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#ResourceEfficiency #EREK



DIGITALISATION & RESOURCE EFFICIENCY

Digitally enabled resource efficiency

Industry 4.0 is a buzzword now. New digital technologies and artificial intelligence are changing what we do at home, work and on the move. They are increasingly important to innovation, optimisation, and in boosting competitiveness and growth. Perhaps a lesser-known benefit of Industry 4.0 is that it helps companies slash costs via more efficient use of materials, water and energy, reducing their waste streams and environmental footprint.

WHERE CAN INDUSTRY 4.0 OFFER BENEFITS?

Practically everywhere! With advances in technology and computing costs coming down, Industry 4.0 is now within reach of businesses large and small, and can be seen in manufacturing and service industries. **Green Alliance's mapping study** found opportunities for digital technologies to boost resource efficiency at different points along the value chain and in diverse sectors. The table below summarises some key opportunities.

Industry 4.0 is a name given to the current trend of automation, digital technologies, data monitoring, cloud computing, internet of things, and other computing-based solutions.

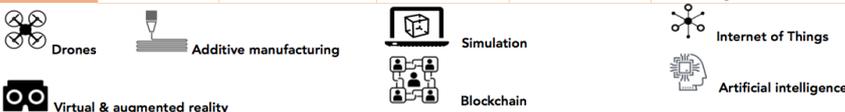
IS THE BENEFIT BEING EXPLOITED?

While the potential resource-saving benefits offered by digital technologies are manifest, not many SMEs are harnessing the benefits. **A survey of 600 companies of all sizes in Germany** revealed that only a fifth of the them are well digitised in relation to efficiency measures (e.g. process optimisation, use of new techniques). A further 20 % reported moderate digitalisation efforts, while more than a third showed no progress at all in this area. Of those engaged in Industry 4.0 practices like this, the majority are large companies. The survey suggests SMEs are either not well informed about the material-saving options through digitalisation, or holding back from applying these measures.

In this edition of EREK Quarterly we provide inspiration to SMEs (interview on page 2), practical examples from companies (page 3), information on support offered by government (page 4), and a host of other relevant tips and information (page 5).

Value chain and wider infrastructure

Sectors	Design	Production processes and supply chains	Products and services	Wider infrastructure	Key applications for improved resource efficiency
Food & drink					<ul style="list-style-type: none"> Optimised crop management Virtualisation of supply chains By-products forecasting and brokering
Construction					<ul style="list-style-type: none"> Digitally enabled design Additive manufacturing for energy intensive materials Improved maintenance, refurbishment and component reuse
Energy					<ul style="list-style-type: none"> Optimised renewable generation Industrial and domestic energy demand management Local energy markets and grid balancing
Mobility					<ul style="list-style-type: none"> Novel materials development Optimised vehicle design and production Predictive maintenance, remanufacturing and fleet management



Source : Green Alliance (2017)

Interview with an expert

IT'S INDUSTRY BUT NOT AS WE KNOW IT!

A new revolution is rivalling the steam- and electricity-powered behemoths of centuries past that made automated production possible and later paved the way for computing and robotics. But there is something tantalisingly different about Industry 4.0, the latest revolution, which is as much about saving resources as previous generations have been about productivity gains. A new study by Germany's VDI Centre for Resource Efficiency (VDI ZRE) explores what these developments mean for small and medium-sized manufacturers in Europe.

As technology becomes more affordable, the digitisation of processes – from stock control to production, packaging and shipping – are now within the means of even small manufacturers. This could be a game-changer as Europe's SME manufacturers start to catch on to the benefits that Industry 4.0 can deliver in terms of resource efficiency. EREK Quarterly caught up with **MARTIN VOGT**, VDI ZRE's managing director, to discuss their new publication, *Resource efficiency through industry 4.0 – potential for SMEs in the manufacturing industries*.

EREK: What is the study about?

MARTIN VOGT: The study analyses how SMEs involved in manufacturing industries could operate more competitively and save resources through the implementation of technologies associated with the digital transformation. Ten case studies are identified, highlighting different scenarios for application and solutions from operational practice. The study showcases how the implementation of selected technologies contributes to resource efficiency in companies, ranging from the manufacturing of electronics or plastics to the construction of machinery.

Can digitalisation actually help companies to realise savings in their business?

MV: According to the self-assessment of companies participating in the study, a reduction of up to 25 % of their energy and material consumption could be realised. The study highlights 11 digitisation measures associated with the reduction of natural resources. Besides measures resulting in lower energy and material consumption, others also focus, for example, on reducing defective parts which leads to a reduction of waste and necessary storage space.

Given Industry 4.0 developments, what do you recommend to SMEs that want to increase their resource efficiency performance and also reduce costs?

MV: The results of the study show that SMEs understand 'digitalisation' or the 'Industry 4.0' phenomenon differently. At the same time, resource efficiency is mostly seen as a side effect of digitisation. However, by implementing digital technologies strategically, companies can leverage remarkable material and energy efficiency potential gains. In fact, digitalisation should be understood as a comprehensive collection and optimisation of all energy and material flows along the life cycle of a product. On that basis, it almost always leads to an increase in resource efficiency. Digital tools should be systematically used to collect and process data in order to optimise the material and energy flows.

Where do you see challenges and barriers to increased resource efficiency through digitalisation?

MV: In Germany, the expansion of broadband networks can still be seen as a challenge. Also, data security and employee qualifications need to be discussed and promoted. Resource efficiency only stands a chance if it is understood as an integral part of a company's digitalisation strategy, ideally at an early stage. For that reason, support activities for SMEs are indispensable. The study concludes with recommendations for SMEs, policy-makers and scientists on how to develop and provide support to SMEs on resource efficiency through digital technologies.



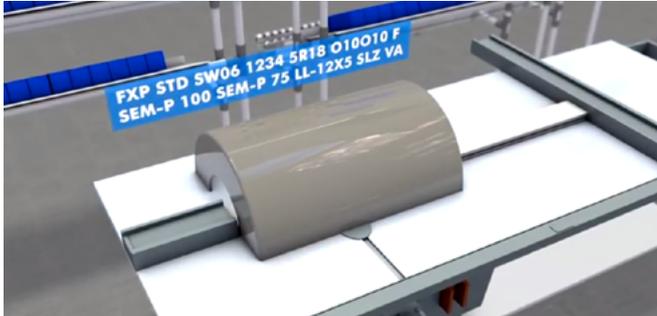
MARTIN VOGT holds a degree in Physics from Humboldt University Berlin and a PhD from University of Cambridge. From 2004 to 2006, he was a postdoctoral research fellow at Harvard University. From 2007 to 2012, he worked as a technology consultant at the VDI Technology Centre in Düsseldorf. Since then, he has also worked at the VDI Centre

for Resource Efficiency focusing on promoting resource-efficient technologies and processes in small and medium-sized businesses. The Centre is mainly financed by the National Climate Initiative of the German Federal Ministry for the Environment. Since October 2013, Mr Vogt has been the Managing Director of the Centre.

Digitalisation in practice

THE WONDERS OF DIGITALISED ONE-PIECE-FLOW MANUFACTURING

Image source: © VDI ZRE



SCHMALZ, a mid-sized manufacturing company located in southern Germany, services mechanical engineering sectors worldwide and has long abided by a simple rule of thumb: only use and produce material which has been deemed undeniably necessary. Digitalisation, as it turns out, has been paramount to achieving this ambitious goal. Take for example its vacuum gripper line which offers an outstanding illustration of the firm's 'just-in-time' production strategy. Clients tend to have very specific demands as to how they would like their gripper to be configured. The details of the gripper are entered into software when an order is placed, and it generates a unique digital production key containing all parameter values relevant to its production – construction class, valve technology, gripper length... etc. The key is then used by the machines at each stage of production. Only the necessary material – as defined by the product's digital key – will be cut out and assembled in a 'one-piece-flow' production process. This saves the company around 200 kg of aluminium and 2.6 tonnes of foam annually. The product is shipped off to the customer immediately, which helps to cut the storage costs, too.

> www.resourceefficient.eu/en/good-practice/wonders-digitalised-one-piece-flow-manufacturing

3D PRINTING FOR NEXT-GENERATION EYE-WEAR

Image source: © PhPfleger



A few years ago, the designer PATRICK HOET read about pioneering developments using 3D printing for false teeth. He immediately realised that the new technology offered huge

potential for eye-wear frame design. The first issue was to find a supplier capable of producing the frames designed by Hoet. It turned out a current supplier, Raytech in the Belgian city of Bruges, had vast experience in laser processes and would be prepared to invest in the digital technology – new 3D printing machines – for Hoet's pioneering eye-wear collection. Two months later, Hoet had market-ready glasses that passed all of the tests. This method of manufacturing shows great material savings: with 3D printing, you only produce what is needed. No stock and no need to modify processes, tools or moulds... offering unprecedented material efficiency. Production can also take place entirely within the one country, offering social and ecological advantages.

> www.resourceefficient.eu/en/good-practice/3d-printing-next-generation-eye-wear

TRACK AND TRACE PAVES WAY TO BETTER DRIVING AND FUEL SAVING



Image source: © Shutterstock

SCOTIA GAS NETWORKS (SGN), which operates across the south of England and all of Scotland, uses telematics to tackle inefficient practices. A 'track and trace' style telematics system had been installed in each commercial vehicle since 2008, but SGN wanted to add driver behaviour functionality. In 2014, it updated the telematics system to TomTom Telematics technology including a driver behaviour improvement system called OptiDrive 360. Drivers have access to a real-time feed of their driving activity and behaviour and receive weekly reports by text to their smart phones. The company firmly believes that by educating drivers and providing data support, the fleet will see a reduction in the cost of routine vehicle maintenance, particularly brake and tyre replacement, but also overall fuel use linked to inefficient driver behaviour such as rapid acceleration and braking between lights. During a 100-vehicle trial, SGN reduced the volume of fuel wasted through idling by almost 68 % and improved average fuel consumption by 11 %.

> www.resourceefficient.eu/en/good-practice/smarter-transport-logistics-driver-behaviour-improvement-system

Check out our EREK database for other good practices, measures and technologies that allow SMEs to cut resources and energy through digital solutions.

Want to digitalise but not sure where to start?

Below you can find some examples of European and national programmes offering support (funding, contacts, expertise, information) to SMEs interested in introducing digital technologies for better environmental performance. EREK network members can also advise customers/local companies looking for experts in digitalisation and relevant support measures.

MICRO-GRANTS FOR SMES FROM KET4CP



MICRO-GRANTS are offered to transnational cooperation projects between SMEs and a minimum of two KET Technology Centres (KET TCs), which aim to integrate 'key enabling technologies' to solve clean production challenges. Focus is on upgrading production processes. Integrating digital technologies for resource efficiency is a prominent area. Manufacturing SMEs that wish to integrate innovative digital solutions for clean production into their production process are invited to apply. Measures can address reduction of energy, materials and water consumption, waste generation and emissions, the use and re-use of recovered and recycled materials, biomass and/or other renewable inputs, process control technologies, and other related topics. The call for submissions is open throughout the year, and the evaluation of applications takes place every three months.

This programme is an SME financial support instrument managed under the **KET4CleanProduction initiative** of the European Commission.

> www.resourceefficient.eu/en/support-programme/micro-grants-smes-ket4cleaner-production

CLEANWEB PROGRAMME, FINLAND



CLEAN-TECH is shifting towards service provision as mobile technology provides opportunities for new business models. The clean-tech consumer market is growing and holistic solutions and services are being sought to meet customer

needs. The CleanWeb programme of Business Finland and Motiva helps clean-tech companies grow and improve financial performance through digitalisation and consumer-driven business models. It is a multi-faceted programme with a wide support portfolio including funding for pilot and demo projects, coaching, training, as well as matchmaking between customers, partners and networks.

> www.businessfinland.fi/en/for-finnish-customers/services/build-your-network/bioeconomy-and-cleantech/cleanweb/

DIGITAL TRANSFORMATION WITH THE EFFIZIENZ-AGENTUR NRW



EFFIZIENZ-AGENTUR NORTH-RHINE WESTFALIA (EFA NRW) is a leading German regional agency on resource efficiency that offers a range of services to companies with varying experience in Industry 4.0 resource efficiency practices,, helping with monitoring, maintenance and overall energy and materials management. EFA NRW applies tools such as the RKR (Resource Cost Accounting) and Eco-Cockpit. The latter is a CO2 and material reporting and accreditation tool. Using experts and tailored analysis of a company's resource efficiency, EFA NRW can help management implement a comprehensive digital strategy to improve resource savings.

> www.ressourceneffizienz.de/ressourceneffizienz/ressourceneffizienz-40.html

Further reading & resources

If you want to learn more about Industry 4.0 and the role it plays in better resource efficiency and shifting to circular production and operations, please check the following links and resources.

REPORTS, STUDIES:

- **NELIGAN A. (2017)**, 'Digital strategies for greater material efficiency in German industry', main results from a German company survey, Institut der deutschen Wirtschaft Köln, [see here](#)
- **GREEN ALLIANCE (2017)**, 'Made Smarter' Review: [see here](#)
- **VDE ZRE (2018)** 'Ressourceneffizienz durch Industrie 4.0 – Potenziale für KMU des verarbeitenden Gewerbes' / 'Resource efficiency through Industry 4.0 potential for SMEs in the manufacturing sector, Available (in German) at: [see here](#)
- **EFFIZIENZ-AGENTUR NORTH-RAIN WESTFALIA (2018)**, 'Ressourceneffizienz 4.0 – Digitalisierung als Werkzeug für mehr Ressourceneffizienz': [see here](#) (in German)
- **HENNING W, HOLGER B. (2017)**, 'The Digital Circular Economy: Can the Digital Transformation Pave the Way for Resource-Efficient Materials Cycles?': [see here](#)

ARTICLES, BLOGS:

- **EREK (2018)** 'Stay competitive, digitalise! What to consider in your digital strategy. Hint: Resource efficiency': [see here](#)
- **WORLD ECONOMY FORUM (2017)**, 'Understanding the impact of digitalisation on society': [see here](#)
- **GREEN ALLIANCE (2017)**, 'Let's use the digital revolution for resource efficiency to raise UK productivity'. by Angela Francis and Catherina Brandmayr: [see here](#)
- **WUPPERTAL INSTITUTE FOR CLIMATE, Environment and Energy (2017)**, 'The circular economy: Resource-efficient and digital' on ScienceDaily: [see here](#)
- **SIEMENS (2015)**, 'Greater productivity in industry thanks to digitalisation': [see here](#)
- **SPOTLIGHTMETAL (2018)**, 'How resource-efficient is metal 3D printing?': [see here](#)
- **ENVIRONMENTAL LEADER (2015)**, 'Is 3D Printing the Future of Sustainable Manufacturing?': [see here](#)

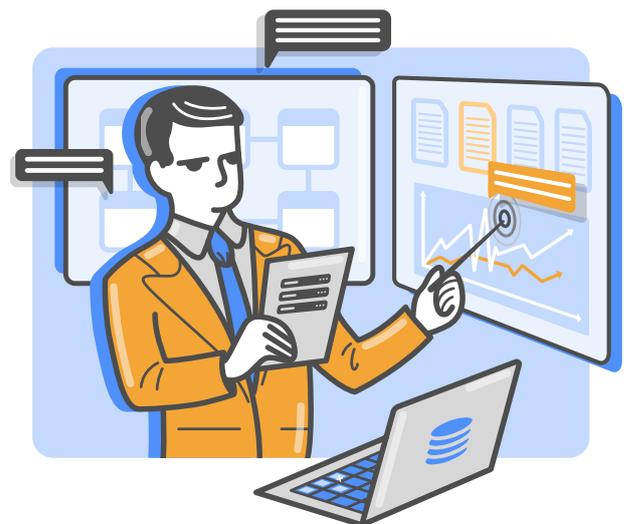
INTERVIEWS:

- 'Using resource efficiency 4.0 to strengthen the economy and the environment', interview with Dr Perte Jahns, Head of Effizienz-Agentur North-Rain Westfalia: [see here](#) (in German)
- 'Digitisation spurs on resource efficiency', interview with Professor Maurice Jutz, co-founder of Effizienzagentur Schweiz AG on Green Economy Dialogue: [see here](#)

VIDEOS:

- A series of videos on resource efficiency including on Industry 4.0 from VDI Centre for Resource Efficiency on Resource Germany TV: [see here](#)
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EREK - YOUR REFERENCE POINT ON BUSINESS COMPETITIVENESS THROUGH RESOURCE EFFICIENCY





The European Resource Efficiency Knowledge Centre (EREK) is here to help European companies, especially SMEs, save energy, material and water costs. We provide tools, information and business opportunities that show you new and better ways to be resource efficient and benefit from circular economy business models which turn waste into an asset.

EREK also supports national, regional and local organisations across Europe that work with SMEs to improve their environmental performance, helping them to become more resource efficient.

www.ResourceEfficient.eu



Test your business's resource efficiency performance

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