

The road to remanufacturing in 7 steps.



We are going to take you on a journey to remanufacturing in 7 steps. In the process we will be following the steps of a (linear) production process, but then in reverse! This will give you an insight into what it takes to close the circle and what kinds of things you have to deal with.



**Before you start,
we would just like to
draw your attention
to the following...**

The value of remanufacturing.

Many producers underestimate the added value and the importance of remanufacturing. Many still regard it as a threat to the traditional business model, a model aimed at the production and sale of new products. However, that is a misconception. Remanufacturing actually offers fantastic opportunities, such as the development of new business, the ending of component shortages and more future-proof entrepreneurship. Producing in order to throw away is so passé, both in economic and ecological sense. The future is circularity.

Definition

Remanufacturing means bringing a used product or product component back onto the market in a state and with a positioning which is appropriate for a strong Dutch brand.

*“Start small, don’t invest too much and see what happens.
That’s more than you can predict in advance.”*

For whom?

If you would like to implement remanufacturing successfully into your organisation, just follow the re-manufacturing roadmap as we take you step-by-step through the remanufacturing process which will make it as easy as possible for you to start out on this journey. The roadmap can be used by anyone in the manufacturing industry, but especially producers of capital-intensive production goods. This is actually where the greatest opportunities lie at the moment.

*“This is something we have to do. In fact, we should have already done it.
But I don’t know really where I should start and what I should be changing.”*

Why is it important?

Why bother with remanufacturing?

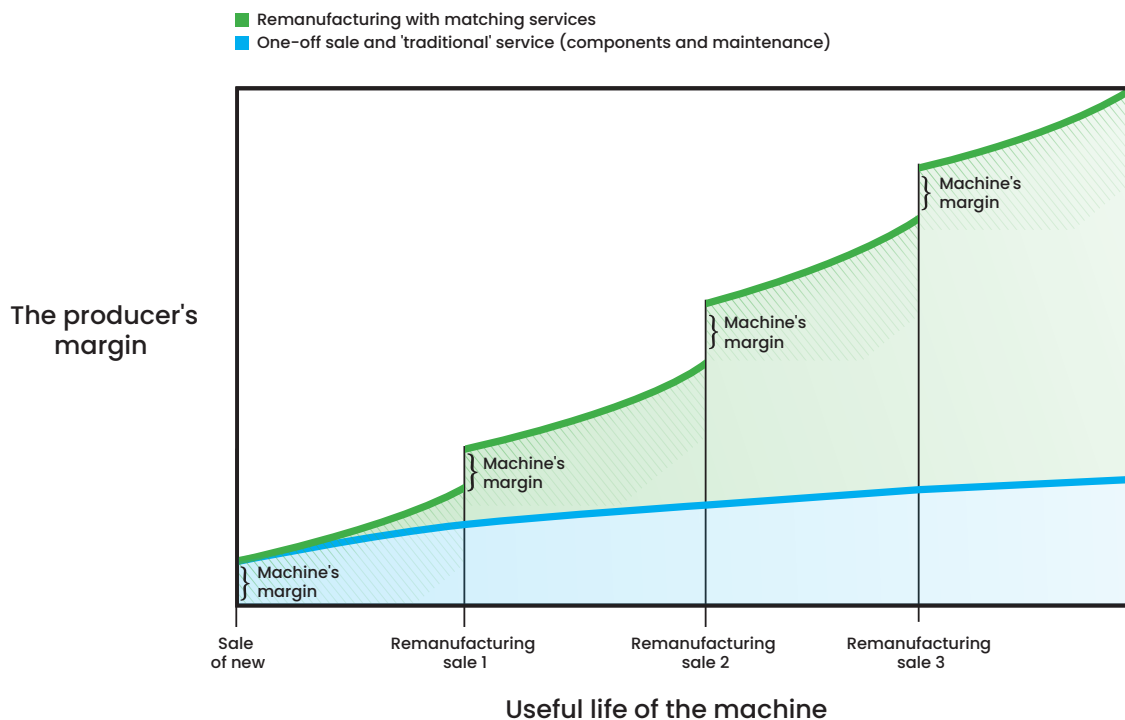
- How you deal with raw materials and whether you maintain access to materials and components is becoming more and more important. Remanufacturing enables you to keep a grip on your raw materials, components and products and build up your own (raw materials) stock, making you less dependent on new products.
- Remanufacturing offers interesting business opportunities. For example, it enables you to earn money from a second-hand market that often already exists. You can earn (more) money from maintaining and upgrading your products while they are still being used by your customer (installed base) and you can protect the lower end of the market from price-cutters.
- It is not always necessary to rebuild. Remanufacturing gives you an insight into how your product is used, as well as your customers’ wishes and the developments they are undergoing. Such knowledge is valuable when it comes to developing new products, services and data applications.

*“Our aim is trouble-free use at the lowest costs for our customers.
When doing so, new is not always the best option. Repairing and up-
grading used machines and extending their useful life fits in very well
with the proposition we put to the customer.”*

How are you going to make any money from it?

Lots of companies only (or primarily) make money from the sale of new products, while often the customer actually needs, and is willing to pay for, long-term, trouble-free usage. Remanufacturing enables you to take a practical step towards offering your customers products that have a long useful life, along with an excellent business model for you as a producer.

- The income with the highest potential in the context of remanufacturing is actually generated from delivering services and the sale of (remanufactured) components. That is where margins are at their greatest. Such incomes are recurring and relate to the total (growing) installed base.
- Remanufacturing makes it possible to resell the same product. This approach gives you more opportunities to recoup the knowledge, skill, manpower, energy and raw materials invested in the product. So, producing goods again and again is unnecessary because a lot of the (added) value is actually still in your product.
- Including remanufactured products in your product range opens new markets and attracts new customers, because not all customers want the best and the latest goods all the time. Sometimes, the desired result can also be achieved with a remanufactured product. What is more, remanufactured products serve (functionally and geographically) as a gateway to new goods, making it easy for customers to get to know and become familiar with your branded products.



"Initially we earned our money from the 10 appliances we sold each year. Now we earn our money from the 200 appliances we've brought to the market in the past 20 years."

What kind of problems do you come up against and can you solve them?

Although it is by no means easy to develop a remanufacturing business, the potential is huge. The question is which problems might you come across and how do you resolve them?

- The mindset, operations and logistics within your organisation are often configured entirely to cope with one-way traffic, so, if you do not look out, this will clash with the return flow generated by remanufacturing. You should therefore first explore remanufacturing from a project-based perspective, separately from the primary production process and with a separate project group in a separate space. To keep things separate, one option would be to subcontract the process partially to remanufacturing professionals.
- Customers have preconceptions about the quality and professionalism of second-hand products. We can eliminate these preconceptions by:
 - ✓ delivering quality which matches the brand;
 - ✓ offering a guarantee and service proportional to new products;
 - ✓ marketing the product professionally;
 - ✓ appealing to new markets and focusing on the customer's wishes;
 - ✓ working on awareness, trust and acceptance of remanufactured products in the market, but also within your own organisation.
- Finding used products is a challenge. Often, parties will already be actively purchasing and reselling remanufactured products, or new players will enter the market, attracted by the value of discarded products. In itself that is a good sign and confirms the demand and market for remanufactured products. The trick is to find those products yourself and repurchase them. In doing so, it is very important to have an insight into the installed base.

"We located our products and repurchased them. Only then did it transpire how much value they still represent. Sometimes, they had changed owners a number of times in the interim. We had missed out on all this profit and we're going to do things differently in the future, not only to benefit from this trade ourselves, but also to protect our brand."

Get started today!

To help you on your way, we have created a practical roadmap which is ideal for use by Dutch manufacturing companies that are proud of their products and are keen to roll up their sleeves and get stuck in. After this initial introduction, there is just one thing left to do and that is to get started! There are two things you have to arrange at the front end, namely:

- Arrange support for higher management, possibly on the basis of this roadmap.
- Put together a project group of enthusiastic people from various layers within the organisation, such as sales, aftersales, development and production. The group should certainly include people with a 'can-do' mentality. The members of the project group should report regularly on progress to management.

"Before you start, you can perform all kinds of research and studies, but often that's no guarantee of clarity. We like to get stuck in and learn in practice. At a certain point in time we simply started, based on the idea of: 'let's just see where we end up'."

Good luck!

**The road to
remanufacturing
in 7 steps.**

Right, so it is now time for action.

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Put together a project team

Form a project group of enthusiastic people from various parts of the organisation, such as sales, aftersales, development and production.

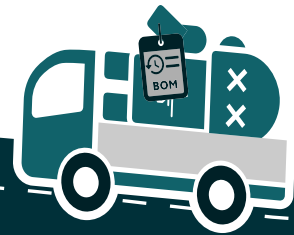
1. Locate

Identify products which are suitable for remanufacturing, find out where they are located and what condition they are in.



2. Recover

Set up a returns logistics process and recover or repurchase your products.



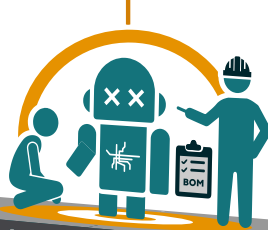
4. Remanufacture

Clean, repair or replace components where necessary and improve them where possible.



3. Perform a diagnosis

Assess the products you receive and decide what has to happen.



5. Sell ... again

Advertise and resell the remanufactured product.



6. Ensure long-term, problem-free usage

Develop services which are important for your customer and keep your finger on the pulse.



7. From project to continuous business

Anchor and multiply your success and standardise work processes, operations and the provision to your customer.



Step 1. Locate



Do you know where the products you have made are located? Do you know how they are being used and what the customer thinks of them? Do you know what condition they are in? Do you know whether they have been resold in the interim?

Select a product (group) or customer and investigate. In order to figure out where you should start, examine bestsellers from the past and the corresponding customer groups. These will have the largest installed base and therefore the largest remanufacturing and service potential. The economic value must be of a sufficient level to cover the transaction costs, for example for research and logistics. And then? Simply retrieve the product! Do this preferably together with the customer. It is also preferable to repeat this search process quite frequently in order to gain a better insight. NB: In addition to information about the functionality, usage and customer satisfaction, this may also generate valuable information about the development of customer wishes and requirements. It may be that the customer does want to resell the product, or is considering carrying out a repair, or reusing the product, or purchasing a new one. The discussion with the user is extremely interesting because it offers, for example, an insight into the development of a customer-oriented remanufacturing proposition.

"We were extremely shocked when we heard that a customer had never actually used an expensive machine we had once sold to them. In such situations you don't understand why the customer didn't notify us. On the other hand, it's strange that we didn't stay in touch. We thought our job was done once the product had been sold."

Step 2. Recover



Recovery is not always as easy as it seems. For a start, the product has to be available, or made available. Sometimes you even have to buy your own product back. This might be a slightly painful process, but it does clarify how much value the product still has, and this information is important! You should also determine the value of the discarded product yourself (valuation), with an eye on remanufacturing. What you are prepared to pay for it depends on the quality of the product, the possibilities for re-use and the demand for remanufactured products in the market.

Arranging the logistics for returns is sometimes tricky. In principle, something that went out can also come back. However, it might not be such a good idea to start with products which are far away, complex and large. In the first instance you should adopt a project-based approach to organising returns logistics, preferably with a member of the project team involved in the logistical process used for new products, so that you can use existing logistical processes and partners. This will enable you to make a better assessment of their added value in the remanufacturing process.

In this roadmap we assume that the products come back to the company where they were also made or assembled. Recovering products is a new experience for many companies. The risk is that new and old products start getting in each other's way. That is why they should be deliberately kept separate during the initial phase, for example by arranging an extra (own) location, or a location provided by a partner (who is going to be doing the dismantling work).

"There's a lively second-hand market for our products. We were able to find a product and buy it back for 10,000 euros. As it transpired, that product had been resold twice in the interim. So others had earned money on it. If our product had always continued to be ours, we would have been able to pocket that profit ourselves."

The importance of data

It is very important to collect and register data if products are going to be given a new life. The ideal process in the future would be to book the recovered product in again when it arrives and link it with existing registration systems and serial numbers. In doing so it is important that you record where the product came from, when it arrived and what (external) condition it is in. As the remanufacturing process continues, you can register the original components which it (possibly) still contains, the defects, the repairs carried out, the replacement components, the type of new components and the guarantee issued. You label the remanufactured product digitally within your systems. In many cases remanufacturing is also an ideal moment to install sensors. This allows you, for example, to record product authenticity and to collect information about a product's condition and use, for example the number of operating hours, the degree of wear and tear, the circumstances, etc.

Step 3. Perform a diagnosis



Just imagine you and your project group are standing in an empty space looking at a product you manufactured years ago. Now you can view the product with an open mind. You can assess the product's condition, what you could still use it for, whether it can be given a new life and what kind of effort that would require. Can you return it to its original state? Does it need new components? Will you have to make changes to meet new customer requirements and wishes? Is a new sensor system required? Or can you make do with a good system with slightly lower functionality?

When performing a diagnosis, you will use the following sources of information:

- ✓ Original construction drawings, product specifications and bills of materials.
- ✓ The most common malfunctions and defects.
- ✓ Visual inspection: identify visual damage.
- ✓ Investigations, tests and possible readouts to establish what is/was broken and what is invisible.
- ✓ Dismantling and assessing at component or module level.
- ✓ Inspection of components and modules.

An important internal source of knowledge is the aftersales department because the staff there know how the new product is used after delivery. What complaints were made? Was there any defect? Which

components have been repaired or replaced? What changes have been made? Answers to these questions provide information about the product's weaknesses. At the same time they allow you to find out where profit can be made. In this respect you should also consult suppliers of components, particularly suppliers of components which are liable to wear and tear, and find out whether, these days, there are any better products on the market.

"It was very interesting to see the state of our products after a couple of years. A great many were still good, a number of things had deteriorated and there were also a few surprises. We also discovered that customers do repairs themselves. In order to ensure a long useful life, it would have been better if we had done those repairs ourselves. Then we would have made some money as well."

Step 4. Remanufacture



Always start the remanufacturing on a project basis, separate from the primary production process and the logistics. Reflect regularly during the project on how this can be done in the future within the framework of existing (project-based or series-based) production and organisation.

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To start with, decide how high you want to place the remanufacturing bar. You can completely let loose with upgrades and that is certainly a good idea and useful to do in a brainstorm. However, you should keep a close watch on the sales market and the value for the customer, and be prepared to pay for it. Are you doing it for an existing customer, or for the customer the product came from? Or are you doing it for an entirely new customer or market? What then are the customer's wishes and requirements? Does it have to be as good as new, or can it be less than that? Do not try to do this entirely by yourself, but hold discussions with the (potential) customer. Once you have determined the desired quality level and the specifications, you can draw up a remanufacturing action plan. Do not make it too complicated. In particular, the plan provides a basis for the manufacturing process and possibly for a later evaluation. The elements are:

- New design and new bill of materials, for when you have to incorporate new components and/or implement upgrades.
- What is okay and what are you going to leave as it is?
- What are you going to repair or replace, or have repaired or replaced?

Repairing or replacing components is an important step which you can take by using new or (re)used components. You can repair broken components yourself, but also have the work done by remanufacturing specialists, or by the original suppliers of the components. Above all, challenge suppliers as well to think about remanufacturing and improving their products with the information you have collected about the failure. By possibly using new or used components, and following any upgrades to components, you can put the product together again and test its quality. Often that can be done using existing quality control procedures.

"If you know that products are going to be returned to you and that you have to repair them to look like new, this will change your perspective. It will then be even more important that they do not break and are easy to replace. The better a product still is, the less you need to do and the higher the margin when you relaunch onto the market."

Step 5. Sell the product... again



When selling and distributing the product to a new (or the same) user, the marketing and sales organisation plays an important role. It is good to realise that you are selling the product for a second time! The question is, how should you market your remanufactured products?

The following are a number of tips for the sales proposition:

- Take the first steps towards remanufacturing together with the customer. This will ensure that you optimally align with customer wishes, requirements and value. Talk to the customer not just about the product, but particularly about the function that the product fulfils for the customer. Also include customers in the development of your sales proposition.
- Involve sales in the project from the beginning in order to create awareness of, and trust in, the (added) value of remanufacturing. This will help sales also recognise the added value compared to the current sales proposition. After all, you can only sell something if you really believe in it. Do not forget to make any bonus structure suitable for the sale of remanufactured products.
- Integrate the sale of new and remanufactured products so that they do not compete with each other, but actually reinforce each other. Remanufactured products can, for example, cover the lower end of the market in terms of price and functionality. The two types of products can also complement each other geographically (via sales in other countries). Think in terms of possibilities and new ('as a service') value propositions.
- Work on awareness and acceptance of remanufactured products among customers and sales organisations (sales companies, agents, dealers). A remanufactured product does not need to be of inferior quality. Sometimes the quality is even better!
- Choose how you want to profile your product in the remanufacturing market, in other words on the basis of price, quality, sustainability, circularity, or perhaps a combination of different factors? Communicate using terms such as 'entry level model', rather than a word like 'cheap'. Try to resist making concessions to quality and present sustainability preferably as a side-effect of 'the best purchase'.

"To us, sustainability is extremely important. And it is so to more and more customers as well. That allows us to score extra points. But the most important thing is to market a good quality product for an affordable price."

Step 6. Ensure long-term, problem-free usage



Remanufacturing fits in a total sales proposition for the customer which is aimed at long-term, problem-free usage for the lowest possible costs. It is also becoming more and more important to focus on maintaining (usage) value for the customer. In addition to re-use, services aimed at asset management, (preventive) maintenance, repairs, spare parts and overhauls are appropriate in this context. Remember that the customer's requirements are subject to change, just like the product's performance. It is therefore important that you continually keep your finger on the pulse and collect information about the customer and how the product is used. This will enable you to make the right proposition at the right point in time. Although that can be done in the form of personal contact, new data and digitisation

options are also extremely useful in this respect, for example using sensors and via tracking and tracing. Also consider the possibility of no longer selling products, but continuing to own them and loaning them out for customers to use. This can be done in the form of renting or leasing, or via a subscription. In this way you take maximum responsibility for the product's result. What is more, you can guarantee that the product actually works and stays up-to-date. Service and recovery at the end of the product's useful life should be automatically included in the contract, so that you can then give the product a new lease of life. This creates a circular economy and allows you to take maximum product responsibility (as required more and more frequently by legislation and regulations). Although it has certain consequences for cash flow and the balance sheet, a remanufactured product is an excellent opportunity to experiment.

It also sheds an entirely different light on the provision of a guarantee. That is now a key selling point when it comes to inspiring confidence, certainly in the case of remanufactured products. In the context of a service providing model such a guarantee is, in effect, no longer necessary, because you guarantee problem-free usage and result with your business proposition. Repairs, maintenance, overhauls and remanufacturing are provided as standard because the product has to keep functioning. A guarantee is, therefore, no longer a cost item, but the core of your business. It is both in the interest of the customer and you are paid for it!

"If you truly put yourself in the customer's position and try to resolve the customer's problems, you will see that that has value and that the customer is prepared to pay for it. Information about use and the customer is crucial for a tailor-made solution."

Step 7. From project to continuous business



After your initial experience with remanufacturing, it is important that you take stock with your project group. Was it enjoyable and successful and does it encourage you to do more? What went well and what can be improved? What problems did you come up against and was it possible to resolve them? What other positive side-effects were there? Brainstorm not only about the technical and economic aspects, but also assess the organisation, cooperation, innovation and the relationship with customers. Also bear in mind that you are not only doing this for the here and now, but are also in anticipation of future developments. Then provide feedback on the results to management and the organisation.

Positive side-effects

The (additional) benefit from recovering used items is that you can truly observe the condition of the product over the course of time and you can see what needs to be improved to ensure a longer (problem-free) useful life. In this way, remanufactured and new products are mutually reinforcing. You can apply the (quality) level of new products to remanufactured products (and possibly the entire installed base) but, at the same time, you can collect valuable information to improve new products, including the design, work preparations and the production process.

We are convinced that remanufacturing offers many companies interesting and sometimes essential (competitive) benefits,

in the field of business continuity, position in the market, customer contact, sustainability, circularity and security in terms of the supply of raw materials. If you are convinced of the benefits now you have completed this roadmap and would like to turn your project into a continuous business, the following are a couple of things you need to bear in mind.

- Maintain a 'can-do mentality'. Use the experiences and enthusiasm of the project group to make a proposal for the follow-up. The direction of travel cannot be changed in one go. Expand step-by-step on specific results and integrate this into the organisation and the proposition made to the customer.
- Make sure (once again) that there is support for the follow-up from higher management. Draw up an internal value proposition for decision-making in respect of the management (how is it going to benefit us?) and make a specific action plan which provides an insight into any barriers that still need to be overcome.
- Continue discussions with your customers, users and suppliers. Do it together. Discuss new ideas, wishes, requirements and opportunities. When doing so, do not lose sight of the joint interest, discuss each individual role and ensure that there is a fair reward.
- Develop an integrated provision for the customer in which remanufacturing is a standard feature. Structure your organisation in line with an amended approach and a new business model. This will require different operational processes, competencies and a new sales proposition.
- Decide whether you want to do everything yourself, or that you subcontract certain elements to professional service providers. The benefit of subcontracting is that you do not, or scarcely, need to change your internal processes and procedures and that external parties supply resources and people. This is customary for certain elements of remanufacturing. The benefit of doing things yourself (via services or operations) is that you retain knowledge, gain as much as is possible from the benefits yourself and keep control.
- In order to create maximum value with remanufacturing it is important to reflect on the standardisation of (work) processes, operations and the provision to the customer. Only when you manage to enlist demand and an underlying need on the part of the customer with remanufactured products, will you be able to create the best earning capacity as a producer.
- Continue to work on the basis of the customer's wishes and customer value and involve suppliers. You do not have to do everything on your own.

"We were crazy to have ever sold our products because, by doing so, we lost valuable raw materials and components we were then unable to replace."

More information

This remanufacturing roadmap was compiled by the Brabant Regional Development Agency (Brabantse Ontwikkelingsmaatschappij) and Niels van Olffen from Mr. Servitization (www.productalsdienst.nl) based on a commission by the Provincial Government of Noord-Brabant. It is being published via the Circular Value Center (CVC), which is a platform of parties active in promoting circularity in the manufacturing industry of Brabant. For more information, please contact Jan Westra at the Brabantse Ontwikkelingsmaatschappij, via jwestra@bom.nl or tel. no.: +31 (0)6-11 22 53 04. This roadmap is based on the experiences of companies that have already implemented remanufacturing in practice and the 2013 Remanufacturing Roadmap, compiled by the regional development agencies in the south of the Netherlands.

Website

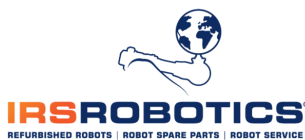


LinkedIn



Who has already committed?

Other companies have already started remanufacturing so, luckily, you will not have to reinvent the wheel entirely on your own. The following are details of the experiences of companies which should inspire you to become involved in remanufacturing.



**Other companies have
already committed.**

"At ASML we have had a complete Re-use department for three years or so now and, being ASML, that department is of course a large one. Several hundred people are currently working on reusing (broken) components, packaging and stocks which we would otherwise throw away. This represents an important step on the way to a circular economy and to reducing our carbon footprint (as part of our ESG Sustainability strategy). It is also generating hundreds of millions of euros in extra value, and perhaps most importantly, we are learning from what has broken so that we can improve new products. At this point in time, re-use at the end of the day is even regularly helping to avoid any production delays. Now we cannot live without it. Before the Re-use department was set up, we already repaired quite a lot of components that were, for example, returned under a guarantee and (defective) components from the field with a known repair method. However, other components are returned without a defined repair method following an upgrade in the field, or extra stock is created if there is a surplus of components due to changes to the plan. If you leave that lying around for some time, you'll eventually throw them away because there's no more demand for them. At a certain point in time we started to question this and then adopted a structured approach to tackling this problem. The parties we work with, our shareholders and our customers also believe it's important. In doing so we've chosen to adopt two approaches at the same time, namely to reflect on the longer term and objectives, but also to start the work and learn by doing. What's needed to turn this into a success is an investment at the front end and someone who is (partially) given time to put together a team, define an objective and get to work. As an entrepreneur you start thinking about the possibilities the return flow offers. We now have an extensive Re-use team whose influence extends right through the entire (global) organisation, a package of (life cycle) services, agreements with our suppliers and re-use locations in Eindhoven and a few other places worldwide. One point to consider is the decision to integrate, or indeed separate, new and second-hand items. Generally speaking we have opted to separate them because, among other things, repairing something does require different skills to constructing something new. We also want to maintain an optimal focus on both re-use and new construction. Of course, both work well together, we can share knowledge, etc., but the physical flows run separately. And don't be fooled into thinking we've already finished. We still face major challenges when it comes to making agreements with suppliers and customers and also within our own organisation. For example, collecting learning experiences with re-use, committing them to paper and bringing them to the attention of the right people involved in new construction (at the right moment). In that way we can maximise the benefits of learning from old in order to create new!" – Richard Peters, Head of the Manufacturing Re-Use Department

ATD Machinery



"ATD has a long tradition of being a leader in the cigar industry, from production to packaging machines. Thanks to our competencies we are also focusing on other industries. What we're good at is developing and making machines which can cut, pack, label, perform visual controls, etc. New markets offer our company opportunities to continue developing our range of products and services on the basis of customer demand. We are noticing that customers are imposing higher requirements on safety, ergonomics, energy efficiency and sustainability. It's important for us to know how customer demand is developing, for example via upgrades, if machines are given a second life and the same applies to maintenance, repairs, replacement of components and overhauls. In order to be able to serve customers properly, data from customers is playing an increasingly important role. Customers want a properly functioning machine and our goal is to provide it. From the perspective of the total cost of ownership that is not always new, but it can still be applicable to a longer useful life or refurbishment. The focus then shifts from (purely) new construction to all machines in and around the field. Where exactly are they? How do they work? What condition are they in? What does the customer need? We then adapt our proposition accordingly. Insights into the functioning of the machines in the field provide us with information which we can use to improve

newly constructed products. Specifications for new machines are the norm when it comes to raising old machines to that level as well. In this way, new and second-hand products can help each other attain a higher level. With an installed base of more than 2,000 machines and awareness of ecological versus economic value, ATD is rapidly able to give older machines a more sustainable working life via overhauls and smart spare supply.” – *Johan Barth, after sales manager*

Hapert aanhangwagenbouw



“Hapert Aanhangwagenbouw is a market leader in the segment for trailers with number plates up to 3,500kg within the Benelux. Our ambition is to keep inspiring and setting the trend by supplying sustainable transport solutions, rather than just trailers. This involves holding discussions with our customers about the objectives they want to achieve. After that we decide which transport solution is appropriate. The right solution is not always a new trailer. Remanufacturing trailers offers us opportunities to provide our customers with, on the one hand, a saving in terms of raw materials and CO2 footprint and, on the other hand, an appropriate fleet solution for the transport challenge they’re facing as they work towards achieving their objectives. When it comes to remanufacturing we focus on adding value for the customer. We know from experience that our products can have value for various customer groups. For one customer group the value will be in a competitive price, while the value for another customer group will be a smaller CO2 footprint. By positioning ourselves properly, remanufacturing enables us to serve an additional market and also offer a total solution within our existing market. We started by doing and set up an enthusiastic project group to reflect on the parallel implementation of a remanufacturing process. The results could not be matched by any research or brainstorm session. The next step was to offer a small-scale pilot to enthusiastic customers who were willing to learn. That led to the organic creation of demand in the market and is enabling us to develop in terms of scalability.” – *Ad Keeris, director*

Vanderlande



“At Vanderlande we have developed a sustainability roadmap based on our customers’ ambitions and desires. From the perspective of customer demand we defined four themes: zero carbon, circularity, good business (ethics) and the social side of sustainability. We’re using this roadmap to steer us towards achieving our own sustainability ambitions and we’re working on implementation via pilots. We’re addressing the issue of remanufacturing within the circular development line. Initially this involved identifying the potential, opportunities and risks with an enthusiastic internal project team and a number of our customers. This can be regarded as a kind of internal value proposition. The greatest opportunities we identified were increased delivery speed (this also prevents customers from tinkering themselves), reduced use of raw materials and fewer CO2 emissions. It is also generating new business. The challenges we faced were return logistics, the setting up of an entirely new production process, guaranteeing quality and determining our role. Together with one of our key customers we’re now implementing a remanufacturing pilot. Our approach is simply to get stuck in and see what happens. The first proposition to a customer may also involve jointly taking up the challenge and exploring the possibilities.” – *Bart van Dartel, BU Technology sustainability lead*

"At WEMO we design, build and maintain production lines for the processing of sheet metal via punching, bending and connecting. The machines are always tailor-made to meet the customer's specification, after which they are used to produce cupboards, panels, doors and beams, etc. When it comes to purchasing technology and machines, a lot of people assume that new is always better. However, we believe that a smarter choice for the customer may be to purchase overhauled systems. Customers can get a properly functioning system from us that meets high quality standards for less money, along with the same guarantee as would be issued with a new product. For us, that's also good business because our margins are comparable with the sale of new products and it makes us less susceptible to economic circumstances. During a period of lower demand for new products, we can compensate on the second-hand market. We started this process because machines were being handed back to us when new ones were purchased. We also noticed that our machines were being sold on. It was at that point that we started actively looking for them and buying them ourselves. You might think that because we provide tailor-made solutions, it is impossible to re-use a machine for another customer. However, in practice that's not really the case. Of course there are limitations, but it certainly appears to be possible to adapt our capital-intensive machines in such a way that makes them suitable for other customers and applications as well. Of course, we upgrade them so that they meet today's requirements and wishes. Sometimes, their performance will be slightly inferior to that of new machines, but it will always be better than when they were first made. Many of our staff have been with us for a long period of time. So it's great to see that, when machines are returned to us for a new lease of life, people can still remember having made them 10 or 15 years ago. That's useful because they understand how they fit together and what is necessary to upgrade. We are currently overhauling two complete production lines in our manufacturing hall. Customers are more than welcome to come and take a look. We repair and improve for however long it takes for them to be happy. One of our fully overhauled machines is being used in Turkey. We discovered that they did not have the budget for a new machine and there was a risk of the deal not going ahead. We then offered them a refurbished system which they were happy to purchase. It's perfectly possible that they will come back to us sometime for a new one because there are now used to our machines. So clearly, refurbished can pave the way to new." – *Koen Boot, COO*

Bluetron



"A wealth of valuable systems, components and modules ultimately disappear for paltry sums onto the scrapheap at the end of their useful life. That represents an unprecedented loss of value, capital and raw materials and a terrible waste because many of those components could be saved. Bluetron has a fully structured and professional process in place for the remanufacturing, repair and refurbishment of electronics for the high-tech manufacturing industry. It enables us to support our customers by extending the useful life of their systems and it also means we don't have to keep producing new components. For us the main challenge is to give electronics a second life. Our aim is to return everything to the customer in working condition. It is important to point out that we also give a guarantee on all the products we supply. We've also noticed that companies regularly hoard batches of rejected components and products. When we're allowed to investigate them, we discover that some of these are not defective at all and are relatively easy to repair. The greatest benefit for those companies is not in itself the value of that component or the contribution to the new life (and therefore sustainability). The real value from them is that they can resupply their customers at all. Often they wait for the same modules which their suppliers are unable to deliver. The importance of this cannot really be expressed in monetary terms." – *Ruud van den Doel, Key Account Manager*

EMtech industrial repairs



"In this day and age, when sustainability and circularity are becoming an ever greater priority, repairing control electronics is an excellent option, certainly in the context of a large continuous manufacturing industry where the outage of appliances and machines leads directly to serious problems due to production coming to a standstill. Indeed, minimising system downtime is the most important thing for our customers. We also supply refurbished and/or new articles and then we always hope that we'll be able to recover old defective units in return. In addition to a repaired unit, our customers can also directly opt for spare parts from stock. You may be wondering what we do with the defective electronic units we receive. Our engineers use a clear description of the complaint to measure and investigate in detail which parts are defective and why the defects occurred. After that we carry out repairs using original or replacement components of a comparable quality. As a precautionary measure we immediately replace the obsolete components which are sensitive to wear and tear so that we can safely issue a twelve month guarantee on the repair. Finally we test the electronics, insofar as possible, so that we know for sure that the unit will function without any problems. Although repairing malfunctions and defects is often an opportunity to establish contact with new customers, we are also involved in other circular activities. We can also perform a Factory Scan of all the electronics installed in machinery, to identify any potential risks of outage. By carrying out additional preventive overhaul work, or delivering spare units, we can reduce and minimise possible future downtime due to defects. This complete package helps to improve the stability and continuity of the entire production process." – *Iwan Molenaar, CEO*

Hague University of Applied Sciences

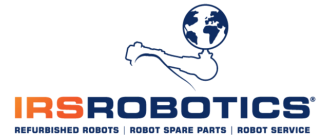


"The combination of digitisation and circular manufacturing industry presents small and medium-sized enterprises with huge challenges, but also opportunities. Both these themes come together in the RE/manufacturing Lab at the Hague University of Applied Sciences. Businesses, students and researchers are jointly developing a demonstration production line for disassembly and remanufacturing. The emphasis in this line is on the use of cobots and the provision of operator support. Businesses can contact us if they have any questions about disassembly. We're working on a number of demonstrators to create a flexible disassembly cell by means of rapid tool exchanges and the smart analysis of camera images. We're also examining the link with operations and business, for example by developing a decision support model for:

- the end-of-use/end-of-life of products;
- the technical feasibility of re-use;
- the prediction of residual value with condition monitoring data.

We are also keeping one eye on the developments in the academic world, while keeping the other eye on practice. That approach is perfectly suited to students on various courses because we can offer them a nice environment for challenged-based learning." – *Jenny Coenen, professor of Smart Sustainable Manufacturing*

IRS Robotics



"At IRS Robotics in Weert we use due diligence and the technical knowledge we already possess to purchase used industrial robot arms. We only purchase A-brand products manufactured by: ABB, Fanuc, Kuka and Yaskawa. We refurbish the robots in accordance with strict internal protocols and give them a second life with a new boss. We do so globally and with a guarantee. In this way, robot technology becomes accessible, affordable and sustainable, not only for the entire small and medium-sized enterprise sector and start-ups, but increasingly for multinationals as well. IRS offers its robots for a substantially cheaper price than is charged for new ones. In doing so we always maintain high standards when it comes to the quality, stability and safety of the A-brands and make no concessions in this regard. Besides selling robots, IRS also offers a periodical and corrective robot service, as well as in-house training courses to technical staff or technical departments. This enables them to resolve basic malfunctions themselves and communicate with our engineers. Our daily objective is to reduce the Total Cost of Ownership (TCO) and to remove any misgivings people have about robotics. We're noticing that sustainability and circularity are becoming increasingly important for our customers. That's why we're working on, among other things, a certificate to demonstrate that the professional re-use of carbon emissions makes a difference and, by definition, generates savings on primary raw materials. So we're not only aligning with what we have believed to be important and a given for more than twenty years, but also with what the customer regards as important, namely price, quality and sustainability." – *Patrick Waltmans, director*

REMADE in HOLLAND



"Remanufacturing is an extremely interesting field. Objections to it exist primarily in people's heads. For around forty years we've actually been proving that it is easy, feasible and profitable. Almost any machine or system will be full of valuable components, of which only a portion will be obsolete, worn out, or defective. Why would you throw all of that away and destroy it just to buy something else that eventually will have to be replaced as well? We set up re-use processes for and in collaboration with our customers. Remanufacturing enables us to restore, among other things, used electric motors, pumps, ventilators, compressors to the same condition they were in when they were new, and preferably even better than that. This is because we look to see how we can limit wear and tear and extend the life cycle by not just repairing or replacing components, but by ascertaining the cause of the wear and tear or defect and by then eliminating that cause. One of our first customers was Océ (these days Canon). We also remanufacture, for example, mobility scooter motors with considerable success for the Dutch mobility resource company, 'Welzorg in Nederland'. Re-using is not difficult. In fact it is a very simple first step towards achieving circularity within your own organisation and it really doesn't require you to completely shake up your organisation." – *Eduard Lebbink, director*

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