

+ EXAMPLES
of successful
Czech projects



CIRCULAR CZECHIA

A circular economy as an opportunity
for successful innovations of Czech firms



Introduction



PAVEL TELIČKA
Vice President of the European
Parliament

Just imagine how great it would sound: A circular economy is being promoted in Czech business, and has become a part of the government programme. We have well-configured legislation, investment incentives and a business environment friendly to innovations...

Unfortunately, as yet nothing of this is true. At present, very few people in the Czech Republic know about the concept of the circular economy, and even many entrepreneurs and managers are unaware of the possibilities that this phenomenon can bring.

However, today already it is clear that we have no other alternative for reducing the environmental burden, improving energy efficiency and ensuring better utilisation of resources. I am convinced that a circular economy represents an immense opportunity. An opportunity not only for the environment, but above all for creating an entirely new branch of industry.

On a European level, a circular economy and effective utilisation of resources is one of the main priorities. So for example: recently proposals were approved for key regulations on waste, which among other factors are introducing specific targets for the collection and recycling of raw materials. Some member states of the European Union (EU), including the Czech Republic, will therefore have to entirely re-evaluate their approach to waste management and recycling within the next two years. I myself was a correspondent for this part of the package of proposals, and I know how large and important this theme is.

In January 2018 the European Commission also issued a new strategy for plastics, which includes a proposal for a regulation for limiting the production of single-use plastics. Its aim is to replace selected single-use plastic materials by more ecological or fully recyclable alternatives by 2030. The purpose is not to prohibit something, but to attempt to reduced the quantity of waste in the seas and oceans, as well as around us.

We need what I mentioned at the beginning: a clear policy, good legislation, a business environment supporting innovations and above all progressive thinking.

So far the Czech Republic has not devoted much attention to this theme, although as a highly industrialised country we could achieve a top ranking in this branch and help not only the environment, but above all the economic condition of the entire country. And we needn't only be pessimistic: as you will read in this brochure too, there are businesses heading in the right direction. However, as yet there are not enough of them.

Now it's time for the political elites also to take on the theme of the circular economy as their priority, and to help start up this new branch of industry. We need what I mentioned at the beginning: a clear policy, good legislation, a business environment supporting innovations and above all progressive thinking.

We still have a lot of work ahead of us before the circular economy becomes a natural component of the functioning of our society. But I believe that we have the capacity to meet this challenge, and that we will succeed within the space of a few years.

For this reason I am glad to welcome an initiative, the result of which includes this study, which illustrates the potential of the circular economy, presents examples from practice, and may thus become an inspiration for all who wish to take the circular route.

McKinsey & Company calculated that adopting the principles of the circular economy can **generate annual savings with a value of 1.8 billion Euro and revenues of 600 billion Euro from 2030 onwards.**

According to the European Commission, the circular economy has the potential to create **2 million new jobs.**

The average European citizen on average consumes 16 tons of material, and only 5% of the value is returned into the economic system.

According to a survey conducted by CSR & Reputation Research 2016, **68% of people in the Czech Republic are willing to pay more for an environmentally friendly product.**

The individual EU member states are preparing for a gradual prohibition of single-use plastic products, and to increase the return collection of packaging materials up to the level of 90%.

80% of greenhouse gases originate from a supply chain which the circular economy partially eliminates.

There are no doubts about the benefits of recycling: **the production of one ton of recycled plastic saves 5 barrels of oil and the equivalent of 1.6 tons of CO².**

About the circular economy not only in the Czech Republic



SOŇA JONÁŠOVÁ
Managing Director, INCIEN

“A circular economy is a system in which we attempt to ensure that all resources are kept in circulation, in the highest possible quality for the longest possible time.”

A circular economy is a system in which we ensure that all resources are kept in circulation, in the highest possible quality for the longest possible time. This system brings not only savings of primary resources, but also for example new jobs, so-called “green jobs”. A study by McKinsey & Company (2015) estimates that by adopting the principles of the circular economy, Europe could create 2 million new jobs and generate annual savings with a value of 1.8 billion Euro from 2030 onwards.

In many respects, this in practice means returning to common sense, conscious production and consumption and respect for the natural resources we have at our disposal. At the same time, however, applying the principles of the circular economy provides companies with more independence in the field of resources, which is becoming a fundamental advantage in today's dynamic world. Essentially this concerns a way of behaving which thanks to the use of low-carbon technologies and modern concepts of the economy (sharing, reuse of materials etc.) will contribute to a fundamental degree to addressing the issue of climate change and at the same time generate profit on a long-term scale.

A low-carbon economy, built on the basis of circular solutions, represents an immense opportunity also for Czech firms within the framework of promoting sustainable development.

Back to common sense

The foundation of this old-new system is the principles on which human society has functioned naturally since time immemorial. At present, however, the global trend is now virtually unpredictable growth of the population and economy, which at the same time also means enormous pressure on natural resources, the potential of which is still not being utilised to the necessary extent. Our age is characterised by the production of quick-turnover and often single-use goods, which are not recycled after the end of their life cycle. There is also a growing problem with the large quantity of waste which even today, in the age of the so-called “fourth industrial revolution”, is to a large extent landfilled.

Nevertheless, changes are gradually taking place in the field of legislation and environmental policy, which is being directed towards ending the system of simple liquidation of waste.

It is evident that it is necessary to begin orienting the production of new products toward effective utilisation of resources, a transition to renewable resources, prevention of waste generation and design of products in such a manner as to ensure that they can be returned into circulation.

In the life of firms and organisations, as well as of individuals, the concept of the circular economy can be applied by means of a simple orientation toward dematerialisation and a shift in the direction of reuse, repair and renewal of products. These changes will undoubtedly also include new business procedures aimed at providing services to customers, and not merely at one-off sale.

What will 2018 change?

In mid-April 2018 the European Parliament approved the almost final version of the circular economy package, which is a set of legislative measures connected to this theme. Today already it is clear that emphasis will be placed on recycling and restrictions on landfilling. Materials, nutrients, water and other resources will have to circulate within the

system, at the highest possible quality and for the longest possible time, and these changes require in particular interdisciplinary co-operation, which will be a genuine challenge for certain branches.

Firms are beginning to be attracted by the theme of industrial symbiosis: a search for opportunities for reuse of water, materials and energy within the framework of their own enterprises or larger industrial units. Projects such as these for example bring greater resistance to volatile price fluctuations, which today is a typical phenomenon in connection with the unpredictable consequences of highly charged geopolitical conflicts.

Another subject of discussion is the specific level of recycling that individual

Also coming to the forefront are recycling technologies that address the problem of these waste materials, which are currently landfilled or used for energy purposes, because their recycling is not economically viable. A clear example of how the new view that firms are taking of waste as resources is correct is the Czech Hydal project, which has the potential to become an absolutely unique circular project on a global level (for details see the section Successful Examples of the Circular Economy in Practice). The Czech Republic will therefore probably soon have its place even among those countries such as the Netherlands, which is considered the "hotspot" of the circular economy concept.

Introducing the principles of the circular economy into business also frequently means taking responsibility for one's products at the end of their life cycle. A good example is the IKEA company, which although the parent company is Swedish, the Czech branch has a large amount of room to manoeuvre in order to implement purposeful projects under its own management. It has launched the project "Second Life for Furniture", thanks to which customers can return old furniture to stores and obtain a voucher for further purchases worth their furniture's residual value. The furniture can therefore be returned into circulation, and IKEA is building not only a quality CSR, but in particular maintaining a relationship with its customers. Within one month of its launch the service had been used by more than one thousand customers.

Although some companies do not have an opportunity to take their products back, they give priority for example to secondary rather than primary raw materials. This is the path being taken by the domestic firm JRK Česká Republika, which sells composters of the highest quality made of recycled beer crates, and is behind the smart waste recording system ECONIT.

Another example is the ERC-TECH company, which produces a wide spectrum of products made from building and demolition waste. This business has brought the firm awards in the competition Waste to Resources Conversion, which has been held since 2017 by the Ministry of Industry and Trade of the Czech Republic, with the aim of drawing attention to interesting products made from secondary raw materials and thereby supporting the trend of the circular economy.

If you are interested in examples of good practice, read on. In this study we present

We live in a time when economic development must go hand in hand with ecological aspects.

states should achieve. It is also possible to expect a change of the actual definition of recycling. In the Czech Republic we often refer to mere separation of waste as recycling, but we follow this up with actual handling of materials only in a very complicated and incomplete manner.

Eco-innovation and pilot circular projects are also supported by the EU

The circular economy is also one of ten thematic priorities of the European Union. In addition to tightening the legislative requirements and increasing pressure for a transition to a circular economy, the European Commission also offers very attractive financial resources for this area. In particular it supports research projects which are oriented toward rapid application of the results of the study in practice. Eco-innovation technologies for lower energy consumption or lower emissions will also be supported, as well as technologies which more effectively utilise the input material with low production of waste or by-products.

Czech firms and the circular economy

We live in a time when economic development must go hand in hand with ecological aspects. And a key role is also played by business and industry. It is clear that these themes are coming into the metaphorical spotlight, and it makes genuine sense to follow them actively.



„According to the European Commission, a transition from a linear to a circular economy means a strengthening of Europeans competitiveness.“

further examples, which clearly show that Czech companies are now gradually beginning to incorporate this trend in their business plans.

Circular Czechia 2040?

Active discussions about the circular economy have been ongoing in the Czech Republic for three years. However, in comparison with other European states, which see immense potential in this area and already have compiled national plans and strategies for the conversion from the linear system of the type of “extract – produce – discard” to a circular economy, we still lag behind. The leaders in the field are countries such as the Netherlands, Sweden or Finland. In the Czech Republic this theme belongs within the jurisdiction of the Ministry of Environment, but with regard to its breadth, complexity and the need for interdisciplinary co-operation, it will be necessary also to engage other ministries. The common endeavour should culminate in the establishment of the strategy Circular Czechia 2040, to which the Ministry of Environment committed itself at the end of May 2018. Within two years the Czech Republic should therefore have its own plan.

One of the key priorities for Europe

The circular economy is not merely a short-term trend. At the beginning of December 2015 the European Commission adopted a circular economy package and included this theme among the priority areas of the EU.

According to the European Commission, a transition from a linear to a circular economy means a strengthening of Europe’s competitiveness, reducing dependency on the import of primary raw materials and creating jobs.

The circular economy is also in accordance with life cycle assessment – LCA. Within the framework of the circular economy, waste from one activity become a source for further activity, and thereby prolong the “life” of the product. The cycle of “from the cradle to the grave” is thus applied, meaning from obtaining raw materials, through the production of the product to its use, and treatment after the end of its life cycle, i.e. recycling and removal. The aim is to minimise the volume of materials – sources which are cast out of economic circulation. This principle contributes to a reduction of our carbon footprint and

in the final phase may also substantially reduce emissions of greenhouse gases.

No problem, just a challenge!

The most important aspect of the circular economy, however, is the fact that although it is the real content of global strategies in connection with the impacts of climate change or raw material security, it is also a fundamental – and above all functioning – basis for configuring business models of the future.

The principles on which the circular economy is built have been demonstrated to be viable in the long term, and at the same time interconnect long-term economic and ecological sustainability. The aim of this publication is to show, using concrete examples of firms in the Czech Republic that have already set out on the circular route, that even the barriers that we currently view as challenges, may through a mere change of perspective be transformed into opportunities that both increase competitiveness and cultivate an environment that is friendly to the successful development of innovations.

Let's go: how to overcome barriers

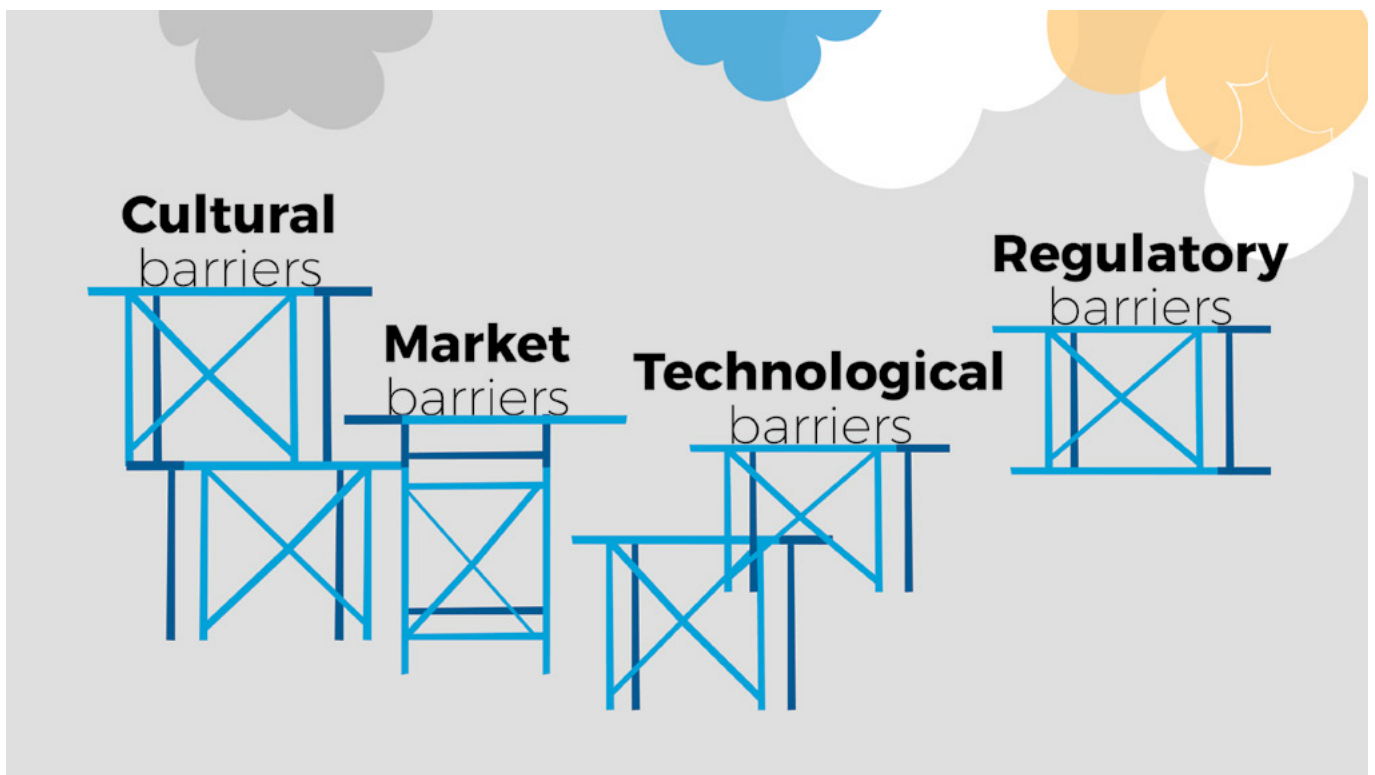


CYRIL KLEPEK
Senior Innovation Designer,
Direct People

“It is necessary to address the circular economy as a part of the whole business transformation”

The principles of the circular economy are relatively clear and logical. So wherein lies the problem? If we consider the barriers that prevent the introduction of the principles of the circular economy into practice, as a rule four main areas are presented: cultural, market, technological and regulatory.

The study Breaking the Barriers to the Circular Economy, which involved 153 international companies and more than 100 experts from a range of governmental and non-governmental organisations, indicated two barriers as being of **fundamental importance - cultural and market**. Let us look at what characterises them, and how we can overcome them.



Cultural barriers

Cultural barriers may appear on the side of consumers and on the side of firms. Consumers are not so interested in ecologically responsible products and services, and at the same time are great traditionalists: Czech consumers are often used to buying familiar, time-honoured brands.

Company employees are not very enthusiastic about contributing to a change of direction towards ecological business. In addition, company culture, social responsibility or sustainable business are mostly not themes for "strong" company departments such as sales or finance, but are generally within the jurisdiction of the marketing, HR or CSR departments.

Solution

Most of the aforementioned barriers are only a matter of mental attitude. According to a survey conducted by CSR & Reputation Research 2016, 68% of people in the Czech Republic are willing to pay more for an environmentally friendly product. In the study of the same name from 2017, this figure was 72% in the age group of under 24. At the same time, according to the study only 5% of employees do not take into account the (even ecological) responsibility of their employer. Furthermore, consumers are becoming ever more accustomed to buying new products and inquiring into new services. These

tendencies therefore open up great market potential for environmentally friendly products and services.

The emphasis given to this issue within firms is genuinely insufficient. It is necessary to address the circular economy as a part of the whole business transformation. Part of the transition to circular business is a change of supplier-client relationships, a change of company brand or a change of the actual business model(s). It is necessary to engage all the important parties. However, above all it is necessary for the top management to take on this agenda.

IT WORKS - AN EXAMPLE FROM PRACTICE:

One good example of how to introduce the principles of the circular economy throughout an entire company is IKEA. On a global level the theme is within the jurisdiction of a top manager, who forms the introduction of circular activities across the entire supplier-client chain. On a local level, however, companies have a high degree of autonomy and realise projects which fit the consumer preferences of local customers. In the Czech Republic this led to the establishment of the aforementioned project Second Life for Furniture (for details about the project see the section Successful Examples of the Circular Economy in Practice).

Market barriers

The primary market barrier is high costs in the transition to circular business. It is necessary to purchase new machinery, storage areas, to negotiate new contracts and introduce other, often fundamental changes. At the same time, many firms are worried about their limited competitiveness during the period of transition to another business model. And so they prefer to wait until the path is forged by someone else and the utilisation of secondary raw materials becomes a commonplace matter.

Nevertheless, the greatest obstacle is obtaining actual secondary raw materials from recyclable sources which are at the same time competitive in terms of price in comparison with primary raw materials. Another frequent problem is the fact that a firm that wishes to make changes in the supplier-client chain today has to go through a complex process of seeking partners. In this process the firm often does not have guaranteed regular supplies of strategically important material for production or other activity in connection with its main business operation.

Solution

The transition to a circular business model is connected with investment, which usually does not exceed the standard investment upon a transition to a different business or production model. Within the framework of the production cycle, it appears as entirely fundamental to have a guarantee of supplies of material for processing and further sale.

In the Czech Republic at present there is no specific tool which would enable the use of secondary resources cheaply and effectively. The solution is a combination of bilateral agreements with an option for the purchase of a specific quantity of secondary resources. Incidentally, this is one of the main argu-

ments in favour of why it is good to be the first to start down this route: those who are market leaders have the best opportunity to obtain long-term contracts and build a position on the secondary resources market which market followers will have difficulty in copying.

IT WORKS - AN EXAMPLE FROM PRACTICE:

In connection with the adoption of the European Strategy for Plastics, the individual member states of the EU are preparing for the progressive prohibition of the use of single-use plastic products and an increase of the return and collection of packaging materials up to the level of 90%. At the same time, they must take into account the regulations relating to increasing the content of recycled (secondary) materials in packaging materials.

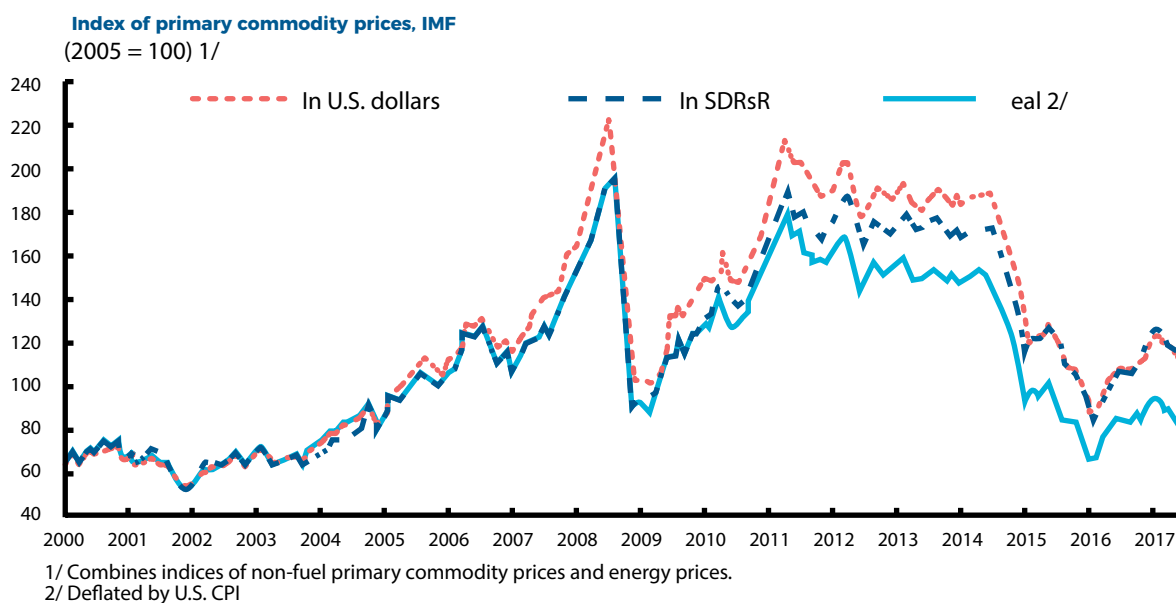
In 2018 the company Karlovarské minerální vody (KMV) launched the project Záloujeme? (Deposit?), which seeks the most effective ways in which to get back to the recycling of the maximum amount of the PET bottles in which KMV and other producers sell packaged water. In addition, in May 2018 KMV presented a new PET bottle produced from 50% recycled plastic. The aim of the project is to ensure a sufficient quantity of secondary raw materials, which are essential in order to meet EU targets. It is clear that the demand for secondary raw materials - with regard to the change in the legislation - will constantly increase. Companies which are already now ensuring sufficient secondary material reduce the risk in connection with a lack of raw materials.

As regards the barrier in the form of low prices of primary commodities, it is necessary to look at the price of raw material as a fundamental input for manufacturing firms from two aspects:

Total prices of the given commodity expressed by the trend component showing long-term development.

Cyclical elements which show long-term fluctuation around the trend.

As illustrated by the graph of the International Monetary Fund (IMF), which incorporates the prices of all the main commodities, the prices of primary commodities are increasing - but mainly their cyclical components are increasing. Geopolitical uncertainty, the mining of mineral raw materials in risk countries, the return of customs policy and the exploitability of resources in combination with growing demand mean price increases, a high degree of uncertainty of supplies and unpredictable prices. As a result it is of key importance to have stable supplies of raw materials, and for a closed cycle to return products back with the aim of repairing or recycling them.



Source: IMF, Primary Commodity Prices

Technological barriers

In this area the greatest problem appears to be the low availability of new technologies and their high acquisition costs. Another obstacle is low co-operation between business and the world of science and technology, primarily universities and research institutions. Also mentioned as a barrier preventing development is the demand to supply a product made from recycled material or a repaired product in the same quality as the "original piece".

Solution

It is possible to develop a suitable technology for a specific manufacturing or recycling process internally or externally. If research and development is not linked with the main production activity, an external solution is recommended. Here it applies that the researchers need a clear assignment from the business in question. It is also possible to utilise the services of technological scouting in seeking an already implemented solution.

It is evident from practice that technological solutions are available and need not be demanding in terms of investment, but that companies are not sufficiently informed about them. Nevertheless, today several partners offer assistance: whether this concerns the organisation CzechInvest, regional innovation centres or private subjects.

The application of the principles of the circular economy cannot be at the expense of the quality of the final products and thus the company's profitability. It is necessary to find a suitable technology and on the basis of a range of tests to verify that the quality of the product has not been effected, and subsequently to decide on any applicable change of production.

IT WORKS – AN EXAMPLE FROM PRACTICE:

An ideal tool for connecting the business sphere seeking new solutions with research organisations is so-called "Innovation vouchers" which are provided by the Ministry of Industry and Trade of the Czech Republic. In the case that a company is considering acquiring new technologies and is not certain whether the given solution will have a genuinely positive impact on the environment, it can for example have an LCA (life cycle assessment) analysis processed by a research organisation. The aim of the support programme is to develop communication, share observations and know-how, which commercial subjects can then utilise for launching or intensifying their own innovation activities.

Regulatory barriers

A whole range of manufacturing procedures, products or sales channels and handling of the product are bound by a certain type of regulation. An example is handling prepared food in restaurants, wherein by law the prepared food must be either sold or liquidated within a certain period of time. Waste management is generally an extremely regulated area. This is naturally a fertile ground for the waste lobby of interest groups, which promote hierarchical waste management. At the same time it applies that the prices of certain raw materials are artificially maintained at the expense of others.

Solution

The aim of the business sector must be to exert long-term pressure for the introduction of specific measures in the field of the circular economy. The introduction of the principles of the circular economy is one of the priorities of the European Union for the coming years, and at present the Czech Republic is also planning not to be left behind. A strategic framework is currently being negotiated, which would make the Czech Republic a circular economy by the year 2040. At the same time, an amendment to the Waste Management Act is being prepared, which shall subsequently penalise an environmentally unfriendly approach to management of resources. In order to cope with regulatory barriers it is necessary to have an overview of the current legislative order, but also to look further. **Inter-sector co-operation of several partners and transparent communication is the best weapon in the battle against the particular interests of lobbyists.**

Overcoming barriers

Good news is that none of the above-mentioned barriers is unalterable or even impassable. Within the context of the given company or local authority, every barrier requires an individual analysis and closer examination.

And what next? After an analysis of the barriers it is time to consider which principles of the circular economy will best fit into company activities. A significant driving force should be securing materials for one's own business and for future generations. Being among the first to perfectly adopt these principles is a significant market advantage. How then are we to launch a successful transition from a linear to a circular business model?

The main thing is to start! But how?

Set a target and plan of action

Together with representatives of key teams, create a common vision and sketch out a plan of action for how to get there.

Focus on your own company values and select those principles of the circular economy that are in accordance with them.

Educate and activate other colleagues

Share your created conception and plan with other colleagues. Ensure thorough educational training and utilise all the available communication channels.

Make use of momentum and hold idea workshops and consultations within individual teams. Allow members of the company to participate and bring specific ideas with which to fulfil your plan of action.

Innovate and optimise at every step

New ideas create interest. Look at your existing business model with different eyes. Seek an opportunity both for recycling materials and for options for repairs, renovation, products as services etc.

The basis of a circular economy is technical and biological cycles. Together with your own or external innovation department, examine the possibilities for a perfect closing of the cycle. Discuss which technologies are necessary.

Engage other business partners

Create a vision, accompanied by the basic steps through which you plan to fulfil it. Communicate it across your own supply chain. Launch your circular strategy out into the world. Cross-sector co-operation plays a key role in meeting targets of the circular economy. Be prepared, because an important aspect is also the manner in which you present your new targets to your partners.

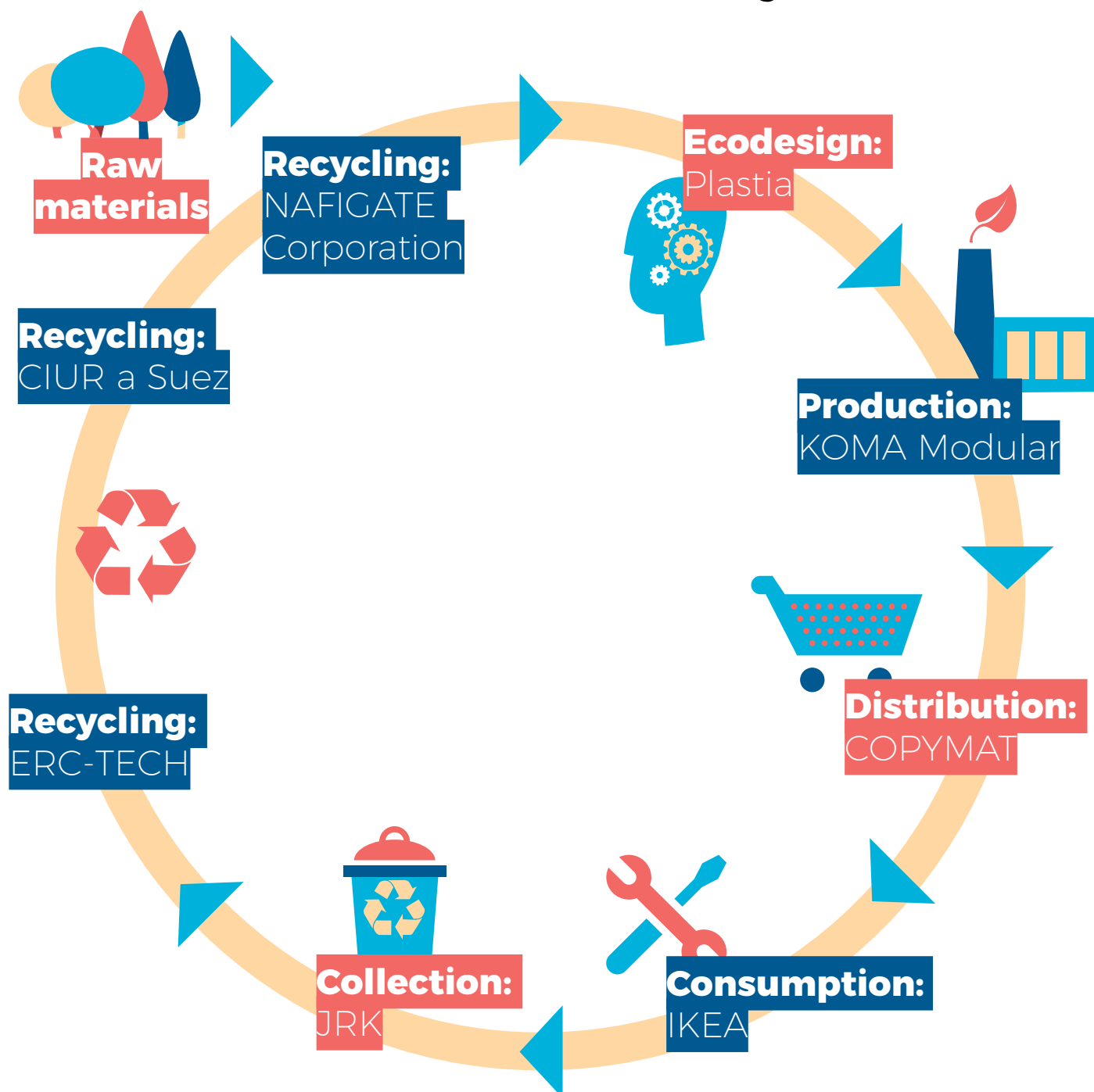


Successful examples of the circular economy in practice

Made in Czech

The circular economy is built on seven fundamental aspects, which are already being applied by some Czech firms. In the ideal scenario, a complete closing of the cycle takes place within the framework of the circular economy.

7 aspects of the circular economy



It is possible to attain an ideal form of a circular economy primarily through complexity and interdisciplinary co-operation, as applies for example in the case of the NAFIGATE Corporation and its product Hydal (for details see this chapter and the text *The Tale of the Pioneering Czech Technology Hydal*). From the very beginning this has been founded on the utilisation of problematic waste material, the properties of which are so improved by recycling that it is possible even to refer to this process as “upcycling”. Furthermore, at the end of its life cycle it becomes a biodegradable part of the environment.

However, we may now also include as good examples of circular practice other Czech firms that have begun individually with the application of key elements.

Plastia

Feeders for birds
all year round



Ecodesign

What it's about

Feed and drink for birds all in one. This is a modular product, which by replacing parts of the product changes its use. After the winter ends, the customer replaces the variable part for feeding with the part for drinking, and so feed becomes drink. The middle section is joint, and holds the whole object together. It is therefore not necessary to buy a new product. The feed/drink can be affixed to a railing or stake, or suspended.

The challenge

We wanted to build a firm on principles which would at the same time become the value framework of our company as a whole. Our ambition is to make items in such a way as to make good use of the properties of plastic, and suppress the inclination to treat plastic as a single-use material. Another great challenge was how to save investments in moulds by conceiving products in a modular manner. And a no less fundamental challenge was the endeavour to eliminate the seasonal nature of the use of our products.

The result

A new product was created. We saved on finances invested in moulds and improved the return on our investment. New and attractive opportunities for co-operation with the non-profit sector emerged, in this case with the Czech Society for Ornithology. The project addressed new target groups that are sensitive both to ecology and to the practicality of products. We succeeded in creating a so-called new functional optimum, in which the customer uses the product or its parts for a far longer time than comparable products on the market. And last but not least, we succeeded in meeting a third challenge, namely reducing the seasonal nature of the product.

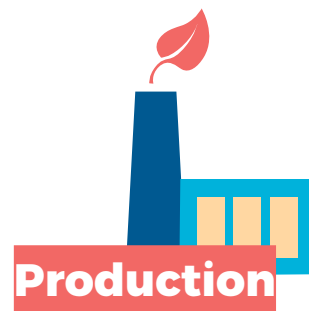


“The circular economy brings us new challenges and at the same time new opportunities. However, many things are not clearly given and defined, and as a result we can forge our own, new paths. And this is something we thoroughly enjoy.”

LENKA NOVOTNÁ
Co-owner, *Plastia*

KOMA Modular

Modular buildings – build, refurbish, dismantle, rebuild



What it's about

Modular construction is a new, alternative branch in the construction of buildings. A modular building is formed of individual modular units, prefabricated on a production line. The principles of the circular economy are of absolutely core significance for the functioning of the entire company, which is probably best documented by the relocation of our Czech modular pavilion from the international exhibition EXPO in Milan for its further use.

We also supply modular kindergartens, which we rent to towns and municipalities. All the client requires is a suitable site, with the possibility of connection to the essential networks. Our company will take care of all the installation, servicing during operation and disassembly. The product corresponds to all the construction prescriptions. When the kindergarten is no longer required, the modular building is relocated to a new site. At present we offer a single classroom for 25 children, and we are planning the production of further kindergartens. The building is in a modern design, using attractive facades.

The challenge

The challenge is to break away from the tried and tested procedures and products of “classic builders”, and to embark upon an innovative construction of premises according to the model of the automobile industry.

The result

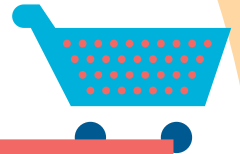
Municipalities can respond flexibly to the current number of children set to attend kindergarten. The task of resolving insufficient places in kindergartens in the Czech Republic is thus shifted from the state to private firms. The assembly of the kindergarten is very quick, specifically within the course of a few weeks. Our company also refurbishes individual modules and uses them for constructing modular buildings which serve also for other purposes. This method of acquiring buildings is termed off-site building, which appositely captures the character of production of buildings on another site than where they are later placed. And above all, permanent buildings are not constructed for temporary use.



“Modular construction breaks away from the tried and tested procedures and products of classic builders and embarks upon an innovative construction of premises according to the model of the automobile industry.”

STANISLAV MARTINEC
CEO, KOMA Modular

COPYMAT



Distribution

Until the last breath of each printer an ecological approach to printing and copying

What it's about

We provide print solutions as a service. We discuss the requirements for functionality of printers and photocopiers, and on the basis of this we recommend solutions. This covers used but effective machines that have not yet exhausted their potential. Thanks to these we attain a reduction of costs and enable clients to invest in the things that are important for their business.

The challenge

We very often come across clients who have bought printers on the basis of the acquisition price, and were afraid to buy used equipment. However, the operation of these printers cost the clients a lot of money, and so instead of servicing their equipment, they preferred to throw it out. For this reason we started providing printing as a service – we met clients' requirements and at the same time repaired and reused equipment which still provided the required comfort and effectiveness. We thereby gained clients, and thanks to the several year guarantee on the equipment we moderate fears of purchasing older machines.

The result

We busted several myths about the sale of printers. For example the one about inbuilt obsolescence devices in every machine. Because after all, we wouldn't provide a guarantee on a machine if it was manufactured in such a manner as to stop working after a certain time. In addition, among our partners we were indicated as the firm with the best relationship to the environment.



"I didn't believe that you could sell printers with love... It's time for us to realise that printing is not about selling, selling, selling, but about long-term co-operation and trust."

KRISTÝNA KUTILOVÁ
Managing Director, COPYMAT



Second Life for Furniture: what one person doesn't need, the next will welcome

What it's about

Second Life for Furniture is a service which offers customers the opportunity to sell IKEA furniture they no longer use or need. People can offer this furniture on the website www.druhyzivotnabytku.cz, where they can upload photographs of the product and describe its current condition.

On the basis of their experience with selling furniture, IKEA employees propose a price for which they will offer the furniture. The customer obtains a refund card worth the amount of the sale price of the furniture, which they can then use for further purchases at IKEA. We sell products with the designation Second Life for Furniture in the section with discount goods, for the same price at which we purchased them.



The challenge

The service aims to support the cycle of items from one user to the next. Customers can sell furniture that would otherwise remain unused in the discount goods corner. Thanks to this system the utility of products is increased, and their life cycle extended.

The result

The benefit of the project lies in the fact that it avoids the creation of waste and at the same time minimises it. During the course of one month we buy and save on average 350 pieces of furniture. We have also received positive feedback from our customers, who subsequently buy this repurchased furniture. On average we sell the furniture within a day and a half. Due to the positive response, we have decided to test out the service also at our store in Hungary.

“The circular economy is a method by which we look at the choice of materials, the supply chain, waste management and the design of our products, as well as the services we offer to our customers. We are convinced that the endeavour to achieve a circular IKEA requires courage, focus on innovations and co-operation with a range of interested parties.”



ECONIT – smart waste evidence system for cities and municipalities

What it's about

This is simple, smart recording of household waste using QR codes, with which waste vessels or sacks are directly marked. The municipality thus obtains an overview of produced waste (down to the level of individual households) and of how full waste vessels are. The motivation system for citizens and statistics show precise data, which helps local authorities configure support activities and campaigns. ECONIT has three basic modules: recording, motivation and statistical, and is fully variable according to the requirements of each local authority.

The result

One of many positive examples is the municipality of Prostřední Bečva. One year after the introduction of the ECONIT waste evidence system, the mayor determined an increase in the quantity of separated waste in all commodities. The quantity of separated plastic increased by 12%, glass by 73%, paper by 90% and in the case of drinks cartons by an incredible 1 860%. In total, over the course of one year the municipality saved CZK 334 000 and reduced the quantity of mixed municipal waste by 31%. The savings generated thanks to this system paid for all the costs for the system, and the municipality is continuing to make savings. The mayor Radim Gálik converted these savings into bonuses for citizens. He reduced charges for municipal waste as thanks for the community's excellent and responsible sorting of waste. Thanks to the introduction of the system, the municipality is not only saving money, but also has an excellent overview of its waste.

The challenge

On the basis of statistics and dozens of our physical analyses, we have determined that almost 80% of landfilled waste is composed of components that could be sorted. The mission of ECONIT is to improve waste management thanks to reducing the quantity of mixed municipal waste, avoiding its creation and increasing the level of separation. Through a combination of modern technology and our several years of experience in waste management, we are increasing the degree of waste separation by means of an innovative and educative solution.



“We’re helping to systematically reduce the quantity of waste mainly thanks to the smart waste recording system ECONIT, which we are developing. We’re helped in this also by physical analyses of waste, a system of composting bio-waste, innovative technologies which convert scraps of food into substrate and a range of educational campaigns. It works, and we’re pleased when we see the excellent results local authorities can attain.”

ERC-TECH



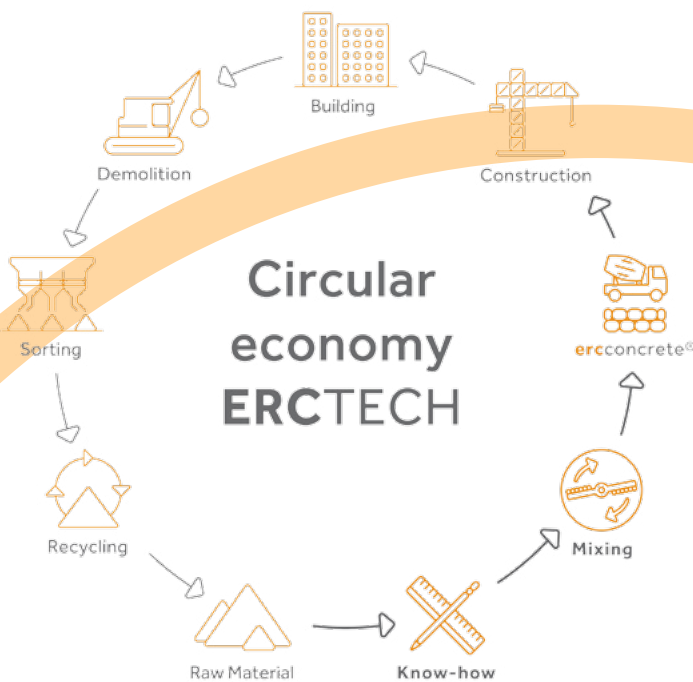
When demolition waste replaces primary raw materials for the construction industry

What it's about

ERC-TECH is a worldwide innovator in the development of concrete and concrete construction elements from 100% recycled aggregates. ERC-TECH's know-how incorporates the processing of recycled compounds from inert demolition waste, especially from concrete, bricks, paving stones, ceramics, sanitary products, concrete/brick compounds, roof tiles and ceramic products, mortar etc. ERC-TECH bases its business on sustainability, both in the area of environmental protection and social responsibility, and from the perspective of economic profitability.

The challenge

The big challenge for us is to solve the worldwide problem with the utilisation of inert and mineral waste from demolitions, the great majority of which today ends in landfills, and to reuse these raw materials for products and constructions. We wish to ensure sustainable development in the construction industry and bring new business opportunities with the maximum positive ecological impact for individual regions and states throughout the whole world.



The result

Instead of mining mineral raw materials and a growth of landfills, ERC-TECH bases its activities on the reuse of waste construction materials, with the aim of manufacturing such products which in their quality and added value replace primary construction materials. ERC-TECH products are used in construction for classes C 8/12 and C 30/37 and higher. Replacing mineral raw materials and the use of 30% less cement has not only a positive financial impact on the price of the product, but also thanks to reducing CO² it has a significant benefit for the environment. If 2.4 billion tons of currently unused inert material from demolition waste were utilised, this would reduce the CO² footprint by 620 million tons every year, with a financial benefit of more than 115 000 billion USD annually.

“Our technology is circular, because it does not represent either an environmental or economic burden. On the contrary, it is an opportunity and source of raw materials, which through their repeated use bring profits to firms, municipalities, regions and society as a whole. Our technology is sustainable, positively influences the environment and works as prevention against waste generation.”

PAVEL GORECKY
Managing Director, ERC-TECH

Conversion of waste plastic foils into a raw material for further production

What it's about

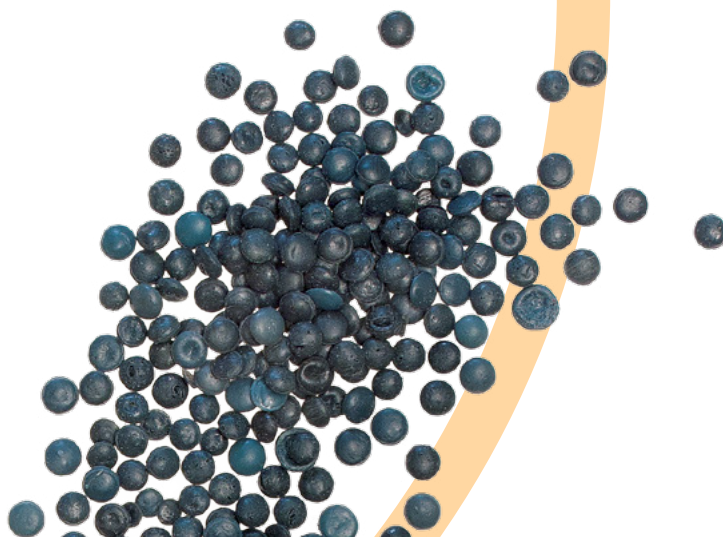
In Europe only approximately 25% of plastics are recycled. The SUEZ group is a pioneer in the field of recycling and the circular economy in general. It operates nine technologies for processing and recycling various types of plastics in Europe. The argument in favour of recycling cannot be disputed: the production of one ton of recycled plastic saves five barrels of oil and the equivalent of 1.6 tons of CO².

The challenge

The main challenge was to replace a natural resource with a recycled raw material and to utilise waste material (specifically plastic LDPE foils), for which processing technology was previously lacking in the Czech Republic. This waste either ended abroad or even in incinerators or landfills. The aim was to recycle a specific type of waste plastic into regranulate of such quality that it would bear comparison with granulate from a natural raw material, namely crude oil. This was made possible primarily thanks to the chosen technology and thorough sorting of the input material.

The result

SUEZ Využití zdrojů has managed its rebirth from a waste management company to a circular one, for example thanks to the launch and successful operation of a new recycling line for waste plastic foils from LDPE (low density polyethylene). The technology with an annual capacity of 5 000 tons is fully running in continuous operation and produces a material comparable in its quality to material produced from oil. Recycling activities generate more than 20% of the turnover of SUEZ Využití zdrojů, while with new investments and innovative solutions this proportion is constantly increasing.



“We are faced with the question of whether we are prepared for a revolution of resources. I am convinced that large companies are specifically prepared for the end of landfilling. They have anticipated the valid Czech legislation and EU initiatives, and are leaders in the field of the circular economy. They have realised that only permanently sustainable production, focused on a constant reduction of the environmental burden and effective utilisation of resources, is the key to long-term prosperity.”

CIUR



Cellulose insulation: after its use will be converted to fertilisers or fuel

What it's about

In 2018 the CIUR company was awarded by the Ministry of Industry and Trade of the Czech Republic in the category of Product from Secondary Raw Materials for the production of the cellulose insulation Climatizer Plus®. Since its establishment in 1991, the company has ranked among the world leaders in the field of producing cellulose fibres on the basis of recycled paper, and annually processes more than 35 tons of secondary raw materials. It produces environmentally friendly and certified products. Three separate manufacturing technologies produce more than 56 products in 84 modifications.

The challenge

The challenge lay primarily in how to utilise the unrepeatable physical-chemical properties of natural cellulose fibre, and manufacture an insulation material from recycled paper which thanks to its properties, used input material, manufacturing process and utilisation would have a positive impact on the environment after the end of its long life span.

A further challenge was to find an optimal method by which to process recycled paper and produce from it insulation material with high quality technical parameters, using an ecological manufacturing process, ecological application and with a positive impact on the environment after the end of the product's life cycle. On the basis of the research, several dozen new methods were proposed for utilising cellulose fibre as an industrial fibre (for road construction, the metallurgical, energy and automobile industry).



The result

CIUR has been producing the ecological cellulose insulation Climatizer Plus® since 1991 using patented technology. The product combines excellent ecological and technical parameters. The insulation for thermal and acoustic protection of buildings is produced from waste newspaper, with an admixture of mineral salts used also in the foodstuffs industry. Blowing with compressed air is used for application. After the end of the life cycle of the insulation, it can be used as a fertiliser, compost, fuel for biogas stations or can be reprocessed into other material.

"We've been producing the ecological insulation Climatizer Plus® using patented technology since 1991. We have more than 25 years' experience with it in 26 countries worldwide."

MICHAL URBÁNEK
Managing Director, CIUR

NAFIGATE Corporation



An idea for the whole world: when frying oil becomes bioplastic

What it's about

Hydal ranks among "upcycling" technologies, and is furthermore inspired by natural processes. Bacteria which produce biopolymer as a store of energy for harder times have been a part of our ecosystem for millions of years. As a result, nature knows not only how to produce this biopolymer, but also to recycle it, since if it is not consumed by the bacteria themselves, it serves as food for other microorganisms. The produced polymer type PHB is therefore 100% biodegradable. Hence the greatest benefit of the new technology Hydal consists in the fact that it partially enables a solution of problems in connection with pollution of the planet caused by plastics and microplastics.

The challenge

At the beginning of the project was the idea of limiting waste of foodstuffs and replacing food by waste. After laboratory confirmation that this was possible – and in fact with even better results than upon the use of foodstuffs – scientists and business people joined forces and found an economically highly effective way of producing biopolymer from a waste product that has reached the end of its life cycle (used oil).

The result

The result is biopolymer Hydal PHA produced on the basis of the "game changing technology" Hydal. And this term is used because the game is truly changing – we are transforming the biopolymers and bioplastics.



"In the first phase of development of Hydal, we were just looking for a way to use waste economically. We didn't fully realise what a fundamental contribution these technologies could have for the globalised world. Today we know. And it's incredibly motivating for our whole team. We're proud to be working on precisely such a project. And that there are so many people and firms on the planet that are interested in this theme and are willing to get involved."

LENKA MYNÁŘOVÁ
Chief Marketing Officer
and co-owner, NAFIGATE Corporation

The Tale of the Pioneering Czech Technology Hydal

Hydal is the first biotechnology in the world which is able to produce biopolymer from waste oil on an industrial scale without removing valuable resources from the food chain. It is a Czech circular economy concept, which is based on utilising a resource that is currently difficult to recycle, in order to produce at the end of the process a product with high added value. Biopolymers are currently rocking the world, since their production consumes only one half of the energy in comparison with regular plastics made from oil. The global trend and at the same time a global necessity is a general shift away from fossil fuels, with an endeavour to close cycles of already existing materials, in which emphasis is placed also on maintaining the highest possible quality.

From an academic environment to an industrial scale

Lenka Mynářová, today the executive marketing director and co-owner of NAFIGATE Corporation a.s. (plc), meets professor Ivana Márová at the University of Technology in Brno. The aim of the visit is to determine whether there are any good ideas "in the closet" within the academic environment of the university which would be worth Lenka investing her energy and the necessary resources in.

The year is 2012, and the situation is almost identical to today: there are several bridges between the academic and commercial sphere which are not always crossed, and as a result many excellent research results remain in this metaphorical "closet". The answer to Lenka's question is a sheet of paper with the title "Producing Bioplastic from Used Frying Oil". This is the paper that provided the idea behind the development of an entire technology.

And here begins the tale of a project which today is gaining global recognition, and is one of the most innovative Czech projects in the field of the circular economy. In the same year, the NAFIGATE Corporation purchased a licence for this patent and also implemented a phase of transition of technology from the laboratory into the world of industry. In this it co-operated not only with the Brno University of Technology, but also with the Institute of Microbiology of the Czech Academy of Sciences in Prague, the University of Chemistry and Technology in Prague, the Research Institute of Chemical Technology in Šáľa and other scientific centres.

In the right place at the right time? Not quite

Although Hydal looks like a project which originated within a moment in the right place at the right time, in reality it has almost ten years of hard work behind it. This is the average time

"It's too good to be true."



it takes for the development of a concept, from the initial idea to industrial production. And it's only rarely that it's possible to speed up this process.

Moreover, approximately only one concept out of a thousand reaches the phase of industrial production. And this route is extremely complex and difficult.

"Hydal is now in year 9 - so it's exactly where it should be. And what are the greatest obstacles on this path? You have to stay motivated for several years, with the faith that you'll succeed. You solve problems and come up against obstacles every day. You don't find many people who believe in you. You have no certainty that you genuinely will succeed. You never have enough money," adds Lenka Mynářová, today with a wide smile on her face. However, her optimism is contagious, and seems to be a key factor for the project, which in this year of 2018 announced the launch of the construction of the first plant producing biopolymer from waste oil in the Czech Republic.

After years of hard work, recognition on a global level

The fact that this is a genuinely successful project is attested to by a range of awards. In 2015 Hydal was the first Czech technology to gain the prestigious American Frost and Sullivan Award for the best innovation. This biotechnology has also won significant awards in China, where it was ranked among the TOP 10 products, and has also gained recognition in the European Union, where it was twice awarded the Seal of Excellence Horizon 2020. In 2018 it won third prize in the prestigious Czech competition SDGs Awards, for meeting UN Sustainable Development Goals in the Czech Republic, and in April of the same year the Czech Business Council for Sustainable Development awarded Hydal as the best project in the Industry category.

A simple idea and simple recycling

The unique biotechnology Hydal is the only technology in the world that is able, industrially and without waste, with the aid of bacteria, to process waste cooking oil, which today is problematic waste, and convert it into an entirely new, highly valuable raw material – biopolymer type PHB. This is subsequently used as a raw material for the production of bioplastics or as a natural biodegradable microplastic which can be applied in cosmetics. When bioplastic has finished its life cycle, you need not worry about throwing onto your household compost or a biological waste bin. Nothing will remain – it will break down into water and CO².

In addition, unlike other types of biodegradable bioplastics, it does not require input agricultural material such as corn, potatoes, sugar cane or sugar beet. It therefore doesn't become a competitor for the production of foodstuffs. If we wished to produce biopolymer PHB from potatoes for example, we would need approximately 18.4 tons. Only 1.14 of oil is required, and conversion is therefore highly effective. **Hydal thus brings a solution not only for recycling used kitchen oil, but also in the search for a cheap raw material which does not increase the exploitation of natural capital for the production of bioplastics.**

China among those most interested in Hydal

There are no global numbers on the actual production of WCO (waste cooking oil). In a number of countries, such as China, this theme is taboo, because WCO represents a fundamental problem – it is a fully toxic substance. Expert estimates insist that in China alone, 30 million tons of these oils are produced annually. And regular practice is such that an immense quantity ends on the black market. Here it is filtered and reused in restaurants. However, the Chinese government wishes to do battle with this problem, which presents an opportunity for Hydal.

Today waste cooking oils are used especially in biodiesel. Although this is 2-3x more expensive than diesel, it is practically the only method of recycling waste oils. Moreover, biodiesel is artificially subsidised. As a result, today the EU is becoming the "dustbin of the world", since waste oils from the whole world are being sent here. However, the quality of Chinese oil is so low that it is not suitable even for the production of biodiesel. Precisely for this reason, China is seeking any other technology that could resolve this current environmental problem, which also represents a danger to human health. The answer they are looking for may just be this Czech idea.

However, there is room for ecological innovation also beyond China. The entire world is facing the same dilemma. In the USA 10 million tons of oil are produced annually – in restaurants alone. Japan produces – again, in restaurants alone – approximately 300 thousand tons. In the Czech Republic the collection of oil is being introduced in municipalities, as is the case in dozens of other countries. Ordinarily oils are poured into the sewer-

age system and become an immense problem, which literally accumulates. Pouring oil into the sewer results in the formation of blockages weighing several tons, which are a nightmare to remove for sewerage operators.

Where to go with the first batch of biopolymer?

A new plant for recycling waste cooking oil is also planned in the Czech Republic. It is being built by the Bochemie company from Bohumín within its complex for approximately 14 million Euro (approx. 362 million Czech crowns). The plant will industrially produce biopolymer, but also natural substances on the basis of Hydal PHA, which can be used for example in cosmetics. Operation is due to be launched in the second half of 2020.

As Lenka Mynářová stated at a press conference in June 2018, where the launch of the construction of the plant was announced, this is the result of several years of operation between various parties. Recently packaging companies have shown an interest in bioplastic. However, if bioplastic is indistinguishable from normal plastic, it practically destroys the recycling cycle. This is because it is produced from completely different materials, and must therefore be collected separately.

Surprisingly, products from the first Hydal plant will find application in the cosmetics industry. Immediately after the problem of the low level of plastic recycling, the EU also has a problem with microplastics, i.e. with particles of plastic which are so small that it is impossible to prevent their escape into the environment. And similar microplastics are used by almost every woman in peeling (abrasive) cosmetic preparations.

The NAFIGATE Corporation has therefore established co-operation with the Scandinavian giant ORKLA, which plans to create a functional cycle between its foodstuffs and cosmetics divisions. Today, waste cooking oil that has been used to fry chips is used for the production of biodiesel, in which the oil is burnt and loses value. In future it shall be used to produce biopolymer substances, by which its value in the final phase shall be further increased – a process of "upcycling" will take place, in which the original product obtains further value thanks to the technological process of its treatment. It shall therefore replace microplastics, which end in water treatment sludge and subsequently often in agricultural lands to where the sludge is taken. By contrast, the new abrasive particles degrade under natural conditions, and therefore place no burden on the environment.

Hydal is thus becoming a pioneering Czech project based on a modest idea and several years of hard work. The driving force was a strong vision and the fact that technology solves a problem which today is facing virtually every state in the world.

You can also find an interview on the project in the monthly journal Waste Forum, which deals with the theme of the circular economy and trends in waste management.

Did you know that...

... the Czech Republic ranks among the first countries to provide lifelong education to managers of companies which have an interest in the principles of the circular economy and are seeking ways in which to apply these in practice? The content of the Circular Economy course includes both theoretical knowledge taught by academics from the University of Chemistry and Technology, Prague, and specific examples from practice, presented by experts and supplemented with excursions and workshops. The course attendees are also familiarised with the complete legislative framework into which these principles fit and of which it is necessary to maintain a constant and current overview.

The annual lifelong education course takes place always from September to May, and those interested can register here: <https://cv.vscht.cz/kurzy-cv/obehove-hospodarstvi>.

Technology as a recipe for a circular economy



JIŘÍ NAVRÁTIL

**Director of Science Technologies,
Direct People**

In seeking further values in waste, or ways to reuse them, a large role is played by suitable technology. The same applies in the case of service – or if you like repair – opportunities and in co-operation with the customer. Technology itself often opens the door to new possibilities of utilising waste which would normally not find any further application. Or it opens up possibilities to create innovative business models, as was enabled for example by digitisation. As a result there is an immense opportunity in waste and the use of new technologies, which many firms are still unaware of.

Technology and the mindset of the circular economy view processes materials in such a manner as to entirely avoid the creation of waste. On the basis of technological knowledge, it is possible to establish a new commercial branch (as successfully achieved by the NAFIGATE Corporation, with its biotechnology Hydal) or to innovate existing business models.

Thanks to a change of mentality in a circular direction, even rigid branches of industry such as construction are experiencing innovations. So for example, the BIM (Building Information Model) environment digitises and optimises resource management. In combination with 3D printing it produces genuinely made to measure buildings and reduces the quantity of unused material. Last but not least, thanks to this valuable data is gathered for the creation of off-grid systems.

Already today there are buildings which use their waste – for example water – as a resource. Waste water is used for controlling the temperature of the internal environment and is returned into the system of the building. Some systems are

able to produce drinking water from atmospheric moisture, of which there is an excess for example in the cellar areas.

The energy sector is proceeding in a spirit of renewability. This is assisted for example by technologies such as organic solar cells. These organic substances, in the form of facade coating, are capable of generating electrical energy on the entire surface of buildings.

In the area of optimising labour with resources in agriculture, there are also technologies which minimise the impact on the surrounding environment. Biodegradable foils are used, which enable the irrigation of arable land only to the necessary depth, and thereby save substantially on the quantity of water. They also prevent the penetration of fertilisers into the deeper levels of the soil, and into precious groundwater. Furthermore, at the end of their life cycle, these foils are a source of nutrients for soil bacteria, which are able to metabolise these bioplastics and obtain nutrients from them. A pronounced trend is the use of bacteria for generating new materials or for effective utilisation of waste. Their metabolic processes are currently being intensively studied, and they are widely used in some branches of industry. Some modified bacteria are used to create pharmaceuticals or bioplastics from waste materials.

Japanese researchers are now concentrating on discovering bacteria which are able to metabolise plastics, producing carbon dioxide and basic building materials suitable for further use. These small organisms can bring new opportunities and open up paths in working with waste in several branches of industry.

Digitisation and resource management with zero waste in the environment is also having an impact on areas such as healthcare. Remote diagnosis of patients enables extensive gathering of data, which optimises the dosing of pharmaceuticals, and subsequently in co-operation with artificial intelligence can help anticipate fatal organ failures (e.g. of the heart). Thanks to this, the amount of patients coming into life-threatening situations is constantly being reduced.

We are surrounded by amazing technological opportunities. However, it is necessary to orient ourselves within them and follow them with an open mind and an awareness of social responsibility, which the circular economy offers.

Following technologies and creating research networking is the work of technological scouts. They are very well oriented within a scientific environment and have an overview of the technologies being innovated. Thanks to co-operation with research institutions and universities, they are able to find talented researchers or a combination of researchers in order to develop a technology or adapt it according to a new assignment from a specific firm.

Technological scouts may help firms in the transition to a circular principle of functioning, generate new profits and gain a long-term competitive advantage. And last but not least, they can bring to the firm a new view of an external partner in the area of utilisation of commodities which are seemingly regarded as unusable.

“We are surrounded by amazing technological opportunities. However, it is necessary to orient ourselves within them and follow them with an open mind and an awareness of social responsibility, which the circular economy offers.”

Let's work together!

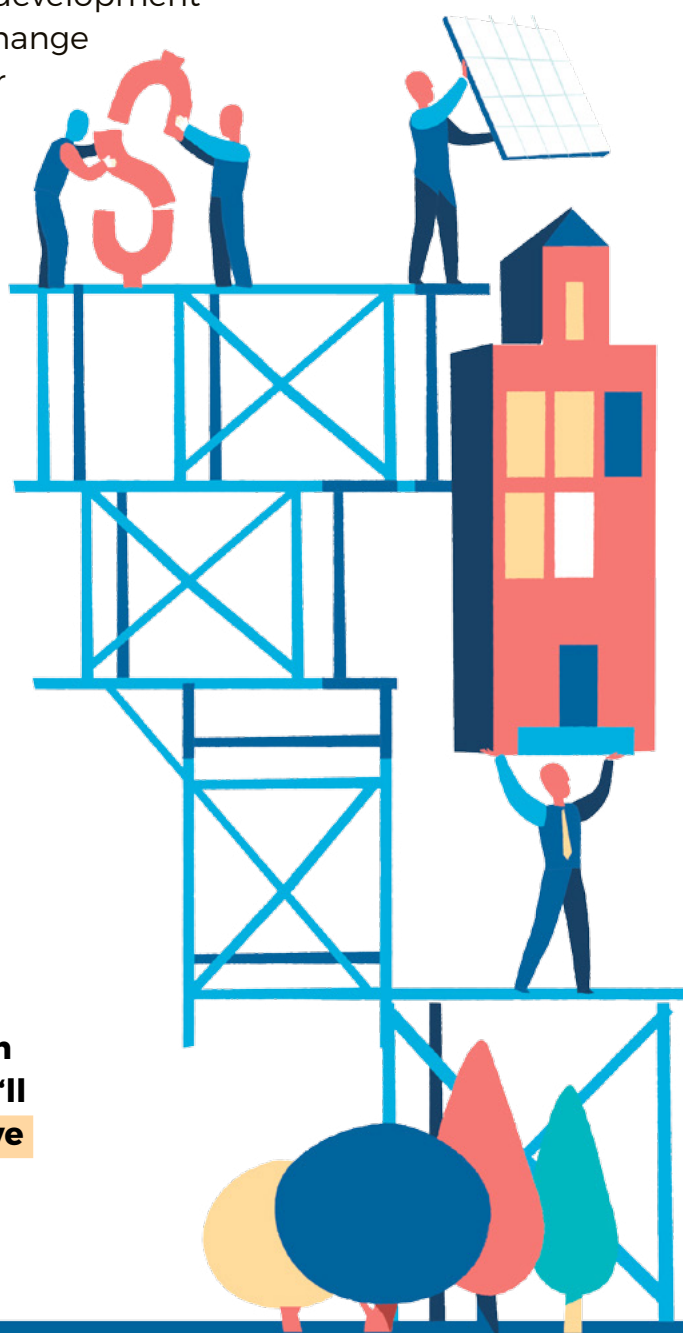
In this age of instant information, constantly changing trends and accelerating technological advance, we have a tendency to search for the key to easy, smart and quickly implementable solutions.

However, the circular economy is built on the principles of long-term sustainable development, and the key to its development is interdisciplinary co-operation, a willingness to change established patterns of behaviour and in particular a willingness to seek new paths, which are nevertheless based on principles that have functioned for centuries. These are respect for natural resources and a humble approach to business. Such projects require a greater amount of attention and time than the mere application of digital technologies to everyday processes.

As a result, it is no coincidence that these fundamental principles have become the foundations on which the innovation agency Direct People and the non-governmental non-profit organisation INCIEN are built. Thanks to the interconnection of the world of innovation in business with ecological aspects, together we can help firms seek new paths for developing their business.

We believe that Czech firms have incredible potential, and it is our dream to cultivate this together.

If you too are considering introducing the principles of the circular economy into your firm and do not know how to begin, let us know. We'll be happy to help you. Because the most effective way to succeed is to simply begin!



Contacts,

links and resources

Contacts

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Where to find news about the circular economy:

Zajímej.se: portal on circular economy www.zajimej.se

Waste Forum: journal on new features in waste management and circular economy

Ministry of Industry and Trade: each year organises a competition for the best circular projects entitled "Waste to Resources Conversion", and provides innovation vouchers for firms
www.mpo.cz/cz/rozcestnik/pro-media/tiskove-zpravy/do-souteze-premena-odpadu-na-zdroje-se-muzete-prihlasit-az-do-20-dubna-2018--vyhrat-lze-treba-studijni-cestu-do-etioapie--235841/

Czech Circular Economy Association: affiliates firms which are introducing ideas of the circular economy into practice.

University of Chemistry and Technology: holds a lifelong education course which offers detailed information and a genuinely deep approach on the theme: <https://cv.vscht.cz/kurzy-cv/obehove-hospodarstvi>.

Interesting links and resources you have encountered in the text:

IKEA: information about project Second Life for Furniture
www.druhyzivotnabytku.cz (VIDEO: www.youtube.com/watch?v=FGNoNy5gxp8)

CSR and Reputation Research 2016 www.retailnews.cz/wp-content/uploads/2017/03/T.-Mack%C5%AF-Ipsos-p%C5%99ed-n%C3%A1%C5%A1ka-na-konf-o-udr%C5%BEitelnosti_22_03_2017.pdf

Czech Circular Economy Association – barriers to innovation: <http://www.caobh.cz/o-nas/>

Criteria for 2nd annual competition of the Ministry of Industry and Trade "Waste to Resources Conversion":
<https://druhotnasurovina.mpo.cz/images/criteria/kategorie1.pdf>

Holland Circular Hotspot www.hollandcircularhotspot.nl

Thanks

This study would never have been possible without the co-operation of many wonderful people and inspirational firms. Direct People together with INCIEN especially thank Kateřina Kodadová and the SUEZ company for their co-operation on the idea for the creation of this material, and for supplying certain source materials.

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The partner of the English edition of the Circular Czechia study is the Embassy of the Kingdom of the Netherlands in the Czech Republic. This organisation contributes actively to transmitting knowledge, technologies and best practice examples, and actively support co-operation between the Czech Republic and the Netherlands, the global hotspot of the circular economy.

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CIRCULAR CZECHIA

A circular economy as an opportunity for successful innovations of Czech firms

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