European Commission

Final meeting of the technical working group for the EMAS sectoral reference document on best environmental management practice in the car manufacturing sector

Seville, 21-22 June 2016

European Commission - Joint Research Centre

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Joint Research Centre

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INTRODUCTION

The European Commission's Joint Research Centre (JRC) is developing a **Best Practice Report** on best environmental management practice in the car manufacturing sector. This document will describe practices that relevant stakeholders can implement in order to minimise their environmental impacts. It will form the basis for the preparation by the European Commission of a Sectoral Reference Document (SRD) for the car manufacturing sector. The development of these documents is part of the European Commission's work to implement the EU Eco-Management and Audit Scheme (EMAS) Regulation. EMAS is a voluntary tool to promote continuous improvements in the environmental performance of organisations across all sectors of economic activity.

The revision of the EMAS Regulation in 2009 (EC No. 1221/2009) introduced a particular focus on environmental performance. To support this aim, the European Commission's Joint Research Centre (JRC) collects information and guidance on **best environmental management practices (BEMPs)** in several priority sectors, including the car manufacturing sector. These are presented in Best Practice Reports and SRDs. These documents are developed in close collaboration with the stakeholders of the different sectors and under the guidance of a Technical Working Group (TWG) comprising experts from the sector. Further information on the SRDs and their development process can be found in the guidelines on the ***"Development of the EMAS Sectoral Reference Documents on Best Environmental Management Practice"*** (European Commission, 2014)[1].

SRDs are documents that EMAS registered organisations must take into account when assessing their environmental performance, but can also be used by others looking for guidance on how to improve their environmental performance.

The final meeting of the Technical Working Group (TWG) for the car manufacturing sector was held in Seville on 21-22 June 2016. The goal of the workshop was to steer the final steps in the elaboration of the Best Practice Report and subsequent SRD, by agreeing on the final scope, best practices to be included and relevant environmental performance indicators and benchmarks of excellence.

N.B.
The notes below present a summary of the discussions held during the final meeting: they aim to summarise the main points arising from the debates and not necessarily to follow a linear point-by-point account of the exchanges. They will be usefully complemented by the material presented (in Annex C) and should be read in conjunction with the draft Background Report distributed ahead of the meeting for a full comprehension of the points captured below.

OPENING OF THE WORKSHOP

The JRC opened the session and welcomed the participants.

- The meeting agenda was presented (see Annex A) and adopted without amendments.
- The TWG members introduced themselves and summarised their experience in environment and car manufacturing (the list of participants is attached in Annex B).
- Participants were informed and agreed that the meeting would be recorded.
- It was agreed to use first names to refer to the different TWG members.

[1] http://susproc.jrc.ec.europa.eu/activities/emas/documents/DevelopmentSRD.pdf

INTRODUCTION OF THE SECTORAL REFERENCE DOCUMENTS, PURPOSE AND GOALS OF THE MEETING

The JRC's EMAS team introduced the work with a short presentation of:

- EMAS
- Sectoral Reference Documents
- Priority Sectors which include Car Manufacturing
- the different reports:
    - background report from consultants;
    - "Best Practice report" with full content and description of Best Environmental Management Practices (BEMPs);
    - legal document (SRD) with a summary of BEMPs, Environmental Performance Indicators and Benchmarks of Excellence
- the Car Manufacturing SRD project timeline (since January 2014),
- the planned final version of the report (end of 2016) and subsequent legal process and adoption of SRD (mid 2017).

Presentation of goals and purposes of the EMAS SRD for Car Manufacturing:

- Presentation of EMAS as a reporting tool and a management system
- Presentation of BEMPs as support for the implementation of EMAS
- Definition of Environmental Performance Indicators and Benchmarks of Excellence

Discussion: The TWG Members provided initial and general comments on the project:

- The draft report is currently too fragmented and too long. It needs a matrix structure in order to emphasise cross-cutting and overarching BEMPs to be differentiated from specific BEMPs that can be implemented to achieve overarching goals.
- The targeted groups should be clearly indicated for each BEMP.
- Some references need to be updated.
- The document should not present as references personal comments or non-factual examples (i.e. advertising claims) but should refer to more broadly acknowledged facts.
- More references and examples from the companies represented in the TWG should be included.

Conclusions/ actions/ next steps:

- Adapt the structure of the best practice report in order to reflect the different BEMP levels
- Reduce fragmentation and improve readability

BEMPs, ENVIRONMENTAL ASPECTS OF THE CAR MANUFACTURING AND ELV SECTOR; DEFINITION OF THE SCOPE OF THE SECTORAL REFERENCE DOCUMENT

The JRC's EMAS team introduced the work in more detail with a presentation of the key features of SRDs: BEMPs, Environmental Performance Indicators and Benchmarks of Excellence:

- An SRD is a compilation of BEMPs implemented by front runners and described in a standardised way: 10-headings structure (similar to structure used for BREFs, best available techniques reference documents, for the Industrial Emissions Directive).
- BEMPs have to be available, implemented and applicable in general
- Achievement of BEMPs can be monitored using appropriate Environmental Performance Indicators (EPIs) and Benchmarks of Excellence (BoE)
- SRDs contain defined EPIs and achieved BoE for a specific sector
- EPIs and BoE should not be too specific (e.g. site specific) but rather sector specific
- EPIs have to be easily calculable

- BoE corresponds +/-to the top 10 / top 10% best performing companies for a given practice or aspect

The JRC followed up with an introduction to the sector and its main environmental aspects, as well as the scope for the study:

- Lifecycle impacts are major for the use phase for some impacts (energy, CO_2) but manufacturing and end-of-life are also very relevant
- Scope set to focus on these phases
  - includes automotive suppliers (later stage) and ELV processing
- The outline and structure of the document was presented
- 2 sections, on manufacturing and ELV
- BEMP proposals are ordered by environmental aspect

Discussion: The TWG Members provided further comments on the overall project:

- EMS and EnMS are overarching BEMPs or "objectives" and other BEMPs can be seen as "tools" to achieve the objectives; the document could be restructured with a multi-tiered approach.
- It could be helpful to have a system in the future that could allow the document be consulted, reviewed and updated in a more dynamic way.
- Quantitative BoEs can be difficult to establish, as it is very difficult even to compare from site to site within the same organisation. Qualitative BoEs are more appropriate in many cases.

Conclusions:

- To structure the document into a 3-tiered structure. However, all BEMPs will be at the same level (third level).
- To reorganise some BEMPs under more overarching BEMPs.

BEST ENVIRONMENTAL MANAGEMENT PRACTICE FOR CAR MANUFACTURING OPERATIONS

The JRC introduced the review of BEMPs, which were discussed one by one for the remainder of the meeting. The discussions are presented below in the order of the document (the order discussed varied due to attendance constraints for some participants)

CROSS-CUTTING BEMP ON ENVIRONMENTAL MANAGEMENT

2.1 Implementing an advanced environmental management system

JRC presentation:

- Advanced implementation of third-party verified/certified and standardised EMS such as EMAS or ISO 14001. Use of an ample set of indicators and use of benchmarking within the EMS.
- 3 EPIs:
  - Portion of sites with verified/certified EMS (%)
  - Number of EPIs generally used (#)
  - Use of benchmarks to drive environmental performance improvement (Y/N)
- BoE:
  - Verified/certified EMS implemented across all the sites under the management responsibility of the company.

TWG comments:

- Make reference to ISO 14001:2015 and include in particular the element of Risk Assessment.
- Stress that the supply chain is the BEMP's driving force for suppliers.
- Clarify the difference between internal and external benchmarking.
- Highlight ' internal' for large companies; ' external' vs. published information for smaller companies.

(TWG in general):

- Consider the opportunity of making reference to
  - Dow Jones Sustainability Index
  - Carbon Footprint
  - Carbon Disclosure Project
- Other remarks:
  - Evaluation of relevant EPIs needs to be carried out at each site taking into account the local conditions (e.g. water scarcity, population density or plant age)…
  - Refine wording of EPI on benchmarking

Conclusions:

- BEMP agreed
- EPIs and BoE agreed but to change the wording in order to reflect the different remarks
- Update the references and include Risk Management aspects

CROSS-CUTTING BEMPS ON ENERGY MANAGEMENT

2.2 Implementing detailed energy monitoring and management systems

JRC presentation:

- Preferably a standardised management system, e.g. ISO 50001
- Real-time monitoring
- 2 EPIs proposed:
  - Sites with certified EnMS (Y/N)
  - Sites with detailed real-time energy monitoring (Y/N)
- 3 BoE proposed:
  - Implementing energy management plans across all sites
  - Implementing detailed monitoring per process on-site
  - Implementing energy management controls

TWG comments:

- Make reference to Directive 2012/27/EU, Energy Efficiency Directive.
- Stress that tax rebates are the major driving force for this BEMP.
- Energy monitoring is important but “real-time” monitoring is not needed in most cases.
- The wording "detailed" (referred to "energy monitoring") is not clear. "Appropriate" could be better.
- Data on energy have to be checked and the text in the BEMP description changed.
- Advertising (company names, e.g. Siemens) should be removed. Technology providers company names should be avoided unless clearly given as a reference for a piece of information presented.
- Stress the importance of acting on the information gathered from the monitoring.
- Fine monitoring allows allocating responsibility and action at the adequate management level.
- The EnMS should be based on energy saving needs.

Conclusions:

- BEMP agreed
- Replace "detailed real-time monitoring" with "appropriate monitoring" in the EPI
- Rephrase the BEMP description and applicability

2.3 Increasing the efficiency of energy-using processes

JRC presentation:

- Identifying energy intensive processes
- Implementing a plan for improving the energy efficiency of these processes
- 1 EPI proposed:
  - Energy consumption per vehicle or per plant per year (Wh/unit or Wh/yr)
- No BoE proposed

TWG comments:

(TWG in general):

- The proposed indicator is too restrictive: organisations should chose the 'functional unit' which best represents their typical activity or output.
- Indicators can be developed considering a functional unit that can be for instance:
  - Wh/vehicle
  - Wh/year
  - Wh/EUR_{sales}
  - Wh/$EUR_{added\ value}$
  - Wh/t
  - Wh/component
  - Wh/h_{worked}
  - ...
- Operators should decide which functional unit is relevant for their site after identifying the main energy consuming processes

Conclusions:

- BEMP agreed
- EPI to be changed considering the TWG comments

2.4 Alternative energy sources – renewable energy generation

JRC presentation:

- Energy can be supplied from alternative and renewable energy sources such as solar thermal, PV, wind turbines, biomass, etc.
- 4 EPIs proposed:
  - Portion of production sites assessed for potential and opportunities for use of renewable energy sources (%)
  - Portion of energy needs supplied with renewable sources (%)
  - Relative reduction in fossil fuels energy consumption (%)
  - Absolute reduction in fossil fuels energy consumption (Wh/unit)
- 2 BoEs proposed:
  - All (100%) the production sites assessed for potential and opportunities for use of renewable energy sources
  - On average across all sites, 30% of energy needs supplied with renewable sources

TWG comments:

- Objective of the BEMP not clear. What is targeted? The use, the production or the buying of renewable energy?
- The 30% BoE is not a good BoE because it is very dependent on the processes of the specific site.
- Rephrase the BEMP objectives as monitoring and promotion of renewable energy and/or alternative energy (e.g. CHP) share
- Clarify if the BEMP addresses on-site production or grid-supply of renewable energy.
- If taking into account grid supplies, the portion of renewable energy in the grid varies significantly from country to country and therefore the 30% BoE is not adequate
- Some car manufacturers have developed their own energy production plants.
- Local conditions are different from site to site and will influence the EPI therefore comparison is difficult.
- Consider amending the BEMP name to emphasise the contribution of fossil fuels and non-fossil energy sources in the total CO_2 emissions

Conclusions:

- Reformulate the BEMP in terms of promoting the use of renewable energy sources and clarify the difference between renewable energy generation, use, (if relevant, export) and purchase.
- Add a requirement on transparent monitoring and reporting, stressing the shares of Fossil Fuels and non-FF use
- To drop the quantitative BoE and keep it qualitative (no 30%)
- Add references to CO_2 emissions factors also for fossil fuels

2.5 Optimisation of lighting in automotive manufacturing plants

JRC presentation:

- Lighting optimisation can be achieved by optimising the lighting devices positioning, increasing their efficiency and managing them in defined zones
- 4 EPIs proposed:
  - Portion of site area with improved positioning (%)
  - Portion of site area with zonal management (%)
  - Electrical consumption of lighting equipment (Wh/yr)
  - Site average efficacy of luminaires (lm/W)
- 2 BoE proposed:
  - x% of sites retrofitted with low energy bulbs at the correct level for the process area
  - 100% sites with zonal management

TWG comments:

- Recommend a combination of artificial and day light
- Important not to focus on "bulbs" but to rephrase into "energy efficient lights", or systems / solutions
- Correct or qualify table 2.11 on adequate lighting levels
- Stress that the lighting has to be appropriate to the work environment and technical requirements

Conclusions:

- Reformulate the first BoE: "most energy-efficient lighting solutions appropriate to the work place requirements are implemented at all sites"
- Review table 2.11
- Stress and detail that energy efficient lighting solutions are subject to fulfilling the relevant technical requirements for the work place

2.6 Rational and efficient use of compressed air

JRC presentation:

- Rational and efficient use of compressed air can be achieved by assessing the need for compressed air devices, optimising the systems (pressure, compression, requirements), minimising the leaks.
- 1 EPIs proposed:
  - Electric use per cubic meter of compressed air at the point of end-use at a stated pressure level (Wh/m^3)
- 1 BoE proposed:
  - <0.11 kWh/m^3 to achieve ~6.5 bars

TWG comments:

- Update the references in the BEMP description (old references) and add new reference organisation.
- The BoE might not actually be relevant, as too dependent on local conditions.
- Leak detection systems are the main tools to decrease energy consumption.
- Compressed air systems are growing over time and old systems with a lot of ramifications cannot be compared to new systems with fewer ramifications.
- Best performance is achieved with latest systems, and especially cascade systems, using different working pressures for distribution and for the different end-uses.
- A suggested EPIs could be based on the energy saving.
- Adjusting compressed air systems settings is an inexpensive and important measure to ensure rational and efficient use of compressed air. Visual management with min-max ranges displayed on pressure gauges can help to reach these objectives.

Conclusions:

- BEMP ok in principle.
- **EM** to check and provide references on cascade systems and energy consumption
- **TB** to check relevance of the BoE with members
- **FC** to send more information on settings and visual management
- Need to update references and find more reference organisations.

2.7 Optimisation of electric motor usage

JRC presentation:

- To optimise the use of electric motors by implementing variable speed drives (VSD) and adapting the motor speed to the need/requirements
- 1 EPI proposed:
    - Portion of electric motors with VSD installed (% - W_{VSD}/W_{Total})
- No BoE proposed

TWG comments:

- A benefit of using VSD is that by reducing the motor usage, the energy consumption for space cooling is also reduced.
- The decision to invest in VSD is based on CAPEX/OPEX. A long term approach stressing the OPEX (and total costs of ownership) could be emphasised.
- This BEMP should make clear reference to **pumps** which are usually among the most inefficient equipment and/or the largest consuming type of electric motors throughout production facilities.
- The total cost ownership (TCO) is a good tool for the purchasing process.

Conclusions:

- Refer explicitly to pumps and associated measures in the BEMP description.
- Include a reference for reduced energy consumption for space cooling.
- Consider adding a specific EPI for pumps.

CROSS-CUTTING BEMPS ON WASTE MANAGEMENT

2.8 Waste prevention and management

JRC presentation:

- Key point is to manage waste according to the waste hierarchy
- 3 EPIs proposed:
    - Establishing and implementing an overarching waste strategy (plan) with targets for improvement (Y/N)
    - Number of sites with a waste management plan (WMP) (#)
    - Number of sites achieving the target levels of the WMP, such as zero waste to landfill
- 2 BoEs proposed:
    - WMPs introduced at all the sites
    - Zero waste to landfill achieved at all the sites and advanced plants progressing in to achieve zero waste to incineration

TWG comments:

- Waste produced in car manufacturing plants is not relevant compared to ELV.
- Data on waste presented in the BEMP is not coherent with data from ACEA.
- REACH legislation may be in contradiction with the aims of this BEMP.
- Zero waste to landfill and/or incineration is too ambitious (are there real cases?).
- Need to clarify if the EPIs apply to the site or to the corporation as a whole.
- Suggest an EPI based on the improvement achieved over years in %.
- Consider adding new EPIs such as:
    - Total waste generated per functional unit (see discussion on functional units in EnMS).
    - Waste cost per functional unit.
    - Hazardous waste generation per functional unit.
- Remove zero waste to landfill and/or incineration BoE

Conclusions:

- Add a broader set of EPIs
- Link WMP and *monitoring* of waste
- Remove zero waste to incineration for the benchmark
- Clarify the reference to corporations with several sites vs site specific EPIs/BoE

2.9 Metal chip recycling and lubricoolant recuperation through briquetting

JRC presentation:

- BEMP is to press metal scrap from processing into briquettes and recover cutting emulsion
- 4 EPIs proposed:
    - Installation of a briquetting system (Y/N)
    - Metal waste generated per production ($kg_{metal\ waste}/kg_{poducts}$)
    - Annual amount of chips processed/pressed (kg/yr)
    - Annual amount of cutting emulsion recovered (l/yr)
- 1 BoE proposed:
    - Zero metal waste disposed of as mixed waste

TWG comments:

- To correct the reference organisation (VAG is not an ACEA member).
- BEMP will depend on the market.
- BEMP will depend on the production size.

Conclusions:

- Keep BEMP.
- To include a comment on the feasibility of the BoE.

CROSS-CUTTING BEMPS ON WATER MANAGEMENT

2.10 Water use strategy and management

JRC presentation:

- BEMP is to monitor water use and to conduct a water strategy review.
- 5 EPIs proposed:
    - Portion of sites that have conducted a water strategy review (%)
    - Portion of sites that have monitoring of water consumption and water use (%)
    - Portion of sites that monitor separately production process water and sanitary water (%)
    - Internal water recycling (%)
    - Water use per vehicle (m^3)
- 3 BoEs proposed:
    - To use a recognised tool such as CEO Water Mandate to conduct a water strategy review
    - To use automated software where possible to monitor water use per site and per process
    - Thresholds for reduction of pollutants in discharged water are set which go beyond minimum legal requirements

TWG comments:

- Rephrase some parts of the BEMP description (words missing).
- The % of water internally recycled is not a EPI in use for the sector: define 'internally' or eliminate this notion?
- The water use per vehicle is an EPI in use for the sector.
- Automated software for measuring water use is not necessarily a BoE.
- Clarify what is meant by supply chain water use.
- Rephrase by changing "OEM" and "Tier 1 suppliers" with "factory site".
- Include the strategy of having separated water networks for different water qualities (i.e. technical water, cooling water, sanitary water).
- Change the EPI on water use per vehicle into water use per functional unit.
- To add in a BoE the assessment of water scarcity.

2.10.1 Conclusions:

- To remove the EPI on internal water recycling and clarify other references to internal recycling.
- To replace the EPI on water use per vehicle by water use per functional unit.
- To add a reference in the BoE on water strategy review a reference to the assessment of water scarcity.
- **TB** to check with ACEA members if automated software are BoE or not.

2.11 Water-saving opportunities in automotive plants

JRC presentation:

- BEMP is to review water efficiency measures and to minimise water use and water consumption.
- 3 EPIs proposed:
    - Portion of existing sites retrofitted with water-saving devices and processes (%)
    - New sites designed with water-saving devices and processes (Y/N)
    - Water use per vehicle (m^3)
- 3 BoEs proposed:
    - All new sites are designed with water-saving sanitary devices and retrofitting of water-saving devices phased in across all sites
    - Zero wastewater discharged to network
    - Water use per vehicle in assembly plants <1.16 m^3

TWG comments:

- Application of this BEMP is likely to be very varied: there is certainly an example site for which these BEMPs cannot be applied at all across the site.
- Zero wastewater discharge might be possible but the cross-media effect will be a higher energy consumption; thus not always the most environmentally sound choice.
- The BoE for water use (<1.16 m^3) is not reasonable – it depends on the processes actually carried out in the factory; on average in the EU, water use is 3.5 m^3. BoE based on this 1.16 m^3 ambitious value would not be relevant in most sites.
- The BoE on water use should be qualitative because quantitative figures are not comparable as they are not calculated in the same way across the different plants.
- The BoE on water use depends greatly on local conditions (water scarcity).
- Zero waste discharge will lead to hazardous waste production as a cross-media effect.
- The scope of processes covered in assembly will greatly impact the water use, hence the lack of comparability across plants. Therefore, it would be helpful to define the assembly plant (Foundry included? Stamping included?).

Conclusions:

- Reformulate the BoE on water use.
- Change the EPI on water use per vehicle into water use per functional unit.
- Remove the BoE on zero wastewater.
- **TB** to check for examples for this BEMP.

2.12 Water recycling and rainwater harvesting

JRC presentation:

- BEMP is to minimise the use of high quality (e.g. potable) water in the processes where this is not necessary and to increase the re-use and recycling of water.
- 5 EPIs proposed:
    - Installation of a wastewater recycling system that supplies internal or external water demand (%)
    - Installation of a rainwater recycling system that supplies internal water demand (Y/N)
    - Rainwater and wastewater reused (m^3/yr)
    - Annual portion of potable water consumption substituted with recycled rain- or wastewater (%)
    - Relative amount of water internally recycled (%)
- 3 BoEs proposed:
    - Closed loop water recycling with a recovery rate >90% where feasible
    - 30% of water needs are met by harvested water in regions with sufficient rainfall
    - Water use per vehicle in assembly plants <1.16 m^3

TWG comments:

- External / internal: still not clear what is meant.
- In general same comments as for water saving opportunities BEMP.
- To stress that 30% of rainfall depend on meteorological conditions.

Conclusions:

- Clarify what is meant by internal and external water demand.
- Emphasise that 30% of water needs can be substituted by harvested water only if possible depending on meteorological conditions.

CROSS-CUTTING BEMPS ON BIODIVERSITY MANAGEMENT

2.13 Review and strategy of ecosystems and biodiversity management throughout the value chain

JRC presentation:

- BEMP is to carry out an ecosystem management review to identify the main issues throughout the value chain and understand the impacts brought about as a result of the production chain and to work with stakeholders to minimise any issues identified.
- 2 EPIs proposed:
  - Technique or tool in place to assess the corporate impacts on ecosystem services (Y/N or % of value chain)
  - Tool covers relevant scope, as determined by prioritisation (Y/N or % of value chain)
- 2 BoEs proposed:
  - Conducting a high-level ecosystem review across the value chain, followed by a more detailed ecosystem review in identified high risk areas
  - Develop strategies to mitigate issues across the supply chain in collaboration with local stakeholders and external experts

TWG comments:

- Include biodiversity as a management system.
- Delete the word "technique" in the EPIs.
- Better define the scope (e.g. are use phase and/or ELV phase covered?)
- Rephrase "technique" into "methodology".
- Referring to the entire value chain is a problem; better referring to direct suppliers.
- The collaboration with local stakeholders (BoE) depends from site to site, might not be possible at some sites.
- The added value of the BEMP compared to the LCA BEMP is not clear.
- Michelin has a biodiversity management system in Brazil

Conclusions:

- Define the boundaries of the value chain considered.
- OK to keep the BoE but review the scope e.g. how far up the supply chain?
- **PM** to provide the example of Michelin in Brazil.

2.14 Biodiversity management at site level

JRC presentation:

- BEMP is to measure, manage and report on biodiversity efforts
- 8 EPIs proposed:
  - Number of projects/collaborations with stakeholders to address biodiversity issues (#)
  - Procedures/instruments in place to analyse biodiversity related feedback from customers, stakeholder, suppliers (Y/N)
  - Feedback from stakeholders on the overall biodiversity performance of a company (quality indicator) (Y/N)
  - 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 (m^2)
  - Plan for biodiversity friendly gardening in place for premises or other areas, owned, leased or managed by the company (Y/N)
  - If located in or adjacent to protected areas: portion of areas under biodiversity friendly management in comparison to total area of company sites (%)
  - Surface of restored habitats and/or areas to compensate for damages to biodiversity caused by the company in comparison to land used by the company (%)
  - Biodiversity Index (to be developed according to local conditions)
- 2 BoEs proposed:
  - Implement a comprehensive biodiversity plan to ensure systematic incorporation through measurement, monitoring and reporting
  - Cooperation with experts and local stakeholders

TWG comments:

- Remove the 3rd EPI.
- The 6th EPI is not clear.
- Clarify on-site/off-site and enable off-site compensation as an option.
- On-site green areas might not be possible in old sites where space is particularly limited
- The 7th EPI is not clear. Specify if it can be implemented retroactively.
- Terms "restored" and "damaged" need definition.
- Refer to effects on workers satisfaction and/or reduced absenteeism.
- Study available on Impact of Aquariums at work place from Stockholm University.

Conclusions:

- To remove EPI 3 (on feedback from stakeholders) and 6 (on size of area under biodiversity friendly management).
- Clarify EPI 7 on the offsite / onsite dimensions.
- Keep the BoE.
- **FC** to provide the reference study on Aquariums impact at work place.

2.15 Green roofs

JRC presentation:

- BEMP is to install or retrofit green roofs on industrial sites.
- 5 EPIs proposed:
  - Portion of suitable sites for green roofs covered with a green roof (suitability depending on structural aspects, access to sunlight, moisture, waterproofing, and drainage or water storage systems) (%)
  - Water holding: run-off water retention (m^3)
  - Water quality (chemical and physical parameters)
  - Cooling effect: reduction in energy demand for HVAC (J)
  - Qualitative biodiversity indicators
- No BoE proposed

TWG comments:

- Sealed surfaces are not easy to manage.
- Specific BEMP, applicable in few cases only.
- EPI on qualitative biodiversity indicators is dependent on local conditions.
- Water quality analysis should not be an EPI, it "scares" organisations to have to carry out a water analysis for the EMAS certification.
- Data on reduced cooling and heating costs (i.e. 70%) has to be checked as it is probably overestimated.
- Need to broaden the scope to highlight the tradeoff with other uses (e.g. solar PV) and also the key benefits such as rainwater management / stormwater runoff.

Conclusions:

- Move the BEMP under water management and change its name (i.e. storm water management).
- Check data on energy saving.
- Consider removing the water quality analysis EPI.

CROSS-CUTTING BEMPS ON SUPPLY CHAIN, LOGISTICS AND SUPPORT

2.16 Integrating environmental requirements into supply chain management

JRC presentation:

- BEMP is to integrate environmental criteria in the assessment of the suppliers.
- 2 EPIs proposed:
  - Percentage of suppliers (by number or by purchasing budget/value) that comply with required standards according to internal or external audits (%)
  - Percentage of suppliers that flow down requirements to their own suppliers (%)
- 5 BoEs proposed:
  - All major suppliers are required to have an environmental management system in order to qualify for purchasing agreements
  - Environmental criteria are set across all environmental impact areas for purchasing agreements
  - All suppliers are sent self-assessment questionnaires and high risk suppliers are audited by third parties
  - Supplier development and training is undertaken
  - Enforcement procedures are defined for non-compliance

TWG comments:

- In general, OEMs asks suppliers to have ISO 9001 and 14001. This is managed in the purchasing department rather than by the environment team.
- Difficult to highlight the return on investment for this BEMP.
- The BEMP should refer to tools which are automotive specific such as IMDS and GADSL rather than generic considerations.
- Difficult to ask the whole chain of suppliers. It is possible only for the direct suppliers, which means that the 2nd EPI is not acceptable.
- The environmental requirements imposed to suppliers should be adapted to the company size.
- The BEMP should refer to existing voluntary tools.
- Tier 1 suppliers cannot have the same criteria for their suppliers as OEMs.

Conclusions:

- Reformulate the BEMP stressing "the direct suppliers" and not "the whole supply chain" and giving more emphasis to promotion of environmental improvement of suppliers rather than "imposing requirements" on them.
- Elaborate further in the BEMP the differences between OEMs and Tier 1 suppliers (in terms of leeway of influence towards their respective suppliers).
- Consider removing the 2nd EPI.
- Keep the 1st EPI.
- Change "all suppliers" for "all direct suppliers" in BoE.

2.17 Collaborate with suppliers and customers to reduce packaging

JRC presentation:

- BEMP is to reduce and reuse packaging used for materials and components supply.
- 2 EPIs proposed:
  - Weight of waste per unit produced (e.g. kg/vehicle) or per value added (kg)
  - Weight packaging waste per unit (kg)
- 1 BoE proposed:
  - x kg of packaging waste per unit produced

TWG comments:

- Generally applicable to the whole chain
- Refer to carbon footprint reduction
- Clarify "weight of packaging waste" in the 1st EPI or make a cross-reference
- A good practice can be to externalise the management of packaging or to collaborate with external companies to improve the management of the packaging
- Refer to modular systems/packages as a good practice

Conclusions:

- Clarify the BEMP and focus on best practice rather than common practice.
- Reformulate the 1st EPI and the reference to the functional units.

2.18 Design for sustainability using Life Cycle Assessment (LCA)

JRC presentation:

- BEMP is to conduct an LCA to identify potential improvements and trade-offs between different environmental impacts
- 2 EPIs:
  - Portion of design projects for which LCA was conducted and results were considered in the decision process (%)
  - Relative improvements in environmental indicators (CO_2e, energy consumption, SO_2e, etc) for new model designs compared to previous model designs (% improvement) along the life cycle (%)
- 2 BoE:
  - LCA is conducted for all design changes according to ISO 14010:2006
  - Targets are set to ensure continuous improvements in the environmental impacts of new vehicle designs

TWG comments:

- In general about LCA:
  - LCA is not a management tool; it can only support the decision process.
  - This BEMP is a mix of Ecodesign and LCA.
  - LCA cannot be conducted for all design change, specify "for main product lines" instead.
  - ISO 14040 is not the only standard, ISO 14062 can also be mentioned.
- The quality of LCA is more important than the quantity (i.e. how many LCAs are carried out). EPI and BoE need to be changed accordingly.
- The use phase of a vehicle is the most predominant in the LCA and any reference to design for dismantling should be avoided.
- The part of the BEMP on Ford and LCA should be rephrased or removed (it is incorrect).
- The part of the BEMP on closed loop recycling is not feasible: vehicles are more than 20 years old and cannot be recycled in a closed loop; it is only possible for metal scrap produced during the manufacturing process.
- The BEMP could deal instead with the issue of selecting a meaningful LCA functional unit: a definition of life-time (km? years?), which may change across models, is one the main factors that makes LCA difficult to use.
- LCA is a tool for supporting decision makers
- Some LCA tools (GaBi and SimaPro) do not take on board ELV.
- ELV phase is a small part of the LC.
- Actual LCA data is very difficult to obtain from the supply chain.
- LCA cannot be applied to the whole supply chain but only to OEMs and Tier 1 suppliers.
- Comparison between new and old models does not make sense because every new model is different.

Conclusions:

- Keep but redraft the BEMP.
- Focus much less on ELV phase.
- Reformulate the 1st EPI: "LCA for main product lines" as a Y/N indicator rather than %.
- Reformulate the 1st BoE: "LCA for main product lines according to ISO 14040 or equivalent"

SPECIFIC MANUFACTURING BEMPS

2.19 Use of kinetic energy recovery systems in engine testing rigs

JRC presentation:

- BEMP is to recover mechanical energy from engine testing by using kinetic energy recovery systems
- 2 EPIs proposed:
  - Share of engine test benches fitted with dynamometric brakes (%)
  - Power annually recovered through KERS (Wh/yr)
- no BoE proposed

TWG comments:

- Suggest moving to energy efficiency BEMP section

Conclusions:

- To move under umbrella BEMP on Energy efficiency

2.20 Reduce consumption, waste and emissions of sand casting

JRC presentation:

- BEMP is to reduce consumption of casting sand and/or emissions by reclaiming casting sand and/or using inorganic binders
- 4 EPIs:
  - Portion of reclaimed sand from moulds (%)
  - Use of inorganic binders (Y/N or %)
  - Waste sand generation index ($t_{waste}/t_{product)}$
  - Fresh sand consumption (t)
- 2 BoE:
  - No sand sent to landfill
  - x % of casting sand reclaimed

TWG comments:

- Make cross-references in the Cars SRD and develop in the Met. Fab. SRD.
- Clarify table p.203: add the objective, i.e. reduction.
- Zero sand sent to landfill is a BoE difficult to achieve.
- Avoid claims or political statements.

Conclusions:

- To be proposed under Metal Fabrication SRD and make a cross-reference in the Cars SRD.

2.21 Efficiency of bodyshop presses

JRC presentation:

- BEMP is to modernise existing presses to increase energy efficiency
- 4 EPIs proposed:
    - Energy consumption per unit production or stroke (Wh/unit)
    - Metal scrap from body production ($kg_{scrap}/kg_{production}$)
- No BoE proposed

TWG comments:

- Metal scrap from body production is ~40%.
- To stress the optimisation of the use of raw materials.
- The textile sector has developed tools to optimise the use of raw materials that may be of inspiration for the car manufacturing sector.

Conclusions:

- To be proposed under Metal Fabrication SRD and make a cross-reference in the Cars SRD.
- **BS** to check the metal scrap index.

BEST ENVIRONMENTAL MANAGEMENT PRACTICE FOR THE HANDLING OF END-OF-LIFE VEHICLES

3.1 Component and material take-back networks

JRC presentation:

- BEMP is to implement extensive collaboration with a take-back network in order to increase the rate of re-use, recycling and recovery of ELV.
- 1 EPI proposed:
  - Recovery rate for specific products or materials through ELV network (%)
- 2 BoE proposed:
  - Collaborations and partnerships in place with local/national organisations
  - x% product recovery rate

TWG comments:

- To clarify the link between the legal base for ELV management (e.g. Extended Producer Responsibility) and the BEMP on ELVs
- There was a discussion on whether to remove or include OEMs from the target group for this BEMP
- The example of NL is very different from other EU-28 MS
- Better define component take-back network
- To consider including a BEMP on high voltage batteries handling (safety issues)
- To stress the international dimension of the second hand parts market
- Make a reference to the EPR and to the Certificate of Destruction (CoD)
- The collaboration between OEMs and recyclers should be promoted but not having OEMs responsible for recycling, systems are already in place but not for free (e.g. ID), and promoting collaboration with other partners also
- Suggest deleting the reference to Japan as the EU and Japan are not comparable
- The example of Renault is a pilot project not full scale
- Remove incorrect statement on unavailability of information on parts.
- Update data on ELV statistics
- The use of word 'recovery' is incorrect (for OEMs recovery of energy is the only recovery)
- Implemented techniques and management depends on economy
- ATFs are small companies with low technical level
- Important to focus on:
  - logistics as the main space for improvement
  - safety issues
  - the needed support from OEMs

Conclusions:

- Redevelop the BEMP redefining the target group: focus on what can be improved at ATFs level.
- Clarify that the BEMP deals with component and materials take-back networks, not ELV take-back networks.
- Add the dimension of using software (based on market information) to select which parts to dismantle.
- Include the sale dimension: new channels that ATFs can use to sell more parts for re-use.
- Consider a new BEMP on batteries
- **GH** to provide information on a market monitoring tool to support ATFs

3.2 General best practices for remanufacturing components

JRC presentation:

- BEMP is to implement methods to increase the scale of remanufacturing activities in the automotive sector
- 2 EPIs proposed:
    - Level of remanufacturing in terms of weight per component (%)
    - Overall remanufacturing levels (% of recovered components)
- no BoE proposed

TWG comments:

- Clarify the EPI on overall remanufacturing levels.
- Clarify which parts are mainly targeted.
- Rephrase "design for dismantling" into "design for sustainability".
- Remanufacturing is mainly from after-market, not from ELVs.
- To clarify the targeted group (include OEMs).

Conclusions:

- Redefine the target group (remanufacturers and OEMs; not ATFs).
- Consider moving this BEMP at the end of the manufacturing section (alternatively, rename the ELV chapter into 'circular economy' chapter).
- Rephrase where needed taking into account the definition of remanufacturing.

3.3 Depollution of vehicles

JRC presentation:

- BEMP is to carry out vehicle depollution to avoid negative impacts on the environment in the End-of-Life stage.
- 2 EPIs proposed:
    - Removal rate of components – compliance with the ELV Directive (%)
    - Recovery rate of fluids (%)
- no BoE proposed

TWG comments:

- % of fluids recovered or components removed is difficult to provide.
- To carry out depollution a permit is required.
- The permit requirements depend on local legislation.
- Operators have to share data with local authorities.
- QMS should be promoted in this BEMP.
- Clarify difference between "recovery" and "recycling".
- Removal and recovery rates are very different from vehicle to vehicle.
- The BEMP should emphasis on the treatment approach/strategy and QMS.
- To rephrase: "recycling" of fluids and not "recovery".
- To remove both EPIs as these are not comparable EPIs from site to site and vehicle to vehicle.
- To add in the BEMP techniques for removal of hazardous substances.
- If BEMP is to install an industrial depollution equipment, this should be reflected in an EPI.
- The mass balance to keep track of the depollution measures is a good tool.
- In the BEMP description, the figures from the 1st source are not reliable.
- Re-sale of air-bags is not recommended by OEMs.
- ATFs do not weigh the vehicles.
- ATFs have obligation to declare the amounts of liquids recycled but do not know the amount of liquids contained in the ELV upon reception.

Conclusions:

- **TB** to consult their members and provide information on state-of-the-art depollution processes and whether these require industrial depollution equipment.

- Remove the two proposed EPI. Consider instead including 3 new EPI:
    - one on the process and/or quality management;
    - one on the use of an industrial depollution machine (unless same performance can be achieved without it);
    - one on mass balancing.

3.4 General best practices for plastic and composite parts

JRC presentation:

- BEMP is to establish a recycling closed loop for selected components.
- 2 EPIs proposed:
    - Portion of LCA studies to determine optimal LCA routes according to local factors (%)
    - Share of components treated according to optimal LCA route (%)
    - Share of recycled materials in new vehicles (%)
- 1 BoE proposed:
    - x% of plastic components recycled

TWG comments:

- This BEMP is out-of-the scope if the targeted group are ATFs.
- The "closed loop" should be defined; there is no closed loop for post-consumer waste.
- To achieve high recycling rates, it is not necessary to have a closed loop.
- Recycling back old components (from ELV) back to the automotive sector is not always possible. Only 10% of plastics are recycled, the rest is incinerated.
- To keep plastics and composites out from landfill and incineration circuits is already a challenge.
- The example of Mazda is a pilot project not a full scale study case.
- Re-use or recycling of parts is not always technically possible as ELV are 20 years old on average.
- "Eco-friendly" incineration of some polymers is possible.
- The portion of plastics in vehicle will keep stable although the average vehicle mass will grow.
- Need to refer in the BEMP to legal obligations such as REACH or POPs Regulation.
- The BEMP should not focus on LCA.
- Update the reference on PCB.
- Remove the "closed loop" concept for recycling.

Conclusions:

- Keep BEMP and modify focus towards ATFs
- To rephrase EPI with: "considering LCA studies..."

3.5 Wiring harnesses – best practice for ELV treatment

JRC presentation:

- BEMP is to establish a recycling closed loop for wiring harnesses by combining design factors, dismantling tools and recycling processes.
- 2 EPIs proposed:
    - Recycling rate (%)
    - Relative reduction of environmental impacts according to LCA (%)
- no BoE proposed

TWG comments:

- The dismantlers remove the wires
- The shredders separate mechanically the copper wires using specific equipment such as cyclones
- Currently 99% of the copper is removed from the ELV throughout the chain (ATFs, shredders and other post-shredders)
- Define "closed loop"
- Remove the KPI on recycling rate as the initial amount is unknown
- Make reference to the different actors involved in the removal of copper
- Stress the design for "sustainability"
- Include OEMs in the targeted group

- Suggest EPIs such as final iron or copper content at the end of the process
- The removal of copper is not an issue
- The removal of aluminium might be of greater interest
- To make references to optimisation for repair

Conclusions:

- To check references and to decide whether to keep or remove the BEMP

3.6 Glazing – best practice for ELV treatment

JRC presentation:

- BEMP is to dismantle glass prior to shredding if supported by an LCA study
- 2 EPIs:
  - Recycling rate (%)
  - Relative reduction of environmental impacts according to LCA (%)
- 1 BoE:
  - x% glass recovery rate

TWG comments:

- The car glass is not valuable (only in Italy it might be).
- LCA studies show it is not better to dismantle prior to shredding.
- Glass cleaning processes are not economically viable.
- Refer to a study on glass dismantling carried out by the EC in the context of the ELV Directive.
- Better to remove the BEMP as not carried out at ATF level.

Conclusions:

- Remove the BEMP

3.7 Tyres – best practice for ELV treatment

JRC presentation:

- BEMP is to recycle tyres
- 2 EPIs:
  - Volume of tyres recovered and sent to the environmentally preferred treatment method (%)
  - Relative reduction of environmental impacts according to LCA (%)
- 1 BoE:
  - 100% of tyres recycled according to the best method as determined by LCA

TWG comments:

- No scope for best practices on tyres at ATF level

Conclusions:

- Remove the BEMP

Other: SRD on Metal Fabrication Sector

JRC presentation:

- Short presentation of the ongoing work
- Background report being finalised
- Looking at most aspects of metal fabrication, techniques and processes
- **Kick-off meeting to be held 21-22 September 2016**

TWG comments:

- Some TWG members expressed their interest to participate and/or being informed of the SRD drafting process for Metal Fabrication Sector

Conclusions:

- Include contacts of TWG in the future e-mails related to the Metal Fabrication Sectoral Reference Document.
- Propose inserting relevant BEMPs from the Car manufacturing sector (sand casting, stamping) in the scope of the metal fabrication work, to be discussed with the TWG for that sector.

CONCLUSIONS AND NEXT STEPS

- The timeline of the work plans for the delivery of the best practice report by the end of 2016.
- TWG Members will remain involved in the coming months for feedback on the revised version which will aim to integrate all the feedback received during the meeting and from members who could not be present.
- The legislative process and the SRD adoption will follow in the course of 2017.

ANNEX A – AGENDA

Tuesday 21 June 2016 – Venue: Seville, Joint Research Centre, Edificio Expo, room A30		
Arrival and registration of participants		10:00 – 10:30
Opening and welcome		10:30 – 10:45
Introduction of experts		10:45 - 11:15
Purpose and goals of the meeting		11:15 - 11:30
Introduction of the sectoral reference documents on best environmental management practice (BEMP); concepts of environmental performance indicators (EPI) and benchmarks of excellence (BoE)		11:30 - 12:00
Coffee break		12:00-12:15
Overview and environmental aspects of the Car Manufacturing sector and ELV sector; review of the scope and structure of the sectoral reference document		12:15 - 12:45
Techniques used in the Car Manufacturing sector to address environmental issues: Cross-cutting BEMP on environmental management		12:45 - 13:00
Techniques used in the Car Manufacturing sector to address environmental issues: Cross-cutting BEMPs on energy management		13:00 - 13:30
Lunch break		13:30 - 14:30
Techniques used in the Car Manufacturing sector to address environmental issues: Cross-cutting BEMPs on energy management (continued)		14:30 - 15:30
Techniques used in the Car Manufacturing sector to address environmental issues: Cross-cutting BEMPs on waste and water management and biodiversity		15:30 – 17:00
Coffee break		17:00 – 17:15
Techniques used in the Car Manufacturing sector to address environmental issues: BEMPs on supply chain, logistics and support		17:15 – 18:00
Wrap-up and close of the day		18:00 - 18:30

Wednesday 22 June 2016 – Venue: Seville, Joint Research Centre, Edificio Expo, room A30		
Opening of the day		09:15 - 09:30
Presentation of the scope and content of the work on Best Practice for the Fabricated Metal Products sector		09:30 - 10:15
Discussion on the respective scopes and interaction with the Fabricated Metal Products document		10:15 - 10:30
Techniques used in the Car Manufacturing sector to address environmental issues: Specific manufacturing BEMPs		10:30 – 11:00
Coffee Break		11:00 – 11:30
Techniques used in the ELV processing sector to address environmental issues: ELV logistics and operations BEMPs		12:00 - 13:00
Lunch break		13:00 – 14:00
Techniques used in the ELV processing sector to address environmental issues: ELV treatment for specific components BEMPs		14:00 – 15:00
Summary of the working group discussions and wrap-up of benchmark selection		15:00 - 16:30
Wrap-up and close of workshop		16:30 - 16:45

ANNEX B – LIST OF PARTICIPANTS

No	Last Name	First Name	Organisation
1	BAHR	Tobias	ACEA
2	CANFORA	Paolo	European Commission- Joint Research Centre
3	CENCETTI	Simone	Fiat Chrysler Automobiles Italy Spa
4	COENE	Frederic	Aisin Europe
5	COLS	Miquel	Denso Barcelona SAU
6	EDER	Peter	European Commission- Joint Research Centre
7	GAUDILLAT	Pierre	European Commission- Joint Research Centre
8	GROSSINHO	Pedro	Federal-Mogul
9	MAS	Pedro	Universidad Catolica de Avila
11	MÜLLER	Egon	Technische Universität Chemnitz
12	ORVEILLON	Glenn	European Commission- Joint Research Centre
13	PAQUOT	Sébastien	European Commission- DG ENV
14	RAVANI	Luca	DNV GL Business Assurance Italia
15	RIEGER	Thomas	AUDI AG
16	SÁNCHEZ	Belén	Gestamp
17	SANDER	Knut	Oekopol GmbH Institut fuer Oekologie und Politik
18	TRAVERSO	Marzia	European Commission- Joint Research Centre
19	VAN DER HAVE	Gert-Jan	Auto Recycling Nederland

ANNEX C – PRESENTATIONS

Purpose and goals of the meeting

Final meeting of the
Technical Working Group on
Best Environmental Management Practice for the
Car Manufacturing Sector

Seville, 21-22 June 2016

jrc-ipts-emas@ec.europa.eu

Sustainable Production and Consumption Unit

Institute for Prospective Technological Studies (IPTS)

Joint Research Centre (JRC)

European Commission

EMAS

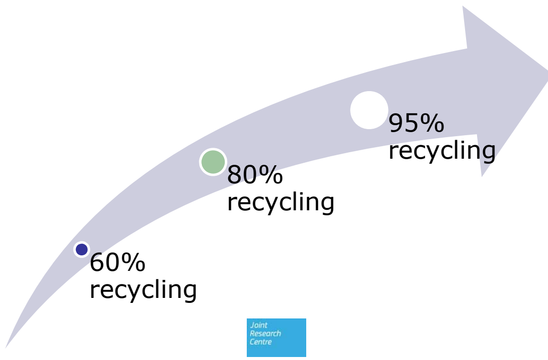
EMAS Performance, Credibility, Transparency

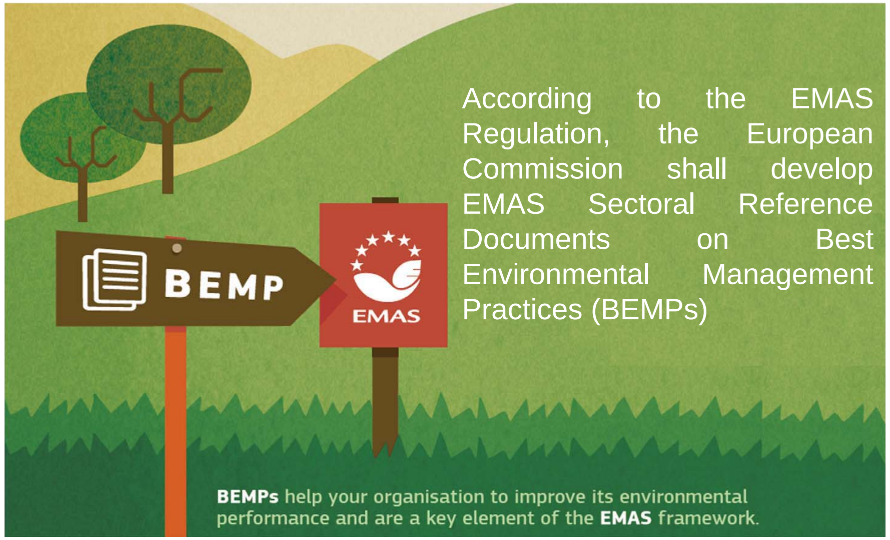
What is EMAS? EU Eco-Management and Audit Scheme

- √ An Environmental Management System?
- √ An EU Regulation?
- √ An environmental performance reporting tool?

EMAS is a commitment to…

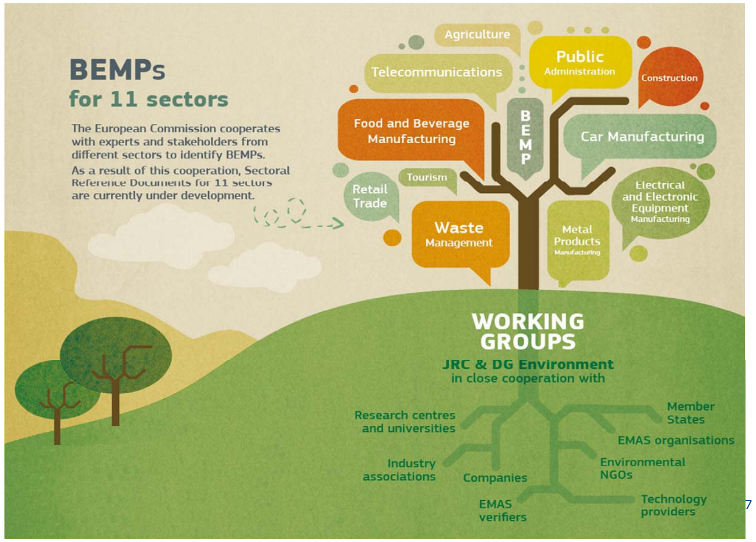
… in environmental performance



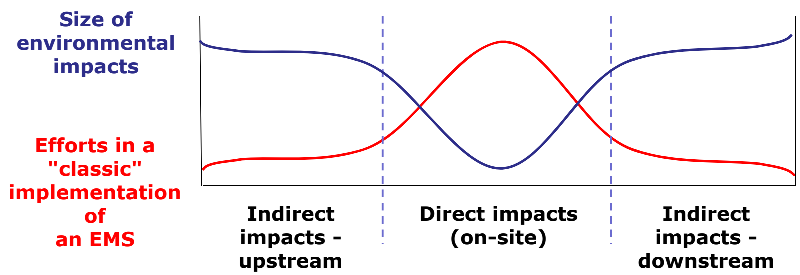


The Sectoral Reference Documents on Best Environmental Management Practice

- ➔Legal basis: EMAS Regulation (EC) No 1221/2009
- ➔Voluntary nature
  - ➔EMAS is a voluntary tool
  - ➔Implementation of best practices is voluntary
- ➔Not only for EMAS registered organisations but for all actors within the sectors covered which intend to improve their environmental performance



Need to focus on the most relevant environmental impacts

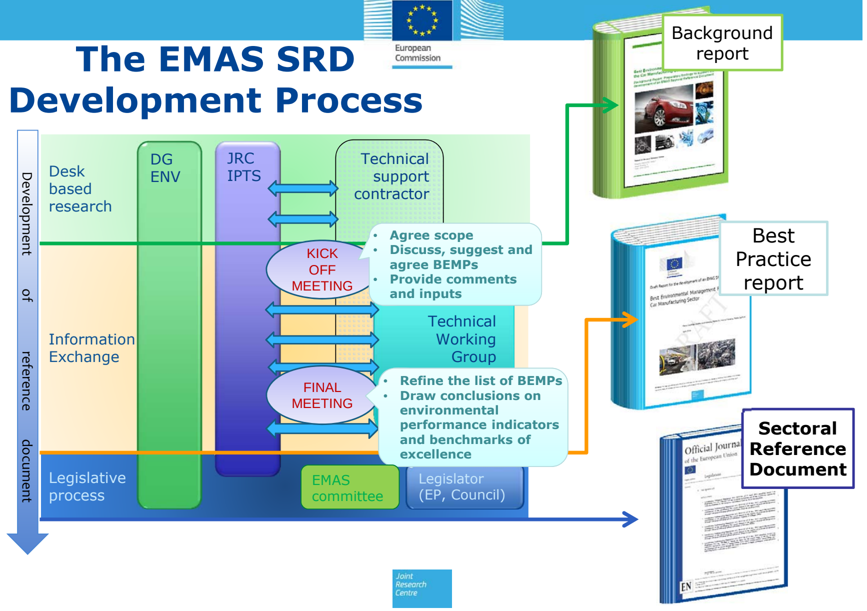


Methodology for developing the SRDs

Each SRD is developed according to the following logical steps:

- Define the scope of the document and identify relevant actors;
- Target processes associated with greatest environmental impact;
- Identify frontrunner actors for particular processes;
- Describe best environmental practices with reference to frontrunner application;
- Identify relevant environmental performance indicators for each best practice;
- Derive "benchmarks of excellence" from front-runner performance;
- Clearly state applicability.

The EMAS SRD Development Process

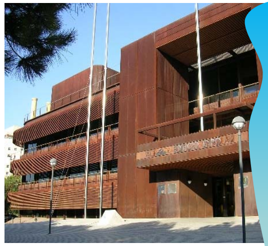


The timeline

Purpose of this final meeting

- Refine the list and concept of all best practices
- Draw conclusions on environmental performance indicators and benchmarks of excellence
- Identify gaps and information needs
- Get further feedbacks and inputs to finalise the work

Thank you!



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Sectoral reference documents and best environmental management practices

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Main elements of the sectoral reference documents

The sectoral reference documents comprise 3 main elements:

- Best environmental management practices (BEMPs)
  Managing and minimising waste in offices

- Environmental performance indicators
  Waste generation in office buildings per employee and year (kg/employee/yr)
- Benchmarks of excellence
  Total waste generation in office buildings is lower than 200 kg/employee/yr

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**
- **direct** and **indirect** aspects
- **technical/technological** as well as **management /organisational** type
- **fully implemented** by best performers
- technically **feasible** and economically **viable**

Best Environmental Management Practices (BEMPs)

BEMP is what goes well beyond common practice

but is already fully implemented

and widely applicable

What is not BEMP:

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

Best Environmental Management Practices (BEMPs)

Description of BEMPs (requires detailed technical information):

- Description
- Achieved environmental benefit
- Appropriate environmental indicator
- Cross-media effects
- Operational data
- Applicability
- Economics
- Driving force for implementation
- Reference organisations
- Reference literature

Structure similar to Best Available Technique Reference Documents (BREFs) according to Industrial Emission Directive

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

How to identify BEMPs

The frontrunner approach

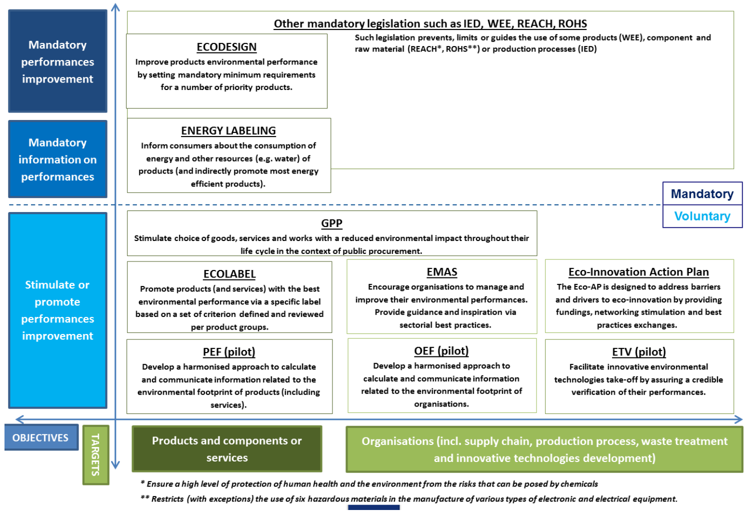
Two final outputs for each sector

The documents produced so far…

Use of the EMAS SRDs

- **EMAS registered organisations**: According to the EMAS regulation "Where sectoral reference documents […] are available for the specific sector, the assessment of the organisation's environmental performance shall take into account the relevant document" (Regulation EC 1221/2009 Article 4.1(d)).
  - Information on (likely) most relevant environmental aspects.
  - Inspiration on what measures can be implemented next for continuous environmental performance improvement.
  - Recommended environmental performance indicators.
- Value beyond EMAS: Reference documents for all organisations in the sectors covered which intend to improve their environmental performance

Interaction between EMAS and other policy instruments



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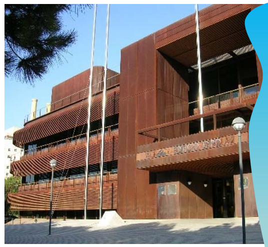

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Environmental performance indicators and benchmarks of excellence

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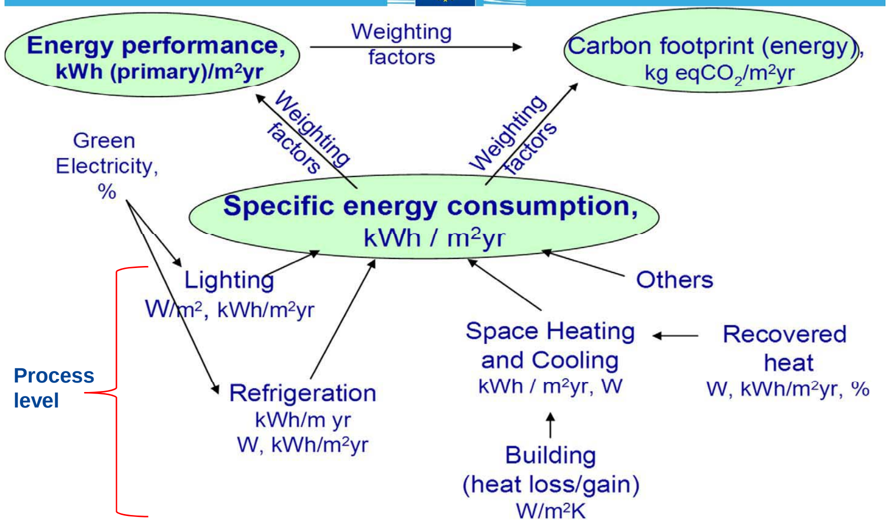
Environmental performance and benchmarks of excellence

- **Environmental performance indicators:** "specific expression that allows **measurement** of an organisation's **environmental performance**" (EMAS Regulation)
  - Core indicators → (i) Energy efficiency (ii) Material efficiency (iii) Water (iv) Waste (v) Biodiversity and (vi) Emissions.
  - Specific indicators
  - (Alternative indicators)
- **Benchmarks of excellence:** level of **environmental performance** achieved by the **best performers** (front-runners)

Environmental performance and benchmarks of excellence – sector level

- Sector-specific environmental indicators and 'benchmarks of excellence' 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**



Selection of environmental indicators

- Sector-specific environmental indicators are defined in relation to a specific **BEMP**
- Indicators must be **actually used** within the industry and/or they must be **calculated easily**
- Indicators must be as **specific** as possible in order to allow the **comparison** across organisations, across sites of an organisation 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.

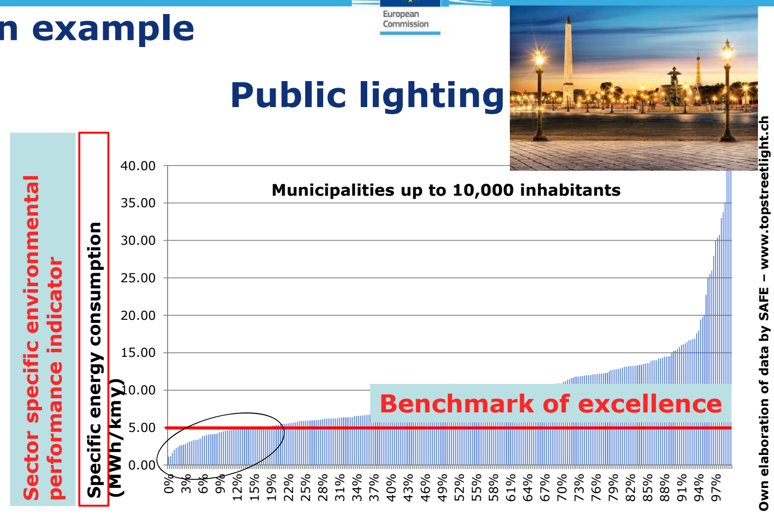
- But then what do we mean by "best practice"?
  - Achievable by ~~a few / many /~~ most / all ? → **Already achieved by a few**
  - Taking account of sector-specific economics ? → **Applicability and special circumstances are also taken into account**

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



Identifying benchmarks of excellence (2)

- Benchmarks of excellence can also be:
  - **a yes or no criterion,** e.g.: natural refrigerants are used in all refrigeration systems in all sites (from the food and beverage manufacturing sector – BEMP on improved freezing and refrigeration)
  - **a percentage of implementation of a certain BEMP**, e.g.: ≥ 50% of the animal population consist of locally adapted breeds (hybrids) (from the agriculture sector – BEMP on the use of locally adapted breeds in the farm)

Use of benchmarks

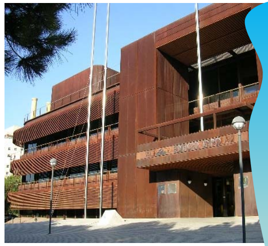
- Provide information to users of **what is potentially achievable** under certain defined circumstances.
- Possibility to **form an opinion** whether an organisation/process is performing well.
- They should be **meaningful** in terms of relevance to **environmental impact**.

Lessons learnt

Environmental performance indicators and benchmarks

- In many cases, clear conclusions on environmental indicators and also on benchmarks of excellence could be drawn.
- Quantitative distribution not always available but other effective methods for benchmarking can be used.
- A key role of the technical working group is to validate the findings, and to draw conclusions on environmental performance indicators and benchmarks of excellence

Thank you!



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Sector overview and environmental impacts
Scope of Sectoral Reference Document

Final meeting of the
Technical Working Group on
Best Environmental Management Practice for the
Car Manufacturing Sector

Seville, 21-22 June 2016

jrc-ipts-emas@ec.europa.eu

Sustainable Production and Consumption Unit

Institute for Prospective Technological Studies (IPTS)

Joint Research Centre (JRC)

European Commission

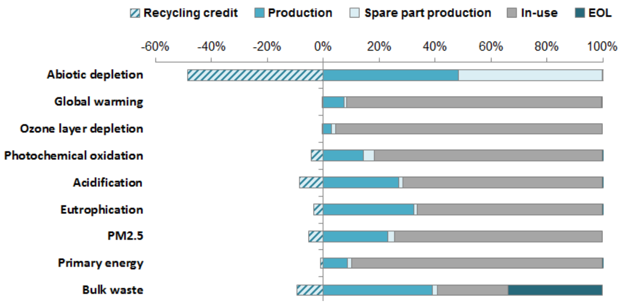
Brief sector overview

Major EU industrial sector
- 16.0 m units (22% global production) in 2015
- 2.3m direct employment in manufacturing / 12.2m indirect (2013) (all motor vehicles)

Industry structure
- Concentrated around increasingly consolidated major OEMs …
- … and supporting a supply chain (Tiers 1+) from MNEs to SMEs

Sectoral Reference Document to aim for largest impact
- Broadly appealing to actors across the supply chain
- EMAS and non-EMAS certified companies

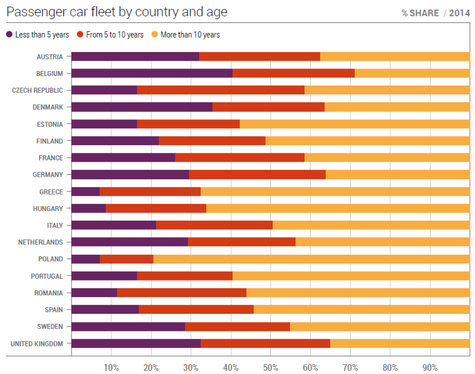
Environmental impact: lifecycle perspective



Share of life cycle impacts for a typical petrol car
(percentage attributable to different life cycle stages)

End of life vehicles

Broad variability across Member States in terms of:
- age of vehicles in circulation,
- collection methods,
- capture rate,
- processing methods, …



in ACEA pocket guide 2016

Initial approach of scope definition

Car manufacturing / ELV

- Focus on M1 vehicles (*product* approach)…
- … but *processes* are comparable for N1 and some other categories of motor vehicles
- … and EMAS is designed for *organisations*.

Relevance of EMAS sectoral reference document

- Scope to identify *Best Practice* in environmental management: additionality to existing requirements / state-of-the-art
- Environmental impacts of design and manufacturing throughout the life-cycle
- Use phase emissions (notably CO_2 / pollutants) are distinct and undergoing rapid regulatory changes

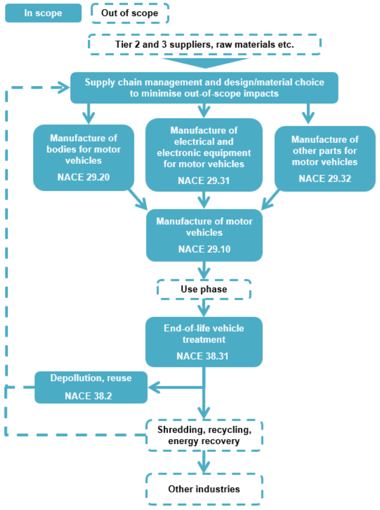
Scope definition by activity

NACE codes

- Systematic classification of economic activities
- Do not necessarily capture the complexity of car industry (e.g. tiered supply chain)

Focus on major impacts:

- Later stages of automotive-specific manufacturing
- End of life vehicle processing



List of BEMPs: manufacturing

	Area	Key aspect	#	BEMP
MANUFACTURING	CROSS CUTTING	Environmental management	2.1	Implementing an advanced environmental management system
	MANUFACTURING	Energy management	2.2	Implementing detailed energy monitoring and management systems
			2.3	Increasing the efficiency of energy-using processes
			2.4	Alternative energy sources – renewable energy generation
			2.5	Optimisation of lighting in automotive manufacturing plants
			2.6	Compressed air
			2.7	Electrical motor optimisation
		Waste management	2.8	Waste prevention and management
			2.9	Metal chip recycling through briquetting
		Water management	2.1	Water use strategy and management
			2.11	Water-saving opportunities in automotive plants
			2.12	Water recycling and rainwater harvesting
		Biodiversity	2.13	Ecosystem management reviews and strategy
			2.14	Biodiversity management
			2.15	Green roofs & Building design
	DESIGN, PROCUREMENT AND SUPPORT	Supply Chain Management and logistics	2.16	Integrating environmental requirements into supply chain management
			2.17	Collaborate with suppliers on packaging reduction
		Design	2.18	Design for sustainability using Life Cycle Analysis (LCA)
		QC / testing	2.19	Use of KERS in testing rigs
	SPECIFIC MANUFACTURING	Casting	2.20	Reduce consumption, waste and emissions of sand casting
		Stamping	2.21	Optimise the efficiency of stamping presses

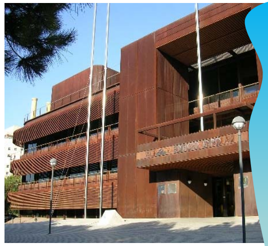
List of BEMPs: end-of-life

	Area	Key aspect	#	BEMP
END OF LIFE VEHICLE HANDLING	ELV logistics	Collection	3.1	Component and material take-back networks
		Remanufacturing	3.2	General best practices for remanufacturing components
	ELV treatment		3.3	Recovery and treatment of specific materials
			3.4	General best practices for plastic and composite parts
			3.5	Wiring harnesses – best practice for ELV treatment
			3.6	Glazing – best practice for ELV treatment
			3.7	Tyres – best practice for ELV treatment
			3.8	Best practices for other automotive components and materials

Applicability

	Area	Key aspect	OEMs	Tier 1 suppliers	Tier 2 & other suppliers	Remanufacturers	ATFs	Shredders
MANUFACTURING	CROSS CUTTING MANUFACTURING	Environmental management	X	X	X	X	X	(x)
		Energy management	X	X	X	X	X	(x)
		Waste management	X	X	X	X	X	(x)
		Water management	X	X	X	X	X	(x)
		Biodiversity	X	X	X	X	X	(x)
	DESIGN, PROCUREMENT AND SUPPORT	Supply Chain Management and logistics	X	X	X			
		Design	X	(x)	(x)			
		QC / testing	X	X				
	SPECIFIC MANUFACTURING	Casting	X	X		X		
		Stamping	X	X		X		
END OF LIFE VEHICLE HANDLING	ELV logistics	Collection				(x)	X	
		Remanufacturing				X		
	ELV treatment						X	(x)

Thank you!



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Car Manufacturing

Identification of cross-cutting BEMPs for manufacturing operations

Environmental, energy and waste management

Overview of the developed BEMPs

	Area	Key aspect	#	BEMP
MANUFACTURING	CROSS CUTTING	Environmental management	2.1	Implementing an advanced environmental management system
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2.1. Implementing an advanced environmental management system

- It is considered best practice to implement an advanced environmental management system across all sites, according to a recognised certified standard such as ISO 14001 or EMAS. This enables continuous monitoring and improvement across a range of environmental factors.

State of Play:
No major changes compared to the background report

Description

- Many major European and global OEM manufacturing plants use a certified environmental management system
- Advanced systems can be based on those implemented according to ISO 14001 or EMAS
- Important dimensions of an advanced system include
  - Deployment across (most/all) facilities
  - Efforts to deploy along the value chain
  - Dimension of continuous improvement, using indicators to monitor progress
  - Dimension of benchmarking, using inter-site comparison to emulate performance

Achieved environmental benefits

- Significant short-term benefits from first implementation, where "low-hanging fruit" can be identified and improved.
- An effective EMS should lead to **continuous improvement**

Applicability

- An EMS is fully applicable to all companies
- The most significant processes should be prioritised
- Some aspects such as water management, biodiversity/land contamination may not be covered in many EMS

Economics

- Certified EMS incurs verification cost
- Typical range 20-70k€ upfront, 10-40k€ annual

Appropriate environmental performance indicators

Metrics	Description
%	number/proportion of sites with a certified environmental standard
#	number of EPIs which are in general use throughout the whole organisation and/or which are reported on in environmental statements
Y/N	use of benchmarks to drive environmental performance

Proposals for benchmarks of excellence

- Implementing a certified EMS across all production sites globally

2.2. Implementing detailed energy monitoring and management systems

It is considered best practice to implement detailed energy monitoring across manufacturing sites at the process level, in conjunction with a certified energy management system in order to optimise energy consumption

State of Play:
No major changes compared to the background report

Description

- Energy management plans should include the following aspects:
  - Energy policy, strategy and action plan
  - Organisational structure
  - Performance measurement
  - Training
  - Communication
  - Continuous improvement
  - Investment
- The implementation of an EnMS should preferably be done according to formal standards that require organisational improvements, such as ISO 50001.

Achieved environmental benefits

- Energy savings
  - with resulting improvements in GHG / pollutant emission and resource use
- Double-digit yearly savings can be achieved initially
  - potential for further improvement remains strong

Applicability

- Broadly applicable

Economics

- Typically payback periods are less than six months and implementation costs are low

Appropriate environmental performance indicators

Metrics	Description
Y/N	Number of facilities with implemented certified EnMSs (%)
Y/N	Number of facilities with detailed real-time energy monitoring systems (%).

Proposals for benchmarks of excellence:

- Implementing specific energy management plans across all sites
- Implementing detailed monitoring per process on-site
- Implementing energy management controls, e.g. to switch off areas of the plant during non-productive times for sites with detailed monitoring

2.3. Increasing the efficiency of energy-using processes

Since the production demands of a manufacturing plant may change over time, it is best practice to ensure that high levels of energy efficiency are maintained, by conducting regular reviews of energy-using processes and identifying options for improved controls, management, repairs and/or equipment replacement.

State of Play:
Major changes with extended scope and examples

Description

- Key principles can be followed to increase energy efficiency across the plant:
  - Energy performance review
  - Automation and timing for baseload reduction
  - Zoning
  - Check for leaks and losses
  - Retrofitting
  - Switch or combine energy source
- Examples of techniques include:
  - Cogeneration
  - Waste heat recovery
  - Increasing automation
  - Just-in-time production
  - Timers
  - Energy-efficient welding, handling and transfer robots

Achieved environmental benefits

- Energy savings
  - with resulting improvements in GHG / pollutant emission and resource use

Applicability

- Broadly applicable

Economics

- Economic benefit for energy saving measures remain a strong decision factor

Appropriate environmental performance indicators

Metrics	Description
kWh/unit MWh/yr	Energy consumption (kWh) per vehicle or per plant per year (MWh/y)

Proposals for benchmarks of excellence:

N/A

2.4. Alternative energy sources – renewable energy generation

Renewable energy generation can entirely meet the energy needs of an automotive manufacturing facility, although the achievability, cost and technologies required will vary significantly depending on the local renewable resource.

State of Play:
No major changes compared to the background report

Description

- Demand side (consumption) to be minimised first
- Supply side can then be diversified into renwable sources such as:
  - Solar thermal: Flat plate
  - Solar thermal: CSP
  - Solar photovoltaic
  - Wind turbines
  - Biomass heating
  - Landfill gas
  - Geothermal heat
  - Hydroelectric generation
- Cross-media effects can be significant

Achieved environmental benefits

- Energy savings
  - with resulting improvements in GHG / pollutant emission and resource use

Applicability

- The applicability of each technology varies widely according to sites

Economics

- Economies of scale are usually significant
- Local incentives are a deciding factor in most cases
- Cost of electricity from 3-4c€/kWh to >25c€/kWh

Appropriate environmental performance indicators

Metrics	Description
%	Percentage of production sites assessed for potential and opportunities for use of renewable energy sources;
%	Percentage of site energy needs met by renewable sources;
%	Percentage reduction in energy consumption from fossil fuels;
kWh / unit	Reduction in energy consumption from fossil fuels – per produced unit.

Proposals for benchmarks of excellence:

- All production sites assessed for potential and opportunities for use of renewable energy sources
- [30%] energy needs met by renewable resources across sites on average

2.5. Optimisation of lighting in automotive manufacturing plants

BEMP is to reduce energy use for lighting through a combination of optimal positioning, using efficient lighting technologies and zonal management strategies

State of Play:
Major changes with extended scope and examples

Description

- Several steps can be taken to optimise lighting energy efficiency:
- Optimising the positioning and distribution of luminaires:
  - height and space between luminaires are key factors, to be weighed against considerations of maintenance, cleaning, reparability and cost.
- Increasing the efficiency of lighting devices.
  - Lighting should achieve high levels of energy efficiency while still ensuring sufficient brightness for safe working. Efficient bulbs include halogen lamps, fluorescent lamps, light emitting diodes (LED) and gas discharge lamps (European Commission, 2012).
- Management of lighting on a "zonal" basis
  - lighting is switched on or off according to requirements in particular areas without affecting work elsewhere.
- Combining the measures above can be the most effective and comprehensive way to reduce lighting energy.

Achieved environmental benefits

- Reduction of operational lighting energy consumption of up to 60%

Applicability

- Broadly applicable
- Individual efficient lighting technologies have restrictions to be accommodated (start-up time, intensity…)

Economics

- Economics of efficient technologies are usually favourable, but…
  - Whole luminaire (/system) price, efficiency and durability to be taken into account
  - Reliable performance data may not be available
  - Maintenance / replacement costs are a key factor

Appropriate environmental performance indicators

Metrics	Description
%	- Implementation of improved positioning, energy-efficient lighting (% of lighting areas within a site, % of total sites).
%	- Implementation of zonal strategies (% of lighting areas within a site, % of total sites).
MWh/yr	- Electrical consumption of lighting equipment (if measured at detailed level) for a plant
lm/W	- Average efficacy of luminaires throughout plant

Proposals for benchmarks of excellence:

- [X %] Sites retrofitted with low energy bulbs at the correct level for the process area (% of sites TBC)
- Zoning schemes introduced in all sites according to best practice levels

2.6. Rational and efficient use of compressed air

It is considered best practice to reduce energy consumption by mapping and assessing the use of compressed air, by optimising compressed air systems and eliminating leaks, by better matching supply and demand of air, by increasing the energy efficiency of compressors and by implementing waste heat recovery.

State of Play:

New BEMP

Description

- Optimisation of the compressed air system:
  - Demand-side measures:
    - 1. Avoid and replace misuse of compressed air
    - 2. Review usage of compressed air tools
    - 3. Monitor and control demand
    - 4. Set up awareness programmes
  - Distribution network and system measures:
    - 5. Identify and minimise leaks
    - 6. Depressurisation
    - 7. Zoning
    - 8. Use of valves
  - Supply-side measures:
    - 9. Size and manage compressor system according to demand
    - 10. Increase the overall energy efficiency of the compressed air system
    - 11. Increase the specific energy efficiency of major compressed air system components
    - 12.Regular filter inspection
    - 13.Energy efficient dryers and optimal drain selection
    - 14.Install waste heat recovery

Achieved environmental benefits

- Reductions in energy use up to 66% are reported

Applicability

- The measures can be applied by all companies that have a compressed air system.
- Waste heat: a continuous demand of process heat is necessary in order to realise the corresponding energy and cost savings.

Economics

- Payback times between two and four years

Appropriate environmental performance indicators

Metrics	Description
kWh/m³	kWh of electricity use per cubic meter of compressed air at the point of end-use at a stated pressure level

Proposals for benchmark of excellence

- Energy Performance Indicator <0.11 kWh/m³ for a compressed air system operation at a pressure of approx. 6.5 bars

2.7. Optimisation of electric motor usage

It is considered best practice to reduce electricity consumption through the optimal use of electric motors in particular using variable speed drives to adapt motor speed to demand.

State of Play:

New BEMP

Description

- Preliminary steps: reviewing motor usage efficiency throughout the system:
  - Power Quality
  - Motor Controls
  - Motor and Transmission Efficiency
- Consider implementing Variable Speed Drives (VSDs)
  - convert the incoming electrical supply of fixed frequency and voltage into a variable frequency and variable voltage that is output to the motor with a corresponding change in the motor speed and torque

Achieved environmental benefits

- Reduction in electricity consumption (→ GHG, pollution, resources)
- Modern motors: up to 40% lower consumption than older models
- Up to 70% reduction in for fans, pumps or compressors with VSDs

Applicability

- Load and usage of profile to be considered in detail
- VSD could increase consumption in rare cases

Economics

- Payback time typically < 3 years

Appropriate environmental performance indicators

Metrics	Description
%	% of electric motors with VSD installed (installed power kW / kW)

Proposals for benchmarks of excellence:

-

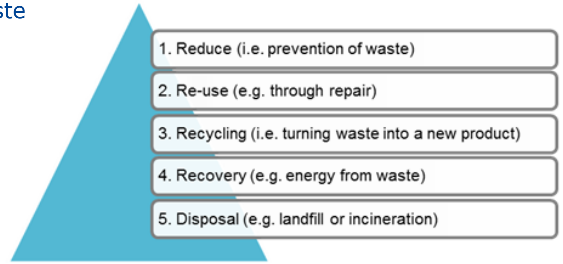
2.8. Waste prevention and management

It is best practice to set up an overall organisational waste management strategy with high level targets for waste minimisation, and to apply it at the site level with tailored waste management plans that minimise waste production during operations and establish strategic partnerships in order to find markets for remaining waste fractions.

State of Play:
No major changes compared to the background report

Description

- The majority of solid waste is generated during the manufacturing stages
- Waste hierarchy to be followed
- 100% diversion of waste from both landfill and incineration achievable



Achieved environmental benefits

- Reduced demand for raw materials
- Reduced waste to landfill and incineration (up to 100%)

Applicability

- Limitations imposed by local infrastructure and waste disposal regulations

Economics

- Driven by resale costs of sorted fractions and landfilling / disposal costs

Appropriate environmental performance indicators

Metrics	Description
(Y/N)	- An overarching waste strategy with targets for improvements has been established and implemented
#	- Number of sites with advanced waste management plans in place
#	- Number of sites achieving target levels of waste management, such as zero waste to landfill

Proposals for benchmarks of excellence:

- Waste management plans introduced in all sites
- Zero waste to landfill achieved from all production and non-production sites, with advanced plants progressing to also achieve zero waste to incineration

2.9. Metal chip recycling and lubricoolant recuperation through briquetting

It is considered best practice to press metal swarf from processing into briquettes and recover cutting emulsion.

State of Play:

New BEMP

Description

- Metal scrap a low-value, contaminated stream
- Briquetting allows
  - Valorisation of waste stream (resale value of briquettes)
  - Reduction of waste fees for emulsion disposal
  - Reduced costs of cutting emulsion
  - Reduced logistical costs of swarf storage
  - Reduced health and safety hazards

Achieved environmental benefits

- Reduction of virgin material use (metal, lubricoolant)
- Reduction of waste generation

Applicability

- Broadly applicable to metal forming operations

Economics

- Variable payback, typically 6months – 3 years

Appropriate environmental performance indicators

Metrics	Description
Y/N	- Installation of a briquetting system (Y/N)
kg/kg	- kg metal waste generated (per kg product or hours worked etc.)
kg/yr	- kg of metal chips processed as briquettes (annual)
L/yr	- L of cutting emulsion recovered (annual)

Proposals for benchmarks of excellence:

- Zero metal waste disposed of as mixed waste

Car Manufacturing

Identification of cross-cutting BEMPs for manufacturing operations

Water and biodiversity management

Overview of the developed BEMPs

	Area	Key aspect	#	BEMP
MANUFACTURING	CROSS CUTTING	Environmental management	2.1	Implementing an advanced environmental management system
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			2.12	Water recycling and rainwater harvesting
		Biodiversity	2.13	Ecosystem management reviews and strategy
			2.14	Biodiversity management
			2.15	Green roofs & Building design

2.10. Water use strategy and management

- Water management is an issue of increasing concern that is typically not covered in detail in standard environmental management systems. Therefore it is best practice to implement monitoring and to conduct a review of water management issues according to a recognised tool such as the CEO Water Mandate.

State of Play:
No major changes compared to the background report

Description

- Water use typically not accounted for comprehensively within standard environmental management systems
  - Proposed BEMP is to also use additional voluntary frameworks
  - Suggested framework is the UN Global Compact CEO Water Mandate & supported by other tools such as the WBCSD Global water tool
- Supply chain water use (supply chain BEMP)

Achieved environmental benefits

- Protection of water resources
- Decrease in energy usage (and associated emissions) linked to water pumping and treatment
- Biodiversity and ecosystem protection

Applicability

- Most relevant to plants in water-scarce areas (often outside EU)

Economics

- Most measures with a payback of less than a year – training, data collection, monitoring, leakage identification, overflow identification

Appropriate environmental performance indicators

Metrics	Description
%	- Sites that have conducted a water strategy review (% of facilities/operations)
%	- Sites that have monitoring for water consumption and use (%)
%	- Sites that have separate water monitoring for production processes and sanitary use (%)
%	- Amount of water that is internally recycled (%)
m^3	- Water use per vehicle (m^3)

Proposals for benchmarks of excellence

- Introduction of a water strategy according to a recognised tool, such as the CEO Water Mandate
- Water use on-site is measured per site and per process, using automated software where possible
- Thresholds for reduction of pollutants in discharged water are set which go beyond minimum legal requirements

2.11. Water-saving opportunities in automotive plants

Best practice is to minimise water use and consumption at all facilities, regularly review the implementation of water efficiency measures and ensure that the majority of practices and appliances are classified as highly efficient

State of Play:
No major changes compared to the background report

Description

- Production processes (other than the paint shop) and sanitary uses can be a significant water-consuming aspect of an industrial site
- Examples of water saving opportunities:
- Avoid
  - Dry sweep all areas before hosing
  - Eliminate leaks
  - Use alternatives to liquid ring pumps, vacuum pumps that require seal (gland) water
- Reduce
  - Improve efficiency of operations
  - Install flow restrictors on tap water supply line
  - Use water efficient nozzles for spray rinsing/hosing
  - Use timer rinse controls
  - Install water efficient staff amenities
  - Use ultrasonic cleaning processes
  - Counter-flow rinsing (water flows in opposite direction to material)
  - Inter-stage rinsing (uses overflow as an intermediate rinse stage immediately upstream)

Achieved environmental benefits

- Water use reduction – high variation between plants.
- Co-benefits can include reduced energy consumption for treating & heating

Applicability

- Broadly applicable

Economics

- High variation between plants, measures can range from €0 - €100,000s

Appropriate environmental performance indicators

Metrics	Description
%	- Existing sites retrofitted with water-saving devices and processes (% of operations)
Y/N	- New sites designed with water-saving devices and processes (% of new sites)
m^3	- Water use per vehicle

Proposals for benchmarks of excellence:

- All new sites designed with water-saving sanitary devices and retrofitting of water-saving devices phased in across all sites
- Zero wastewater discharged to network
- Achieve water use per vehicle in assembly plants of <1.16m³

2.12. Water recycling and rainwater harvesting

It is best practice to avoid/eliminate the use of high-quality water in processes where this is not necessary, as well as increase reuse and recycling to meet remaining needs.

State of Play:
No major changes compared to the background report

Description

- Key elements of the system:
- Wastewater recycling
  - A pre-treatment tank to collect water from various processes;
  - Treatment system, with the sludge going to the foul drain and treated water to one or more treated water storage tanks;
  - A pump to supply treated water to points of use.
- Rainwater harvesting
  - Catchment area, usually a roof surface or pavement;
  - Conveyance system
  - Storage device
  - Distribution system
- Suitable reuse applications in the car manufacturing sector include:
  - Cooling water
  - Non-crop irrigation
  - Toilet and urinal flushing
  - Vehicle/component washing.

Achieved environmental benefits

- Reduced demand for mains water supply
- Range of 15-90% reduction

Applicability

- Recycling applicable to all new buildings (and some retrofit, but expensive)
- Rainwater harvesting highly dependent on the climate and local regulations (e.g. stormwater management)

Economics

- Costs are site-specific, but several examples have proven to be cost-effective, with indicative payback period of <5 years.

Appropriate environmental performance indicators

Metrics	Description
%	- Installation of a wastewater recycling system that supplies internal or external water demand
Y/N	- Installation of a rainwater recycling system that supplies internal water demand
m^3/yr	- Quantity of rainwater and wastewater reused
%	- Percentage of annual potable water consumption substituted with recycled rain- or wastewater.
%	- Amount of water that is internally recycled

Proposals for benchmarks of excellence:

- Closed loop water recycling implemented with recovery rate of at least 90% where feasible
- 30% water needs met by harvested water in regions with sufficient rainfall
- Achieve water use per vehicle in assembly plants of <1.16m^3

2.13. Review and strategy of ecosystems and biodiversity management throughout the value chain

It is considered best practice to conduct an ecosystem management review so that the impacts of ecosystem services throughout the value chain can be clearly understood, and to work with relevant stakeholders to minimise any issues.

State of Play:
No major changes compared to the background report

Description

- "Ecosystem service" categories (Millennium Ecosystem Assessment, 2005):
  1. Provisioning services, or goods and products obtained from ecosystems, such as food, freshwater, timber;
  2. Regulating services, or benefits from the ecosystem's natural regulating processes involving climate, disease, soil erosion, water flows, and pollination, as well as protection from natural hazards;
  3. Cultural services, or the spiritual and aesthetic enjoyment derived from nature;
  4. Supporting services, or such natural processes as nutrient cycling and primary production that maintains other services.
- Conduct an ecosystem management review to
  - understand the impacts of ecosystem services throughout the value chain
  - work with relevant stakeholders to minimise any issues

Achieved environmental benefits

- Main environmental benefit is the conservation of natural resources, and the associated ecosystem service provision.

Applicability

- The approaches outlined can readily link with many other existing company processes and analytical techniques, such as life cycle assessments, land management plans, economic impact assessments, company reporting, and sustainability appraisals

Economics

- Varies – only a few hours to conduct a qualitative review of ecosystem services (such as the suggested Corporate Ecosystem Review methodology)
- Application of spatially explicit modelling tools requires hundreds of hours of work

Appropriate environmental performance indicators

Metrics	Description
Y/N or %	Technique or tool in place to assess the corporate impacts on ecosystem services (Yes/No – or % coverage of the value chain)
Y/N or %	Tool covers relevant scope, as determined by prioritisation (Yes/No - or % coverage of the value chain).

Proposals for benchmarks of excellence:

- Conducting a high-level ecosystem review across the value chain, followed by a more detailed ecosystem review in identified high risk areas
- Develop strategies to mitigate issues across the supply chain in collaboration with local stakeholders and external experts

2.14. Biodiversity management at site level

It is best practice to improve direct impacts on biodiversity on company premises by measuring, managing and reporting on biodiversity efforts, working with local stakeholders.

State of Play:
No major changes compared to the background report

Description

- Comprehensive approaches for biodiversity management are not common in the automotive sector.
- Guidance exists at the general level, whereas work is ongoing to develop best practices for the automotive sector specifically
- Implement site-specific actions including:
  - **Measurement:** Best practice organisations have introduced extensive measurement activities at all of their sites using location-based biodiversity or risk screenings, including assessment of the surrounding areas, and measurement according to indicators and species inventories
  - **Management and collaboration with stakeholders:** Managing the site to promote and maintain biodiversity
  - **Reporting**

Achieved environmental benefits

- Reduced direct impacts on biodiversity, thereby increased conservation of natural resources, and associated biodiversity and ecosystem service provision.

Applicability

- Broadly applicable

Economics

- Benefits are difficult to quantify

Appropriate environmental performance indicators

Metrics	Description
#	- Number of projects / collaborations with stakeholders to address biodiversity issues.
Y/N	- Procedure /instruments in place to analyse biodiversity related feedback from customers, stakeholder, suppliers (quality indicator).
Y/N	- Feedback from stakeholders on the overall biodiversity performance of a company (quality indicator).
m^2	- 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, m^2).
Y/N	- Plan for biodiversity friendly gardening in place for premises or other areas, owned, leased or managed by the company.
%	- If located in or adjacent to protected areas: Size of areas under biodiversity friendly management in comparison to total area of company sites.
%	- Total size of restored habitats and/or areas to compensate for damages to biodiversity caused by the company (m^2) in comparison to land used by the company (m^2).
	- Biodiversity Index (to be developed according to local conditions)

Proposals for benchmarks of excellence:

- Implement a comprehensive biodiversity plan to ensure systematic incorporation through measurement, monitoring and reporting
- Cooperation with experts and local stakeholders

2.15. Green roofs

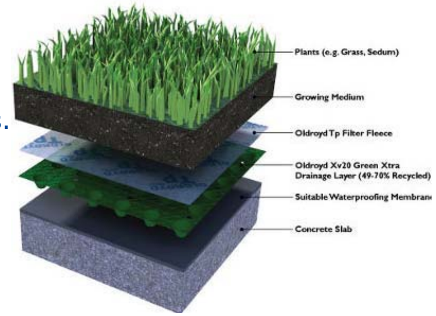
It is best practice to install or retrofit green roofs on industrial sites, particularly in environmentally sensitive areas where management of stormwater runoff is important.

State of Play:

No major changes compared to the background report

Description

- Green roofs can offer environmental benefits in several different areas depending on the site and design.
- Some green roofs have been installed on manufacturing sites. Particularly in environmentally sensitive areas where management of stormwater runoff is important



Achieved environmental benefits

- Manage storm water runoff (-40%),
- Improved water quality (85% fewer suspended solids in runoff),
- Building insulation - reduced cooling and heating costs (-70%),
- Increased roof lifespan (around 20 years),
- Providing biodiverse habitat

Applicability

- Suitability of building for green roofs depends on structural aspects, access to sunlight, moisture, waterproofing, and drainage or water storage systems.

Economics

- Higher capital costs are often offset by lower maintenance, replacement and utility costs.
- Installation: 60 to 115 €/m2; Maintenance: 0.4 to 4.0 €/m2.

Appropriate environmental performance indicators

Metrics	Description
%	- % coverage of sites that are suitable for green roofs (suitability depending on structural aspects, access to sunlight, moisture, waterproofing, and drainage or water storage systems)
m³	- Water holding: % retention, water run off (m3);
misc.	- Water quality: pH, temperature, total suspended solids (TSS), total dissolved solids (TDS), dissolved oxygen (DO), chemical oxygen demand (COD), and nutrients (ammonia, nitrite, nitrate, phosphate, and total phosphorus);
MJ	- Cooling effect: reduction in energy demand for HVAC (MJ);
-	- Qualitative biodiversity indicators (e.g. number of species living in the roof).

Proposals for benchmark of excellence

-

Car Manufacturing

Identification of cross-cutting BEMPs for supply chain, logistics and design

Overview of the developed BEMPs

	Area	Key aspect	#	BEMP
MANUFACTURING	DESIGN, PROCUREMENT AND SUPPORT	Supply Chain Management and logistics	2.16	Integrating environmental requirements into supply chain management
			2.17	Collaborate with suppliers on packaging reduction
		Design	2.18	Design for sustainability using Life Cycle Analysis (LCA)
		QC / testing	2.19	Use of KERS in testing rigs

2.16. Integrating environmental requirements into supply chain management

- The concept of integrating environmental requirements into the supply chain involves building environmental criteria into the vendor assessment process. Frontrunner organisations require all of their major suppliers to have certified environmental management systems, set targets for environmental criteria and conduct audits of high risk suppliers to ensure compliance. This is supported by training and collaboration with suppliers to ensure that their environmental performance improves.

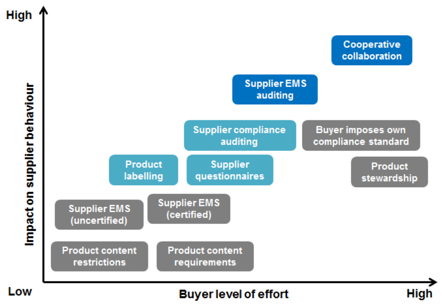
State of Play:

No major changes compared to the background report

Description

- Quality schemes for suppliers encompass complementary elements (see opposite)

- The very best results are obtained with:
  - Requirements for suppliers to have an audited EMS
  - Environmental improvement goals set for suppliers
  - High level of cooperation and collaboration with suppliers to achieve goals
  - Monitoring and enforcement



Achieved environmental benefits

- Benefits can be achieved on all environmental impacts/pressures
  - e.g. waste, energy, water…
- Typically extend over large geographical range
  - Opportunity to reduce impacts in countries with weak environmental standards

Applicability

- Applicable to all companies, with a focus on large organisations

Economics

- Audit costs for supplier monitoring (up to 1k€/day) and training
- EMS costs for suppliers (see BEMP 2.1 -Typical range 20-70k€ upfront, 10-40k€ annual)
- Costs can be limited by:
  - Focussing on high impact and high risk areas of the supply chain first;
  - Conducting some audits using internal experts rather than third-party suppliers;
  - Rotating audits so that suppliers are audited on a multi-year basis (e.g. every three years).

Appropriate environmental performance indicators

Metrics	Description
%	Percentage of suppliers (by number or by purchasing budget/value) that comply with required standards according to internal or external audits;
%	Percentage of suppliers that flow down requirements to their own suppliers

Proposals for benchmarks of excellence

- All major suppliers are required to have an environmental management system in order to qualify for purchasing agreements
- Environmental criteria are set across all environmental impact areas for purchasing agreements
- All suppliers are sent self-assessment questionnaires and high risk suppliers are audited by third parties
- Supplier development and training is undertaken
- Enforcement procedures are defined for non-compliance

2.17. Collaborate with suppliers on packaging reduction

It is considered best practice to reduce and reuse packaging used for materials and components supply.

State of Play:

New BEMP

Description

- The best practice is based on the following principles:

1. reduce unnecessary packaging while ensuring adequate functionality (parts integrity, ease of access)
2. investigate alternative materials for packaging which are either less resource efficient, or easier to reuse / recycle
3. develop reverse logistics for returning empty packaging to suppliers / recuperate from customers in a closed loop
4. investigate alternate uses for disposable packaging to divert from disposal (higher up in the "waste hierarchy")

Achieved environmental benefits

- Waste reduction
- Reduction of resource use

Applicability

- Broadly applicable

Economics

- RoI 10-40%

Appropriate environmental performance indicators

Metrics	Description
kg	Weight of waste per unit produced (e.g. kg/vehicle) or per value added
kg	Weight packaging waste per unit

Proposals for benchmarks of excellence

- [TBD] kg of packaging waste per unit produced

2.18. Design for sustainability using Life Cycle Analysis (LCA)

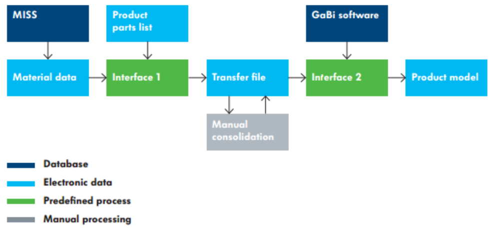
Conducting life cycle assessment (LCA) helps to identify potential improvements and trade-offs between different environmental impacts, as well as helping to avoid shifting environmental burdens from one part of the product life cycle to another. Best practice LCAs in the automotive sector will be carried out extensively during the design phase, set specific goals for improvement in different environmental impacts and ensure that these targets are met.

State of Play:

No major changes compared to the background report

Description

- Performing an LCA will help:
  - A. Ensure sustainability of resources
  - B. Ensure minimal use of resources in production and transportation
  - C. Ensure minimal use of resources during use phase
  - D. Ensure appropriate durability of the product and components
  - E. Enable disassembly, separation and purification
- Best practice is based on
  - Use of internationally accepted
  - standards
  - Integrating LCA into decisions at the earliest stages of design
  - Establishing cross-discipline teams
  - Establishing environmental improvement targets
  - Data for the complete value chain, including suppliers
  - Clear and transparent communication to the public
- Typical LCA methodology:



Achieved environmental benefits

- LCA allows ' big picture' view to avoid shifting environmental burdens
- Trade-offs between environmental impacts may still have to be arbitrated

Applicability

- Tool is resource intensive for small organisations
- Designed to monitor performance improvement rather than benchmarking between organisations

Economics

- Time to conduct LCA decreases rapidly
  - 2-4 person-months initial implementation
  - less than 1 person-month for subsequent

Appropriate environmental performance indicators

Metrics	Description
%	Conducting LCA to inform design decisions (% designs)
%	Improvements in environmental indicators (CO_2e, energy consumption, SO_2e, etc) for new model designs compared to previous model designs (% improvement) along the life cycle

Proposals for benchmarks of excellence:

- LCA is conducted for all design changes according to ISO 14040 (2006) standards
- Targets are set to ensure continuous improvements in the environmental impacts of new vehicle designs

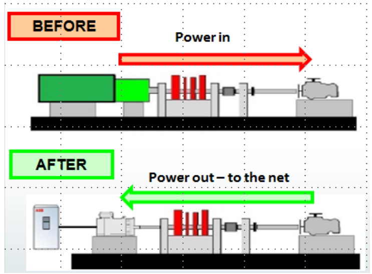
2.19. Use of kinetic energy recovery systems in engine testing rigs

It is considered best practice to recover mechanical energy from engines operated on test benches through the use of kinetic energy recovery systems

State of Play:
New BEMP

Description

- The best practice consists in the replacement, during loaded hot testing of engines, of the passive (dissipative) brakes applied to the engine to simulate loads, by dynamometric brakes which can recover electrical energy from the braking applied.
- This electricity is then fed back to the plant's network through appropriate signal conditioning.



Achieved environmental benefits

- Instead of using electrical energy to apply a load on the engines being tested, the technique allows recovering mechanical energy from the running engines to feed back into the electrical network of the plant.

Applicability

- Only concerns facilities where finished operational engines undergo testing

Economics

- The payback time of the investment is calculated to be under 3 years.
- The electrical energy savings represent less than 10% of the whole plant's consumption.

Appropriate environmental performance indicators

Metrics	Description
%	- share of engine test benches fitted with dynamometric brakes
kWh/yr	- power recovered through KERS (annual)

Proposals for benchmarks of excellence:

-

Sectoral Reference Document on the Metal Fabrication sector

Final meeting of the
Technical Working Group on
Best Environmental Management Practice for the
Car Manufacturing Sector

Seville, 21-22 June 2016

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Sustainable Production and Consumption Unit
Institute for Prospective Technological Studies (IPTS)
Joint Research Centre (JRC)
European Commission

Scope → NACE (rev2) Div. 25

NACE code	Description
C	**MANUFACTURING**
25	**Manufacture of fabricated metal products, except machinery and equipment**
25.1	**Manufacture of structural metal products**
25.11	Manufacture of metal structures and parts of structures
25.12	Manufacture of doors and windows of metal
25.2	**Manufacture of tanks, reservoirs and containers of metal**
25.21	Manufacture of central heating radiators and boilers
25.29	Manufacture of other tanks, reservoirs and containers of metal
25.3	**Manufacture of steam generators, except central heating hot water boilers**
25.30	Manufacture of steam generators, except central heating hot water boiler
25.4	**Manufacture of weapons and ammunition**
25.40	Manufacture of weapons and ammunition
25.5	**Forging, pressing, stamping and roll-forming of metal; powder metallurgy**
25.50	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
25.6	**Treatment and coating of metals; machining**
25.61	Treatment and coating of metals
25.62	Machining
25.7	**Manufacture of cutlery, tools and general hardware**
25.71	Manufacture of cutlery
25.72	Manufacture of locks and hinges
25.73	Manufacture of tools
25.9	**Manufacture of other fabricated metal products**
25.91	Manufacture of steel drums and similar containers
25.92	Manufacture of light metal packaging
25.93	Manufacture of wire products, chain and springs
25.94	Manufacture of fasteners and screw machine products
25.99	Manufacture of other fabricated metal products n.e.c.

Overview of Best Practice proposals

CURRENT PROPOSAL from the DRAFT BACKGROUND REPORT
(Vito / Sirris / Agoria; BE-based)

- 2.2 Best environmental management practices for the supporting processes
  - Management, procurement and supply chain management
  - Utilities
- 2.3 Best environmental management practices for the manufacturing processes
  - All manufacturing processes (cross-cutting)
  - Forming processes
  - Removing processes
  - Finishing processes
- 2.4 Concurrent engineering and product design as Best Environmental Management Practice

2.2 Best environmental management practices for the supporting processes

Management, procurement and supply chain management

- 2.2.1 Cross-sectoral and value chain collaboration (by communication and integration)
- 2.2.2 Chemical leasing & Chemical management services
- 2.2.3 Measures for stock reduction - while keeping customer demand flexibility

Utilities

- 2.2.4 Efficient ventilation
- 2.2.5 Optimal lighting
- 2.2.6 Systemic approach of cooling circuits
- 2.2.7 Selection of coolant as environmental and performance criterion
- 2.2.8 Efficient use of pressurised air systems

2.3 Best environmental management practices for the manufacturing processes

All manufacturing process

- 2.3.1 Application of solid low-friction coatings on tools and components
- 2.3.2 Application of wear- and corrosion-resistant coatings for lifetime extension of tools and equipment.
- 2.3.3 Reduction of standby energy of metal working machines

Forming processes

- 2.3.4 Incremental Sheet metal Forming (ISF) as alternative for mould making
- 2.3.5 Additive manufacturing of complex equipment - flow optimization for optimal heat transfer and temperature control
- 2.3.6 Multi-directional forging: a resource efficient metal forming alternative

2.3 Best environmental management practices for the manufacturing processes (continued)

Removing processes

- 2.3.7 Hybrid machining as a method to reduce energy consumption
- 2.3.8 Machining of near-net-shape feedstock

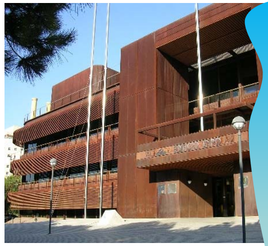
Finishing processes

- 2.3.9 Reduce the energy for paint booth HVAC with predictive control
- 2.3.10 Selection and optimization of thermal processes for curing wet-chemical coatings on metal products

2.4 Concurrent engineering and product design as Best Environmental Management Practice

- 2.4.1 Remanufacturing of high value components
- 2.4.2 Lean principles to reduce energy and material consumption in the FMP sector
- 2.4.5 Co-design and open innovation with downstream partners to reduce environmental impact during product life cycle

Thank you!



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Car Manufacturing

Identification of specific BEMPs for manufacturing operations

Overview of the developed BEMPs

	Area	Key aspect	#	BEMP
MANUFAC TURING	SPECIFIC MANUFA CTURING	Casting	2.20	Reduce consumption, waste and emissions of sand casting
		Stamping	2.21	Optimise the efficiency of stamping presses

2.20. Reduce consumption, waste and emissions of sand casting

- It is considered best practice to reduce consumption of casting sand by reclaiming sand and/or to reduce emissions by using inorganic binders in casting

State of Play:

New BEMP

Description

This best practice covers several avenues to improve the environmental impact of sand casting through two main techniques:

- Reducing sand consumption and waste sand generation by reclaiming used sand;
- Switching from organic to inorganic binders in core sand for light metal casting

Achieved environmental benefits

- Reduced consumption and waste of sand
- Reduced VOC emissions from organic binders

Applicability

- Applicable to all foundries using sand casting

Economics

- Example of gross savings of 45% on sand not purchased and net savings of 20% including additional operational costs
  - RoI timeframe of about 2 years.
- Example of investment costs of €2.1m for regenerating waste sand corresponding to 12.000 crankcase cylinders and 135.000 brake parts a week
  - –50% waste sand produced.
- Example plant ~ €4.5 million, sized to recover up to 10 tons of sand per hour.

Appropriate environmental performance indicators

Metrics	Description
%	- Reclaimed sand from moulds (% of total sand use)
Y/N or %	- Use of inorganic binders (Y/N or % tonnes of production moulded using inorganic compounds)
t/t	- Foundry waste sand generation (tonne / tonne produced)
t	- Tonnes of new sand used

Proposals for benchmarks of excellence

- - No sand sent to landfill
- - XX% of casting sand recovered

2.21. Efficiency of bodyshop presses

It is considered best practice to retrofit existing presses (in brownfield applications) to increase energy efficiency, by replacing heavy components, updating the system controls, mounting gear-based recuperation of energy, or to install servo drives.

State of Play:

New BEMP

Description

- Main types of presses in use
  - Mechanical
  - Hydraulic
  - Servo
- Suitable retrofit measures for brownfield installations:
  - exchange of heavy components
  - update of the system control
  - gear with recuperation of energy
  - installation of servo drives

Achieved environmental benefits

- Waste reduction
- Reduction of resource use

Applicability

- Broadly applicable to stamping operations

Economics

- Investment costs for servo presses estimated to be 20-30% higher than conventional
- But higher output and lower maintenance costs

Appropriate environmental performance indicators

Metrics	Description
MWh/ unit	Energy consumption (MWh) per unit production (or stroke);
kg/kg (%)	Scrap or rejects (kg per vehicle weight, or %) from body production.

Proposals for benchmarks of excellence

- -

End-of-Life Vehicles

Identification of BEMPs for End-of-Life Vehicle treatment

Overview of the developed BEMPs

	Area	Key aspect	#	BEMP
END OF LIFE VEHICLE HANDLING	ELV logistics	Collection	3.1	Component and material take-back networks
		Remanufacturing	3.2	General best practices for remanufacturing components

3.1. Component and material take-back networks

- Effective take-back networks employed by frontrunner organisations can increase the rate of reuse, recycling and recovery that is economically achievable when treating ELVs. This involves extensive collaboration between different industry actors to recover components, consolidate with other waste streams where possible as well as training and support.

State of Play:
No major changes compared to the background report

Description

- Effective take-back networks can increase the rate of reuse, recycling and recovery that is economically achievable when treating ELVs.
  - Collection systems aim to take back specific components or ELVs and ensure they are properly treated.
  - Local systems/regulations/infrastructure vary
  - Lack of information amongst ATFs, on how to appropriately deal with vehicle parts at end-of-life.
- Best practice includes:
  - Collaboration with industry actors
  - Management of product return
  - Consolidation with other waste streams.
  - Providing technical support and awareness-raising

Achieved environmental benefits

- No benefit per se but prerequisite for higher reuse, remanufacturing, recovery and recycling potential
- Avoidance of black market dismantling sector

Applicability

- Greatest potential for collecting advanced technologies with limited service life (e.g. hybrid or electric vehicle batteries), or less financially attractive components/materials to dismantle (e.g. plastic and glass components)
- Depends on local regulation, customer base, geographic dispersion and the type of product involved.
- Overriding factor is dismantler's knowledge of demand for spares

Economics

- cost of collection and treatment of ELVs is covered by the revenues from recycling. Closed-loop recycling can reduce price risk from raw materials

Appropriate environmental performance indicators

Metrics	Description
%	Recovery rate (%) for specific products or materials through ELV networks.

Proposals for benchmarks of excellence

- Collaboration and partnerships in place with local/national organisations
- Product recovery rate (X%)

3.2. General best practices for remanufacturing components

This BEMP is focussed on methods to increase the scale of remanufacturing activities in the automotive sector - frontrunner organisations have established procedures to ensure high quality of remanufactured parts while reducing environmental impacts and scaling up activities to cover more components.

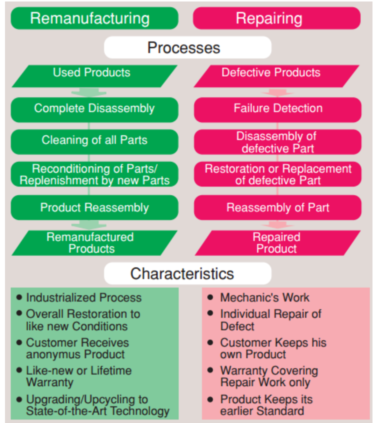
State of Play:

No major changes compared to the background report

Description

Remanufacturing based on:

- Step 1: Completely dismantling the used part
- Step 2: Cleaning all components (➔ env. friendly cleaning techniques)
- Step 3: Checking components, repairing or replacing defective components, replacing missing components
- Step 4: Reassembling the part, readjusting as necessary and submitting it to a final test



(Steinhilper, 2010)

Achieved environmental benefits

- Renault estimates (Ellen MacArthur Foundation, 2013):
  - 88% less water required compared to new;
  - 92% fewer chemical products used;
  - 70% less waste generated.

Applicability

- Remanufacturers, OEMs with reman. operations

Economics

- Resale value of reman part 50-75% of a new unit (APRA Europe, 2014)
- Main costs incurred for remanufacturer: labour, sourcing of materials/parts (Steinhilper, 2010) plus storage and transportation.

Appropriate environmental performance indicators

Metrics	Description
%	level of remanufacturing in terms of weight per component (%)
%	overall remanufacturing levels (% of recovered components).

Proposals for benchmarks of excellence:

-

End-of-Life Vehicles

Identification of BEMPs for End-of-Life Vehicle treatment

Overview of the developed BEMPs

	Area	Key aspect	#	BEMP
END OF LIFE VEHICLE HANDLING	ELV treatment		3.3	Recovery and treatment of specific materials
			3.4	General best practices for plastic and composite parts
			3.5	Wiring harnesses – best practice for ELV treatment
			3.6	Glazing – best practice for ELV treatment
			3.7	Tyres – best practice for ELV treatment
			3.8	Best practices for other automotive components and materials

3.3. Depollution of vehicles

- Depollution of vehicles must be carried out carefully, and where possible using specifically designed equipment. Environmental considerations are relevant to contamination ofsoil and water, but also related to the potential for recovery of materials for reuse and recycling.

State of Play:
No major changes compared to the background report

Description

- Depollution of vehicles must be carried out carefully, and where possible using specifically designed equipment.
- Depollution of vehicles is regulated by the ELV Directive and therefore practiced by all ATFs at some level.
- However, it is known that levels of compliance can be low

- BEMP includes:
  - Use of a commercial depollution machines
  - Conducting depollution in an optimal sequence

Achieved environmental benefits

- Increase in the % of liquid removed from the vehicle.
- Reduces hazardous substances in vehicle hulk, and potential to contaminate soil and water.
- Impacts on the effectiveness of subsequent remanufacturing and recycling.

Applicability

Economics

- Costs include: the investment cost (~€100,000 to ~€200,000 for installation), training, certification, maintenance and supporting equipment

Appropriate environmental performance indicators

Metrics	Description
%	- Compliance with ELV Directive – removal rate of components (%)
%	- Recovery rate of fluids (%)

Proposals for benchmarks of excellence

- -

3.4. General best practices for plastic and composite parts

Best practice organisations have established closed loop recycling for selected components, and continue to develop new areas to increase the level of recyclability of their vehicles.

State of Play:
No major changes compared to the background report

Description

- 2 main methods for treating plastic and composite parts
  - dismantling and recycling of components
  - post-shredder recycling.
- Relative advantages and disadvantages of these methods depend largely on the availability and performance of ELV treatment technologies
  - best practice is therefore to evaluate the pros and cons based on specific information relevant to plastic and composite parts.
- BEMP to
  - Apply the principles of life cycle assessment
  - Improve separation
  - Develop markets for recyclates
  - Establish closed-loop recycling (where possible)

Achieved environmental benefits

- Depends on the recovery method used and the substituted materials.
- Benefits include a reduction in energy consumption and GHG emissions compared to the current practice of landfill

Applicability

- Highly dependent on quality and purity of plastic, storage, logistics, treatment technologies, demand for recycled materials

Economics

- Typically payback periods are less than six months and implementation costs are low

Appropriate environmental performance indicators

Metrics	Description
%	Conducting LCA studies to determine optimal LCA routes according to local factors
%	Components treated according to optimal LCA route
%	*Incorporation of recycled materials into new vehicles (% weight).*

Proposals for benchmarks of excellence:

- High rate [XX %] of recycling of plastic components through either dismantling or post-shredder technologies

3.5. Wiring harnesses – best practice for ELV treatment

Frontrunner organisations have implemented closed loop recycling for vehicle wiring harnesses through combining design factors, dismantling tools and recycling processes

State of Play:
No major changes compared to the background report

Description

- Metal recycling is a mature process
  - however the copper in a vehicle wiring harness can present a problem for separation.
- Frontrunner organisations have implemented closed loop recycling for vehicle wiring harnesses through combining design factors, dismantling tools and recycling processes
- Focus on improving the removal and recycling rates for current vehicles as far as possible.
- Earlier intervention at the design stage for new vehicles can have also a substantial impact on the feasibility of subsequent stages

Achieved environmental benefits

- Greater levels of material recovery – almost all copper could be recovered.

Applicability

- Removing wiring harnesses is labour intensive and expensive compared to the gain in material and therefore not currently widely practice

Economics

- Dismantling times for wire harnesses can range from 5 minutes to over 30 minutes, depending on the accessibility and complexity.
- Key driver is to avoid copper contamination of steel fraction to increase resale value of steel

Appropriate environmental performance indicators

Metrics	Description
%	- Recycling rate (%)
%	- Reduction in environmental impacts according to LCA criteria

Proposals for benchmarks of excellence:

-

3.6. Glazing

In cases where life cycle assessment indicates that dismantling automotive glass prior to shredding is more environmentally beneficial, frontrunner organisations facilitate this process through the ELV network in an economically viable manner. This requires efficient removal of glass, separate treatment and recycling into high quality products

State of Play:
No major changes compared to the background report

Description

- Dismantling of automotive glass prior to shredding can be more environmentally beneficial, and should be assessed on a case by case basis (using LCA).
  - Frontrunner organisations facilitate this process through the ELV network in an economically viable manner.
  - Efficient removal of glass, separate treatment and recycling into high quality products.
- However, manual removal of automotive glazing is labour intensive; reuse / recycling options limited ➔Best environmental options may vary
  - Assess the environmental benefits of dismantling vs post-shredder recovery
  - Where dismantling is environmentally preferable, frontrunner organisations ensure efficient removal of glass, separate treatment and recycling into high quality products.

Achieved environmental benefits

- Each 10% increase in cullet used in a glass furnace results in a 2-3% energy saving in the melting process.
- Each tonne of cullet used saves 230 kg of CO2 emissions

Applicability

- Broadly applicable but dependent on treatment options, labour cost, logistics, storage and demand.

Economics

- Major constraint
- Depends on the labour cost (~€4-€5 per vehicle), cullet price, landfill cost, and the penalty associated with failing to comply with the ELV Directive (2000/53/EC)

Appropriate environmental performance indicators

Metrics	Description
%	- Recycling rate (%)
%	- Reduction in environmental impacts according to LCA criteria

Proposals for benchmarks of excellence:

- [%] glass recovery rate

3.7. Tyres

The best environmental management options for tyres may vary depending on local factors, but generally the best options are to recycle tyres into applications that can displace virgin materials (including closed-loop recycling into new tyres) or to use as tyre-derived fuel in cases where coal is displaced.

State of Play:
No major changes compared to the background report

Description

- The best environmental management options for tyres may vary depending on local factors, but generally the best options are ordered below from higher to lower benefit:
  - (Encourage longer usage periods)
  - Direct reuse and retreading
  - Recycling and reprocessing of materials
  - Energy recovery
  - Recycling of materials (whole)

Achieved environmental benefits

- Avoidance of virgin materials (including avoiding the production and transport of the substituted materials).
- Reduction in waste, water and energy, e.g. Lifecycle savings from retreading a tyre = waste (85%), water (86%) and energy (57%).

Applicability

- Highly dependent on local context

Economics

- Establishing large-scale end-use markets allow a stable market base, which provide greater reliability and economies of scale – e.g. markets for tyre-derived aggregates and tyre-derived fuel

Appropriate environmental performance indicators

Metrics	Description
%	- Volume of tyres recovered and % sent to the environmentally preferred treatment method
%	- Reduction in environmental impacts according to LCA criteria

Proposals for benchmarks of excellence:

- 100% of tyres recycled according to the best method (as determined by LCA)