption in metal processing

The following indicators were agreed by the TWG:

- Consumption of lubricoolants per processed part (l/part)

4.4 Use of metal working fluids for multiple operations

As already discussed during the applicability session, TWG agreed to include the content of this BEMP as an element of BEMP 4.2 (Selection of metal working fluids).

4.5 Incremental sheet metal forming

The following indicators were agreed by the TWG:

- Energy use per manufactured product (kWh / kg finished product or manufactured part)
- Resource efficiency (kg finished product / kg of material input)
- Environmental benefits of switching to ISF are proven by a full LCA or a simplified LCA based on semi-quantitative analysis (Y/N)

4.6 Reduction of standby energy use of metal working machines

The following indicators were agreed by the TWG:

- Energy use per manufactured product (kWh / kg finished product or manufactured part)
- For individual relevant machines: Total energy use per machine and year (kWh/year)
- For individual relevant machines: Energy use during downtime (kWh/hour)
- Percentage of machines having a switch-off/do-not-switch label (%).

4.7 Maintaining material value for metal working residues

The content of this BEMP will be expanded to cover different techniques to recover metal working residues (e.g. oil, emulsions, metal powders), such as separators and briquetting, which are relevant at different scales.

The following indicators were agreed by the TWG:

- Oil recovered (l oil / year)
- Oil recovery efficiency (% of oil in briquettes or separator output)

The following case studies could be investigated and, if relevant, included: Metaplast, BMT Aerospace, IG Watteeuw, Hansgrohe.

4.8 Additive manufacturing

The text of the BEMP can be further developed taking into account the following points:

- Importance to consider the yield on the primary metals (as low as 25-30% for metal powders, better for wires...)
- Reusability/recyclability of "waste" metal powders (e.g. used for 3D printing).

The following indicators were agreed by the TWG:

- Environmental benefits of switching additive manufacturing are proven by a full LCA or a simplified LCA based on semi-quantitative analysis (Y/N).

4.9 Multi-directional forging

The following indicators were agreed by the TWG:

- The percentage of generated flash per manufactured part (%)
- The total energy required for the forging process (energy input for forging / kg finished product or manufactured part)
- Resource efficiency (kg finished product or manufactured part/ kg of material input)

4.10 Hybrid machining as a method to reduce energy consumption

The following indicators were agreed by the TWG:

- Energy use (kWh / kg finished product or manufactured part)
- Resource efficiency (kg finished product or manufactured part/ kg of material input)

4.12 Use of predictive control for paint booth HVAC management

The following indicators were agreed by the TWG:

- Energy use for painting (kWh/ m² of surface coated/painted)

VIII. Discussion on benchmarks of excellence

The following benchmarks of excellence were agreed by the TWG:

Cross cutting BEMPs

BEMP	Benchmarks of Excellence	Actions
2.2 Setting a framework for environmental policy and management	<ul style="list-style-type: none">– Systematic consideration of life cycle thinking, lean management and circular economy in all strategic decisions making.– New products developments are assessed for environmental improvements.	
2.3 Collaboration and communication along and across the value chain	<ul style="list-style-type: none">– All purchased goods and services meet environmental criteria established by the company.– Collaboration with other organisations to use energy and resources more efficiently at a systemic level.– Structural engagement of stakeholders in the development of more environmentally friendly products.	
2.4 Energy management	<ul style="list-style-type: none">– Continuous energy monitoring at process level is implemented and drives energy efficiency improvements.– Budget is allocated to all energy efficiency improvements with return of investment up to five years.	
2.5 Environmentally and sound efficient	<ul style="list-style-type: none">– Regular (at least once a year) review of the use of chemicals to minimise their use and explore	

management of chemicals	opportunities for substitution.	
2.6 Biodiversity management	– A biodiversity action plan is developed and implemented for all relevant sites (including manufacturing sites) to protect and enhance the local biodiversity.	
2.7 Remanufacturing and high-quality refurbishment of high value or large series products and components	– The company offers remanufactured/refurbished products with LCA verified environmental benefits.	
2.8 Link to relevant Reference Documents on Best Available Techniques (BREFs)	<i>no benchmark formulated</i>	

Optimisation of utilities BEMPs

BEMP	Benchmarks of Excellence	Action
3.2 Efficient ventilation	– Demand driven ventilation is implemented to reduce HVAC energy use.	
3.3 Optimal lighting	– The lighting system is designed to meet the light needs in the different areas of the manufacturing site and takes into account daylight and actual presence of staff.	
3.4 Environmental optimisation of cooling systems	– The cooling system is optimised with regard to energy use, water use, material use and global warming potential.	
3.5 Rational and efficient use of compressed air systems	– The electricity use of the compressed air system is lower than 0.11 kWh/m ³ of delivered compressed air, for large installations working at 6.5 bars effective, with volume flow normalized on 1013 mbar and 20°C, and pressure deviations not exceeding 0.2 bars effective.	
3.6 Treating waste water with mechanical vapour compression evaporators	<i>no benchmark formulated</i>	Lennart to provide information on the achievements with this technology in his company for the potential formulation of a benchmark
3.7 Use of renewable energy	<p>– All electricity use is met by self-generated or purchased verified renewable electricity.</p> <p><i>If examples of fabricated metal product manufacturing companies using renewable heat in manufacturing processes are confirmed, the following additional benchmark is also considered agreed:</i></p> <p>– The use of renewable heat generated on-site is integrated in suitable manufacturing processes.</p>	<p>All TWG members to look for examples of fabricated metal product manufacturing companies using renewable heat in manufacturing processes (rather than just for space heating, etc.)</p> <p>Mark to provide</p>

		information on Volvo UK. Louis to provide information on use of solar collectors to pre-heat water.
3.8 Rainwater collection	– Rainwater is collected and used as process water in manufacturing and ancillary processes.	

Manufacturing BEMPs

The formulation of a benchmark of excellence encompassing all of the manufacturing BEMPs was agreed as follows:

BEMP	Benchmarks of Excellence	Action
All manufacturing BEMPs	The company achieves continuous (i.e. year-on-year) improvement in environmental performance as reflected by an improvement in, at least, the following indicators: <ul style="list-style-type: none"> – energy use per manufactured product – resources efficiency – consumption of metal working fluids per manufactured product 	JRC to ensure the report makes very clear what is intended by "metal working fluids" (i.e. lubricants, coating fluids...)

In addition, the following benchmarks of excellence for two specific manufacturing BEMPs were also agreed:

BEMP	Benchmarks of Excellence	Action
4.6 Reduction of standby energy use of metal working machines	– All metal working machines have either a green standby mode or a label indicating when they should be manually switched off.	
4.7 Maintaining material value for metal working residues	– Turning chips and grinding swarf have oil/moisture content respectively lower than 2% and 8%	

Annexes

LIST OF PARTICIPANTS

**Final meeting of the technical working group for the EMAS Sectoral Reference Document
on best environmental management practices for the fabricated metal products sector**

BRUSSELS, 27 – 28 NOVEMBER 2017

First Name	Last Name	Organisation
Belen	SÁNCHEZ	Gestamp
Daniel	SINGLER	Hansgrohe SE
Enrico	FLAMIGNI	SCM Fonderie
Felipe	MARTÍNEZ RODRÍGUEZ	European Aluminium
Ioannis	ANTONOPOULOS	European Commission, JRC
Lennart	HERMANS	CDP
Lennart	SCHLEICHER	Schäffler AG
Liesbet	VAN DEN ABEELE	VITO
Louis	BRIMACOMBE	IOM3 - Institute of Materials, Minerals and Mining
Marco	DRI	European Commission, JRC
Mark	JOLLY	Cranfield University
Michael	KLUEH	Hansgrohe SE
Milos	MILUNOV	BiPRO
Miriam	JACOB TOR WEIHEN	Coventya
Orsolya	MALLÁR-VARGA	Metaplast Gear Technology
Paolo	CANFORA	European Commission, JRC
Patricia	TOURAIIS FERREIRA	NOVA University of Lisbon
Pedro	GROSSINHO	Federal-Mogul
Peter	FISCHER	Peter Fischer Managementberatung
Pierre	GAUDILLAT	European Commission, JRC
Radostina	PETROVA	European Commission, DG RTD
Sonja	BAUER	BiPRo
Susanne	HEUTLING	European Commission, DG ENV
Thomas	VANDENHAUTE	Sirris
Veronika	ABRAHAM	BiPRO



FINAL MEETING OF THE TECHNICAL WORKING GROUP FOR THE EMAS SECTORAL REFERENCE DOCUMENT ON BEST ENVIRONMENTAL MANAGEMENT PRACTICES FOR THE FABRICATED METAL PRODUCTS MANUFACTURING SECTOR

BRUSSELS, 27 - 28 NOVEMBER 2017

Centre de Conférences Albert Borschette (CCAB), Rue Froissart 36, 1040 Etterbeek, Belgium

Room 3.A

DAY 1 – Monday, 27 November 2017

09:00 – 10:00 | *Arrival and registration of participants*

10:00 – 10:30 | Opening of the meeting and introduction of experts

10:30 – 11:30 | Background and purpose of the meeting:

- background
- scope and structure of the EMAS SRD for the Fabricated Metal Products manufacturing sector
- state of play and meeting objectives

11:30 – 12:30 | Plenary discussion: reaching the target audience for the document and maximising best practice uptake

12:30 – 14:00 | *Lunch break*

14:00 – 14:15 | Introduction to Environmental Performance Indicators; setting Benchmarks of Excellence

14:15 – 16:00 | Overview of the Best Environmental Management Practices (BEMPs) for the Sector

16:00 | *Coffee break*

16:00 – 18:00 | Feedback session: proposals for Environmental Performance Indicators

18:00 – 18:15 | Wrap-up and close of the day

– N.B. An optional social gathering will be organised in the evening of day 1 –

FINAL MEETING OF THE TECHNICAL WORKING GROUP FOR THE EMAS SECTORAL REFERENCE DOCUMENT ON BEST ENVIRONMENTAL MANAGEMENT PRACTICES FOR THE FABRICATED METAL PRODUCTS MANUFACTURING SECTOR

BRUSSELS, 27 - 28 NOVEMBER 2017

Centre de Conférences Albert Borschette (CCAB), Rue Froissart 36, 1040 Etterbeek, Belgium

Room 3.A

DAY 2 – Tuesday 28 November 2017

09:00 – 09:15 | Opening of the day

09:15 – 10:00 | Plenary discussion: applicability of the Best Environmental Management Practice throughout the sector

10:00 – 12:30 | Outcome of feedback session – environmental performance indicators for fabricated metal products manufacturing

(Coffee break at 11:00)

12:30 – 14:00 | *Lunch break*

14:00 – 16:00 | Discussion on benchmarks of excellence

16:00 – 16:30 | Wrap-up and close of the workshop

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EU Science Hub



Joint Research Centre

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20 Years of PREMIUM ENVIRONMENTAL MANAGEMENT

Best Environmental Management Practices and the EMAS Sectoral Reference Documents

Presentation at the
Final meeting of the Technical Working Group on Best Environmental Management Practice for the Fabricated metal products manufacturing sector
Brussels, 27-28 November 2017

Paolo Canfora, Pierre Gaudillat, Marco Dri, Ioannis Antonopoulos
European Commission – Joint Research Centre



EMAS

Performance, Credibility, Transparency

What is EMAS? EU Eco-Management and Audit Scheme

- ✓ An Environmental Management System
- ✓ An EU Regulation
- ✓ An environmental performance reporting tool

Joint Research Centre



EMAS is a commitment to...

CONTINUOUS IMPROVEMENT

... in environmental performance

Joint Research Centre



But what if you ask yourself

- where to start?
- can we still do better?
- is this relevant for us?
- are others doing better?
- how to measure that?
- what can we do about this aspect?

Look at the EMAS Sectoral Reference Documents



European Commission



**Best
Environmental
Management
Practices
can help**

**For both EMAS and non-EMAS
organisations**




The 'frontrunners approach'




**GO GREEN WITH
BEST ENVIRONMENTAL
MANAGEMENT PRACTICES!**

BEMP
Best practices to reduce
environmental impacts
Already in Use by Best Environmental Performers

→  +  + 

Practical
Guidance Environmental
Performance
Indicators Benchmarks
of Excellence

A sectoral approach






Main elements of the sectoral reference documents

The sectoral reference documents comprise 3 main elements:

- Best environmental management practices (BEMPs)
Food waste minimisation by retailers
- Environmental performance indicators
Kg waste generation per m² of sales area
- Benchmarks of excellence
Zero food waste sent to landfill or incineration plant

An example from:

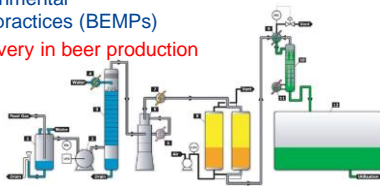




Main elements of the sectoral reference documents

The sectoral reference documents comprise 3 main elements:

- Best environmental management practices (BEMPs)

CO₂ recovery in beer production



- Environmental performance indicators
kg CO₂ recovered / hL beer produced

- Benchmarks of excellence
50% of CO₂ produced by fermentation is recovered

An example from:



Best Environmental Management Practices (BEMPs)

What is BEMP:

- those techniques, measures or actions that allow organisations of a given sector to **minimise their impact on the environment**
- **fully implemented** by best performers
- **direct** and **indirect** aspects
- **technical/technological** as well as **management /organisational** type
- technically **feasible** and **economically viable**



Best Environmental Management Practices (BEMPs)

What is not BEMP:

BEMP is what goes well beyond common practice

but is already fully implemented

and widely applicable

- Obsolete techniques
- Common practice
- Good practice
- Proprietary techniques
- Emerging techniques
 - are available and innovative
 - not yet proved their economic feasibility
 - not yet implemented at full scale

Environmental Performance Indicators and Benchmarks of Excellence

- **Environmental performance indicators**
 - "specific expression that allows measurement of an organisation's environmental performance" (EMAS Regulation)
 - already in use*
 - environmentally meaningful*
 - can be a proxy*
- **Benchmarks of excellence**
 - exemplary environmental performance
 - very ambitious*
 - achieved by frontrunners*
 - not a target but a measure of what is possible*

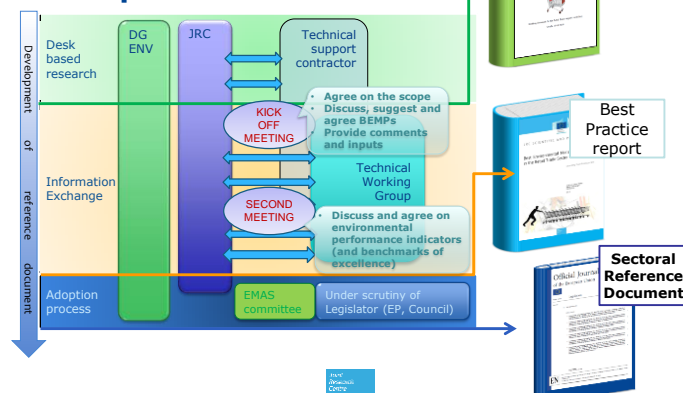


A development process based on stakeholder involvement

Three phases:

- **Desk research** (background collection of information from literature, frontrunner organisations and experts)
- **Information exchange** within the forum of a **Technical Working Group** comprising sector experts to identify and validate the best practices identified, the indicators and the benchmark of excellence
- **Legislative process** (member state representatives in the EMAS Committee)

The EMAS SRD Development Process



The documents produced so far...

Best practice reports



3 Sectoral Reference Documents

Thank you!

**Paolo Canfora
Marco Dri
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<http://susproc.jrc.ec.europa.eu/activities/emas/index.html>


European Commission

Best environmental management practice for the Fabricated Metal Products manufacturing sector

Final meeting of the Technical Working Group
supporting the development of an EMAS Sectoral
Reference Document




Brussels, 27-28 November 2017

Overview of the scope

jrc-emas-srd@ec.europa.eu
European Commission
Joint Research Centre (JRC)
Circular Economy and Industrial Leadership Unit


 JRC



European Commission

Scope – NACE code groups covered (1/2)

NACE Division	NACE code groups	Description
24	24.2*	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
	24.3*	Manufacture of other products of first processing of steel
	24.5*	Casting of metals
25	Entire group	Manufacture of fabricated metal products, except machinery and equipment
28	28.14	Manufacture of other taps and valves
	28.15	Manufacture of bearings, gears, gearing and driving elements
29	29.32	Manufacture of other parts and accessories for motor vehicles

* only small scale operations (considerably smaller than IED thresholds with substantially different manufacturing processes, e.g. much more manual than automated processes)

 JRC


European Commission


Scope and structure of the document


Target group of the document: Fabricated metal products manufacturers

Scope based on a life-cycle thinking approach ("from cradle to grave").

The BEMPs are grouped:

- Cross-cutting issues;
- Optimisation of utilities;
- Manufacturing processes.


 JRC

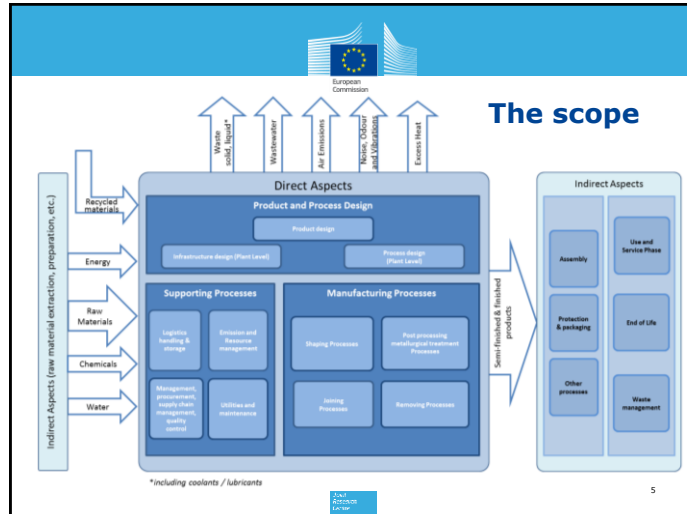

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Scope – NACE code groups covered (2/2)

NACE Division	NACE code group	Description
32	32.12**	Manufacture of jewellery and related articles
	32.13**	Manufacture of imitation jewellery and related articles
	32.20**	Manufacture of musical instruments
	32.30**	Manufacture of sports goods
	32.40**	Manufacture of games and toys
33	32.50**	Manufacture of medical and dental instruments and supplies
	33.11**	Repair of fabricated metal products
	33.12**	Repair of machinery

** these activities are considered in scope insofar as the products concerned are composed mainly of metal

 JRC





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Optimisation of utilities chapter

BEMPs	Most relevant direct environmental aspects	Related main environmental pressures	Relevant BRefs
3.2 Efficient ventilation	Supporting processes	Energy Water Emissions to air Waste: hazardous	STS FNE ICS
3.3 Optimal lighting			
3.4 Environmental optimisation of cooling systems			
3.5 Rational and efficient use of compressed air systems			
3.6 Treating wastewater with mechanical vapour compression evaporators			
3.7 Use of renewable energy			
3.8 Rainwater collection			

2.4.1
Process
Level

7



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Cross-cutting issues chapter

BEMPs	Most relevant direct environmental aspects	Related main environmental pressures	Relevant BRefs
2.2 Setting a framework for environmental policy and management	All operations	Raw materials	ENE STM STS
2.3 Collaboration and communication along and across the value chain		Energy	
2.4 Energy management		Water	
2.5 Chemicals management		Consumables	
2.6 Biodiversity management		Emissions to air	
2.7 Remanufacturing of high value components		Odour, noise and vibration	
2.8 Link to the relevant Reference Document on Best Available Techniques		Waste: Hazardous and non-hazardous waste	
		Land use	
		Biodiversity	

2.4.1
Process
Level

6


European Commission

Manufacturing processes chapter

BEMPs	Most relevant direct environmental aspects	Related main environmental pressures	Relevant BRefs
4.2 Selection of Metal Working Fluids	Manufacturing processes	Energy Waste Water Emissions to air Emission to water Noise, odour, vibration etc. Waste: Hazardous, non-hazardous	STS FMP
4.3 Minimisation of lubricant consumption in metal processing			
4.4 Use of metal working fluids for multiple operations			
4.5 Incremental sheet metal forming as alternative for mould making			
4.6 Reduction of standby energy of metal working machines			
4.7 Maintaining material value for metal residues			
4.8 Additive manufacturing for complex equipment			
4.9 Multi-directional forging			
4.10 Hybrid machining as a method to reduce energy use			
4.11 Machining of near-net-shape feedstock			
4.12 Use of predictive control for paint booth HVAC management			

2.4.1
Process
Level

7




State of Play and Meeting Objectives

Presentation at the
Final Meeting of the Technical Working Group on Best
Environmental Management Practice for the Fabricated
Metal Products manufacturing sector

Brussels, 27-28 November 2017

Paolo Canfora, Pierre Gaudillat, Marco Dri, Ioannis Antonopoulos
European Commission – Joint Research Centre

Process & milestones: achieved to date			
	BEMP	EPI	BoE
Draft background report (VITO)	First survey of best practices BEMP proposals	First proposals of specific EPIs for each BEMP	
TWG (kick-off meeting)	<ul style="list-style-type: none"> - Agree on scope of the document - Review and amend BEMP proposals, new suggestions → agreed list of BEMPs - Inputs for BEMP development 	Initial discussion of EPIs for each BEMP	
Draft best practice report	Update of BEMPs in light of TWG feedback: <ul style="list-style-type: none"> - Scope enlargement - New BEMPs developed + BEMPs revised (with BiPRO) - Final list of BEMPs 	Update in light of TWG feedback: <ul style="list-style-type: none"> - New and revised proposals of EPIs for all (new and revised) BEMPs 	Proposals of benchmarks of excellence



Process & milestones: final TWG meeting			
	BEMP	EPI	BoE
TWG Final Meeting (in progress)	Overview of the new developed and revised BEMPs	Agreement on a set of specific indicators for each BEMP, on the basis of: <ul style="list-style-type: none"> - proposals of indicators in the draft best practice report (also on the posters) - suggestions for potential new EPIs used by the industry by TWG members 	Agreement on a set of benchmarks of excellence based on the proposals circulated in advance of the meeting or other proposals from TWG members. Collection of further examples of frontrunner companies achieving the identified benchmarks



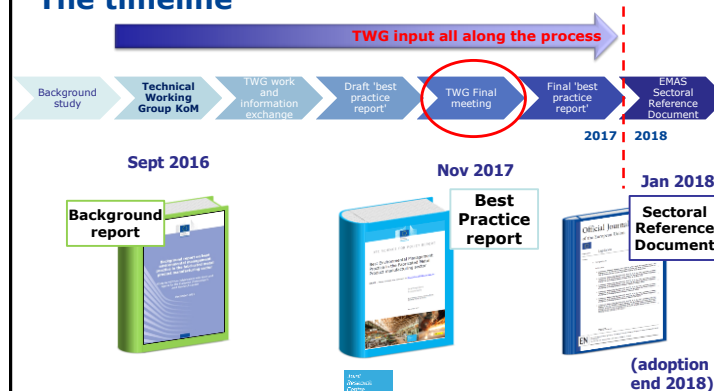
Process & milestones: follow-up and finalisation

	BEMP	EPI	BoE
Final BEMP report (JRC)	<ul style="list-style-type: none"> - Take into account TWG outcome - Update of BEMPs in light of TWG views - Final BEMPs 	<ul style="list-style-type: none"> - Agreement on the list of EPIs - Update the indicators in light of the TWG outcome - Final list of EPIs 	<ul style="list-style-type: none"> - Agreement on list of BoEs - Update the proposed BoEs in light of the TWG outcome - Final list of BoEs
SRD process (adoption)	<ul style="list-style-type: none"> - Summaries of BEMPs 	<ul style="list-style-type: none"> - incl. final list of EPIs 	<ul style="list-style-type: none"> - incl. final list of BoEs

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The timeline



Milestones and project outcomes

Background research

- Proposals for BEMPs
- Proposals for environmental performance indicators
- Proposals for benchmarks of excellence



Technical Working Group – Best Practice Report development

- Agree on scope of the document
- Discuss initial BEMP proposals
- Agree on list of BEMPs
- Provide complementary data and inputs
- Agree upon Environmental Performance Indicators (EPIs)
- Agree upon Benchmarks of Excellence (BoEs)
- Validate set of BEMPs / EPIs / BoEs
- Final BEMP report



Meeting objectives

Sectoral Reference Document

- Summarise findings on BEMPs / EPIs / BoEs



Thank you!



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Environmental performance indicators and benchmarks of excellence

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Environmental performance indicators

- **Environmental performance indicators:** "specific expression that allows **measurement** of an organisation's **environmental performance**" (EMAS Regulation)

- Core indicators
- Specific indicators
- (Alternative indicators)

- (i) Energy efficiency
- (ii) Material efficiency
- (iii) Water
- (iv) Waste
- (v) Biodiversity and
- (vi) Emissions.

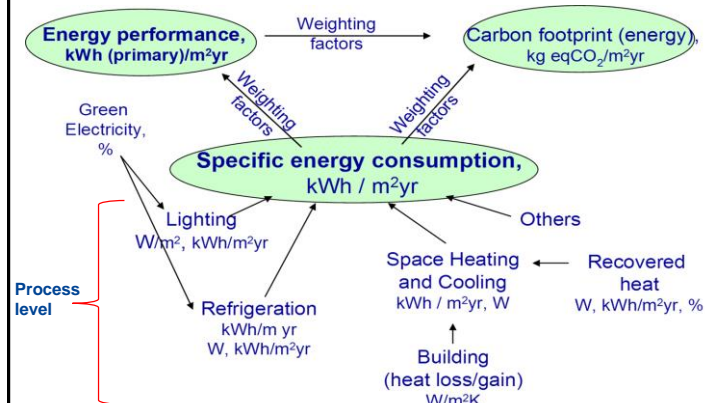


Environmental performance indicators – sector level

- Sector-specific environmental performance indicators are considered **an outcome of the whole process**
- Final selection of the indicators is made in accordance with **available data and practical/technical information** from organisations, stakeholders, literature, etc.
- Indicators should measure the environmental performance of the organisation - but as focussed on the **'process'** or **'activity'** level



An example from the retail sector



Selection of environmental indicators

- Indicators must be **actually used** by organisation of the sector and/or they must be **calculated easily**
- Indicators must be as **specific** as possible in order to allow meaningful **comparison** over time, across sites of an organisation, across organisations and against given **benchmarks**

From indicators to benchmarks

"Benchmark" levels can be defined based on many approaches e.g.:

- ~~The best~~
- Top 10 or **Top 10%**
- ~~Current average in sector~~
- ~~Potential average in sector using "best practice"~~
- etc.
- But then what do we mean by "best practice"?
 - Achievable by ~~a few / many / most / all~~ ?
 - Taking account of sector-specific economics ?

Already achieved by a few

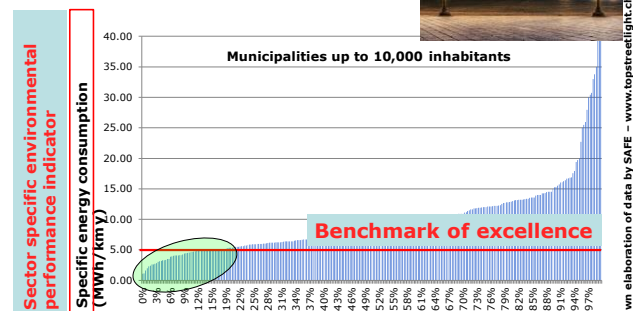
Applicability and special circumstances are also taken into account

Identifying benchmarks of excellence (1)

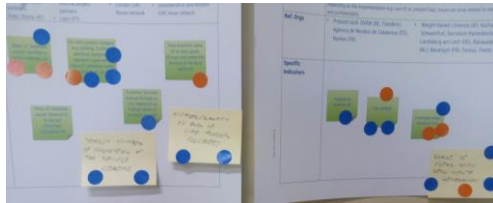
- Frequency distributions** of a quantified *environmental performance indicator* can be used to derive the benchmark of excellence once the indicators have been identified.
- The benchmarks of excellence correspond to the performance levels achieved by **frontrunners**.
- They correspond to the performance of best performers identified e.g. as the **top 10-20%** in the industry

Quantitative benchmark: an example

Public lighting



Providing feedback on indicators



- ☐ Alternative proposal? Add a
- ☐ Amend the proposal? Add a
- ☐ Wish to support a proposal? Add a blue dot
- ☐ Found a not-so-good proposal? Add a red dot

post-it

Thank you!



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Best environmental management practice for the Fabricated Metal Products manufacturing sector

Final meeting of the Technical Working Group supporting the development of an EMAS Sectoral Reference Document



Brussels, 27-28 November 2017

BEMPs overview

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European Commission
Joint Research Centre (JRC)
Circular Economy and Industrial Leadership Unit

2.2 Setting a framework for environmental policy and management

- BEMP is to apply a set of environmental policy principles, approaches and management tools in order to
 - optimise processes at the production stage and
 - reduce environmental impacts along the whole value chain, such as:

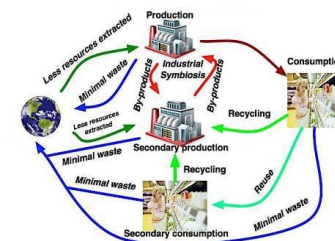
- Circular economy
- Life cycle thinking
- Lean management
- Stock reduction.



Cross-cutting chapter

2.3 Collaboration and communication across and along the value chain

- Collaboration with other companies within the sector, companies in other sectors and throughout the value chain for:
 - Sustainable procurement
 - Industrial symbiosis
 - Co-design and open innovation



2.4 Energy management

- BEMP is to put in place an energy management plan including the following elements:

- Energy policy strategy and strategy
- Senior management commitment and responsibility
- Target setting
- Performance measurement and assessment
- Communication
- Staff training
- Investment and procurement

- The plan can be based on a standard format (e.g. ISO 50001)
- It can be part of a broader environmental management system (like EMAS).

2.6 Biodiversity management

- Take into account direct and indirect impacts on biodiversity throughout the value chain and company's operations:

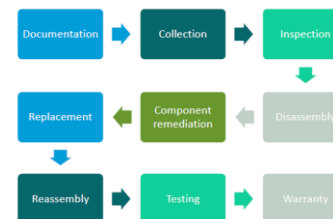
- Conduct an ecosystem management review
- Conduct a site review and identify hotspots
- Measure impacts
- Work together and closely with stakeholders
- Report on company's results

2.5 Environmentally and sound efficient management of chemicals

- BEMP is to
 - optimise the amounts of chemicals used for manufacturing processes
 - minimise the chemicals that are disposed
 - substitute hazardous chemicals wherever possible
- ... by implementing the following measures:
 - Review of the current chemical use and management on-site;
 - Reduction of the chemical use
 - Use of external expertise wherever relevant.

2.7 Remanufacturing of high value components

- BEMP is to take into account and enable opportunities for remanufacturing along the entire life cycle of the fabricated metal products manufactured.



2.8 Link to the relevant BREFs

- Use BREFs to:
 - identify relevant environmental issues to address and,
 - implement the best available techniques (BAT), where appropriate.

[illegible]

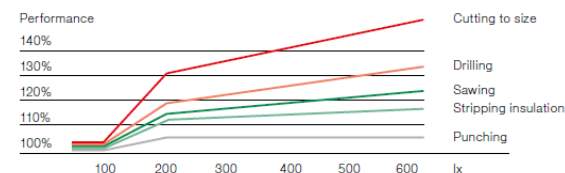
3.2 Efficient ventilation

- Improve the efficiency of the ventilation system.
- Reduce energy use by e.g.:
 - Mapping and reducing sources of heat and pollutants;
 - Heat recovery from exhaust air;
 - Use of variable speed drive motors for ventilation;
 - Optimisation of the position and orientation of blowers;
 - Adapting supply to ventilation demand

Optimisation of utilities chapter

3.3 Optimal lighting

- Define actual (current and future) light needs;
- Define the optimal lighting solution;
- Optimise new and existing lighting systems e.g. maximising the use of daylight, installing presence detector-controlled lighting in key locations etc.



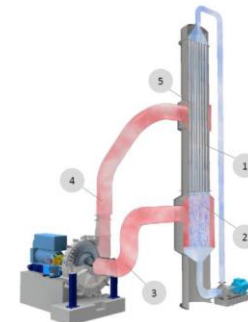
3.4 Environmental optimisation of cooling systems

- Define the cooling needs
- Redesign the cooling system:
 - avoiding over-dimensioning;
 - exploiting potential for system optimisation;
 - exploiting opportunities for free cooling;
 - selecting the optimal cooling tower system;
 - selecting the most environmentally friendly refrigerant



3.6 Treating wastewater with mechanical vapour compression evaporators

- Wastewater is treated up to the specifications of process water
- can be then reused in production processes.
- Required energy is delivered by exploiting the waste heat of production processes or renewable energy generation.



3.5 Rational and efficient use of compressed air systems

- Map and assess the use of compressed air;
- Where the use of compressed air is appropriate:
 - Optimise the compressed air system configuration;
 - Optimise the compressed air use;
 - Perform appropriate maintenance for compressed air systems.

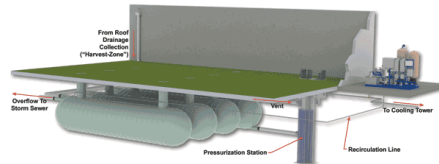
3.7 Use of renewable energy

- Use of renewable energy for on-site processes:
 - purchase of verified-additional renewable electricity;
 - generate electricity and heat from renewable energy sources;
 - install energy storage systems, where relevant.



3.8 Rainwater collection

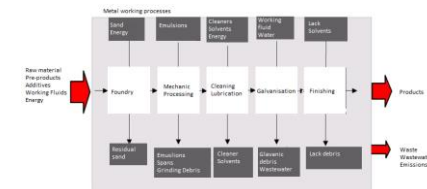
- Collect and use rainwater as process water.
- Rainwater collection systems consist of:



- catchment area;
- conveyance system to collect it in a storage tank;
- distribution system (pipes and pump).

4.2 Selection of metal working fluids (MWF)

- Selection of MWFs based on a broad set of criteria considering the whole life cycle of the fluids and the metal products (including both environmental and economic aspects);
- Evaluation and control of the performance of the selected MWF during and after their application.



Manufacturing processes chapter

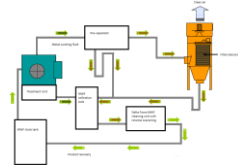
4.3 Minimisation of lubricoolant consumption in metal processing

- Apply cryogenic cooling or high pressure lubricoolant supply to minimise resource use and extend tool service life



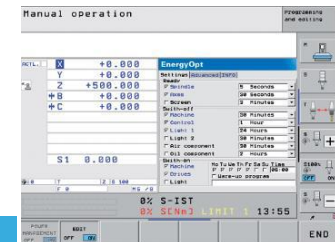
4.4 Use of working fluids for multiple operations

- Use MWF to provide different functions e.g. lubricant, chip removal, cleaner.
- Further environmental benefits when MWFs are recovered/reformulated.



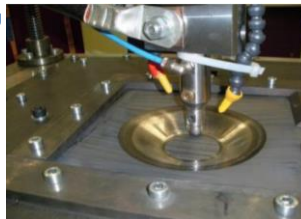
4.6 Reduction of standby energy use of metal working machines

- Switch off machines manually or automatically in most efficient way
- Purchase of energy-efficient machines with a "green" standby mode integrated.
- Several subunits switch off individually instead of putting the entire machine simply on standby.
- Reduce duration of standby phases during downtime through an optimisation of production planning.



4.5 Incremental sheet forming (ISF) as an alternative for mould making

- Used as an alternative for mould making
- Suitable for small series of production.
- Allows the manufacturing of complex products with a higher material efficiency.



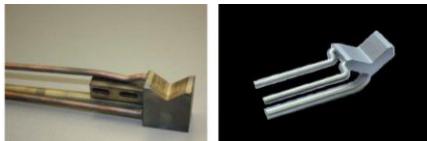
4.7 Maintaining material value for metal residues

- Segregation of flows of metal residues of different grades;
- Pressing chips and swarf into briquettes;
- Recovery of cutting emulsion.



4.8 Additive Manufacturing (AM) for complex equipment

- AM technologies, when appropriate, can be used to increase material efficiency.
- Suitable for complex geometries e.g. light-weight parts.
- Enable full customisation of the fabricated products/parts.



Conventional vs AM

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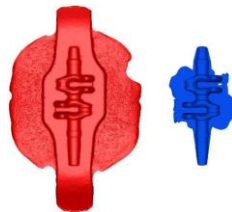
4.10 Hybrid machining as a method to reduce energy use

- Break down entire processes into their single steps and list the functional requirements for each step.
- Select the most suitable technology for each process step, taking into consideration the energy consumption as well as other relevant parameters (geometry, material type and properties, etc.).

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4.9 Multi-directional forging

- Suitable for complex products with a high variation in cross-section.
- Reduction of the formation of flash.
- Pressure application in different directions in the piece under fabrication.
- Less deformed material "escape" to each side and therefore less material need to be removed by machining afterwards.



Conventional vs multi-directional

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4.11 Machining of near-net-shape feedstock

- Near net shapes are machining feedstock, with an initial form close to the final geometry.
- Belt casting, metal injection moulding and rapid plasma deposition are some examples of technologies that allow producing near net shapes.



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4.12 Use of predictive control for paint booth HVAC management

- Set a humidity / temperature window of operation
 - Instead of set operating point
- Regulate inflow of air
 - Based on requirements of drying process and temperature / humidity of incoming air

