Steinbeis

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The Transfer Magazine

Networked Competence

Feature Topic: The Environment and Resource Efficiency

Insights from Steinbeis experts

The 2015 Steinbeis Day

A review of highlights

The 2015 Transfer Award

Award winners and their projects

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Editorial 03

Come on companies – show some commitment! 04
Entrepreneurship can be learned. But more established enterprises also have to be aware of their responsibilities.

Feature Topic: The Environment and Resource Efficiency 05
Insights from Steinbeis experts

Tracking Down Energy Loss 06
Resource efficiency within companies

Energy Efficiency in Transport and Logistics 07
Training on sustainable development is crucial

Small Investment – Major Impact 08
Resource efficiency drives in production

Innovative IT Systems: Support with Environmental Compliance Projects 10
Software called CCPro helps establish systematic and reliable processes

Today's Building, Tomorrow's City Block 12
Steinbeis experts support sustainable city development

"Energy makes the world go round!" 14
An interview with Heinz Pöhler, Director of the 4le Steinbeis Consulting Center

"It all comes down to the life cycle assessment." 16
An interview with Prof. Dr.-Ing. Matthias Stripf, director of the Steinbeis Transfer Center for Thermo-fluid Dynamics and Efficient Energy Conversion.

Energy Efficiency in Manufacturing 18
A significant building block in ensuring resource efficiency

"Resource efficiency is a growth market." 20
An interview with Dr. Bertram Lohmüller, director of the Steinbeis Innovation Center for Sustainable Resources and Energy Management

"Logistics plays a leading role in the digitalization of the value chain." 22
An interview with Dietmar Ausländer, director of the Steinbeis Transfer Center for Logistics and Factory Planning

"We're experiencing a transformation in the energy system." 24
An interview with Professor Gerd Heilscher, Director of the Steinbeis Transfer Center for Local Renewable Energy Systems

The 2015 Steinbeis Day 26
The Steinbeis Arena on Industry 4.0 – discussion forum – Steinbeis workshops – exhibition

The 2015 Steinbeis Evening 28
The Steinbeis Foundation Transfer Prize – employee honors – premiere of Early Birds

Testing Eagle Eyes 30
The Steinbeis Foundation Transfer Award 2015

Getting a Feel for Energy Efficiency 31
The Steinbeis Foundation Transfer Award 2015

Virtual Testing of Reality 32
The Steinbeis Foundation Transfer Award 2015

A Role Model for Demonstrating Values in Science, Transfer, and Society 33
The Steinbeis Foundation Transfer Award 2015

Management Quality as a Driver of Business Success 34
Steinbeis study points to data-driven HR as a value driver within companies

Welcome to the Steinbeis Network 35

Training Spotlight 36

Secure Immobilizers – Not to be Taken for Granted 39
Steinbeis experts work with partners to develop a method for protecting cargo bikes

No More Threats of Being Held Back! 40
Steinbeis experts develop digischule, an online school grade administration tool for students and teachers

Innovation Management at SMEs: Implementing New Concepts and Preparing Ideas for Markets 42
The Steinbeis-Europa-Zentrum provides support with the development of future strategies

Gerd Birkhold 43
Obituary

It's All About the Dosage 44
The Steinbeis Research Center for Simulation develops innovative, low-cost dosing system

Consulting Spotlight 46

News 47

New Releases from Steinbeis-Edition 50

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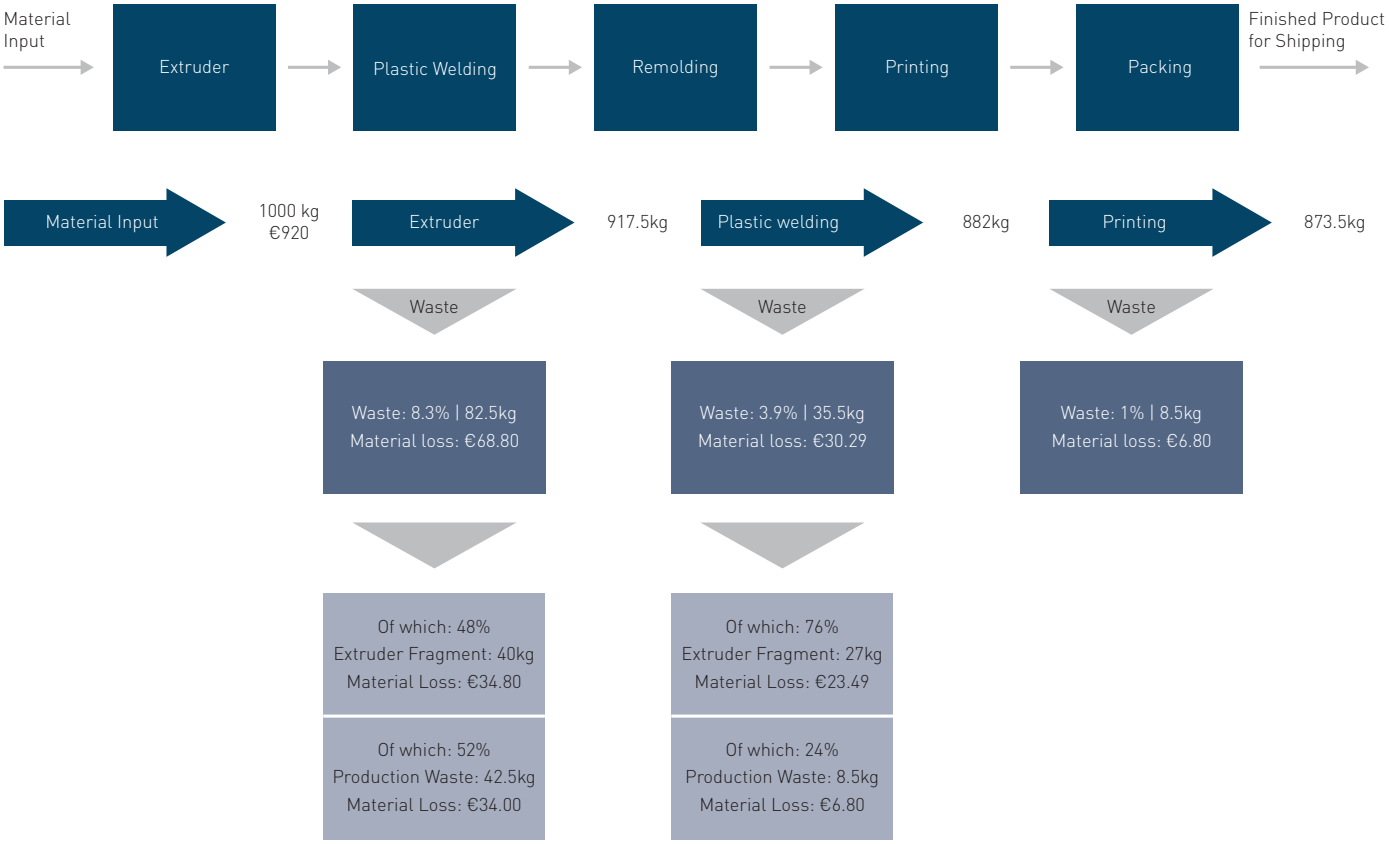

Small Investment – Major Impact

Resource efficiency improvements in production

Energy efficiency is an important issue, especially following the introduction of new energy services legislation in Germany. One thing that is often overlooked is the biggest cost driver in the processing industry: material expenditures. To make full use of any potential cost savings and raise competitiveness, companies have to look very carefully at all material flows. This raises the important question of how to organize resource efficiency projects strategically and in terms of operational implementation. The Steinbeis Transfer Center for Energy and Environmental Process Technology, Eco-Management is demonstrating the different options open to manufacturing companies when it comes to resource efficiency – showing that it really is worth subjecting the issue to closer scrutiny.

According to the German Federal Statistics Office, manufacturing companies invested 858 billion in materials in 2013. On average, this is around 47% of all company expenditures, making it the biggest cost factor. This includes outlays on energy, which is mainly sourced through non-renewable energy sources, particularly from fossil fuels, even if these only account for 5% of all material costs. A simple calculation reveals the possibilities: A company with sales of 50 million, 5% profit margins and material costs creating 40% of expenditures can raise its material efficiency by 5% and thus also raise profits from 2.5 to 3.5 million euros – or 70%.

As a rule, much greater savings are possible. The only question is how a company deals with such issues on a strategic level and in operational or implementation terms. The following approach has proven to be quite effective: The first key step is to conduct an analysis of potential, taking a snapshot of the current status and possible optimizations. This involves initial interviews in which objectives and expectations are captured, as well as the key criteria by which resource efficiency measures should be benchmarked. At this point, a company needs to establish clear lines of responsibility for a given project. It can then organize a workshop to start screening existing data and work out if there are any information gaps in order to define key processes. Information can be used to establish input and output flows, drawing diagrams if necessary and also modeling energy and material flows. The tool the firm adopts should be tailored to its needs in order to enable the company to categorize information by individual processes. In most cases, missing data can be derived from calculations and estimates. In fact, in many cases, it doesn't even make sense to take actual measurements. Once a basic data template is in place, a model can be used to calculate related cost drivers. Available data can be looked at together to check for plausibility.

It is during this phase of a project that discrepancies in the plausibility of the data are actually quite beneficial. This is because they motivate people involved in the project to invest time in explaining data variations. This often results in identifying inadequacies. Visualization tools can also be used to work out which parts of a process are most intensive in terms of energy and material use. They can also help identify potential improvements. With the right key performance indicators, which should be tailored specifically to the company, efficiency measures can be defined and priorities can be set. It is also best to go through different scenarios for each identified area of potential savings. All of the results are then pulled together, documented, and explained. The project finishes with a presentation of the energy and material flow model, the results of the analysis that was carried out, possible optimization measures, and implementation suggestions – at all times taking any commercial aspects into account as well as different ways to use the model to gain operational transparency.

This lays an excellent foundation for measures such as the introduction of an energy management system according to the ISO 50001, or even official audits. When a company is attempting to drive optimization, it makes sense to take baby steps over a longer period. This is allows people to implement the project properly and not become overwhelmed in the process. Some optimization processes result in genuine change, so it is also important to take different change management issues into account. As a rule, however, many measures can be introduced relatively inexpensively, so the time and effort of such a project is worth it, especially given the value it generates.

This was exemplified in the analysis of an SME carried out by the experts at the Steinbeis Transfer Center for Energy and Environmental Process Technology, Eco-Management. The firm that was analyzed makes plastic parts in a production process that covers a number of stages. The machines used by the SME were originally designed for large batches and much more extensive machine tooling processes. An analysis of potential helped identify the fact that the extruders and a number of downstream parts in the process could be significantly improved in terms of energy and material use. A typical production line was chosen to capture all inputs and outputs in detail and these were then mapped. It became possible to save materials worth EUR 371,000 per year on the plant, simply by introducing a variety of measures – without actually having to invest much, if anything at all. To leverage further potential to save money, it was recommended that the company use special cleaning fluids on the extruders. This simple measure would make a significant difference in terms of machine availability in production and improve revenues by a seven-figure number. The potential energy savings were estimated at up to EUR 80,000. To achieve this, it would only be necessary to make a small investment, with a breakeven point of well under one year.

By comparing the savings made with this example – in terms of energy and materials – it is clear that manufacturing companies should not focus unilaterally on energy efficiency. Improving material use offers much greater leverage and the extra time and money needed to capture not just energy flows but also material flows is actually only minimal. However, compared to energy savings projects, it is even more difficult to find the right experts with the necessary skills to provide third-party support. Even experienced specialists sometimes struggle with some of the highly specific issues, and may even have to first acquire the required know-how or turn to a network that they can trust, like the Network offered by Steinbeis.

Steinbeis Transfer Center for Energy and Environmental Process Technology, Eco-Management

Services
- Applied research and development
- Technical consulting
- Process analysis
- Optimization of production processes

Key Areas
- Technology consulting and process analysis:
  - Energy and material efficiency
  - Utilization of byproducts and waste products
  - Compliance with environmental regulations
- Research and development:
  - Production-integrated environmental protection
  - Registering and evaluation of environmental impacts
  - Ecological balances
  - Cost reduction potential in environmental protection
  - Reduction of resources in production
  - Efficiency improvements through process coupling

Image: Example of an extract from a production process with a corresponding Sankey diagram showing material flows and the cost of 1000 kilos of material input.

Prof. Peter Kleine-Möllhoff is director of the Steinbeis Transfer Center for Energy and Environmental Process Technology, Eco-Management, which is based at Reutlingen University. His Steinbeis Enterprise advises clients on the optimization of their production processes with respect to energy and material efficiency, the use of byproducts and waste, and complying with environmental regulations.

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