

GOOD PRACTICES

***University-Industry cooperation
models in Kosovo and Austria***

"The path to employability and competitiveness in a global setting is becoming more and more a question of ability to absorb and apply knowledge. Every day know-how and new skills are being created in workplaces as firms and employees struggle to develop new products and services, to solve problems in a demanding market and to create value. However, this knowledge only rarely finds its way to the education sector. The same is true of the opposite direction of knowledge flow; research results and theoretical as well as practical skills, which are developed in research and education institutions, filter down to employers with difficulty, mainly through the knowledge and skills of graduates. "

Methodology for the Development of a Sector Profile, p.9, project ALLED, Kosovo 2016

Pristina/Graz 2018
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Dear Reader,

Maria Rottensteiner, Project Manager at WUS Austria

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Education has always been considered one of the cornerstones of development and building human capacities has proven a useful tool in mitigating global inequalities. The HERAS project supports the modernisation of education policies, systems and institutions in Kosovo, to help improve the educational landscape. Building the capacities of higher education institutions helps to provide students with an education that is more aligned to the needs of the labour market and society and better prepares them to tackle the challenges of the modern world.

Applied approaches in education and training focus on the development of personal skills and competencies so that people of all ages gain knowledge and understanding of the way in which the economy works and reacts to market forces. This involves approaches to the development of creativity, problem solving, team working, taking calculated risks, communication skills, leadership, decision taking, time management, taking responsibility and other individual skills which can lead to improved employment prospects. Applied study programmes also identify the role of the entrepreneur in society and the various requirements of self-employment. Also, they contribute to creating an entrepreneurial mindset and entrepreneurial competencies and skills.

Building bridges between higher education institutions and the world of work and closer cooperation in both directions is inevitable. Experience and results from earlier projects show that active involvement of non-academic partners in curriculum development and performance evaluation enhances the innovation potential of higher education institutions and the employability of their graduates.

Applied study programmes have not yet been very common in Kosovo. So far there are individual measures at the University of Prishtina and the University of Applied Sciences in Ferizaj (UASF), the latter is currently the only public university officially delivering applied study programmes. UASF, for example, develops activities in cooperation with local and international partners by connecting local economic needs (both regional and wider) with continuous improvement in the quality of learning, and thus features as good practice from Kosovo in the frame of this publication. Individual good practices at other higher education institutions in Kosovo are mostly based not on institutionalised but on individual cooperation of academic staff with companies. Many of these examples are good practices in their own case, and can be scaled up in the future.

Evidently, not all competences that are relevant for work places in Kosovo can be taught at educational institutions. The extent of applied sciences that can be provided at higher education institutions depends on the type of economic sector on the one hand and the field of study on the other hand: some sectors develop so fast (e.g. internet-based technologies) that specific training needs to take place at the work place in real time.

For Kosovo this means that new ways need to be found to capture and institutionalise the creative potential of university-industry cooperation and utilise it for the creation of a work force that is fit to contribute to the development of society and economy.

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LEGAL FRAMEWORKS IN AUSTRIA AND KOSOVO

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AUSTRIA

The legal basis for operating the Universities of Applied Sciences (UAS) in Austria is the University of Applied Sciences Studies Act (*Fachhochschul-Studiengesetz*¹). The highest state organs for the university sector are the Federal Ministry of Education, Science and Research and the *Agency for Quality Assurance and Accreditation Austria* (AQ Austria). The legislation contains only a few organisational requirements to provide for an orderly functioning of the studies:

University of Applied Sciences degree programmes may be provided by the Federal Government and other legal entities under public law. Legal entities under private law may provide University of Applied Sciences degree programmes if the primary object of their business is establishing, providing and operating University of Applied-Sciences degree programmes.

Universities of Applied Sciences and institutions offering University of Applied Sciences degree programmes shall offer degree programmes at university level, providing a scientifically rigorous professional education.

Their main objectives ("profile") shall be:

- Ensuring a practice-oriented education at university level
- Imparting the ability to solve problems in the respective profession according to the state of the art and the current and future practical requirements
- Promoting the permeability of the educational system and the professional flexibility of the graduates.

Some of the main principles for designing studies can also be found in the law (e.g. that the different scientific doctrines and scientific methods must be taken into account or the reference to the principle of the freedom of teaching in connection with the organisation of courses in the framework of the teaching tasks to be complied with, as well as the design of their content and methodology). The detailed design, however, is left to the approval by AQ Austria.

Studies are established as bachelor degree programmes (180 ECTS credits) and master degree programmes (60 to 120 ECTS credits). There are no doctoral degree programmes in the UAS-sector.

Funding and infrastructure: One characteristic of the system of UAS is the system of mixed funding based on the standard cost system. The Federal Government bears a large part of the personnel and running costs per study place (norm cost model). Further costs (for buildings, investments, etc.) are borne by the UAS providers (usually the governments of the federal provinces, regional territorial authorities or other public and private institutions assume part of the costs). UAS are authorized to charge students tuition fees amounting to 363,36 EUR / semester (in 2018).

¹ Bundesgesetz über Fachhochschul-Studiengänge (*Fachhochschul-Studiengesetz – FHSStG*)
<https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10009895>

The Agency for Quality Assurance and Accreditation Austria has to accredit the implementation of University of Applied Sciences degree programmes ("programme accreditation"). The curriculum plays an important role in the accreditation procedure (obligatory professional practical training; attendance of the study courses is mandatory for students).

KOSOVO

The *Law on Higher Education for Kosovo* from 2011 bears no specific provisions for Universities of Applied Sciences^{2,3}. For universities operating under this title in the future, the extend of potential future provisions for applied sciences in Kosovo will be essential not only from an operational aspect, but also with regards to accreditation and public relations. Many young Kosovans are yet to become aware of the benefits of an education that relates to applied sciences, so to this day the majority of students choses to enrol in traditional universities.

The first and currently only University of Applied Sciences, the University of Applied Sciences in Ferizaj (USAF), was established in July 2015 by the Assembly of the Republic of Kosovo after 40 years operating as Faculty of Applied Sciences in Ferizaj and part of the University of Prishtina. The university takes good practice examples from the University of Applied Sciences Salzburg - Fachhochschule Salzburg, following close cooperation between the two institutions for almost 10 years. This cooperation has established a notion of what applied sciences are and can be in Kosovo in the future.

COOPERATION MODELS

Cooperation between higher education institutions, labour market and society is relevant to ensure that graduates can apply at their future working places what they have learnt during their educational programme. Three examples of potential cooperation models that are/can be realised in smaller markets, such as Kosovo:

Theses, scientific studies, research projects - can you afford not to cooperate?

In the frame of their thesis/project, students work together with a company on a real problem which the company faces (e.g. improving company-customer relationship). The work of the student can be paid or unpaid, financial funding can be provided by the company or external sources (through national funds foreseen for such collaborations). Students look for funding themselves or with support of the company/university (support for fundraising is often institutionalised at universities where many students undertake joint projects with companies).

University staff can contribute to or lead scientific studies or research projects together with companies/representatives of industry. The collaboration gives them an inside into current developments and challenges in the field/s that they teach and they can integrate this into the curriculum (curriculum review when necessary/where possible) through cases and examples, new reading material etc.. Students too can contribute to studies that are carried out in collaboration with companies. This can be part of a course project or course paper or as part of their final thesis.

To foster the development of such collaborations, awards by universities, companies or by municipalities (e.g. if the research is of regional consequence) can be given to the most excellent collaborations (including a small prize). This ultimately enhances the awareness raising and the importance of such collaborations (award event, media coverage). The selection panel includes representatives from industry and universities.

² LAW No.04/L-037 on Higher Education in the Republic of Kosovo;
<https://masht.rks-gov.net/uploads/2015/06/02-ligji-per-arsimin-e-larte-anglisht.pdf>

³ The new law on higher education is being drafted in 2018 and is expected to be adopted in 2019. On working group level it was discussed and agreed that the new law will have provisions for Universities of Applied Sciences, although at this moment it is not known to which extend.

Benefits for universities/students and companies:

- ✓ Broader access to experts in different fields with different competences
- ✓ Additional capacities available (are sometimes needed ad hoc)
- ✓ New insights and exchange on innovation needs, new methods and tools
- ✓ Successful graduates who find a job that matches their knowledge and competences; well educated (and sometimes trained) work force that needs little training to start a job
- ✓ More and deeper knowledge about current and future topics and challenges; increased competitiveness

Joint curriculum development

Exchange between university and industry on curriculum development does not mean that the labour market dictates what kind of graduates should be educated, but means to ensure that graduates, after years of learning and investing time and money, are able to find a job. Not just any job, but a job that corresponds to what they have learnt.

The involvement of business representatives in curriculum development is one of the key elements of university-business cooperation. This is to ensure that upon finishing their studies, graduates do not only hold a title but are also prepared to find a job that corresponds to their level of qualification. For the labour market this means that graduates are fit for work without much further training. This is of course not possible for all industries, as for example for sectors with complex or a broad variety of specific, tailor-made equipment which will usually have to train all newcomers in handling the equipment that is used specifically at their company/plant. However, being fit for the labour market goes beyond knowing how to use specific machines. It also means that graduates have an understanding of the scope and challenges of the industries in which they will be working, that they are prepared for working in different settings (independently, in larger or smaller teams etc.), and equipped with problem-solving skills. Also, the ability to learn and the significance of lifelong learning are becoming more important, and that graduates stay curious and motivated to learn throughout their careers.

Involvement of business/industries in curriculum development can happen in different ways, e.g. directly via an industrial board which joins curriculum development working sessions, round tables specifically with business representatives upon start of curriculum development; or indirectly via feedback on interns which the business hosts for a particular study programme. Ideally, a mix of different means is applied to ensure a relevant amount of critical feedback. The exchange between university and industry in the frame of curriculum development results in more labour-market relevant curricula and benefits the whole of society through better and faster economic development.

Joint product development

Companies and education institutions decide to jointly develop a product that requires research, a broad portfolio of expertise and experience and maybe special equipment that is not available in-house. Agreements on the scope of the input, financing and most importantly Intellectual Property Rights are a crucial threshold for joint product development. Reaching these agreements is intensive in time and resources, but once mutual trust between two or more cooperation partners is built, the products can be developed with decreasing efforts. Agreements of this form are extremely complex and require specific legal expertise and an operational framework that legally allows and supports such a kind of cooperation, which in many country-specific environments may not be the case (yet).

Mentorship - business to student

Mentorships aim to support students in the process of developing ideas and shaping them into a marketable product or project output (e.g. paper). A good mentor (senior staff from a company) helps his/her mentee (student) to think through an idea, that can be a business, product, or research, suggests ways to generate a start-up/product/research paper and provides the experience that the students are missing. Depending on the needs of the student, the mentorship may last over the whole process of developing an idea or covers only a particular part of the process (e.g. business plan development). The mentorship is a cooperation between mentor and mentee that is beneficial for both sides: the mentees benefit from the experience of the mentor on meeting a particular challenge, while the mentors stay in touch with the latest trends in a market of ideas and get to work with and maybe recruit young thinkers with new ideas and a fresh mindset.

The collaboration requires mutual respect and a code of conduct in order for the mentorship to be successful and satisfactory for both sides. It also requires a mutual understanding of what both sides expect from the mentorship and what should be its outcome/s. Mentorships are ideally institutionalised and come with a set of guidelines that represent goals, expectations, needs and responsibilities from both sides.

APPLIED STUDY PROGRAMMES - GOOD PRACTICES IN KOSOVO AND IN AUSTRIA

CASE 1. Partnership with the industry leading to the introduction of the University Industrial Board

University of Applied Sciences Ferizaj

The University of Applied Sciences in Ferizaj (UASF) was established in July 2015 by the Parliament of the Republic of Kosovo following a 40-year tradition of professional and applied science education which was at the time carried out by the Faculty of Applied Sciences in Ferizaj, as part of the University of Prishtina. The UASF is the only public educational institution in Kosovo providing applied study programmes. It provides programmes in four disciplines: Engineering and Informatics; Architecture, Design and Wood Technology; Tourism and Environment; and Management. The University has around 2000 students at its campus in Ferizaj. The Industrial Board of the University includes a large variety of different cooperation partners from the industries and contributes to making the university's educational services fit for the needs of the labour market.

Web: <http://www.ushaf.net/?lang=en>

Partnership with the industry leading to the introduction of the University Industrial Board



Photo: University of Ferizaj; picturing some of the companies the university has agreements with

When the University of Applied Sciences in Ferizaj (UASF) was established, one of the elements which differentiated UASF from other public universities in Kosovo was the strong collaboration with corporate partners which the Faculty of Applied Sciences of University of Prishtina had already started with the industry. The idea behind this approach originated from the first cooperation of Prof. Bajraktari, Dean of the Faculty of Applied Sciences of the University of Prishtina, with Prof. Petutschnigg from the University of Applied Sciences in Salzburg back in 2009. This cooperation was part of the Twinning Project with the Department of Forest Products Technology & Timber Construction at the University of Applied Sciences in Salzburg.

This new approach of strong and institutionalised university-industry cooperation, that UASF adopted afterwards, constitutes a distinctive characteristic with which the university is identified today in Kosovo. With this pioneering approach, UASF is accomplishing one of the key elements of its vision of a "modern, inventive and integrated education university, where practice complements theory and where advanced professional skills are developed for the future of the society" and thus becoming a model for other academic institutions.

Following its inception, UASF began signing Memorandums of Understanding (MoU) with local partners, followed by national businesses covering a wide range of industry, with the main focus on the local furniture making industry. The purpose of the MoUs is to link the theoretical learning with practical work for greater achievement in education and advancement of knowledge in practice, as provisioned in the study programmes and their respective curricula as well as to develop business activities that benefit both institutions. The objectives of agreements with businesses are threefold:

- Realisation of practical work by the UASF students in the businesses with which an MoU has been signed;
- Development of students' theses by providing mentoring in the theoretical/scientific aspect as well as practical work in the company;
- Engagement of UASF in solving practical/scientific problems for companies (technical and research services).

After signing over 30 MoUs with different businesses, an Industrial Board was established in 2016. The Industrial Board consists of representatives of the industry (labour market) and authorities and business organisations (Chambers of Commerce, etc.) with which the University has signed cooperation agreements. It is a non-profit and advisory body of UASF and is based on the goodwill of its members for one key purpose: enhancing the quality of the education at UASF.

The main activities of the Board are:

- Providing advice and suggestions to the UASF Senate regarding existing study programmes for the purpose of updating them (align /adapt them to the companies' needs),
- Supporting the realisation of professional practice (work placement/internship) of UASF students, in accordance with the study programme needs,
- Collaboration with the UASF in research, professional services, project cooperation, innovation as well as proposals for cooperation on joint projects with the University and other partners,
- Providing scholarships for students as well as financial support for research projects of students and academic staff,
- Suggesting amendments, upgrading and amending regulations and other acts in force at UASF,
- Recommending the introduction of various education and training programmes to UASF including adult education and vocational training, etc.

The strong partnerships with the industry over the last two years have led to the successful completion of numerous activities:

- Organisation of two consultation sessions with the Industrial board for the revision of one study programme and the design of a new programme;
- Organisation of work placements of students at the end of the summer semester leading to the exhibition of students' practical work organised by UASF for three years in a row;
- Enabling regular student visits to the companies' facilities throughout the academic year;
- Participating in the employment fair with job openings exclusive to UASF students/graduates;
- Providing computer-aided design (CAD) training to a number of staff from different businesses, etc.

UASF plans to scale up the cooperation by offering the university's knowledge, facilities and newly acquired equipment (machines and computerised workshop equipment, i.e. 3D scanners and rapid prototyping) to businesses in innovation and new product development initiatives, so that UASF can also fulfil its part of the agreement.

Text provided by the university.

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CASE 2. Students' projects based on challenges from the business world



Faculty of Mechanical Engineering at University of Prishtina "Hasan Prishtina"

The Faculty of Mechanical Engineering (FME) is part of the University of Prishtina "Hasan Prishtina". It has more than 1,300 students. There are 11 study programmes, 6 at Bachelor Level and 5 at Master level. Our Faculty has an international network of partner institutions from the region and from Europe and participates in various international projects like Erasmus+, HERAS, HigherKos, ALLED, etc. Our Faculty has established an Industrial Board as the result of the cooperation with industry and companies.

Programmes of FME are highly specialised in the areas of Production and Automation, Mechatronics, Thermoenergetics, Renewable Energies, Mechanical Constructions, Mechanisation, Industrial Management, Traffic and Transport. FME is a leading institution of Kosovo in the fields of Mechanical Engineering. The degree programmes are offered at university level, and aim at professional training, professional development, and scientific research. The Faculty has well developed R&D centres and laboratories which also cooperate with business partners in many different projects. Recently, FME has established the Innovation Centre, part of a cooperation between the University of Prishtina "Hasan Prishtina" and the Ministry of Innovations and Entrepreneurship of Republic of Kosovo.

Web: <https://fim.uni-pr.edu>

Project 1: Development of an electrical wheelchair

The project "Autotronic DP" about the development of an electrical wheelchair for persons with disabilities was developed by Mechatronics students and financially supported by the HERAS Project.

The purpose of this project was to design and to develop a compact vehicle in order to be able to move in certain exterior and interior environments. The vehicle is designed to suit the needs of people with disabilities.

The electric vehicle uses an electric motor that is supplied with electricity from a battery. The electric vehicle has many advantages such as low noise and zero pollution of the environment. It is designed to operate with higher energy efficiency than internal combustion engine vehicles.

The purpose of this vehicle development was to make life for disabled persons easier and more comfortable by installing various sensors, signalling, lighting and other auxiliary equipment.

Besides helping to improve the life of a particular group of people who are disabled, the development of this project was challenging the skills of the students which were acquired during the studies. With the development of this vehicle, students also gained knowledge of project planning, feasibility studies, vehicles design, mechanical construction by analysing and manufacturing various parts, installation and programming of various components.

Project 2: TePEMA (at the tree)

The Project "TePEMA" has been developed by Mechatronics students of the Faculty of Mechanical Engineering – FME and students of the Faculty of Civil Engineering and Architecture. The project was financially supported by UNICEF – "Innovation Lab Kosovo" and at the request of the Municipality of Prishtina City. It is located in Zahir Pajaziti Square in the Center of Prishtina. This project is considered as the most innovative project in the Republic of Kosovo.

The Project "TePEMA" aims at raising awareness of the environment and at improving the quality of air in open or closed environments, a target achieved through a combination of technology and plants. And our formula is **TECHNOLOGY + ECOLOGY = EFFICIENCY**.

According to the calculations, we have found that a single product of the prototype "TePEMA T" is equal to approximately 70 ordinary trees and the space is saved about 80 times. "TePEMA T" collects rainwater precipitation that it uses for irrigation and is characterised by high efficiency. In the construction that was developed are planted plants.

The plants have been chosen by professors, ecologists, and various biologists who helped in the selection, both in terms of absorbing pollutants and in resisting climate change. Plants absorb pollutant air gases during the photosynthesis process, while, during filtration of the air particles, they stop using them for food and keeping them in their biomass.

Our team consists of programmers, engineers, 3D modellers, constructors, designers, etc.

Text provided by the university.

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CASE 3. Cooperation between University of Applied Sciences in Ferizaj and Salzburg University of Applied Sciences in the field of Wood Science and Design Education

Salzburg University of Applied Sciences

At Salzburg University of Applied Sciences 2,700 students receive training in the disciplines of Engineering, Business and Social Sciences comprising Tourism, Business Management and Social Work, Design, Media & Arts and Health Studies. The institution focuses on future-oriented degree programmes and practice-oriented solutions for business and society, especially in the fields of technology, health and media.

Web: <https://www.fh-salzburg.ac.at/en/>

Cooperation between University of Applied Sciences in Ferizaj and Salzburg University of Applied Sciences in the field of Wood Science and Design Education



Photo: Michael Ebner

When the university cooperation started, back in 2009, the Faculty of Technical Applied Sciences Ferizaj was still part of the University of Prishtina. A Twinning Project with the Department of Forest Products Technology & Timber Construction at Salzburg University of Applied Sciences included an analysis of the forest and sawmill structure in Kosovo; a study of the properties of *Quercus cerris* with the goal of exploring new possibilities of using this species in the furniture production; and a survey which focused on an improvement of bioenergy usage in Kosovo. The results were presented and published in the proceedings of the '1st International Conference on Processing Technologies for the Forest and Biobased Products Industries' (September 2010) to an international audience. The main aim was to establish a new series of scientific conferences at the University of Prishtina with the objective to invite companies to take part in the conference and thus encourage a closer cooperation between industry and university.

During the HigherKOS project "Modernisation of higher education and improvement of the system of research in the field of forest, energy and environment protection" (2013-2015) particular attention was paid to the long term improvement of cooperation with the industry. A new study curriculum (today: "Interior Architecture and Furniture Design") which is more focused on design contents was developed for the Faculty of Applied Sciences at University of Prishtina. The implementation of the new curriculum led to a considerable increase in student numbers in 2014/15 and finally to the foundation of the University of Applied Sciences in Ferizaj (UASF) as an independent academic institution in 2017. The role model of Salzburg University of Applied Sciences (FHS) was of great importance in the whole process. The new curriculum implemented at the UASF makes the study programme more attractive and modern and in the long term will allow for the better development of the Kosovan wood industry.

To encourage an improvement of academic and management capacities as well as the modernisation of teaching methodologies, several workshops which allowed for project-based learning and teaching experiences were held in Ferizaj, Kosovo and Kuchl, Austria. The challenge certainly was to bring students and members of staff from both countries together and make them work on a common project and involve the industry and the local community in these activities. In the following, three of these workshops are briefly described to exemplify the way how these activities strongly contribute to university development.

In the workshop "Change by Design" (Ferizaj, November 2013) students redesigned an urban area in Ferizaj and presented their group results to a large audience with guests from inside and outside the university, including the national TV as well as journalists from local papers. Especially this presentation event made the workshop a very important experience for students and teachers and drew considerable attention to the study programme offered at Ferizaj campus.

The workshop "InnoWood" (Kuchl, March 2014) offered the possibility for 6 Kosovan students and 2 members of staff to take part in an Erasmus Intensive Programme workshop together with students and teachers from Austria, Finland, Hungary, Scotland and Spain. The interdisciplinary and transnational team constellations allowed for a particularly rich learning experience. Also in this project, after two weeks' intensive work the models, posters and concepts were presented to a larger audience and to experts from outside the university.

The successful cooperation continues in the third project edition in the frame of HERAS: Industrial Collaboration in Design Education (2017-2019). A workshop with the participation of a large number of students was held in Ferizaj in May 2018. This time the cooperation between industry and academia went a step further. The industry was not only involved in the presentation of the results but defined the workshop tasks from the very beginning. The students were sent out to make field studies in five companies of the Ferizaj region. The goal was to identify a product, an idea, a solution and describe a scenario where the company could go to in the future. In September 2019 another Scientific Conference will be held in Ferizaj which, apart from the international scientific exchange, will offer the possibility for the companies to present their views and needs and thus contribute to strengthen the cooperation between university and industry.

The key factors of the cooperation between FHS and the UASF have been from the very beginning the cooperation in the curriculum development with a strong focus on industry involvement; the exposure to new teaching methods with a focus on project-based learning in the educational workshops; and the scientific support through joint research papers. A very strong personal involvement on both sides adds to its success. Our motto for our ten-year cooperation has been learning by doing and learn from each other.

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CASE 4. Horizon 2020 project ThermoDrill – Fast track innovative drilling system for deep geothermal challenges in Europe

Montanuniversität Leoben

Montanuniversität Leoben is a Technical University in Austria with around 4,000 students and is well-known for undertaking high-quality research focused along the "added value chain", from the extraction of raw materials and their preparation, material & product development, production processes, manufacturing, building components/plants up to recycling and deposition. The different research areas of Montanuniversität Leoben embrace R&D for SMEs and for industry as well as for public institutions. Additionally, Montanuniversität Leoben participates in the setting-up of national competence centres, CD laboratories, research studios and it also takes part in a high number of national, European and international research projects.

Web: <http://www.unileoben.ac.at/en/>

Horizon 2020 project ThermoDrill – Fast track innovative drilling system for deep geothermal challenges in Europe



Photo: www.thermodrill-h2020.org, with permission of Montanuniversität Leoben

Geothermal energy is a key component of Europe's energy strategy to significantly enhance the share of renewable and sustainable energy systems in Europe. In order to make geothermal energy more attractive, there is an urgent need to provide cost-efficient and novel deep drilling technologies and concepts which increase the number of economically viable geothermal projects in Europe.

In the ThermoDrill project, an interdisciplinary team of experts from research and industry (9 partners from 6 different European countries; 2 universities and 7 industrial partners) has set itself the ambitious goal of developing a fast and cost-efficient drilling system based on an innovative combination of conventional rotary drilling and water jetting. The new technology will afford at least a 100% increase in the rate of penetration in hard rock, and an associated cost reduction of more than 30%.

The challenge

Europe is confronted with a number of significant challenges which are influenced by globalisation trends and political changes. For example, strong dependence on gas supplies from Russia is a potential threat not only to Europe's energy security but also to European society and industry as a whole. The use of geothermal energy as a renewable resource is a fundamental prerequisite for ensuring a secure and sustainable energy supply in Europe.

Enhanced Geothermal Systems (EGS) have the potential to become a cornerstone of Europe's future renewable energy strategy. EGS can provide baseload energy 24 hours a day with near zero carbon emissions and can be implemented almost anywhere in the world. Favourable locations normally lie at depths of between 3,000 and 5,000 metres below the surface, usually in hard rock formations such as granite. As drilling costs rise exponentially with increasing depth, they represent the main cost drivers of geothermal plants, typically accounting for more than half of the investment costs.

The ThermoDrill project

As already mentioned the ThermoDrill partners collectively constitute a consortium of high quality, well suited and committed to the planned tasks assigned to them, since there is a good equilibrium between partners from different research and application fields as well as adequate industrial involvement to ensure the exploitation of results. So, for example, the two academic partners (Montanuniversität Leoben, Austria and Technische Universität München, Germany) bring in the latest scientific knowledge whereas three leading industrial drilling technology providers take care that the ThermoDrill developments are in line with the market requirements. Additionally, three end user partners contribute with their experience/know-how from national projects in Switzerland, France and Germany. That particular knowledge is further expanded within the ThermoDrill project. Another industrial partner from Spain is responsible that all health, safety and environment-related standards and regulations are met and that risk prevention is practiced.

This further means that the ThermoDrill consortium consists of world leading industrial and academic players in the deep geothermal energy field and has the experience, know-how and state-of-the-art facilities that allow to fully exploit the innovation potential which is associated with the ThermoDrill project target.

The ThermoDrill consortium addressed the following research and development topics in order to achieve these goals:

The ThermoDrill consortium addressed the following research and development topics in order to achieve these goals:

- Revolutionary and breakthrough drilling technology;
- Unique drill bit prototype;
- Novel drilling fluid tailored to the new drilling technology;
- Simulation and experiments.

Revolutionary and breakthrough drilling technology

Geothermal wells often have to be drilled through very hard rock formations. This takes state-of-the-art drilling equipment to its limits, resulting in an urgent need for a faster and more durable technology. The combination of conventional rotary drilling with high pressure water jetting has the potential to be the required game-changing technology. The high pressure jet cuts the rock surface in front of the drill bit, reducing the stress in the rock and thus significantly increasing the rate of penetration. The pressure is generated downhole, meaning that no additional surface infrastructure is required and high safety standards can be upheld.

Unique drill bit prototype

The drill bit needs to withstand the enormous hydraulic pressure transferred through the bit to the jetting nozzles. For this reason a novel high pressure body was designed and integrated into the frame of a roller cone bit. The extended nozzles allow quick and easy maintenance and exchange of worn-out parts, while also keeping the distance between the borehole bottom and the nozzle to a minimum.

Novel drilling fluid

The main functions of a drilling fluid include removing the cuttings from the borehole bottom, ensuring wellbore stability and cooling the drill bit. The ThermoDrill project set out to find a fluid which acts not only as a drilling fluid but also supports the jetting process. The newly developed fluid combines these two functions and allows for increased drilling performance while meeting stringent environmental standards.

Simulations and experiments

Assessing successful novel drilling approaches requires detailed knowledge of the drilling process and the interaction between the high pressure water jet and the rock. Simulation activities were therefore a central analytical element in the project. In addition, a large number of experiments were carried out to continuously optimise the current approach, as well as to make the ThermoDrill technology fit for future industrial use.

The benefits

- Provides revolutionary geothermal drilling technology;
- Demonstrates the efficiency of the new drilling technology under relevant environmental conditions;
- Reduces the technical and financial risks associated with drilling deep geothermal wells;
- Complies with highest health, safety and environmental standards;
- Close cooperation between science and industry and technology transfer.

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CASE 5. Student-company collaboration in the framework of the MIG Bachelor programme

FH JOANNEUM (FHJ) - University of Applied Sciences

With more than 4,000 students, FH JOANNEUM is a young University of Applied Sciences. FH JOANNEUM has an international network of partner institutions in different educational sectors and also within several industries. With its highly specialised degree programmes in the areas of international business and technology, information engineering, mobility, media and design, social services and public health, FH JOANNEUM is one of Austria's leading Universities of Applied Sciences. The degree programmes are offered at university level and aim at a professional training on a scientific basis. The university has well developed R&D centres, which work - in cooperation with international partners - on a multitude of projects.

FHJ considers international projects to be the backbone of their activities. "We aim to stimulate innovative developments at local and international level. We see it as our mission to foster knowledge transfer. The practical results and solutions provided by our applied research are made available to industry, public institutions and society as a whole. We aim to act as an interface between society, industry and science. We aim to promote cooperation in order to generate new synergies in the tertiary education sector. We strive to promote intercultural competence by strengthening our regional and international focus in equal measure and aim." (Mission Statement).

Also, at FH JOANNEUM, with "Production Technology and Organisation" the first dual study programme in Austria was launched in winter semester 2002 (further information: <https://www.fh-joanneum.at/produktionstechnik/bachelor/en/>)
Web: <https://www.fh-joanneum.at/en/>

Student-company collaboration in the framework of the MIG Bachelor programme



Photo: Saubermacher AG

As part of its Bachelor programme "Management Internationaler Geschäftsprozesse" (MIG), the Institute of International Management offers applied courses in cooperation with local and international companies in the 3rd and 6th semester. In the current case, students of the 6th semester were paired with the renowned recycling and waste management company Saubermacher, which had the goal to expand its activities into Slovenia, specifically in terms of tank cleaning services. Students were asked to identify the potential market and market volume within a timeframe of 3 months of extensive research. The company would give advice and provide directions throughout the working period to ensure a result that fits into the strategic direction of Saubermacher. The final results were presented to the Head of Sales as well as other top-level managers.

Student- company cooperation of such kind has clear benefits for the teaching institution and client firms alike. The first beneficiaries are the *students*. The overall learning objective of this course is to provide students with a deeper insight into market entry modes and market potential analysis tools. Students shall learn to independently create approaches to solve complex problems, based on sound market research and analysis. A further objective is to foster creative and consulting skills by solving real business cases for an external client. By providing high quality results, the *teaching institution* sharpens its profile towards the industry and expands its network for further collaborations and paid research assignments. The *client company* receives a low risk opportunity to get in contact with universities and prospective interns / employees by monitoring them to provide valuable market information with huge strategic value at a relatively low cost. After the assignment, the cooperation phase is finished, which technically allows the company to extract itself easily, in case of a hypothetically less than satisfactory outcome.

The most crucial part of such cooperation schemes is the preparation phase. The university and the responsible company representative need to meet several times to clearly define the scope of the assignment, which has to fit to the timeframe of the class being taught, the skill set of the students and the value to the company. Expectations need to be stated explicitly on both sides to ensure a common understanding, for example, are the students acting on behalf of the company when making phone calls or on behalf of the university without mentioning the company name at all. Nonetheless, the assignment might change slightly during the exploration phase, as students might discover important facts that the company has not thought of and therefore wishes to pursue instead of the original plan. This possibility has to be communicated to the students at the beginning of the course as a circumstance that is happening all the time in real life and they need to keep an open mind and flexibility. Sometimes, non-disclosure agreements are being signed, when dealing with sensitive information.

To sum up, it can be said that university- company assignments are invaluable in terms of learning experience for the students and even the university, as each semester brings a new client with a new background, case study and expectations. What is most important for the university / lecturer of the course is to understand its role as a regular communication touchpoint between the client and the students to avoid misunderstandings and dissatisfaction. Currently, such courses offered at the Institute of International Management involve smaller groups of 20 students, who divide themselves into teams of 4-5 people. Depending on the assignment, upscaling can be made possible, maybe even by including students from other study programmes with other skill sets than business skills (such as design, programming etc.)

Text provided by the university

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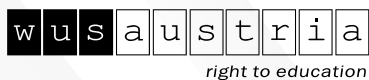
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Outlook

These four cases constitute only a fraction of good practices in Austria and Kosovo. In Kosovo a number of initiatives are available at public and private higher education institutions albeit these are not institutionalised, many of them unrecorded and thus less accessible. It will be essential that also these other initiatives, which are driven by individual units or motivated professors and company representatives, are brought together to exchange their experiences and that they jointly lobby for a framework that allows higher education institutions to institutionalise university-industry cooperation, providing a legal framework and institutional support (legal and financial) for university's cooperation with industry. The aim of the HERAS project is to make visible good practices, possibilities and examples that are relevant in the context of Kosovo, to share and promote them and inspire more people to take a lead and to become pioneers in bringing students one step closer to relevant and fulfilling work experiences, that will shape Kosovan economy and society.

IMPLEMENTING CONSORTIUM



This brochure has been published with the financial assistance of the Austrian Development Agency and implemented by WUS Austria (Lead Consortia). The views and opinions expressed herein, can in no way reflect the official opinion of the Austrian Development Agency nor the opinion of the implementing partner.

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