PRODUCTION
A CHALMERS AREA OF ADVANCE

CASE COLLECTION

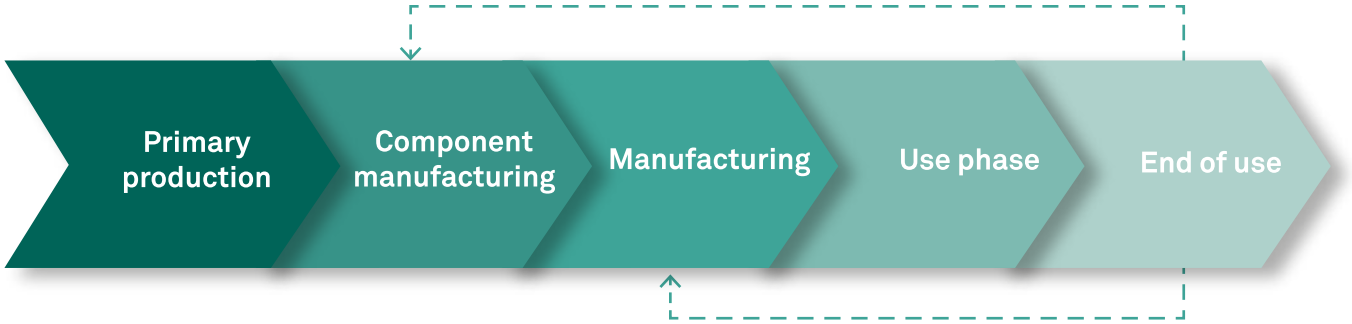
for sustainable production

Making sustainability work for production development

Many companies are struggling with making environmental and life cycle issues part of their mainstream business processes. A cradle-to-gate perspective is more and more often used for environmental assessment of products – but seldom for production systems. Energy use, use of raw materials and local emissions can give hints to improve the environmental performance of manufacturing operations.

Many companies have understood their opportunities to contribute to sustainable development. They are committed to make their business more sustainable. Evidence for this is for example ambitious sustainability goals in strategy documents. However, the question how to implement sustainability considerations in mainstream business processes still presents a challenge. That applies also for the development of production processes, which is what this example is about, and also when environmental aspects of sustainability are focused.

A life cycle perspective where products are regarded from cradle-to-grave or from primary production to end of use has become a cornerstone in the sustainability work in many companies. The main application field is sustainable product development that considers also recycling and re-usability.



But also a company's actual production processes can be regarded in the systemic cradle-to-grave perspective. This should be done to avoid problem shifting and sub-optimisation. In order to minimise the lifecycle environmental impact of manufacturing operations, a few key factors need to be minimised: material use, energy demand and emissions with an effect on the local environment.

Information is there, use it!

Much, but not all, of the information that is needed to make a lifecycle consideration in production development is already being collected and handled by companies. Emissions to the local environment is an important part of the permit to operate, and are thus measured. Energy demand is being measured on an aggregated level, if for no other reason because energy bills have to be paid. However, the data are then not really useful for production development purposes. Use of raw material is also being measured, as raw materials are something being paid for, and reduction of scrapped material is an important part of the quality work.

However, the implications for the life cycle environmental performance of the production process are seldom recognised. Energy and material use are considered important for cost and quality reasons, but not seen as part of what shapes the environmental performance of the operation. Only the local emissions are regarded as environmental aspects. Hence "environment" is perceived as a local concern to be dealt with in permit processes.

We suggest that companies, in their production development processes, see all three factors energy use, use of raw materials and local emissions as elements shaping the environmental performance of manufacturing operations. Energy and material are thereby given weight in decision processes both as environmental aspects and as cost aspects.

We also see that a shift to a systems perspective is perceived as complicated, time-consuming and expensive. This need not be the case, since most of the information needed is already available. However, the environmental implications of energy and material use need to be understood and acted upon. As a support to industry we have developed a structured register of indicators for environmental implications in production development. This enables pro-active consideration of environmental improvements and opportunities.

Substantial resource saving potential

If sustainability aspects in a mainstream business process, such as production development, are implemented on a broad scale, the results could potentially lead to substantial reduction in resource demand. For instance, let

us assume that resource use can be reduced by an average of 5 % for each development project. What would that mean for resource demand for Swedish industry?

According to the statistics provided by SCB, the combustion of fuels in manufacturing industry (including automotive, machinery and equipment, electrical equipment but excluding basic process industry) amounted to 15,000 TJ in 2010. Possible reduction due to production development would then correspond to 750 TJ. The share of non-renewable fuels was reportedly 50 %, which gives a potential 375 TJ from non-renewable sources that can be cut. Additionally 22,000 TJ electricity use is reported for the same sectors, which indicates a reduction potential of 1 100 TJ. In the Swedish electricity mix, the share of fossil fuels and nuclear is about 45 % meaning that about 10,000 TJ come from non-renewable sources. This adds 500 TJ of potential reductions due to production development. The above is a rough estimation, based on publicly available data and the assumption that a widespread transfer of the approach is possible.

Wide industrial interest

This research is carried out together with the collaborative Swedish Life Cycle Center, a centre of excellence for the advance of applied life cycle thinking in industry and other parts of society. For our project, partners from industry provided cases and gave feedback on intermediate results. New insights are implemented in practice. A wide scale of industry sectors are prepared to implement the new mind-set.

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Responds to the active field of:
Sustainable Product Lifecycle Platforms

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For production and production development we suggest:

- Emphasise the win/win situation regarding cost reduction and reduced energy and material use in industrial decision processes on production development.
- Increase the level of detail with which energy use is being measured in manufacturing operations, in order to support energy reduction programmes.
- Create or complement existing roles within production development with dedicated responsibility for global environmental performance of the production process. Complementary training, new mandates and resources may be needed. The quality organisation can possibly be used as a template and starting point.