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CIRCULAR BUSINESS | **FOCUS ON A CIRCULAR SMART INDUSTRY IN GELDERLAND (NL)**

Smart and Circular Manufacturing Industry

Circular economy
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A survey in The Netherlands revealing the circular nature of the manufacturing industry

Smart industry in the province of Gelderland in circular perspective

The transition to a (more) circular economy can make an important contribution to reducing the environmental footprint and the use of raw materials in our economy. The province of Gelderland strives for a «smart and clean industry» without waste. The manufacturing industry, which is traditionally strongly anchored in Gelderland, is an important user of (critical) raw materials and therefore plays an important role in the transition to a more resource-efficient economy. Against this background, 20 companies in the province were interviewed, focusing on how these companies use circular perspectives in their daily practice. Particular attention was paid to the role that ICT increasingly plays in that primary process and to the way in which it influences «circularity».

Overall observations

The interviews showed that the smart manufacturing companies already act «circularly» in many ways. By their nature, OEMs and system suppliers design their products in such a way that repairability is high and thus uptime at their customers is as high as possible. Increasingly innovations in the field of IT indeed play a major role in this. The innovations and business models that were encountered during this survey contribute to a further reduction of the use of materials in 5 different ways:

1. Circular design of products to be able to offer better maintenance to customers (generic to all OEMs and system suppliers)

2. More efficient use of raw materials by production companies (more efficient production, 3D printing, use of production waste) (encountered with 10 companies)

3. Lifetime extension of components and products (through remanufacturing, maintenance contracts optimized by ICT sensors, upgrading) (14 companies)

The province of Gelderland has a historic focus on manufacturing industry. In total **1976** companies employ **22,882** people. Only **4% (84)** of these companies already employ **60%** of this workforce.
Most **(13)** companies interviewed supply concrete products or entire systems to customers, whereas **7** do not design themselves and are suppliers to OEMs.

4. Asset sharing: making more intensive use of production equipment by not purchasing machines yourself, but by sharing capacity (ICT enabling to reveal the availability of the asset at any time) (6 companies)

5. Keep control over goods by retaining ownership (and therefore also controlling the return flows) and only offering the services that the products deliver (ICT revealing the condition of the asset, thereby also facilitating pre-financing; includes product rental) (9 companies)

Illustrative examples

Sheet processor 24/7 TailorSteel have fully **automated order placement** ensuring that materials can be used much more intensively, for example through 'nesting' of customer orders. A conventional process leads to 30 % cutting loss, with 24 / 7TailorSteel that is 10 % less loss.

The **3D metal printer** at Kaak Terborg can produce up to 600 small components at a time. By being able to design differently now, the 3D printer delivers up to 50 % reduction in material use. And of course, also to a reduction of waste flows. It is also surprising that the steel with the same design is up to 30 % stronger than sheet steel.

Batteries for e-bikes are leased making purchasing a tricycle much cheaper and at the same time creating excellent return logistics for batteries.

Beumer, an international supplier of transport and packaging systems works with intensive maintenance contracts. Sensors continuously transfer all data to a central system where data analysis, pattern recognition and machine learning, lead to an increasingly high-quality form of **preventive maintenance**, and a **longer lifetime** of motors, bearings and circuits.

UVS-IS has developed a maintenance sensor that provides data about performance and vibrations; current examples of benefits comprise optimized inventory management (from 40000 to 4000 items in stock), less downtime and better maintenance planning.

The rapid developments and switch to e-bikes mean that Van Raam (adapted tricycles) can **switch to circular business models**. Batteries for e-bikes are leased making purchasing a tricycle much cheaper and at the same time creating excellent return logistics for batteries. The introduction of e-bikes means that all information (GPS, Use, Performance Motor, Performance of batteries) can be sent via a smartphone connected to the battery to a central database, yielding direct access to customer information for the first time and enabling offering predictive maintenance and other services to customers.

Concluding

Innovations in the manufacturing industry contribute to a more circular economy. In most cases, the use of sensor technology is crucial in achieving these results. In that sense, «smartness» makes a strong contribution to more efficient use of materials at the companies themselves and at their customers.

The manufacturing industry can thus form a source of inspiration for many other sectors and entrepreneurs. ■

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