

Smart, Sustainable & Connected



Success Stories of Energy Efficiency Networks in the EUSALP-Region



Imprint

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This Handbook was drafted with input gathered from all project partners over the second phase of the project implementation (August 2020 – January 2021).

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For further information about the CAESAR project, you will find a short description at the beginning of the document. To learn more and to download additional resources please refer to the project website. <https://www.project-caesar.eu/>

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Introduction

Climate protection has ever since been an important topic and has become increasingly relevant in recent times. As a field of action, in which concrete measures and technologies are implemented in order to achieve climate protection goals, energy efficiency comes to the fore, both in politics and society. Therefore, this topic is equally relevant for cluster managements as well as for companies. This is why the ARPAF project “CAESAR” (CApacitating Energy efficiency in Small Alpine enteRprises) aims to implement an energy efficiency network consisting of various interest groups (cluster managements, other intermediaries and politicians) with the objective of jointly promoting energy efficiency and the exchange in this field.

Taking into account the current challenges due to COVID-19, companies - especially small and medium-sized enterprises (SMEs) - should be equally supported in the ongoing transformation processes in the field of energy efficiency.

This brochure presents examples of how SMEs have managed their energy transformation and achieved their energy efficiency goals. Furthermore, it sheds light on cluster initiatives as key enablers in this process and how they successfully support the transformation.

This brochure is also result of a survey and a network meeting that was conducted in the course of the CAESAR project with cluster managers from the partner region. The participants expressed the need for an exchange on already functioning good practice examples, in order to learn from each other’s success and to foster the cross-sectoral networking and exchange between the regions.

About the project „CAESAR“

CApacitating Energy efficiency in Small Alpine enteRprises

The CAESAR project aims to support SMEs particularly in energy efficiency measures and innovation processes with various instruments. One of the consortium’s objectives is to build and maintain a network of stakeholders to implement renewable energy policies in SMEs. It will provide the basis for a successful qualification of interested parties (policy makers, companies, energy agencies, auditors) in the regions to introduce and accompany renewable energy measures and technologies in companies. The consortium will set the benchmark for companies and develop and distribute a low barrier energy efficiency review tool tailored to the needs of all regions of the Alpine Space as well as small enterprises.

The project consists of the following partners:

- Agency for Energy South Tyrol – CasaClima / Agentur für Energie Südtirol - KlimaHaus
- ClusterAgentur Baden-Württemberg
- Energy Management Agency of Friuli Venezia Giulia (IT)
- Energy Tirol (AT)
- E-institute (SI)



2 The Success with Cluster Initiatives - The Gree Turnaround

Does it really pay off for enterprises to participate in a cluster initiative? It sure does! Because cluster initiatives are relevant innovation and networking enablers that can use their strength to enhance the competitiveness of companies and whole regions. But what does collaboration between the cluster stakeholders actually look like in the field of energy efficiency? What are the individual benefits and added values? And what can be achieved together? This brochure intends to provide answers to these questions. Based on the practical examples presented, it demonstrates how individual, cooperative and demand-oriented solutions can be developed together with a cluster management and other actors. As a key result it shows how these solutions have positive effects on the companies.

Cluster initiatives are organized networks and alliances of different actors in a regional economic system. These include SMEs, global players and start-ups as well as various research institutions, universities and other actors. A characteristic feature of a cluster initiative is the integration of economic actors and relevant intermediaries in all areas of the value chain. In summary, it can be said that a cluster initiative is usually regionally localised, the actors have a technological connection to each other, show a high degree of interconnection between the cluster actors and are also characterised by a high level of trust. Therefore, these organisations provide an excellent platform for jointly tackling economic as well as socio-economic challenges.

Although the technical spectrum of energy efficiency technologies is very broad, the individual topics are well connected. The classic areas in this field therefore focus on energy efficiency in buildings, energy supply of areas and the application of energy efficiency technologies in industrial processes. The following examples show how energy efficiency can be increased and energy consumption can be reduced.

3 Abstracts

Energy Efficiency in compressor rooms

Sacilese Industriale Vetraria Srl is a company from Italy's north eastern region Friuli – Venezia Giulia, that processes flat glass, a very demanding production process in terms of energy consumption. The company launched an intervention in order to improve energy efficiency of the "compressor rooms" of the ovens used to process glass. Although they absorb only a minority share of electricity consumption, it has been elected as an area of investigation and allowed the company to save around 76,000 euro yearly. The case of Sacilese Industriale Vetraria Srl shows, that energy efficiency projects can be carried out by companies without necessarily being forced to intervene with very expensive and global level requalification activities.



Developing a Corporate Energy Strategy

SIAP CARRARO SpA produces gears for various application spheres: wind-powered generators, railway and automotive applications. Very active in terms of energy efficiency and in controlling the effects of its activities that can affect the environment, the company invested into a cogeneration plant powered by natural gas for the production of electricity for self-consumption, a trigeneration plant combining cooling, heat and power. The Group's attention has led the company in recent years to embrace a corporate energy strategy, take decisions in terms of energy efficiency along the entire supply chain and to carry out a series of activities from an organizational and operational point of view, to review the choices in energy consumption.

Optimizing energy efficiency in compression processes through an integrated adsorption cooling device

The project successfully integrated an adsorption-cooling device into an air-compression system, thus creating a new marketable product. Air-compression is widely used in industrial installations; however the process is rather inefficient with huge energy losses in the form of heat. Adsorption cooling systems are able to generate cooling-capacity from this heat source, thus preventing the discharge of valuable energy from heat producing systems. The result of the project is a combined air-compressor / adsorption cooler in a single design framework with improved energy efficiency and great potential for market applications.

Establishing and evaluating the “Energy Comparison Value” (ECV) to measure energy savings in complex electrical networks

Measuring an improvement in energy efficiency within a complex electrical system is impossible when detailed knowledge on the state of every individual part of the system is unknown. In large and very complex systems, like an industrial facility or production plant, this information is usually not available. LIVARSA was able to develop and verify the “Energy Comparison Value” (ECV) in cooperation with the University of Applied Sciences in Offenburg, Germany. The ECV enables the end-user to accurately measure the energy saving potential of various energy efficiency measures. Furthermore, the evaluation of the ECV led to the creation of a new business model for LIVARSA.

New Company Building with Office

The example of the wooden industrial hall of energy sector company Lizergy GmbH in Freudenstadt, Baden-Wuerttemberg / Germany, shows that regional timber construction is an excellent method to meeting the requirements of sustainability aspects. The quality of the workplace is significantly higher due to this construction method and the employees' identification with the company is strengthened. In addition, electricity costs can be saved through the self-sufficient energy supply. With this project, Lizergy GmbH has built an industrial hall made of wood that combines office space and storage.



Using waste-heat from HP (Hydro Power) plant for heating a nearby museum

At waste-heat regeneration Fala project, focus laid on waste heat recovery using heat pumps and building a simple model. The project concentrated on waste-heat recovery system application in hydro power plants, which justified the exploitation of waste-heat source from HP plants as a low temperature waste heat source – on the pilot of historic, 100 years old HPP Fala Museum. Using waste heat from HPP generators is a novelty providing big replication potential in countries with strong HP sector.

Heating Atlantis Water Park with waste heat from AquafilSLO

The project “Heating Atlantis Water Park with waste heat from AquafilSLO” is a successful example of achieving energy efficiency through industrial symbiosis. The system of distributing waste heat from AquafilSLO industrial plant to nearby BTC City Atlantis Water Park was set-up in 2015 and covers all thermal power needs of the water park, while saving resources for cooling down the vapor at the industrial facility. The system is highly economically viable and climate-friendly since it saves some 2.000 tons of CO2 emissions annually which equals to yearly emissions of 1100 cars. The BTC City and Aquafil were awarded for the project in 2016 at the National Energy Days as “the best energy efficiency project of the year”.

Geothermal energy use and heat recuperation in hospitality (ESCO model)

The project was designed to provide comprehensive energy supply and efficiency solution to big spa resort Terme 3000 Moravske Toplice. Resalta, as a provider of comprehensive energy solutions, provided the client with an energy supply contract to provide heat from geothermal sources to the hotel and spa. Resalta’s long term solution was to direct the heat energy of the geothermal well more efficiently. Two new water circuits were installed, using heat exchangers to extract heat from the source to simultaneously cool thermal waters for spa use and heat sanitary water as well as non-mineral pools in the hotel. The solution provided savings of 65.000 m3 drinking water and 2.212 MWh energy annually, with 23% lower heating costs.

The path towards climate neutrality

“The customer shares an idea. We shape it with competence, commitment and flexibility”. This is the welcome message on ARBOR’s website. The company, established in the sixties as a family business, is now engaged in the production of chairs targeting a high-end contract market, to a large extent internationally-oriented (90% of total production).

ARBOR has always been concerned about environmental issues. Lately, they have embarked on a path towards energy efficiency and an increased use of renewable energy sources, with the belief that climate protection and business competitiveness go hand in hand.



4

Good- Practices

4.1 Energy Efficiency in compressor rooms

Company: SACILESE INDUSTRIALE VETRARIA Srl

Cluster Initiative: COMET - Cluster Metalmeccanica FVG (www.clustercomet.it)

Country/Region: Italy, Friuli Venezia



Background

With over 60 years of experience in glass industry/manufacturing throughout Europe, Sacilese Industriale Vetraria Srl is a company based in Friuli Venezia Giulia, Italy's northeasternmost region. Its plant inaugurated in Montereale Valcellina (Pordenone), on 2003, has an area of 45.000 m² and 20.000 m² of covered area and is nowadays able to produce over 1.000.000 of glasses a year.

Thanks to modern and innovative equipments, together with qualified organisation of production, Sacilese is considered a leader company at European level in manufacturing and supply of tempered curved and flat glasses.

With high precision and a wide range of customised products characterizing the company technologies include: cutting, grinding, drilling, tempering, shaped glass, screen printing and bending that Sacilese provides mainly for three sectors i.e. the production of glass for shower cabins, automotive and building plants.

Particular attention is given to the market and to the technological equipment: the use of highly precise experimental equipment allows the company to provide its clients with tolerances up to +/-0,3mm.

Investments on the latest technology machines and automation of the entire process are made annually. This cycle allows Sacilese to ensure the highest quality of finished products and an appropriate cost optimisation. Standards and Certifications include: ISO 9001 Standard, ISO 14001 Standard, OHSAS 18001 Standard, CE Marking, ECE ONU Reg.43 Standard, Certification FF.SS., ISO 614 Standard, Certifications SSV plus the "Quality Environment and Security policy".

At the forefront in terms of logistics, the company is equipped with a Data-Base Management with innovative tracking/traceability and recognition by "RFID" technology.



Key Challenge

The million pieces processed every year by Sacilese Industriale Vetraria Srl are flat glasses, therefore produced mainly with oven treatments. Glass manufacturing is indeed among the most energy-intensive industries. Even though the glass industry energy consumption per unit of output ratio is similar to that of other energy-intensive industries, since glass has a low volume of shipments compared to other energy-intensive industries, the share of total industrial energy use is lower for glass.

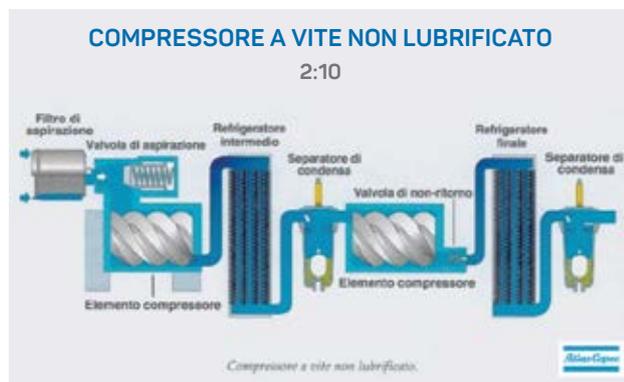
The bulk of energy consumed in the glass manufacturing industry comes from natural gas combustion used to heat furnaces to melt raw materials to form glass.

These furnaces are mainly natural gas-fired, but there is a small number of electrically-powered furnaces. Many glass furnaces also use electric boosting (supplementary electric heating systems) to increase throughput and quality.

After the melting and refining process is complete, the glass is formed and finished to create the final product. Specific manufacturing processes depend on the intended product, and can include annealing (slow cooling), tempering, coating, and polishing, which require additional energy.

There is substantial potential for energy efficiency improvements in glass manufacturing. Estimates range from 20% to 25%, mainly focused on the extremely energy-intensive melting and refining process. Energy used in other key glass-making processes, such as forming, is highly variable depending on the product, that is why those processes do not have the same potential for efficiency gains.

Even though in the glass industry the ovens / the furnaces are much more energy-intensive, Sacilese Industriale Vetraria Srl decided to elect as a specific area of investigation the compressor rooms (convection oven room and main compressor room) in order to consider all the company's many small saving niches in terms of consumption.



Solution

The process of re-evaluation of its plants, that has been carried out - and led to Sacilese Industriale Vetraria energy efficiency project - started at the end of 2012, when a one-week measurement campaign has been carried out on both the compressor rooms that the company is equipped with (convection oven room and main compressor room) and present within its premises in Montereale Valcellina.

The measurement campaign has been carried out by using Atlas Copco's energy diagnosis of the compressor rooms (www.atlascopcogroup.com), a kind of management energy check-up. Atlas Copco Group is a Swedish multinational company that develops and manufactures industrial tools and equipment such as - among the others - air compressors (of which it is the world's leading producer). Atlas Copco, more in particular, has developed a series of energy analysis tools (the so-called MB lite), which gives evidence of the potential for energy savings linked to the optimal use of compressed air.

Based on the results obtained by the measurement campaign, Sacilese Industriale Vetraria Srl has decided to intervene with the introduction of two variable speed lubricated screw compressors, both supplied by the Swedish multinational company.

The first compressor with 55 kW of power (GA55VSD) for the convection oven room and the second one with 132 kW of power (GA132VSD) for the main room.

Results

Sacilese Industriale Vetraria Srl case shows that energy efficiency projects can be carried out by companies without necessarily being forced to intervene with very expensive and global level requalification activities.

An intervention like the one above described has brought the company to support an economic investment, which however can be considered contained in relation to the many benefits obtained. Simulation calculations and succeeding check-ups carried out have indeed estimated savings for Sacilese Industriale Vetraria of around 76,000 euros/year.

Nevertheless, the considerable results obtained in terms of energy savings achieved by the efficiency improvement is not the only benefit the company enjoys.

The Ministerial Decree adopted by the Ministry of Productive Activities on 20 July 2004 (Ministerial Decree of 20 Jul. 2004 on electricity, Ministerial Decree of 20 Jul. 2004 on gas) has indeed established the Energy Efficiency Certificates (TEE, also called white certificates), an incentive mechanism which rewards virtuous companies for investments in energy efficiency, such as those conducted by Sacilese Industriale Vetraria Srl.

TEEs are calculated according to the additional primary energy savings that are obtained compared to the "average market" consumption of the efficient plant/process and according to the technical life of the intervention. In the specific case, the assessment of intervention carried out on the basis of savings estimates and commitments made leads to quantify a saving of electricity compared to the average / market / year of 163



MWh with the equivalent generation of 80 TEE / year. The market value of TEE varies over time, but a reliable estimate corresponds to an annual TEE sales revenue of about 8,000 euros. Since TEEs are recognized for 5 years, the total additional revenue estimated for the five-year period is 40,000 euros.

Contribution by the cluster initiative

With regard to the project carried out by Sacilese Industriale Vetraria Srl, an operative support has been given by “COMET – Cluster Metalmeccanica FVG” (www.clustercomet.it), which is the regional cluster representing the mechanical and metalworking sector in Friuli Venezia Giulia, Italy’s most northeastern region.

More in particular, the cluster organisation encouraged the company to carry out the necessary investments that have facilitated its effective development and stimulated the local market of energy efficiency, by acting as a facilitator and conducting among the others, the following networking activities:

- a) facilitating contact and cooperation between the company and solution providers;
- b) putting the company in contact with relevant stakeholders, such as RTOs; (Recovery Time Objective)
- c) fostering the adoption of support measures by the regional administration.

Description of the cluster initiative

COMET is the cluster representing the mechanical and metalworking sector in Friuli Venezia Giulia, Italy’s north-easternmost region. The cluster is the outcome of a process driven by the regional administration in 2015 and is now recognized by regional law as a point of reference for all the 3,850 enterprises operating in mechanics and metal components production.

Almost 48% of manufacturing companies in Friuli Venezia Giulia operate directly for the mechanics sector, that represents a strategic asset for the whole regional ecosystem.

COMET represents Friuli Venezia Giulia’s position at the EUSALP SubGroup “AG2 – Digital Industry” (EU-Strategy for the Alpine Region; www.alpine-region.eu) and, among the others, at the S3 Thematic Platforms on “Efficient and Sustainable Manufacturing” (www.s3platform.jrc.ec.europa.eu).

Representing a high energy-consuming industry, energy efficiency - together with the use of renewable energy sources - is topical for COMET, which support its companies in planning and launching energy efficiency intervention, often carried out together with RTOs and other local stakeholders.



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4.2 Developing a Corporate Energy Strategy

Company: SIAP CARRARO

Cluster Initiative: COMET - Cluster Metalmeccanica FVG (www.clustercomet.it)

Country/Region: Italy, Friuli Venezia



Background

SIAP Spa (www.siapgears.com) is the CARRARO Group's centre of excellence for quality components and gears. Based in Maniago (Friuli-Venezia Giulia), SIAP Spa is nowadays one of the most important partners for gear systems for the main OEMs in every sector world-wide.

Thanks to its impressive technological competence, SIAP can offer a broad product range for various application spheres: from drivelines for construction and agricultural applications to wind-powered generators, railway and automotive applications, material handling.

SIAP produces shaved or ground cylindrical gears, straight bevel gears, lapped or ground spiral bevel gears, shaped or broached epicycloidal ring gears, hobbled or rolled drive shafts with shaved or ground finishing.



Products include:

- Cut steel: cylindrical helical and spur gears for applications in the railway, agricultural, construction equipment and automotive sectors.
- Ring gears for planetary drives for construction equipment, agriculture and truck.
- Bevel gears for differential units and drivelines for the agricultural, construction equipment and automotive sectors.
- Toothed shafts: Output pinions for planetary drives for construction equipment, rail and wind energy applications. The high quality of SIAP gears is guaranteed by its consolidated know-how and highly verticalised production processes. Preliminary heat treatments (e.g. annealing or quench and tempering), hobbing (e.g. Oerlikon or Gleason cutting for bevel gears), finishing operations (e.g. lapping or grinding for bevel gears) and final heat treatments (e.g. carburizing and hardening or nitriding) are all performed at the company's production facility in Maniago, using automated and certified processes.

Due to the availability of a laboratory with the most complete and modern equipment for chemical, metallurgical and contamination inspections places SIAP at the technological forefront in its field.

SIAP CARRARO is responsible for the effects of its production processes on the environment and it believes that the integration of its activity, products and services with the environment may not only help to satisfy the demands of its end customers - while possibly increasing its competitiveness - but also to maintain the necessary harmony with the final context and thus improve its corporate image.

Key Challenge

Over the years, one of the main challenges addressed by the whole CARRARO Group and the company itself has been to ensure a responsible use of resources and energy supply through the entire whole production process, while at the same time cutting the energy consumption.

CARRARO Group is committed to publish its Sustainability Report on an annual basis, which integrates environmental issues with economic and social ones. As reported in its 2019 version, released in June 2020, the challenge for reducing the industrial costs and environmental impacts are reflected in the energy field in a constant research for more and more energy efficiency standards and by defining the approach and methodology to be used to reduce energy intensity, energy consumption and greenhouse gas emissions from its industrial activities.

Effective implementation of these methods contributes to cost control and containment indirect environmental impact also in terms of emissions and reduces the need for technical support infrastructure.



The Group's attention to a more careful use of energy has led to tackle a series of major actions and challenges, both from an organizational and operational point of view, e.g. by dedicating resources and skills for energy efficiency through the production processes; developing a series of actions for the review of energy consumption choices and effective programmes of immediate-term improvement (such as the study of alternative energy production systems); promoting, developing and combining different technologies.

More in depth, with regard to the plant in Maniago the main challenge has been to recover energy sources required for the steel heatment process and improving its energy performance through the implementation of a cogeneration system (CHP) aimed at satisfying the electrical, thermal and refrigeration needs of SIAP Spa.

Solution

The Group adopted so-called "**energy efficiency investment plans**", together with an Energy Corporate Strategy. In implementing policies to contain energy consumption together with the energy efficiency investment plans, the Group implemented a series of choices and actions such as introducing the energy management function or choosing to use only 100% renewable energy for electricity (photovoltaic panels) within its Italian plants.

According to these guidelines from 2014, the CARRARO Group has dedicated resources and expertise for energy efficiency of consumption in production and technological processes.

A best practice to this effect is represented by the **energy efficiency project implemented within the SIAP Spa premises in Maniago**, where the company's plant has been provided with a cogeneration power plant fuelled by methane gas with a nominal power of 904 kW, for the production of electrical energy for self-consumption (i.e. heating the premises and offices of the plant and process heating).

Cogeneration or recycled energy is the simultaneous production of two or more forms of energy from a single fuel source. In practical terms, what the cogeneration power plant entails is the use of what would otherwise be wasted heat (such as at the SIAP CARRARO manufacturing plant's exhaust) to produce additional energy benefit to provide heat and electricity for the building in which it is operating.



Results

The innovations introduced make significant contribution to the containment of energy consumption and emissions from the plants, year by year.

In particular, cogeneration contributes in many ways to more reliability. By generating the electricity themselves, the company is more independent than its competitors that entirely depend on commercial electricity suppliers. Furthermore, bigger energy savings make all of us less dependent on imported fuel resources.

2019, the decrease in total energy use within the (entire) organization is around -3.9% (ref: CARRARO Group Sustainability Report, June 2020). Only with regard to Maniago, based on the simulation results and their viability energy savings were quantified in approximately 20,000 GJ/year.

Contribution by the cluster initiative

With regard to the project carried out by SIAP CARRARO, an operative support has been given by “COMET – Cluster Metalmeccanica FVG” (www.clustercomet.it), which is the regional cluster representing the mechanical and metalworking sector in Friuli Venezia Giulia, Italy’s most northeastern region.

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- f) fostering the adoption of support measures by the regional administration.

Description of the cluster initiative

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4.3 Optimizing energy efficiency in compression processes through an integrated adsorption cooling device

Companies: Apikal Drucklufttechnik GmbH & Sorption Technologies GmbH

Cluster-Initiative: innoEFF – Cluster Innovation and Efficiency (www.innoEFF.de)

Country/Region: Germany, Freiburg im Breisgau



Background

The goal of the project is to combine air compressors with an adsorption-cooling device to be able to use the exhaust heat from the compression process to create cooling for other processes and/or appliances. The result is a marketable product, namely a white-label air-compressor with an integrated adsorption cooling system.

There are two companies involved in the successful implementation and execution of the project. The two technology partners are *Apikal Drucklufttechnik GmbH* from Eschbach and *Sorption Technologies GmbH* from Freiburg im Breisgau.

Apikal is a leading supplier of air compression technology in Germany. The company has constructed, installed and operated air compression technology for over 20 years. Compressed air is an important working medium in many industrial and commercial processes. According to a study conducted by the European Union, approx. 18 % of electricity in the industrial sector is consumed for the production of compressed air, as air compression can be found in almost every industrial production site. The importance and prevalence of it across all industrial sectors cannot be underestimated. As the energy-efficiency of the air-compression process is only about 5 %, most of the energy is discarded as heat, the potential for increases in efficiency and energy saving therefore is considerable.



Sorption Technologies GmbH is a manufacturer of adsorption-cooling devices. Cooling processes are prevalent across all industrial and commercial sectors. Approx. 14 % of all electricity in Germany is used for cooling, thus the refrigeration technology is responsible for about 5 % of greenhouse gas emissions in Germany. Sorption-cooling systems differ from regular compression cooling systems, as they need a heat-source to operate. Cooling is realised through the effect of adsorption and evaporation of the working fluid, usually water. There are very few established companies who specialize in ad- or absorption cooling processes as the prevalent cooling mechanism is still compression-cooling.

Key Challenge

Many industrial processes produce heat as a by-product in the production process. This waste heat usually has a rather low temperature profile and cannot be used in another process. Therefore, it is generally vented to the outside. In some cases it is used for room-heating and other applications, which is usually dependent on the time of year and often not applicable.

As stated above, only about 5 % of the energy input into an air-compressor is converted to compressed air whereas almost 95 % are converted into heat. As a result the generation of heat diminishes the efficiency of the process. There are physical limitations to the avoidance of heat generation and the only way to increase efficiency is to use the waste heat in another process or system. Through the application of energy retrieval systems, such as adsorption cooling, approx. 80 % of the lost energy from the compression cycle can be recuperated. Unfortunately, the direct usage of this waste heat is often not achievable due to its comparatively low temperature profile. In some cases, excess heat can be used for room or water heating purposes where a temperature profile below 50°C is sufficient.

The cost structure of air compression typically consists of approx. 16 % investment, 6 % maintenance and 78 % energy cost. As a technology that is widely used, the cost structure shows that increases in efficiency, i.e. saving energy, can help the end-user save considerable amounts of money.

That is where adsorption-cooling systems can be implemented as these use the excess heat from the compression to generate cooling capacity which in turn can be used in other industrial processes or the air conditioning of buildings.

Sorption technology allows the generation of coldness (a cold medium) from a heat source. As cooling is desired in many industrial processes as well as for example air conditioning in buildings, the combination of air-compressors with an adsorption cooling device is an ideal combination by increasing the energy efficiency of all involved sub-systems. The waste heat from the air compression can therefore be used for cooling purposes.

Solution

There are very few companies on the market that specialize in adsorption cooling technology. Thus an industrial-scale systems approach has yet to be established. These cooling systems are usually rather expensive



and have to be individually designed for each use-case. Within the project, Sorption Technologies chose a new approach and developed new process steps to further decrease cost and improve the design. Some of these new systems approaches have a patent pending.

A strong network of suppliers with a pre-fabrication facility was established in China which further helped reduce production cost. Technical completion of the individual units is realized in Germany, which secures quality assurance and on-time installation.

Efficient communication and cooperation proved to be invaluable in the execution of the project, especially during the corona-crisis in early 2020. The two companies maintained excellent communications throughout the project, an imperative requirement for success. This also involved the cluster management at the innoEFF cluster and further stakeholders.

As it is often the case with new and innovative project ideas, funding is crucial for the realization and implementation of a new product, design or service. Within the project, additional funding was secured through the grant project "Vernetzte Industrie". This project promotes innovation in energy efficiency and proved to be an ideal funding source for apikal and Sorption Technologies. "Vernetzte Industrie" is a "Lighthouse Project" in the RegioWin grant competition, promoting innovation and energy efficiency. Grant money in the project is provided by the state of Baden-Württemberg as well as the European Regional Development Fund (ERDF). The funding also proved crucial during the corona-crisis as considerable delays could be buffered. Additionally, the grant money alleviated the increased risk because of the innovative nature of the technology.

Results

Sorption Technologies was able to develop an adsorption cooler which is more compact in size compared to existing technology and considerably cheaper due to an improved cooling process and improved production procedures. This led to the creation of a combined air-compressor/adsorption cooler, which is a new product on the market. By combining these two systems the energy efficiency of the compression system is considerably improved and thus an attractive investment for potential customers. The project is still ongoing and final steps for completion still have to be undertaken. In the near future, the customers of apikal will be able to purchase state-of-the-art art compression systems with a built-in adsorption cooler in a compact design. A demonstration model will be showcased in Eschbach, Germany from early October 2020 on. This demonstration model will use heat from the small district heating grid. From a cost perspective, the project is already a success. The project is in its completion phase but it is expected that the cost per kW of cooling capacity is reduced by almost 50 % compared to existing technology. Detailed technical results from the demonstration model will be available in late 2020.



Contribution by the cluster initiative

Within the project the innoEFF cluster was involved in securing the grant funding through the grant project “Vernetzte Industrie”. “Vernetzte Industrie” is a funding platform for innovative technology in the field of energy efficiency with a regional focus on the upper Rhine region. The money is provided through the European Regional Development Fund (ERDF) via the RegioWin grant competition of Baden-Württemberg. Over 30 projects have been realized within the last 4 years that promote energy efficiency in industrial processes.

The cluster will furthermore provide assistance in the marketing and public relations. A panel of potential customers, energy-consultants and -planners will be invited by the cluster to the presentation of the demonstration model in early October 2020.

Cluster Initiative

The innoEFF-Cluster connects stakeholders and promotes knowledge exchange between companies, universities and research institutions. Thereby creating an environment for innovation and technological advancement with a strong focus on technologies promoting resource efficiency. The main goal of the cluster initiative is the promotion of innovative technologies and the development of marketable products and services from innovative technological approaches. Main themes include sustainable energy systems, digitalization as well as cross-sectional technologies.

Cluster activities range from knowledge-transfer forums to technical excursions, marketing and publicity services as well as the initiation and expert monitoring of research projects. The cluster has a strong regional focus on the upper Rhine region with cooperation across the French and Swiss borders.

It is also part of the NGO “Klimapartner Oberrhein” in Freiburg, Germany, which is a network of companies, research institutions and communities promoting technologies in the field of resource- and energy efficiency.

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4.4 Establishing and evaluating the “Energy Comparison Value” (ECV) to measure energy savings in complex electrical networks

Company: LIVARSA GmbH

Cluster-Initiative: innoEFF – Cluster Innovation and Efficiency (www.innoEFF.de)

Country/Region: Germany / Switzerland



Background

The company involved in the project is LIVARSA GmbH. LIVARSA was founded as a start-up in 2010 in Switzerland. Today LIVARSA has two subsidiaries, one in Grenchen, Switzerland, the other in Zell am Harmersbach, Germany. The company offers a technical approach to save energy in complex electrical networks that is capable of savings of 2 – 6 % of total power consumption and can be implemented after the network of electrical appliances is already installed and operational.

Power consumption is a crucial part in the cost-structure of large companies and SMEs in the industrial sector. Typically, about 5 – 15 % of the individual sales revenue is spent on electricity. The industrial sector accounts for approx. 30 % of total power consumption in Germany with an additional 10 - 15 % consumed in the trade and service sectors. Therefore, the energy savings potential is enormous and the German federal government has introduced legislation as well as support programmes to reduce power consumption. Due to the “Renewable Energy Law”, the cost of electricity in Germany is particularly high compared to other European countries at up to 30 cents per kWh. That is an increase of nearly 100 % in the last 20 years.



Compared to just a few years ago the cost of electricity is now a major part in companies expenditures. Thus, the willingness for investment in power savings technology has increased and services provided by companies such as LIVARSA are highly sought after. New technologies and electrical appliances are much more efficient than their counterparts of just a few years ago but a complete replacement of existing machinery is often neither commercially viable nor feasible. By installing a highly complex measurement control module, the LIVARSA technology can be added to existing systems, generating considerable power savings. A factor to keep in mind is that companies in the industrial sector typically only consider an investment if the return on investment (ROI) is six years or smaller.

Key Challenge

The key challenge in measuring energy savings in complex networks concerns comparability and reproducibility. In a simple theoretical system e.g. one single 1 kW motor, this problem can be solved easily. A measurement of energy consumption over one hour for example will show 1 kWh of energy consumed. After the installation of the LIVARSA technology or another energy saving device the consumption will be reduced by a certain percentage which can be seen directly in the measurement.

However this approach is impossible for large and complex electrical networks as can be found in industrial installations and large buildings. Incremental one-hour measurements will consistently show different results as production processes are never linear and show unpredictable peaks and valleys in energy consumption. The comparability decreases proportional to the complexity of the system. Therefore comparing years, months or even days of energy consumption is meaningless as production lines change, output increases or decreases and so on. This is a serious challenge and until now, no viable solution to this problem was developed.

This circumstance led to huge problems in sales and distribution of the LIVARSA technology. The concept could be explained in a theoretical setting but it was impossible to prove in practical, complex applications. This was further aggravated by the fact that there were companies, mainly in the 1980s and 90s, with some still operational today, that market energy saving technology that is fraudulent, relying on the fact that actual savings are near impossible to determine in an exact manner. Thus, many potential customers today remain sceptical and demand further proof of concept and scientific research into the matter.

Solution

The solution to the problem was achieved by successfully implementing and scientifically validating the “Energy Comparison Value” abbreviated ECV. In cooperation with the Offenburg University of Applied Sciences, Germany, the ECV was diligently assessed and evaluated. The cooperation between LIVARSA and the University of Offenburg was initiated, organized and moderated by the innoEFF-cluster management.

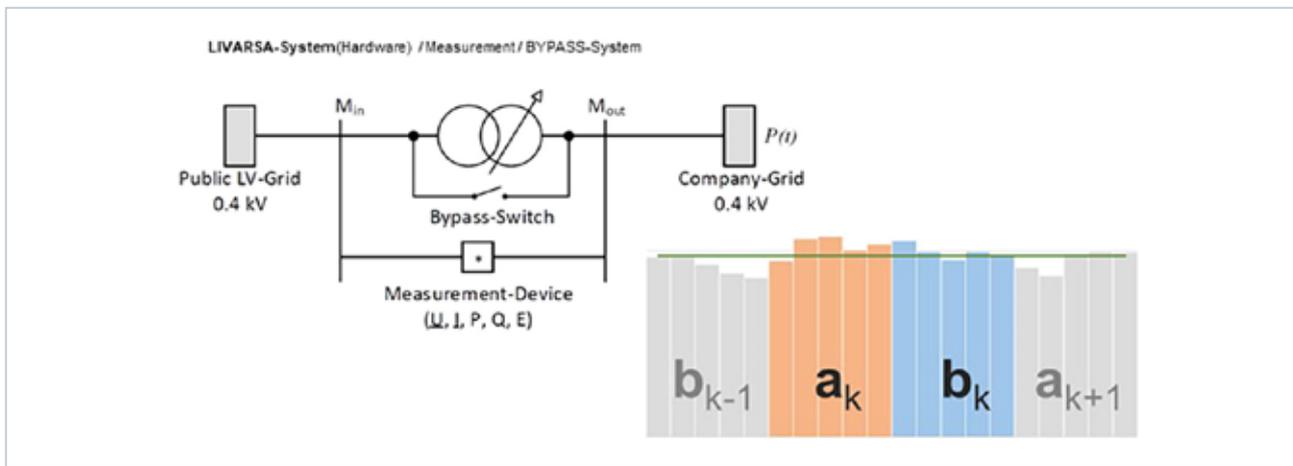
In general, the ECV is established by measuring energy consumption in a complex system for short intervals of a few minutes. Continually measuring for 5-minute intervals over 72 hours, the test series returns $M = 60/5 \cdot 72 = 864$ discrete measurements. The assumption is that the sum of all odd-numbered measurements ($A = M_a$



$(1+3+5\dots+863)$) equals the sum of all even-numbered measurements ($B = M_b (2+4+6\dots+864)$). Therefore $A = B$ in complex electrical networks. It is possible that this could be shown in a scientific setting to be accurate. These values can be established for any system without detailed knowledge of its individual parts.

In a second step the energy saving technology can be added to the measurement series. For example energy saving is only activated during the odd-numbered measurements A. After the test series, A should be smaller compared to B, therefore indicating that a certain percentage of energy was saved.

Comparisons across various electrical systems and electrical applications were able to prove that the theoretical assumptions are correct.



Results

The main result is the successful validation and implementation of the “Energy Comparison Value” which gives LIVARSA the opportunity to accurately assess the energy savings potential in any given complex electrical system. In return this helps potential customers to assess and calculate the potential benefits and ROI values. Now LIVARSA can guarantee the measured savings potential, which is usually in the order of 2 – 6 %.

Additionally it was possible to attract Siemens as a large partner referring to the financing of projects. Due to the exact measurements, Siemens is now cooperating with LIVARSA and offers financing for potential customers. The business model could be updated to include rental contracts, thus considerably diminishing the capital investment of potential customers.

As one of the most successful and trusted technology companies, the cooperation with Siemens proved to be a valuable asset in the marketing process of LIVARSA’s technology.

LIVARSA has trademarked the “Energy Comparison Value” and an assessment into an ISO certification is currently underway.



Contribution by the cluster initiative

In the beginning of the project the cluster management was involved in finding a suitable research institution to conduct the assessment of the ECV. The clusters knowledge of the research landscape within the region proved to be invaluable for LIVARSA. Finally, a cost-effective and sound scientific approach to the research project was established with Prof. Bausch at the chair of electrical engineering at the Offenburg University of Applied Sciences. After the completion of the project, the innoEFF-cluster is involved in further publicity work and marketing strategies. Currently an ISO-certification is explored.

Cluster Initiative

The innoEFF-Cluster connects stakeholders and promotes knowledge exchange between companies, universities and research institutions. Thereby creating an environment for innovation and technological advancement with a strong focus on technologies promoting resource efficiency. The main goal of the cluster initiative is the promotion of innovative technologies and the development of marketable products and services from innovative technological approaches. Main themes include sustainable energy systems, digitalization as well as cross-sectional technologies.

Cluster activities range from knowledge-transfer forums to technical excursions, marketing and publicity services as well as the initiation and expert monitoring of research projects. The cluster has a strong regional focus on the upper Rhine region with cooperation across the French and Swiss borders.

Furthermore it is part of the NGO "Klimapartner Oberrhein" in Freiburg, which is a network of companies, research institutions and communities promoting technologies in the field of resource- and energy efficiency.

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4.5 New Company Building with Office

Company: Lizergy GmbH

Cluster-Initiative: RegioHOLZ – Cluster Forest and Wood ()

Country/Region: Germany, Nordschwarzwald

Key Challenge

Due to its growth, a crafts enterprise needed a new company building. The building was intended to house an office, an assembly area and a storage area. Since the company's philosophy is "Optimize Energy Sustainable", the entire building should be built energy self-sufficient. Energy self-sufficient does not only mean covering current energy consumption, but also the "gray energy" that is used during the construction and manufacture of the building materials.

At that time was no suitable concept available along with no corresponding programmes to calculate the data. The process the company wanted to change through this project was to optimize new-construction-projects as a whole in terms of energy efficiency in order to show sensible ecological and economical alternatives to today's building standards. Energy consulting/creation of energy concepts, photovoltaics and energy storage as well as electrical installations belong to the company's central section.

The main challenges of the project were calculating the corresponding future energy consumption, finding companies that implement the unconventional construction method at reasonable costs, and building the system in such a way that it reacts to larger future fluctuations (e.g. if e-mobility will be implemented in the future) and that the building can still be self-sufficient.

Solution

The problems were solved through a lot of proactive planning and calculating of the energy consumption by ourselves through the development of an own energy concept as well as the combination of partially existing products via a bus system that controls and records the corresponding energy flows. Financial help was given by funding from the ELR programme (Entwicklungsprogramm Ländlicher Raum, Development programme for rural areas).

In order to be as self-sufficient as possible, a large photovoltaic-system was built which generates its own energy. Furthermore, to bridge times without specially generated electricity, an energy storage device was installed. A heating system with infrared heaters helps to reduce power consumption.

To achieve all the given wishes, conventional building materials such as steel and concrete were replaced by wood. Besides, a software was implemented for measuring and controlling all energy flows.



Results

The result is a building with an annual energy consumption of 55.580 KW/h, which is completely produced and provided by the system itself. Over the next 30 years, 2.600.000 KW/h will be transferred to the power grid to compensate the gray energy.

Moreover, the office building is completely made of wood and the warehouse on top of the assembly hall is mainly made of wood. Overall 140m³ of wood was used. The building has a visually appealing design and offers workplaces with a very high workplace quality. During this project, a building was built that fits perfectly with the company philosophy and provides an impulse to rethink how new buildings can and should be built.

The quality of the workplace is significantly higher thanks to the construction method. Thereby the employees' identification with the company strengthened. In addition, electricity costs of 14.500 euros per year can be saved due to the self-sufficient energy supply. Consistent planning of the building, which was geared towards the internal processes, can also save a considerable amount of working time. Furthermore, rainwater is temporarily stored in ponds on the company's own property and included in the landscape design, which reduces the wastewater contribution and relieves the burden on rainwater disposal.

The break-even compared to the building standard is 13,8 years. For this calculation the additional costs in comparison with the building standard of approximately 200.000 euros are compared with the savings of 14.500€ (the soft factors are not included in this calculation).



Cluster Initiative

The RegioHOLZ initiative connects participants in the wood and furniture industry along the entire value chain. The goal is to create industry-spanning synergies through exchange and cooperation between those participants. Besides the moderation of the network, which includes the organization of dialogue forums and other event formats, the economic-promotion-team offers competent contacts in networking issues for the entire forest- and wood industry.



The initiative has three goals:

1. Joint national and international Marketing
2. Attract and secure specialized staff
3. Create company-oriented network platforms

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4.6 Using waste-heat from HP (Hydro Power) plant for heating nearby museum

Company: Drava Hydropower Maribor Ltd

Cluster-Initiative: Smart City Maribor Initiative

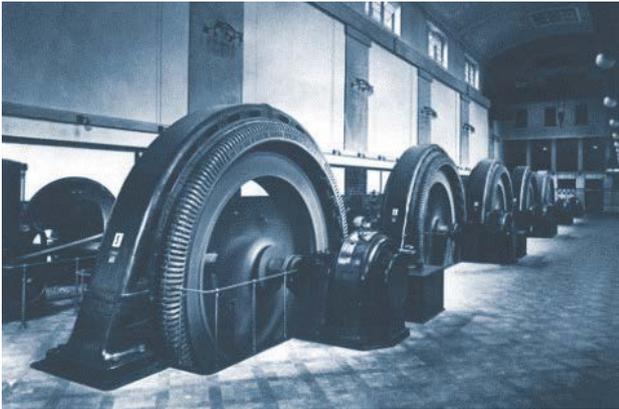
Country/Region: Slovenia



Background

Drava Hydropower Maribor Ltd (DEM) is the biggest hydropower producer in Slovenia and leading company in the area of efficient use of renewable energy. It operates a chain of eight big hydropower plants on Drava River and a number of small HPPs and photovoltaic plants. The company also owns and operates a hydropower plant museum located at 100 years old HPP Fala, which is still in operation. In recent years, DEM is focusing on the projects that are increasing energy efficiency of existing plants by increasing production using advanced operational management and IT technologies. It is also introducing energy efficiency to other facilities, such as office buildings, mobility etc.





Key Challenge

DEM has identified the opportunity to explore in-depth the potential use of waste heat as an energy resource and as part of this improve the heating system in the 100-year-old hydro powerplant museum Fala, via recovery of low-temperature waste heat produced as part of the cooling process in the adjacent hydro powerplant. The room with an outstanding museum value was heated by the electrical fan heaters. Fan heaters use electricity as a heat source. They operated depending on the selected speed regardless of the required room temperature.

With the activation of the individual heat exchanger, the heating operation was only controlled manually. Such system caused the museum space to be heated with interruptions, where temperature in the room varies considerably because of the uneven heating. Temperature fluctuations can have a negative effect on the exhibited objects in the museum and the user experience. The initial economic forecast for replacing this outdated heating system with waste heat recovery-based system, suggested 60% reduction in costs for heating and investment payback period of around 8 years, which is in line with investment requirements of the company.

Solution

DEM's pilot project Fala, concentrated on waste-heat recovery system application in hydro power plant, utilising a low temperature waste heat source, for the purpose of space heating at the on-site museum building. The waste heat that occurs in the process of operation and cooling of the electricity generation aggregator will be recovered via water/water heat pump. The aggregator operates between 6000 to 6500 hours per annum. The heat pump is operated via low temperature heat from cooling liquid during the operation of the aggregator, and with river water during periods when the aggregator is not in operation. In addition, a small storage tank for water was implemented for water based calorific heating.



The solution was developed by in-house engineers and confirmed by external review. The project was driven by the company itself, given its mission and development model. The initial project proposal and pre-feasibility study was developed internally by the DEM/E-zavod project team. In the following stage, the University of Maribor was engaged to review the pre-feasibility assumptions and further develop the project in on the technical, financial and economic side. During this process it was established that the technology and work needed for the implementation were readily available and did not require any additional permits (construction or environmental). Furthermore, the assessment of economic and environmental parameters suggested these were on balance in line with companies requirements.

Based on these finding the company decided to enter the investment process and commission the project documentation, which was delivered by an external consultant. The financing model of the project was straight forward, with the company being the direct investor. By responding to a national call of Eko-sklad on energy efficiency with appropriate documentation, the company also obtained a subsidy in the range of 20% of the investment. The completion of work and the commissioning of the system was done in April 2019.

Results

On the one hand the implementation of the internal waste heat recovery system will contribute to more efficient use of resources and on the other hand it will lower the cost of heating for the Fala museum premises.

Based on pre-feasibility assessment calculations, the investment will be paid off in about 8 years based on assumptions of energy market prices fluctuation and ROI just over 5%.

The system will enable not only energy savings of 144.946,5 kWh annually but also a reduction of 135.612,8 kg/CO₂ emissions.

Contribution by the cluster initiative

The support was provided from Smart City Maribor Initiative network, which is a partnership of innovative stakeholders from Maribor region. E-zavod as a network manager provided support by including DEM to the EU funded project CE-HEAT, where financial and expert support to the project was provided.

Cluster Initiative

The Smart City Maribor Initiative (SCMI) was launched to spark sustainable development of a smart city environment, to pursue innovation in the city of Maribor, and to develop pilot projects that will enable the provision of smart city activities (in the field of smart services, technology and products). The initiative aims at implementing advanced projects that will improve the quality of life in Maribor and its broader region, and encourage technological, social, and organizational innovation. By launching the Smart City Initiative, Maribor joined other advanced urban environments, which have recognised the advantages of intensive collaboration between the municipality, research institutions, and industries to ensure high quality living standards and technological



development. The Smart City Initiative Maribor was established as a partner network operating in the form of a cluster. Partners may join the network by signing a memorandum in which they commit to respect the operating principles and the initiative's development policies.

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4.7 Heating Atlantis Water Park with waste heat from AquafilSLO

Company: BTC Company & AquafilSLO d.o.o.

Cluster-Initiative: Center of Energy Efficient Solutions (CER)

Country/Region: Slovenia



Background

BTC City represents one of the largest business, shopping, entertainment, recreation and cultural centers in Europe with a total area of 400.000 m² of shopping, office, warehousing and service premises. More than 4.000 people work at the City, welcoming over 20 million visitors annually. The BTC Company is the owner and manager of the BTC City.

One key attraction of BTC City is Atlantis Water Park, which covers 15.000 m² with swimming pools, saunas, water slides and similar.

Nearby company AquafilSLO d.o.o. is the Slovenian part of the Aquafil Group and produces nylon 6 from waste material in the ECONYL Regeneration Process. The process generates excessive thermal energy that was considered as the potential energy source for Atlantis Water Park.





Key Challenge

The challenge for the BTC Company was to provide sufficient energy for heating the facilities of Atlantis Water Park in a sustainable and cost-efficient way, while there was waste heat being generated at the nearby AquafISLO d.o.o. industrial facility in the form of the vapor from the process of chemical recycling (ECONYL® Regeneration System). The vapor had to be cooled down before it was discharged into the municipal sewage system. The company used electrically powered air coolers, using additional energy.

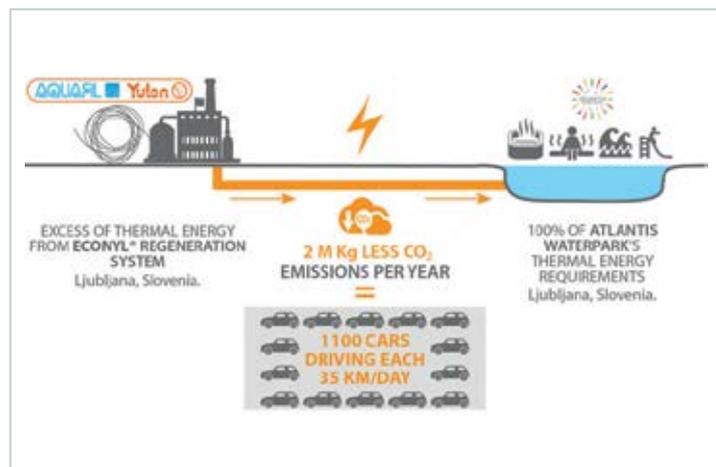
There was a win-win potential challenging both companies to enter into the industrial symbiosis project with an objective to reduce operational costs and save CO₂ emissions at the same time.

Solution

The solution was implemented in a way that total thermal requirements of Atlantis Water Park are covered by the waste heat generated at ECONYL® Regeneration System. Approximately 7.000 MWh of thermal energy per year is transferred to the water park by the heat exchangers, installed at the AquafISLO facility.

The main infrastructural investments needed for the supplying of the waste heat to water park were investments in heat exchangers at the industrial facility and the pipelines needed for transporting the thermal power.

The partners AquafISLO and BTC Company shared the investment costs.



Results

The main result is a successful case of industrial symbiosis of two companies, which proved to be economically and environmentally beneficial and sustainable. The system is in operation since 2015.

The collaboration has not only economic benefits for both partners but also reduces a significant amount of CO₂ emissions by 2.000 tones: the amount of greenhouse gases produced by 1100 average Slovenian cars in one year driving 35 km per day.

Cluster Initiative

Center of Energy Efficient Solutions (CER) is a Slovenian cluster of advanced businesses and organizations from different sectors having 59 members generating 9 billion EUR annually. The mission of CER is to accelerate innovative climate-neutral circular economy and green technologies that meet the environmental energy challenges. CER participates in strategically important decisions that are in the interests of a wider society. CER realizes its vision with

- promoting tools for accelerating the green economy and green technologies (innovations, business models, finance, regulatory environment, taxes, incentives, impact measurement),
- cooperation, networking, openness, distribution in the development of green technologies (networking between different sectors, industries, actors, competitors and partners),
- raising awareness of the positive, multiplier effects of the green economy (health, knowledge, education, green jobs, equity, raising GDP, security, the future),
- promotion of Slovenian knowledge, scientific achievements, technological breakthroughs in the field of green technologies,
- global networking and internationalization.

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4.8 Geothermal energy use and heat recuperation in hospitality (ESCO model)

Resalta™

Background

The Terme 3000 - Moravske Toplice spa resort is located in the magical Prekmurje region and is famous for its unique healing black thermal-mineral water that rises from the Moravci springs. As the resort is situated above the underground spring, it uses its water to fill some of the thermal pools open to the guests. Because of the large consumption of water and the high number of guests, Sava Turizem wanted to improve the efficiency of some of the energy systems providing water and heating to the swimming pools.

Resalta is a leading renewables and energy services provider in Central and Southeastern Europe, operating in ten markets throughout the region. A dynamic, fast-growing company, Resalta works with both public and private clients to finance, design and implement projects that champion decarbonization, reduce energy consumption, lower CO₂ emissions and promote sustainability while generating cost savings. So far, the company has realized over 260 energy projects for over 180 clients and continues to expand its product and service portfolio.

Resalta frequently operates using the ESCO business model. Resalta provides not just project development but also savings guarantees, project design, implementation, operations and maintenance services and complete project financing. Resalta takes on all operational and financial risks, taking care of installed equipment for the duration of the project contract. It recoups its investment from achieved savings by the client. The project described below was implemented following the ESCO model, for a contract duration of seven years.

Key Challenge

The client had previously used the well to provide direct thermal energy, which had presented difficulties due to the high mineral content that left solids and sedimentation on pipelines and created many blockages. The natural temperature of the water at the well is 69°C, which the resort needs to cool to 47°C to use for the baths. In the past the resort took advantage of the spring for heating purposes, but the system used to exploit geothermal energy is obsolete and filled with deposit and as such did not function at the time Resalta was hired to improve the systems.

For heating sanitary 2/3 water, the non-thermal pools and the air-handling ventilation units, the resort uses water from another spring, with a temperature of 58°C. Water needed to be cooled down by adding cold water to 30°C, which was an inefficient process. The entire system was unreliable and subject to frequent clogging from the minerals in the thermal water.



Solution

Resalta, as a provider of comprehensive energy solutions, provided Terme 3000 Moravske Toplice with an energy supply contract to provide heat from geothermal sources to the hotel and spa.

Resalta's long term solution was to direct the heat energy of the geothermal well more efficiently. Two new water circuits were installed, using heat exchangers to extract heat from the source in order to simultaneously cool thermal waters for spa use and heat sanitary water as well as non-mineral pools in the hotel. This solution resulted in a far more energy efficient system, adequate levels of minerals in the natural pool water, less clogging and a smooth and reliable functioning of the circuits. Resalta has installed all the new equipment and is selling the exchanged heat to Terme 3000 Moravci applying ESCO model.

The project included the reconstruction of direct energy use of a geothermal water source from well into indirect energy use. The primary and secondary circuits are separated by two heat exchangers. The secondary circuit will thus be closed. Due to the large amount of deposited solid compounds and limescale on the pipe walls, their use is impossible, so it is necessary to carry out a complete reconstruction of mechanical installations that take care of the distribution and regulation of the source and preparation of hot sanitary water.

With the implementation of the project, no solids are deposited on the walls of the pipelines on the secondary side and thus blockages have been eliminated. The primary open circuit and the heat exchanger, which are used alternately, are cleaned regularly.

It was also necessary to make a new pipe connection from the external collection basin for geothermal water to the distributor for swimming pools. In this case, it was not possible to avoid the deposition of solids in the pipeline, as natural highly mineralized geothermal water from the well must enter the pools. With the implementation of the project, geothermal water is once again used to provide heating. This means that the energy used to cool the well water from 69 °C to 47 °C can be usefully recuperated and used to heat domestic hot water, water in other pools and air.



Results

The following results were achieved by the introduction of solution:

- 65,000 m³ of drinking water saved annually
- 2,212 MWh of heat recuperated annually
- 23% lower heating costs

Cluster Initiative

Center of Energy Efficient Solutions (CER) is a Slovenian cluster of advanced businesses and organizations from different sectors having 59 members generating 9 billion EUR annually. The mission of CER is to accelerate innovative climate-neutral circular economy and green technologies that meet the environmental energy challenges. CER participates in strategically important decisions that are in the interests of a wider society. CER realizes its vision with:

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4.9 Energy transition, the competitive advantage for SMEs

Company: ARBOR SRL

Cluster-Initiative: Cluster Legno Arredo e Sistema Casa FVG

Country/Region: Italy



Introduction / Background

In 1961 ARBOR is founded by the Granzotto family for the manufacturing of unfinished wooden chairs for local companies.

In 1976 a new and more industrialized line of cabinet doors is added to the semi-finished items production. Gradually, this becomes the main activity of the company.

1983 is the year of the first great crisis in this field. The cabinet door market collapses, but ARBOR – very swiftly – is capable of converting its entire production and it switches to the chair market without suffering significant consequences.

In 1993 ARBOR inaugurates its new production plant, which is also the current headquarter of the company, three times larger than the first plant. With the advanced technology introduced, the company changes towards an industrial activity to all extents and purposes.

In 2003 the industrial site is further expanded with the construction of a paint plant: this system is the first one in Europe in the chair manufacturing, featuring a production cycle performed on 100% water-based products.



At the same time, 50 years since the beginning of the business, a new upholstery department is installed, completing in this way the in-house production capabilities.



Such a well-integrated production allows ARBOR to interpret the different needs of the customers with proper technical solutions and optimized working cycles.

Today the Company is still managed by the Granzotto family, who holds 100% of the property. With the same original craftsmanship spirit, the company nowadays addresses to a top-of-the range contract and residential market, which consists of 90% export.

The ARBOR slogan “Your idea, our solution” summarizes the competitive advantage that made ARBOR a leader in the production of chairs and furniture components on customer design (OEM-ODM). The secret lies in the ability to support the normal production stages, along with several additional services described in this section, that allow the best implementation of the customer’s ideas.

It is a precious historical heritage because the artisans Granzotto brothers, when they founded ARBOR, were required to not only manufacture, but also to solve problems, propose alternatives and show initiative. Features that were transmitted over time and that are – until today - the keys of a great cooperation with customers and designers.

All that is required is an idea from the customer: from that the company designs and develops the model, provides technical solutions to create an industrial and functional product and takes care of every detail. Both designing and prototyping are in-house processes with full guarantee of confidentiality.

ARBOR has an internal written procedure of quality control of raw materials, operating processes and finished product.

The painting plant is based on a fully water-based process; the drying and heating systems are running on wood waste.

ARBOR relies on CATAS for testing according to the standards of the different markets and uses of the product. The institute is able to issue internationally recognized official certifications. ARBOR greatly values its partnerships with schools and universities, both Italian and foreign. Its constant research and development have granted important awards in the sector.

The company is in possession of FSC-Certification for the manufacture of chairs, tables and furnishings.

Therefore, we are able to supply our customers with products in compliance with the reference FSC STD 40-004 v3.0 to ensure a sustainable forest management.

Heating Autonomy: the 100% originate from the usage of production residues, previously subject of controlled recovery.



Description of the key challenge addressed

ARBOR has always been committed to reducing their environmental footprint. As evidence of this it should be underlined that 100% of the thermal energy used stems from solid wood production waste upon prior controlled recovery. In addition, the varnish painting lines use water-based dyes, which are free from solvents that can be harmful to the environment and to human health.

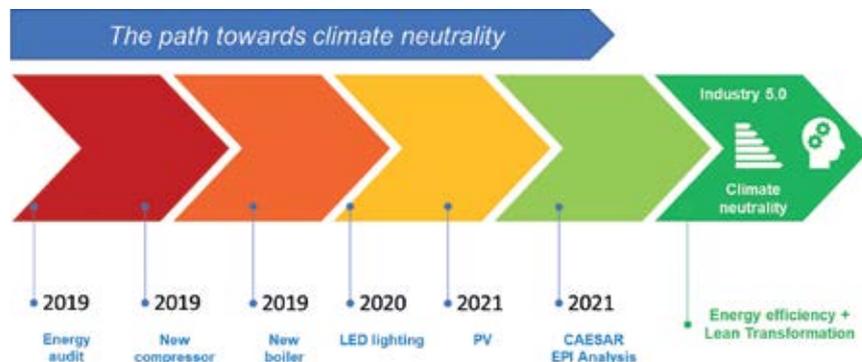
In view of a revamp of the production site, ARBOR performed an energy audit to identify those measures considered more effective to increase energy efficiency and RES use, as well as to reduce management costs. The most promising measures to reduce energy consumption will involve the lighting and heating systems. As for the integration of renewables, an option would be the installation of a roof PV system.

Within the frame of adopting sustainable practices and thanks to the support of the Wood Home FVG Cluster, ARBOR got involved in the CAESAR project, which aims to promote energy efficiency and the use of renewable energy sources among Alpine SMEs. The project is funded under the ARPAF fund as an initiative of the EUSALP strategy and the Energy Agency of Friuli Venezia Giulia (APE FVG), as a partner in the project, is coordinating activities among SMEs on a regional level.

Following the definition and the analysis of the energy Key Performance Indicators (KPIs) by APE FVG, ARBOR followed up on project activities by adopting a long-term approach towards planning, monitoring and communicating their environmental targets at the same time improving their strategy to market positioning. As a matter of fact, there is an increasing consensus on taking climate and environmental protection as a synonym with business competitiveness. Thus, it is strategic for a company to highlight and promote any initiative implemented with the aim of fostering climate mitigation by making it an integral part of normal business practices.

Solution approach / key factors / instruments

The pathway of ARBOR towards climate neutrality is characterized by the following stages:



Past - An energy audit of the plant was performed in compliance with the UNI CEI EN 16247-1: 2012 standard which triggered the finalization of the following interventions:

- replacement of the previous generation compressor with a more efficient one equipped with an inverter;
- replacement of the biomass boiler with a new generation ensuring higher efficiency;
- replacement of over 500 traditional lighting fixtures with LED bulbs;
- installation of a 433 kWp rooftop photovoltaic system connected to the national electricity grid through the on-site exchange mechanism (SSP).

Present - Participation in the CAESAR project promoted in Friuli Venezia Giulia by APE FVG:

- data collection and company audit;
- analysis of energy and material flows within the production process;
- definition and processing of energy KPIs (general, electric and thermal) to monitor the impacts of the implemented energy conservation measures on GHG and energy costs reduction.

Future - Evaluation of the possibility of undertaking the path towards Industry 5.0 as suggested by APE FVG and Toyota Material Handling Italia (TMHIT). The proposal stems from ARBOR's request for a follow-up on activities carried out within CAESAR. As previously mentioned, the company asked if it was possible to plan, monitor and communicate their environmental objectives. Under this respect, APE FVG and TMHIT signed an agreement labelled "Energy Efficiency + Lean Transformation". The goal is to provide support to companies towards climate neutrality and the energy transition considered as strategic factors to increase their competitiveness. The proposed approach foresees the monitoring of both the energy stream (energy efficiency) and the value stream (Lean Transformation). In particular, reference markets are quite sensitive to the achievement of environmental targets. Therefore, it is important how energy efficiency interventions, the improvement of production flows and the integration of renewables are assessed and communicated.

Results

From the analysis of the Energy Performance Indices, it turned out that the electrical component, which is more than five times higher than the thermal one, covers the highest share of primary energy demand necessary to transform the raw material (wood) into finished goods (chairs).

For this reason, the positive effects generated by the use of electricity produced by the photovoltaic system were analyzed in detail, estimating an instantaneous self-consumption of 60%:

- primary energy demand [kJ]: - 19%
- general Energy Performance Index [kJ / kg]: - 19%
- greenhouse gas emissions [tCO₂eq / twood]: - 19%
- energy costs: - 22%

These results are self-explanatory and provide a means to address the challenges ARBOR may face in the future.



Contribution by the cluster initiative

Cluster Legno Arredo FVG is not new in helping companies develop relevant projects that can strengthen the business and operating activities. In particular, with regard to this project carried out by ARBOR SRL, the Cluster connects the company with solution providers and stakeholders, such as for example APE. Also the Cluster helped to gather useful information about energy efficiency and encourage investments to facilitate the “transition” and adoption of more energy efficient methods.

The Cluster organizes events and initiatives to foster the disclosure of important themes such as green transition, the use of renewable materials, and energy efficiency.

Description of your cluster initiative

Cluster Legno Arredo e Sistema Casa FVG (www.clusterarredo.com) is the regional Cluster of Friuli Venezia Giulia region (north-east of Italy) representing the furniture industry of the region itself. With more than 3000 companies operating in the wood, furniture and home-system industry, Cluster Arredo is among the biggest regional clusters.

Also, the Cluster operates on one side, in collaboration with the regional government (S3, circular economy projects, market research) and on the other side with the companies offering several types of services. The Cluster is also involved in several European projects such as BRILLIANT co-funded by COSME programme.

Representing a very big part of FVG economy, the Cluster is involved in circular economy initiatives, promoting energy efficiency, green transition and the use of renewable materials.

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Green Deal, SMEs and the support by Cluster Initiative

Climate change and environmental degradation are existential threats to Europe and the world. It confronts our society, but also the economy, with major challenges and demands a fundamental change of direction in energy consumption. This is why Europe needed a new strategy to succeed in the transition to a modern, resource-efficient and competitive economy, that includes sustainability goals and climate protection. A central task in this context is the reduction of fossil fuel consumption and the increased use of renewable energies. The European Green Deal as concept and action plan was presented and implemented in 2019 and as a primary target aims to reduce greenhouse gases in the EU to zero by 2050.¹ Globally, this is an important objective, as the EU would be the first continent to be climate neutral. In order to achieve this, a number of measures must be taken in the next years. These include transformation efforts in the areas of finance, energy supply, transport, trade, industry, agriculture, forestry and much more.

Even if the green deal was initiated on a political macro level in the European Union, specific transformation goals, such as a more energy efficient production processes, must be achieved on a micro-level: within the individual European companies, especially the numerous small and medium-sized enterprises. This brochure gave some insights on how different European SMEs addressed environmental challenges and implemented creative energy efficiency solutions and tools in their strategy and daily operations – in order to serve the idea of the green deal. But climate protection is not the only added-value of these measures. Since scarce resources and long-term rising energy costs are also challenging our economy, there is a high need to increase energy efficiency and flexibility in companies. Keeping this in mind, these measures and solutions will make companies more profitable and might even open up a new scope of action. Within these transformation processes, cluster initiatives can play a very important role. They have an overview on the differential characteristics, needs and challenges of their regions' actors and are able to translate a political agenda such as the green deal in order to adapt it to the specific regional and sectoral ecosystem. In this regard, cluster initiatives can support innovation and transformation processes through fostering knowledge exchange and technology transfer. By acting as a connector and moderator among differential actors, they can promote open innovation processes, bundle competencies and ideas as well as channel interests towards differential target groups apart from customers.

In the end it shows, that the Green Deal on the one hand requires action and investments on behalf of the European companies. On the other hand, the companies themselves can reach out for new opportunities and grow with innovative ideas, technologies and measures addressing energy efficiency. These companies not only invest in new strategies and can thus further expand the market, but also make work performances more efficient by means of new technologies or processes. In this regard, companies do not only contribute in reducing CO₂ emissions, they also ensure that all European citizens will benefit from environmentally friendly energy, industry, transport and buildings, better air, water and soil quality, healthier food and sustainable agriculture, as well as economic growth in new fields.

¹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_de



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- ClusterAgentur Baden-Württemberg (DE)
- Energy Management Agency of Friuli Venezia Giulia (IT)
- Energie Tirol (AT)
- E-institute (SI)
- Auvergne-Rhône-Alpes Energy Environment (F – observer)
- Autonomous Province of Trento, Provincial Agency for Water Resources and Energy (IT – observer)
- Infrastrutture Lombarde SpA (IT – observer)

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