ORGALIME

Position Paper

Brussels, 3 August 2015

CIRCULAR ECONOMY 2.0: HOW IT CAN WORK SUCCESSFULLY FOR AND WITH EUROPEAN MANUFACTURING

Executive summary

Orgalime welcomes the debate on the Circular Economy and thanks the European Commission for its open consultation process.

We are committed to provide our active input into this debate, as we believe that, with the Energy Union, the Digital Single Market, the forthcoming Internal Market for Products and Services, the Circular Economy is one of the core pillars, which if it is well-designed and part of a joined up and coherent policy approach will contribute towards the core overall jobs and growth objective of the present Commission.

Orgalime's industry, with its output of 1825 billion euro in 2014 and 10.3 million employed in Europe, does attach significant importance to the development of a Circular Economy policy which is integrated with all other policy areas being developed by the present Commission.

Our industry believes that the sustainable use of resources is a shared objective. We see the Circular Economy as an essential pillar of resource efficiency, which, if is well-designed, will both achieve its environmental objectives and be supportive of Europe's manufacturing sector with a positive impact on both growth in the manufactuirng economy and jobs. Orgalime firmly believes that the core jobs and growth objective of the present Commission must be at the core of the policy thinking and regulatory framework derived from the Circular Economy.

In the present paper and its annexes, therefore:
- we provide our core thinking and recommendations on the Circular Economy
- we outline the main barriers of Circular Economy and our suggestions for solutions, and
- we provide a list of examples of our industry´s resource efficiency and circular economy activities.

The sustainable use of resources - a shared objective

From a policy perspective in an increasingly populated world, it is essential to move towards an ever more sustainable use of resource.

Likewise, the *efficient use of resources in both, production processes and products* manufactured by our companies is a constant preoccupation of our companies for very good economic reasons: resource inputs usually account for between 30 and 60% of total input costs. Better using these makes sound business sense. Therefore our industry has always invested heavily in materials research, in energy efficiency, better use of water, etc.

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Now another step change is taking place: *innovative technologies are offering many new opportunities*: the uptake of these, especially ICT-enabled technologies manufactured in Europe are boosting productivity, energy, resource and cost efficiency at the same time. This is a reality and is developing fast. This is good for business, good for employees and good for the environment.

Circular Economy as an essential pillar of resource efficiency offers opportunities to the sector represented by Orgalime

Over 80% of Orgalime´s members' output is in capital goods and durable consumer goods, where more often than not, we are leading the world, whether in the areas of material technology, productivity, energy efficiency or other resource efficiency technologies, such as waste treatment or water treatment technologies. As a supplier to all other industrial sectors, we offer innovative technology solutions to environmental challenges throughout the economy.

Europe's engineering industries are successfully withstanding the harsh global competition through quality, know-how, competence, durability, skills and innovation. For capital goods and durable consumer goods there is in our view no issue of so-called "planned obsolescence". Products last 10, 20, 40 years or more and end up in highly critical applications, such as industrial plants, power plants, airplanes, airports, hospitals or automotive applications, where productivity, reliability and durability are essential elements of the investment decision. After sales, maintenance and other services are an integral and increasing share of companies´ turnover, often representing a larger share of turnover than the initial sale of the product. Remanufacturing is a practice applied by many companies in the business-to-business segment since many years.

Products with a short life span represent a minority of Orgalime´s membership; however, they dominate today´s Circular Economy debate. In this area, there is a range of products that cater to the individual desire of the consumer for either very affordable or fashionable products. It is logical that companies should serve this demand.

The Circular Economy policy will work best if it is carefully designed and works both for the environment and for Europe´s real economy

In the area of product design, much has been done through the Ecodesign directive with its holistic approach, where more than fourty measures have been implemented or are in the process of being adopted. Orgalime, which has since the outset been a supporter of this policy, believes that the limits of a policy which is primarily focused on products is being reached. It is time to move toward a more systemic approach for which the Ecodesign directive is less well suited.

There now needs to be sufficient room and flexibility for bringing the added value of technical progress and innovative, cost efficient product designs to consumers with least environmental impact from a life cycle perspective. Our companies´ investment into energy efficiency, existing sector specific legislation and the overall sustainability innovation must not be upset by Circular Economy policies.

In the context of the use of secondary raw materials, quality requirements really matter: substance policy objectives should not be circumvented. However, given the crucial role that materials technologies play in product design, securing confidential business data, know-how and Intellectual Property Rights are essential to maintain European engineering industries´ global competitive edge, growth and jobs.

Given the importance of designing this new policy in the right way, Orgalime appreciates the Commission´s consultation process in view of designing a Circular Economy Package 2.0 that combines environmental ambition with economic and social aspects, recognises industry´s achievements, builds on industry led initiatives and truly turns Circular Economy policies into the economic opportunity for European industries that manufacture and create jobs in Europe.

Orgalime suggests the following main building blocks for the new, more ambitious Circular Economy Package 2.0:

- Pursue a holistic, systemic, integrated approach throughout the economy by setting boundary limits, while leaving it up to the industry to create and develop the economic framework.
- Acknowledge that economic activities of different sectors are interlinked and dependent on each other: material loops are, and have to be, open and interconnected across sectors, borders and applications to achieve the highest degree of resource efficiency. The Circular Economy can therefore not be realised by few sectors, but requires a horizontal approach and overall economic standpoint.
- Get the policy framework right through the following key boundary limits: enacting strict landfill and waste shipment policies, realistically increased recycling and recovery targets, strict implementation and enforcement of waste policies and the setting of EU minimum quality criteria for secondary raw materials based on ISO or EN standards.
- Adopt a forward-looking approach to rule-setting taking into account the opportunities that the increased use of ICT in manufacturing ("Internet of Things") is bringing and will bring.
- Implement the "Energy Efficiency First" principle and exploit energy system savings potentials throughout the different market segments during the reviews of the Energy Efficiency and Energy Performance of Buildings Directives, to prevent valuable energy resources from being wasted.
- Improve the use of industrial energy waste for heating and cooling.
- Require REACH compliance for secondary raw materials to protect human health and the environment and to ensure a fair level playing field.
- Remove the legislative inconsistencies between REACH and the sector specific RoHS Directive: in particular one common substance evaluation methodology should apply for both EU laws when setting any further new substance restrictions for electrical and electronic equipment. The RoHS principle of "repair as produced" should also be introduced under REACH to secure the availability of spare parts, thereby extending the useful life of products.
- Support the market driven development of competitive EU secondary raw materials market through technology and process development and without discriminating between materials, industrial sectors or technologies.
- Unlock investment in resource efficiency technologies through promoting Green Public Procurement based on Life Cycle Costing and innovative financing instruments.
- Provide incentives and promote research in market driven technology development through Horizon 2020 and increased SME participation.
- Treat the circular economy in a global perspective (raw materials and recycled materials are in a global market).
- Pursue international technical standards coordination between markets, thereby facilitating trade.
- Place more emphasis on the consumption phase: gather reliable information and data regarding the impact of consumers and on consumers, their expectations, behaviour and willingness to change; carry out an analysis to identify areas of true potential and possible ways to improve use patterns and enhancement of innovative consumer behaviour.
- Bring innovation and technology advances to the market through boosting resource efficiency technologies in the implementation of the Industrial Emissions Directive. BREFs can be an alternative to Ecodesign rules where the product group in question cannot be integrated into the ecodesign approach due to system restrictions, such as industrial ovens. The method to formulate BREFs and BREF conclusions requires improvement and has to be more transparent, especially in terms of consensus building and balanced stakeholder involvement. Boosting resource efficiency means also to develop a more concerted waste treatment and recycling technology BREF.
- Assess the need for any resource efficiency targets in an integrated manner during the review of the EU 2020 Strategy: launch an inclusive, transparent analysis of the policy impacts of any such targets, their cumulative impact and interaction with other policy objectives, as well as their impacts on EU industry and its competitiveness (including on the EU's 20% manufacturing target), before endeavouring to set numerical targets.

IN CONCLUSION

We call upon regulators to design a Circular Economy Package 2.0 that supports our industry's efforts and in particular:

- Strives for a common knowledge base of the matter at both, EU and international level.
- Focuses on improving access to reliable, competitive raw materials for Europe's engineering industries on EU and international markets.
- Creates a framework to make existing resource efficient products and technologies taken up by the market to become effective on the ground.
- Creates real commitment for strong enforcement of the EU's waste legislation to avoid leakage of valuable waste fractions outside Europe and to strengthen the EU's secondary raw materials market.
- Provides coherent, integrated policy objectives, boundary limits and sufficient flexibility for manufactures to implement them.
- Taps the resource efficiency potentials, including on energy efficiency, through smart manufacturing and Digital Agenda.
- Implements "Energy Efficiency First".
- And preserves the high level of protection of human health and the environment of EU chemicals legislation, notably the REACH Regulation and RoHS Directive.

For further background information regarding Orgalime´s view on Circular Economy, we refer to our earlier Position Papers:

- Orgalime Position Paper on "Policy Recommendations on the Circular Economy Package" – 27 October 2014
- Orgalime Position Paper on "Resource Efficiency Indicators" – 6 May 2014
- Orgalime Position Paper on "Circular Economy & Waste Policy" – 6 May 2014
- Orgalime Position Paper on "Resource Efficiency: An economic necessity while societal challenge" – 16 January 2012

In annex, we outline the main barriers of Circular Economy and our suggestions for solutions, and we provide a list of examples of our industry´s resource efficiency and circular economy activities.

ANNEX 1: BARRIERS OF CIRCULAR ECONOMY AND SUGGESTED SOLUTIONS OVER THE DIFFERENT LIFE CYCLE STAGES

The Design Phase of Product

The main barriers:	Orgalime´s suggestions for solutions:
○ Questionable environmental benefits of product requirements as long as waste appliances are still landfilled ○ Questionable environmental benefits of product requirements as long as waste appliances are still illegally shipped outside Europe ○ Questionable environmental benefits of product requirements, since material recovery in a broader sense is more dependent on the productivity of the recycling activity as a whole rather than on parameters that producers of products can influence by design ○ The overriding environmental impact phase of products in scope of the Ecodesign Directive is the use phase (accounting on average for +/- 80% of all impacts), not the waste phase ○ The time delay between the moment of design of the product and its actual end of life treatment: the recycling technology to be in place many years after is mostly not known at the time of product design ○ Economic viability: Repair is often more costly than buying new, the separation of certain parts/materials of products is often more costly than producing new ○ Lacking consumer demand - unclear consumer expectations and motivations ○ Increasing consumer trend to exchange appliances despite still fully working ○ Consumer behaviour (initial product price remains still the main buying decision; maintenance during use influences life time and performance; consumer does not always return waste appliance to take back schemes) ○ Lack of quality of recycled materials while product liability for default or accident stays with the product manufacturer ○ Non-traceability of secondary raw materials while product liability for default or accident stays with the product manufacturer ○ Impossibility to verify the recycled content in a material with currently established methods – risk of free riding, unfair competition and market distortion ○ Non-availability of sufficient quantities of high quality secondary raw materials ○ Consumer Safety Legislation that must not be circumvented ○ No access to end of life/recycling data (which would for example be necessary for the calculation of recyclability rates) ○ Costs of product design would be with producers, while economic benefits would be for recyclers or other third parties, such as (illegal) waste traders, commercial agents or independent repair centres	Not all of the identified barriers seem removable to us today, however, the following actions could in our view stimulate more circularity at the design phase: ○ Give priority to enacting and enforcing a strict landfill and waste shipment policy. ○ Set and enforce minimum quality criteria for secondary raw materials to secure high level of protection of workers and consumers. ○ For WEEE: monitor and develop detailed statistics, data and reporting of all WEEE flows and actors; move towards the new WEEE Collection Rate on “WEEE generated” to capture all flows; monitor and report on municipal self-marketing of WEEE; ensure that all WEEE flows are recycled following high level standards to prevent loss of valuable resources; mirror the new market realities in the review of Extended “Producer” Responsibility. ○ Exploit the opportunities that the increased use of ICT in manufacturing (”Internet of Things”) will bring throughout the different market segments, including in the waste treatment sector. ○ Support industry led initiatives. ○ Target product groups for which the overriding environmental impact from a life cycle perspective occurs in the waste phase. ○ Make sure that product requirements on the waste phase will have no negative impact in other life cycle stages or on product safety, functionality or affordability. Any action on end-of-life aspects must not shift environmental problems to other life cycle phases, such as the use phase. ○ A case by case approach, differentiating between the different targeted products. ○ Measurable and enforceable requirements. ○ Life cycle balancing and cost efficiency: all criteria of article 15 of the Ecodesign Directive need to be fulfilled for any ecodesign requirement ○ Development of product groups specific standards taking into account generic ecodesign requirements according to annex I of the Ecodesign Directive. ○ Promote R&D: Develop “innovation Partnerships” for meeting resource efficiency goals; develop Joint Technology Initiatives or other forms of PPPs, as well as Joint Programming Initiatives that pool national research efforts in areas of resource efficiency; focusing EU research funding (EU Horizon 2020) on key resource efficiency objectives, supporting innovative solutions for sustainable energy, transport and construction, recycling, reuse, substitution of environmentally impacting or rare materials; launch a “Resource Efficiency Finance Round Table”.

○ WEEE leakage from official producer run schemes: New entrants and actors handling WEEE due to its economic value but who do not fall under the producer responsibility principle or the obligations of the WEEE directive (the assumptions and underlying concepts of the WEEE Directive that design for recycling would pay off for producers are overruled by these market developments) – as a result, the majority of WEEE (especially high value scrap) is handled outside the producer driven waste management schemes by such other actors than producers ○ Lack of enforcement of existing ecodesign requirements ○ Lack of measurability and enforceability of end of life product requirements ○ Lack of harmonised standards and methodologies ○ Risk of upsetting energy efficiency investments; the drawbacks of circular economy action on other environmental requirements, such as energy efficiency or substitution of hazardous substances ○ Repair, refurbishment and reuse could jeopardise consumer safety or worsen energy poverty ○ The understanding that the use of materials in the design of a product is a waste of materials, while it can actually save resources (for example, the more copper, the more energy efficient motors are) ○ Possible negative impacts on cost efficiency and affordability of products for consumers ○ Standardised mass production of products is overruled by digitalisation and the trend of increasing product customisation	For ethical, environmental and economic reasons, compliance of secondary raw materials with REACH and EU safety legislation should not be compromised for Circular Economy objectives. More collaborative and cooperative approaches that are necessary in a Circular Economy need to be in line with EU competition rules. Confidential business data and Intellectual Property Rights must not be sacrificed.

The Production Phase of Products

The main barriers:	Orgalime´s suggestions for solutions:
○ The overriding environmental impact phase of products in scope of the Ecodesign Directive is the use phase, not the waste phase ○ Lack of enforcement of existing EU waste policy acquis ○ Lack of tapping energy efficiency systems savings potentials ○ The use of secondary raw materials in manufacturing is depending on a variety of production aspects ○ General remark: The understanding of the Commission stakeholder questionnaire is that manufacturers produce waste. However, manufacturers produce products that have environmental impacts over the different life cycle phases, such as the production phase. Continuing this erroneous understanding would mean that the new package would remain stuck in the conceptual error of the first package, namely isolating waste phase related product aspects from a life cycle perspective.	○ Exploit the opportunities that the increased use of ICT in manufacturing (”Internet of Things”) will bring throughout the different market segments. ○ Enact and enforce strict landfill and waste shipment policies, realistically increased recycling and recovery targets, strict enforcement of waste policies or the setting of minimum quality criteria for secondary raw materials to ensure that substance policy objectives are not circumvented. ○ Bring EU waste treatment standards, such as WEEE, to the international level (ISO/IEC). ○ Implement the “Energy Efficiency First” principle and exploit system savings potentials throughout all market segments during the reviews of the Energy Efficiency and Energy Performance of Buildings Directives. ○ Improve the use of industrial energy waste for heating and cooling.

This risks environmental burden shifting from the waste phase to other life cycle phases.	○ Cooperation must be fostered, not only along the supply chain but among different sectors, borders and applications. ○ Bring innovation and technology advances to the market through boosting resource efficiency technologies in the implementation of the Industrial Emissions Directive. BREFs can be an alternative to Ecodesign rules where the product group in question cannot be integrated into the ecodesign approach due to system restrictions, such as industrial ovens. The method to formulate BREFs and BREF conclusions requires improvement and has to be more transparent, especially in terms of consensus building and balanced stakeholder involvement. Boosting resource efficiency means also to develop a more concerted waste treatment and recycling technology BREF. ○ Encourage further industrial symbiosis.

The Use/Consumption Phase of Products

The main barriers:	Orgalime´s suggestions for solutions:
○ Initial product price remains the consumers´ main buying decision ○ Lack of maintenance, improper maintenance or use of products by consumers negatively impact product performances, including product lifetimes ○ Consumer use leads to degradation and loss of quality of materials ○ Consumer does not well separate waste at the end of life stage ○ Consumer does not return waste appliances (but stores them, throws them into household waste or other) ○ Innovative business models (performance based contracting) are not very popular to the general public today. ○ In general: the consumption phase should be looked at as strongly as the design, production and waste phases.	○ Carry out an analysis to identify areas of potential for improvement. ○ Enhance innovative consumer behaviour. ○ Gather information and motivation about how to improve use patterns and what impacts consumers can have. ○ Base Public Procurement on the principle of Life Cycle Costing. ○ Exploit energy systems savings potentials through the Energy Efficiency and Energy Performance of Buildings Directives. ○ Apply the “repair as produced principle” of the RoHS Directive also under REACH to ensure the availability of spare parts and the longest possible use phase of repairable products.

The Waste Phase (including the post-consumer waste and development of a market for secondary raw materials)

The main barriers:	Orgalime´s suggestions for solutions:
○ Landfill of products ○ Illegal waste shipments ○ Lack of enforcement of EU waste policy acquis ○ Non-harmonised implementation of certain legal frameworks or the lack of harmonisation in Europe, such as the definition of end of waste criteria, the different interpretation of “hazardous waste” with regard to waste transport and shipments	○ Enact and enforce a strict landfill and waste shipment policy, realistically increased recycling and recovery targets and minimum quality criteria for secondary raw materials. ○ Ensure REACH compliance of secondary raw materials.

○ Legal obstacles, such as the difficult interlinkages between EU Chemicals Policy (REACH, RoHS) and Circular Economy, or the conflict between strict criteria for shipments of used EEE (items can only be shipped during the legal warranty period, or need to demonstrate that they are still fully functional) and Circular Economy objectives ○ International trade of remanufactured products and limited access to spare parts for remanufacturing outside the EU remain a barrier ○ New entrants and actors handling WEEE due to its economic value but who do not fall under the producer responsibility principle (the assumptions and underlying concepts of the WEEE Directive are overruled by new market developments) – as a result, the majority of WEEE (especially high value scrap) is running outside the producer driven waste management schemes	○ For WEEE: monitor and develop detailed statistics, data and reporting of all WEEE flows and actors; move towards the new WEEE Collection Rate on "WEEE generated" to capture all flows; monitor and report on municipal self-marketing of WEEE; ensure that all WEEE flows are recycled following high level standards to prevent loss of valuable resources; mirror the new market realities in the review of Extended "Producer" Responsibility. ○ Bring innovation and technology advances to the market through boosting resource efficiency technologies in the implementation of the Industrial Emissions Directive. BREFs can be an alternative to Ecodesign rules where the product group in question cannot be integrated into the ecodesign approach due to system restrictions, such as industrial ovens. The method to formulate BREFs and BREF conclusions requires improvement and has to be more transparent, especially in terms of consensus building and balanced stakeholder involvement. Boosting resource efficiency means also to develop a more concerted waste treatment and recycling technology BREF.
<u>Concerning development of a market for secondary raw materials:</u> ○ Leakage of available waste/material due to continued landfilling, illegal waste shipments, improper enforcement of existing EU waste policy acquis or new waste market realities that are not reflected in the (extended) producer responsibility principle/schemes ○ No standardised recycled materials on the market for sophisticated technical applications, which can be used over a prolonged period while maintaining the same high quality and product functionality ○ Lack of quality of secondary raw materials while product manufacturers remain liable for any product default or accident ○ Non-traceability of secondary raw materials while product manufacturers remain liable in case of product default or accident ○ Lack of minimum quality standards ○ Costs of secondary raw materials ○ For historic reasons (pre-REACH phase) and depending on the recycling technology used, undesired substances (that may be even be restricted by law for certain applications, such as EEE) will continue to be present in secondary raw materials for a very long time ○ Safety aspects that must not be circumvented ○ Impossibility to verify the recycled content in a material with currently established methods – risk of free riding, unfair competition and market distortion ○ Type approval requirements for certain applications ○ Lack of reliable end of life/recycling data ○ Innovation and investments are difficult if there is no market	○ Market take up of secondary raw materials will happen where they answer our industry´s technological needs: Minimum quality criteria for secondary raw materials should be developed and secondary raw materials need to be REACH compliant. ○ In general, artificially created markets never work as well as those that develop from the market itself: Reinforcing the secondary raw materials market is a good idea, too; however, market forces should be the drivers of innovation in recycling technologies rather than product recyclability/recoverability/ durability standards. ○ Enact and enforce a strict landfill and waste shipment policy – stop illegal waste shipments, and realistically increased recycling and recovery targets. ○ Bring innovation and technology advances to the waste sector through boosting resource efficiency technologies in the implementation of the Industrial Emissions Directive. Boosting resource efficiency means also to develop a more concerted waste treatment and recycling technology BREF. ○ Bring innovation through new resource efficiency technologies to the waste treatment sector, including through the Industrial Emissions Directive and waste treatment standards at EU and international level. ○ For any new substance restrictions in EEE: develop and apply one common substance evaluation for REACH and RoHS implementation based, inter alia, on risk, the availability of reliable substitutes and technical feasibility of substitution. Restricting an undesired substance in one sector "only" will be of limited effectiveness for Circular Economy objectives as the same substance will continue to enter material cycles via other applications, improper waste treatment processes and due to pre-REACH realities.

	Also, realistic compliance deadlines are a prerequisite that industry can successfully handle substance restrictions. We also have doubts that incinerating substances of very high concern for energy recovery could realise non-toxic material cycles. Due to the imminent lack of enforcement of EU product and waste legislation, intense global trading realities, even with more circularity, these substances can be expected to re-enter European material cycles. ○ To improve legislative consistency in our sector, the implementation process to the Eco Design Directive can assess the use of hazardous substances during use, manufacturing and end-of-life treatment for a particular product group, as it has been done under the ongoing implementation. In case the preparatory study demonstrates that the use of a specific substance in a given product category fulfils all criteria of the Eco Design Directive for setting requirements, the relevant substance restriction should be adopted under the REACH Regulation or, where relevant, under the Recast RoHS Directive in full coherence with the REACH Regulation, and under above cited conditions (one common evaluation method based, among other, on risk, availability and reliability of a substitute, technical feasibility, sufficiently long compliance deadlines).

ANNEX 2: LIST OF EXAMPLES OF RESOURCE EFFICIENCY AND CIRCULAR ECONOMY ACTIVITIES IN THE SECTORS REPRESENTED BY ORGALIME

The sustainable use of resources, including circularity, in the engineering sector has many different faces. There is no “one size fits all” approach due to the variety of challenges and technological needs that require flexibility and different answers. Some of the sectors activities, to name a few, include the following:

- Continuous investment into Research and Innovation
- Miniaturisation and dematerialisation
- Material efficiency improvements
- Preparing products for reuse
- Reuse and repair of products in accredited centres
- Refurbishment of products in accredited centres
- Remanufacturing of products in accredited centres
- Improvements of energy consumption of products in the use phase (including implementation of the Ecodesign Directive)
- Energy Labelling of products
- Waste Management: The sector built up take back systems for waste electrical and electronic equipment in record time
- Implementation of the substance restrictions under the REACH Regulation and sector specific RoHS Directive (four new substance restrictions have just been added in June 2015 and will enter into force in June 2019/2021 depending on the product category), and voluntary substance phase outs where reliable substitutes exist for a specific application
- Improved water efficiency of products and voluntary labelling schemes

Concrete examples include the following:

Example: Remanufacturing: Caterpillar returns an end-of-life, broken or blemished products or components to "same as new" working condition or better, with the same warranty. The company remanufactures more than 6500 different products, including engines and engine components, hydraulic components, transmissions, final drives, and steering clutch and brake groups among others. The processes include inspection of the component of its salvage-ability and then refund of the "core deposit", which establishes a strong consumer incentive to return cores (exchange system – or reverse logistics); complete disassembly of the core; remanufacturing to exact specifications; inclusion of all appropriate engineering updates; and making ready for sale with the same warranty as a new one. Comparing a remanufactured cylinder head with a new one, this translates into an 86% safety advantage, 61% less greenhouse gas, 93% less water used, 86% less energy used, 99% less landfill space, and 99% less material used. Please see: http://www.caterpillar.com/en/company/sustainability/remanufacturing.html

Example: Clean power for sustainable manufacturing: In 2012, Philipps unveiled a 2-megawatt wind turbine in Fall River, Massachusetts, to meet around 70% of the power requirements for its Lightolier manufacturing plant, which makes lighting products for the retail and hospitality sectors. The renewable energy project is part of Lightolier's plan to create a net-zero manufacturing facility. Its other recent sustainability initiatives have reduced electricity use by 40%, water by 78%, natural gas by 36% and volatile organic emissions by 98%. Please see: http://www.philips.com/shared/assets/global/sustainability/downloads/Philips-approach-to-sustainability-brochure.pdf

Example: **Refurbishing medical products to close the materials loop**: As healthcare budgets come under increasing pressure, care facilities are seeking ways to extend their resources without compromising on quality. The driving goal behind the Philips Diamond Select program is to make first-rate medical equipment available at a lower cost by offering high quality refurbished, upgraded and tested systems with full warranty. We are investigating how we can create an even greater residual value for Philips medical equipment and its customers, so it's easier to maintain, upgrade, refurbish or remanufacture products.
Please see: http://www.philips.com/shared/assets/global/sustainability/downloads/Philips-approach-to-sustainability-brochure.pdf

Example: Remanufacturing: To Bosch as the automotive supplier remanufacturing is an important strategic approach to secure a long-term after-market supply. Where economically viable, Bosch has also introduced reverse logistic systems. Bosch annually takes back 2.7mio used parts, equivalent to 11,000 t, worldwide as secondary raw material for remanufactured products. Please see:
http://www.bosch-presse.de/presseforum/details.htm?txtID=5868&locale=en

Example: Environmental innovation through robotics:
ZenRobotics Recycler (ZRR) is a robotic waste sorting system designed for construction and demolition waste, sorting metal, wood and stone fractions. The ZRR system autonomously reclaims valuable raw materials for recycling purposes from a continuous stream of waste. http://zenrobotics.com/

Example: Reduction of input material ("doing more with less")
Required storage place for 8 MB of memory in the 1970s and today's technologies: The first super computer in 1976 had 8 MB of memory and a weight of 5.5 tons. Today's smart phones have exponentially improved memory capacity and reduced to pocket size. (Source: ASML, Netherlands)


1976


2011

Example: Resource savings through the use of sensors and data analytics: A Hungarian manufacturer did an internal analysis of its production facilities. He put sensors throughout the plant and found multiple savings, including in the heating and cooling systems: By connecting the compressor cooling system to the hot water production for showers of workers, which are simultaneously used, energy savings were realised that translated into some 100.000 Euro annual cost savings.

Example: **Resource savings through the use of sensors and data analytics:** A major automobile manufacturer analysed in detail for what they use energy (which represents a relatively minor part of costs). 4% is used for compressed air and vacuum. The company managed to save 37% of these costs in one plant. Now it is going to apply the solution to the group to realise energy savings.

Example: Resource savings through the use of sensors and data analytics: A wheel manufacture: the air tightness of wheel rims are tested under helium, which used to be wasted. Now it is recovered by around 98% through vacuum pumps, thus resource savings.

Example: Preventive maintenance due to increased use of ICT in manufacturing: The Austrian skiing resort Mayrhofen has equipped its snow groomers with sensors. In combination with GPS and a detailed, electronic map, this system measures the exact height of the snow coverage when operational on the slopes during the night. This system is interconnected with the operation system of the snow generators. The precise data transmitted allows the skiing resort to produce less additional snow, however, under ideal metrological conditions and precisely at the places where needed. Besides saving on capital through less equipment and a better maintenance schedule, the skiing resort managed to save per season up to 25% of the water and electricity previously used for snow production.

Example: Preventive maintenance due to increased use of ICT in manufacturing: A Danish producer of wind turbines increases efficiencies of 25000 wind turbines through predictive maintenance: each of the turbines is equipped with sensors. Every day, the 25000 turbines installed send their performance and diagnostic data, which allows the producer to precisely plan maintenance and inspection. These may then be carried out during times of lower demand, be planned according to weather conditions. Wind turbines down-times are reduced considerably. The lifetime of parts is increased, the need for spare parts reduced, less waste is generated. It allows for more efficient generation of green energy.

Example: Less fertiliser use due to increased use of ICT in manufacturing: Precision farming is increasingly used to ensure optimal growth and quality of crops. Instead of a plain, uniform application of fertilisers, which does not reflect the natural variation of nutrients that are already in the soil, a more advanced method is used: A real-time nitrogen-sensor, installed at the front of the tractor, measures automatically the exact amount of nitrogen in the leaves, be it day or night. Its computer then tells the fertiliser spreader (or sprayer, for liquid fertiliser) at the back of the tractor to deliver the optimal measure. Poorly grown areas of crop that require more fertilisation will obtain higher rates of fertiliser, while less fertiliser will be supplied to already well-growing areas of crop. Fertiliser savings of up to 14% and an average productivity increase of up to 6% result in direct benefit to the farmer while preserving the environment.

Example: Combined lightening and radiobase stations: Today there are 100 times more lampposts in the world than there are telecom sites. Street light poles are everywhere in cities; public lighting may account for up to 50 percent of a city's electricity bill. Outdoor lighting is 20-30 percent of this. There is also a technology shift taking place in the industry, with some 500 million outdoor luminaires that are more than 20 years old and need updating. The Zero Site offers city officials an innovative way to integrate LED lights in the same pole to provide power savings (opex) of 50-80 percent in the city. Please see: http://www.ericsson.com/ourportfolio/products/zero-site

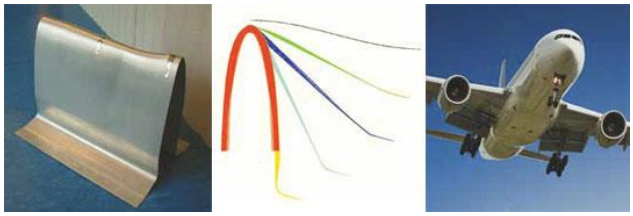
Example: Recycling – strengthening the secondary raw materials market
Today's WEEE recycling technology allows for the recovery of up to 95% of the base materials.

Example: Substitution of rear earth materials added with energy efficiency:
ABB's new SynRM² motor technology will deliver IE5 efficiency **without rare earth magnets**
http://www.abb.com/cawp/seitp202/ad26393b09a61275c1257caf00217a16.aspx

Example: Substitution of critical raw materials
Researchers have developed nanostructure aluminium which can substitute copper in many future applications. It reduces weight, material input and increases efficiency.
http://www.siemens.com/innovation/apps/pof_microsite/_pof-spring-2010/_html_de/forschungsinstitute-in-russland.html)

Example: Savings in energy and natural resources
Improved baggage handling conveyors are 100% PVC free (replaced by recyclable polyester), use 100 kg less natural resources than conventional systems , lead to e**nergy savings of up to 80%** and r**educe maintenance cost and time.**
http://www.vanderlande.com/News-Events/News/Savings-in-energy-and-natural-resources-with-new-BLUEVEYOR-baggage-handling-conveyor-from-Vanderlande-Industries.htm)

Example: Research & innovation
Project on “Improving stretch forming of complex shapes”: Through this research, the number of forming steps could be reduced from 9 to 6, the manufacturing time was reduced by 50% and scrap went down from 50% to 10% (Source: www.m2i.nl)



Example: Wood drying is the most energy intensive procedure of the treatment of wood. With new dry kiln technologies and an intelligent process management, 40 % of the electrical and more than 10 % of the thermal energy can be saved. The payback period of this technology comes to only 15 months.

Example: Savings in energy and natural resources through the **application of the energy label** of washing machines including water efficiency**.** http://www.newenergylabel.com/de/labelcontent/washers

Example: **Reducing energy consumption**: A global switch to LED lighting would reduce energy consumption by 40%, save €128bn and cut 670m tonnes of CO2 emissions. This is equal to the annual output of 640 medium-sized power stations!
http://www.philips.com/shared/assets/global/sustainability/downloads/Philips-approach-to-sustainability-brochure.pdf

Example: Using intelligent automation engineering, such as better metering or a better management of processes, realises **significant energy savings.** (Source: ZVEI brochure: “High tech environmental and climate protection: Automation putting energy efficiency first” and ZVEI brochure “The versatile contribution of process automation to improving energy efficiency”).
Example: Avoiding Waste: Miele actively pursues a policy of avoiding and separating waste at the source, from the administrative offices to the sorting plants adjacent to production. The total amount of waste has thus dropped by 1.7 per cent from 29,100 metric tons in the financial year 2010/2011 to 28,600 tons in 2011/2012. Of this waste, 87.8 per cent was sent for recycling and processing and only 2.5 per cent became landfill. In the financial year 2011/2012, the amount of hazardous waste produced was reduced by 147 metric tons on the previous year to 2,344 tons. The amount of waste from production per ton of product dropped from 144 kg/ton in 2010/2011 to 142.8 kg/ton in 2011/2012. (> For more details, see the section "Waste" in "Facts & Figures"). http://www.miele-sustainability.com/international/en/sustainability-2013/4713.htm

Example: Higher performances through big data: The welding equipment and solution of a Finish manufacturer comprehensively monitors the welding process automatically, recording all necessary parameters of the welding procedure. A real time process and quality control makes the welding process safer by identifying faults at an early stage. The same data allows clients, for example construction companies, to plan buildings more precisely and have an overview of the manufacturing process of individual components along the entire value chain. For them, the need for quality audits is reduced and management of construction sites facilitated. The documentation required, for example by classification bodies in shipbuilding or offshore platforms can be provided automatically by the system. The company has made a successful transformation from a pure manufacturing company to a solution and service provider within ten years.

Example: Ecodesign Directive 2009/125/EC– energy efficiency improvements in the use phase are to realise 9% of the EU 20% energy efficiency target. More than 40 different product groups of Orgalime’s industries are enabling these energy savings.

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