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SUCCESS STORIES

At eye level with the big ones

Sustainable textiles for the future

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AT EYE LEVEL WITH THE BIG ONES

The small Viennese machine tool company Paigl today saves up to 500 euro per machine and shift in the machining of fiberglass components. This is a result of participating in the CORNET "High Performance Manufacturing" Project.

A good business climate is possible. Wolfgang Bitter, together with his partner Andreas Weiß, runs a "two-family" operation in Vienna's 14th district. Hans Paigl GmbH is a company with 13 employees, more than half of whom are related to management. The only thing that seems a little unfamiliar is the company name – a relic from the takeover of the company in 1998. But Hans Paigl GmbH is also proof that the ingenuity of a company is in the head and not in the balance sheet. The small machine tool company is one of 21 Austrian SMEs participating in the international CORNET Project "High Performance Manufacturing" (HPM) from which 200 enterprises in the metal industry from all over Austria are profiting. The entire HPM program is supported by research institutes, industry representatives and companies from Austria, Germany and Slovenia. In Austria alone, efforts are underway to develop improved cutting processes, new tools, intelligent machine designs and new material procedures using the expertise of four institutes from inside and outside of universities. On the Austrian side, 60 percent of the HPM participation was funded by the Austrian Research Promotion Agency (FFG). The rest was financed by EcoPlus, the Business Agency of Lower Austria, and its Viennese pendant, the Economic Advancement Fund.

"Paigl saves up to 500 euro per shift and machine due to practical benefits derived from the theory-based research results of CORNET", according the owners Andreas Weiß (l) and Wolfgang Bitter.

TRANSNATIONAL RESEARCH FOR THE BENEFIT OF SMES

For Wolfgang Bitter and many other machine tool companies, the problem was clearly defined. "We all continued to have problems with the machining of fibreglass components. Depending on the cutting speed, we ended up with frayed work-pieces or broken tools." No self-respecting toolmaker would be satisfied with that. "We sought out scientific support for coming up with the right parameters for fibreglass machining." Wolfgang Bitter and Andreas Weiß fell back on a trusted contact. "We knew that the Institute of Production Engineering of the Technical University (TU) Vienna has the necessary technical infrastructure to tackle the problem," says Bitter. They had already gotten the right answers there to other questions. What is important here: The small company in Vienna has no threshold fear of research facilities – "never did," Bitter emphasizes. Making contact was worth it. It allowed Paigl GmbH to gain access to the CORNET HPM Project which dealt in part with precisely those theoretical problems that could help Paigl in its work. The university technicians developed a general test program that Paigl tailored to its individual needs, bringing to fruition the principle of collective research: adapting and applying the most recent basic research findings to the objectives of the many companies. "We machined the material at varying cutting speeds and took it to the TU where our work-pieces and those of other companies were examined," is how Bitter

describes his role in the development process. Based on the newly formulated material parameters, the TU sought the optimum ratio between cutting speed and tool wear for such specific materials. Successfully, as it turned out. After six months of milling and measuring, the correct settings for machining the material were found. For Bitter, the result of his cooperation within CORNET HPM Project is clearly quantifiable. "When machining fibreglass, we now save up to 500 euro per shift and machine." His operating expenditure: roughly 60 working hours. Direct capital outflow: zero. In addition to his own personal advantages, at the end of the project, Bitter, as well as all the other partner companies, will have access to all research results of the CORNET HPM Project compiled by the involved international research institutes. The Paigl example shows how even a medium-sized company can derive practical benefits from the theory-based research results of CORNET. But Bitter enjoys an additional benefit for himself and his company by participating in this project. "The networking in such projects is incalculable. You interact with university professors and other industry notables on the same level."

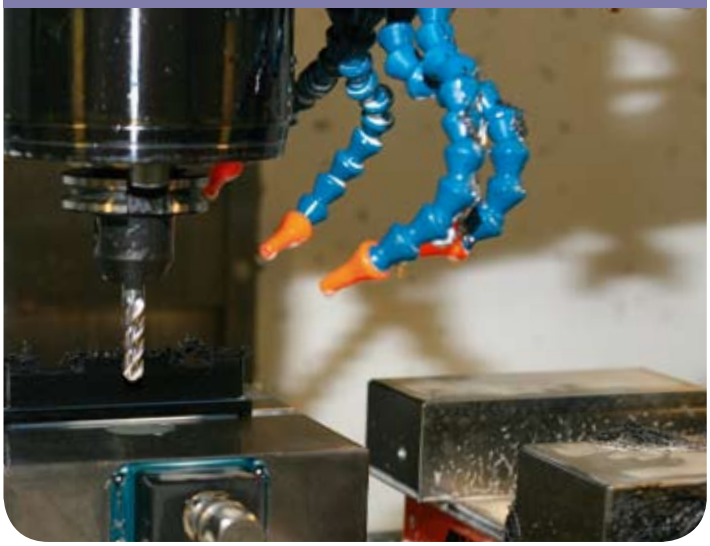
FOLLOWING IN THE FOOTSTEPS OF THE BIG PLAYERS

Collective Research represents the currently most popular working model, in which knowledge and innovation from research institutes inside and outside of universities are prepared to transfer them to Europe's small and medium-sized enterprises. CORNET targets collective research that makes international basic research findings available to industry and especially SMEs.

"When machining fibreglass, we now save up to 500 euro per shift and machine."

In each of the three funding countries of the HPM Project – Austria, Germany and Slovenia – there is a "local group" consisting of research facilities as scientific partners, clusters of manufacturing industries and several small and medium-sized enterprises as industrial advisors. All of these partners collaborate in this project across borders to exchange information and come up with new machining technologies. In the case of HPM, it is the Vienna-Lower Austria Autocluster ACVR that took on the role of chief administrator of all partner institutions. ACVR Manager Peter Kuen: "It is our task to bring suitable institutions and enterprises on board that have an interest in the problem and the ability to solve it." Collective Research is a "logical organizational form" for allowing SMEs to share international research results. "The results of the research

CORNET makes transnational collective research findings available to industry and enterprises.



are distributed to the partners. At a later stage, there will be a general publication," according to Peter Kuen. The results are collected in a database, processed and already accessible free of charge. There is already international interest in the HPM results regarding material machining. Website visits from all continents and civilian as well as non-civilian institutions confirm the repercussion of the international joint project: Collective Research prepares industry solutions that can be translated by the SME into individual solutions. Paigl and its managers are living proof of this.

PROJECT DETAILS

Project title
- High Performance Manufacturing

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Research (summary)
- The overall objective of High Performance Manufacturing is to increase efficiency and quality of production processes associated with rapid and successful introduction of high-tech materials.

Involved countries
- Austria, Germany and Slovenia

SUSTAINABLE TEXTILES FOR THE FUTURE

Oil is the fuel that drives the global economy, but oil reserves are going down. And there are major concerns about the future because of our great dependency on oil and its impact on the environment. The energy sector is putting forward solutions and the search for alternatives to oil as a raw material is in full swing. The textile industry is also doing its bit through the use of biopolymers like PLA and PTT. This is being done on a small scale, which makes further research necessary.

The complete exploration and valorisation of the potential of biopolymers and their often unique properties are matters high on the agenda of the textile industry. In a CORNET project called Biotext, a consortium led by Centexbel, the scientific and technological research centre of the Belgian textile industry, is laying the foundations for further research into high-quality applications of biopolymers in textiles.

Project leader Ruys: "CORNET is providing us with the funding to carry out collective transnational research and to create the necessary synergy".

SYNERGY THROUGH TRANSNATIONAL RESEARCH

The economic dimension plays a role as well as the ecological one. In the West European textile industry there is still scope for innovation that can trigger a new élan. There are opportunities that can be leveraged by conducting research into high-quality and predominantly technical textile applications. "So there were ample reasons for participating in 2006 in the CORNET initiative," says Luc Ruys, the man at Centexbel responsible for Biotext. "This European programme provides us with the funding to carry out collective transnational research and also to create the necessary synergy. We found three research centres willing to come into the project, namely ITCF (Denkendorf) and ITA (Aachen) in Germany and AITEX in Spain". The project got underway in July 2007 and is scheduled to run until mid-2009.

The research focuses on experimental biopolymer families and their usability during extrusion processes for textile applications. Extrusion involves pressing the polymers in liquefied form through a forming plate and then cooling them down. This allows production of semi-manufactures like monofilaments and tapes, filament yarn and bicomponent yarn. "We set to work with melt-processible starch derivatives, copolymers of polylactic acid (PLA), polyhydroxybutyric acid (PHB) and copolymers of them," adds Ruys. "At Centexbel we are examining how these different types behave in extrusion processes. ITCF in Denkendorf is concentrating on the textile research and studying the polymers themselves. ITA in Aachen specialises in the further processing stages. AITEX in Spain started up extrusion tests for making bicomponent yarn, with two polymers alongside each other in a filament."

INITIAL RESULTS ENCOURAGING

Centexbel obtained the required raw materials in the form of starch polymers. The research centre processes them into rough textile applications, i.e. monofilaments with a diameter between 50 micrometres and 1 millimetre, and also tapes and narrow strips. "Fibres of this kind are

Centexbel processes starch polymers into textile applications: monofilaments, tapes and narrow strips.

excellent for our experiments," explains Ruys. "We built pilot extrusion lines that come close to the industrial process for them. Extrusion is obviously still not taking place optimally, in comparison with oil-based polymers. Nevertheless, we are already able to produce a small quantity of filaments."

The textile industry is interested in what the project has yielded so far. There is not yet a ready-to-go industrial process, because the mechanical properties are not yet sufficiently under control. "All the same, this project has already fulfilled our expectations," says a satisfied Ruys. "We are currently working at speeds of 1500 metres per minute. Standard speeds in the industry vary from 2000 to 5000 metres per minute, depending on the type of yarn. We are now expanding the research by experimenting with higher extrusion speeds."

The partner research institutions in Germany have also secured positive results. The research into the use of biopolymers showed that certain combinations of monomers can be processed into filaments, with a maximum ratio of 80% PLA to 20% PHB. This was achieved with extrusion to a limited quantity of multifilaments with a diameter of 20 micrometres. AITEX, the Spanish partner in the project, first gained experience with a new bicomponent line. Consequently, they did not enter the project until July 2008, with bicomponent extrusions of biopolymers. The initial results in this field are now coming to the fore. Centred on this basic selection of filaments, the research will progress to other types of extrusion, enabling the production of fine yarn.

FOLLOW-UP PROJECT PLANNED

There is going to be a follow-up to Biotext. Centexbel is working on an application to CORNET for a follow-on project that will experiment with the composition of the yarn. The research will concentrate on specific applications. The focus will be on technical textiles and more specifically on textiles for hygiene and medical applications. In the longer term, the research may be widened to include applications in interior textiles or in sportswear and other clothing.

"There are numerous advantages to using biopolymers in textile applications."

"There are numerous advantages to using biopolymers in textile applications," explains Ruys. "Not only are they products that cause hardly any CO_2 emissions during manufacture, they are also biodegradable. For example, there are agricultural films for use in the field, made of starch-based polymers. They are usable for one or two seasons and then simply disappear". Another example is that the absorbent properties of fibres based on biopolymers are adjustable. This makes them excellently suited to medical applications in products like bandages. What's more, the fibres also have fire-retarding qualities and a high degree of stability under ultraviolet light. "The biopolymer applications in textiles are endless," concludes Ruys. "Through the follow-on project we hope to be able to meet the demand of the textile industry and to offer in due course an innovative answer to the ecological and economic challenges of today and tomorrow."

PROJECT DETAILS

Project title

- Properties and potentials of biopolymers in textile extrusion applications

Project coordinator

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Research (summary)

- The aim is to correlate the raw material parameters and processing parameters with the resulting morphology (internal structure) and resulting fibre properties.

Involved countries

- Belgium, Spain and Germany

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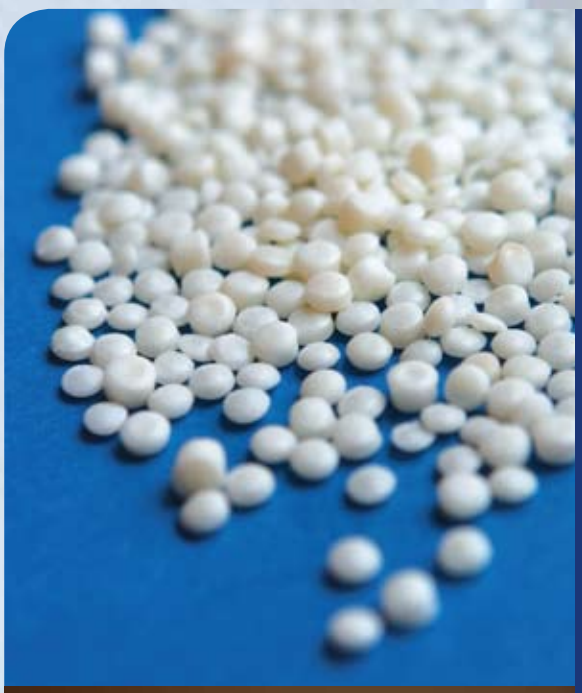

CORNET

CORNET stands for Collective Research Networking. It is a network for information exchange and collaboration between national and regional programmes and schemes for collective research across Europe. The objective is to promote close cooperation between the responsible national/ regional ministries and agencies and to create opportunities to set up transnational collective research with national/regional funding. This means that CORNET partners in the participating countries and regions are working together to align programme conditions and procedures.

Up to date information on CORNET, calls for proposals, rules for participation, and participating countries and regions is available on the CORNET website: www.cornet-era.net. For specific questions please contact your national or regional funding organisation; the contact details are also on the CORNET website.