2025

Geothermal in Industry and Agrifood

Case Studies from Europe


INDUSTRY

Automotive Industry – Sweden

Volvo Manufacturing Plant in Köping, Sweden

The borehole thermal energy storage (BTES) system at the Volvo Powertrain plant in Köping is currently the largest BTES system in Sweden. The factory is one of Volvo's biggest sites for the production of transmissions such as gearboxes for trucks, boats and buses.

Use	Space cooling, space heating, seasonal thermal storage
Technology	Geothermal heat pump
Commissioning	2014
System size	215 boreholes with an average depth of 270 meters

To reduce energy consumption and create a more comfortable working environment for employees, Volvo opted for a geothermal cooling and heating system. It is used for cooling the buildings in summer, storing warmth from this process in the boreholes, and reutilising it for heating in winter.

The first storage unit with 125 boreholes has been commissioned in 2014 and was expected to reduce electricity and heating use by 5,000 MWh per year, equivalent to the annual energy consumption of around 300 homes with district heating. The system has continuously been expanded and today comprises a total of 215 boreholes with an average depth of 270 meters. In 2023, the latest geothermal storage was added to the system. For the first time, a heat pump was connected to the thermal storage to additionally provide domestic hot water.

Chemical Industry – Finland

Source: Lempäälän-Vesilahden Sanomat. Photo: Kiilto Oy

Kiilto Chemical Plant in Lempäälä, Finland

Kiilto Oy is a Finnish manufacturer of chemicals for construction and industrial purposes. In 2018, the company took a great step in reducing its CO_2 emissions by integrating a hybrid heat pump system at its plant in Lempäälä.

Use	Process cooling, space heating, seasonal thermal storage
Technology	Geothermal Heat pump
Commissioning	2018
Heating capacity	Geothermal HP 130kW
Energy savings	Over 1800MWh/year, or a 14% reduction
CO_2 reduction	350 000 kg per year

A geothermal heat pump is used for cooling the machines for glue production while the waste heat from this process is recovered using a second heat pump and used for the heating and hot water of all buildings on the site covering 3.2 hectares. In addition, recovered waste heat is stored underground in the geothermal wells during summer and fed into the heating system during winter. The hybrid system has not only reduced the plant's energy consumption by 14%, but the improved cooling has significantly increased the production capacity of the polymerization process and production plans no longer need to be changed according to the cooling capacity.

Automotive Industry – Hungary

Source: Audi MediaCenter

Audi factory using geothermal in Hungary

Use	heat
Technology	Geothermal heat
Commissioning	2015
Borehole depth	2,400 meters
Capacity	82,000 MWh thermal per year.
CO_2 savings	17,000 tonnes per year

The car manufacturer Audi uses geothermal energy in its production facility in Györ, Hungary. It is the biggest geothermal installation for industrial purposes in the country and does not only supply Audia but also provides geothermal heat to 4,266 households and 1,046 other customers.

The well is about 2,400 meters deep, which required two months of drilling. Installed in 2012 and operational since 2015, geothermal energy provides most of the production site's heating, namely 70%. The rest is compensated by natural gas, thanks to bio-gas certificates. The geothermal energy output is 82,000 MWh of thermal energy per year. Calculated since 2015, the company used 250 GWh of geothermal energy, translating to a reduction of 50,000 tonnes of CO2 emissions, 17,000 tonnes per year. Audi Hungaria is Hungary's biggest consumer of geothermal energy.

In combination with solar power, the geothermal power plant allows the Audi factory to become the second carbon-neutral Audi site. The company aims to reach carbon neutrality in all sites. For instance, since 2017, Audi relies on rail transportation with Deutsche Bahn which is largely carbon neutral.

Automotive Industry – Germany

Source: Vulcan Energy

Geothermal Lithium for Cars in Germany

Use	lithium
Technology	Geothermal lithium
Commissioning	2027
Expected Capacity	6,000 to 17,000 metric tonnes per year of battery grade lithium chemicals
Expected CO_2 savings	300-700 kg for a 50-kWh battery

With increasing environmental and climate requirements coming up, the need for electric vehicles increases. Renault, pioneer in the European EV market and set to become carbon neutral by 2050. Together with the Australian-German geothermal lithium developer Vulcan Energy Resources, they are working on lithium extraction via geothermal energy in Insheim, Germany.

The project was announced in 2021 and commercial delivery was supposed to start in 2026. Yet due to delays in financing, the begin of large-scale industrial production has been pushed to 2027. The geothermal power plant itself has been commissioned already years before. With the acquisition of Vulcan Energy Resources, lithium extraction shall be accelerated. Concretely, the installation will pump hot brine from several kilometres below the ground. This liquid will give off heat which then produces electricity. Afterwards the water is pumped back into the ground.

Renault expects to receive between 6,000 to 17,000 metric tonnes per year of battery grade lithium chemicals produced in Germany by Vulcan. This lithium will have lower carbon and water footprint than conventional lithium and avoid 300-700 kg of CO2 for a 50-kWh battery.

Automotive Industry – France

Source: Stellantis

Stellantis factory France

Use	Power and Heating
Technology	Heat pumps
Commissioning	2025
Capacity	30% of site's energy
CO_2 savings	70%

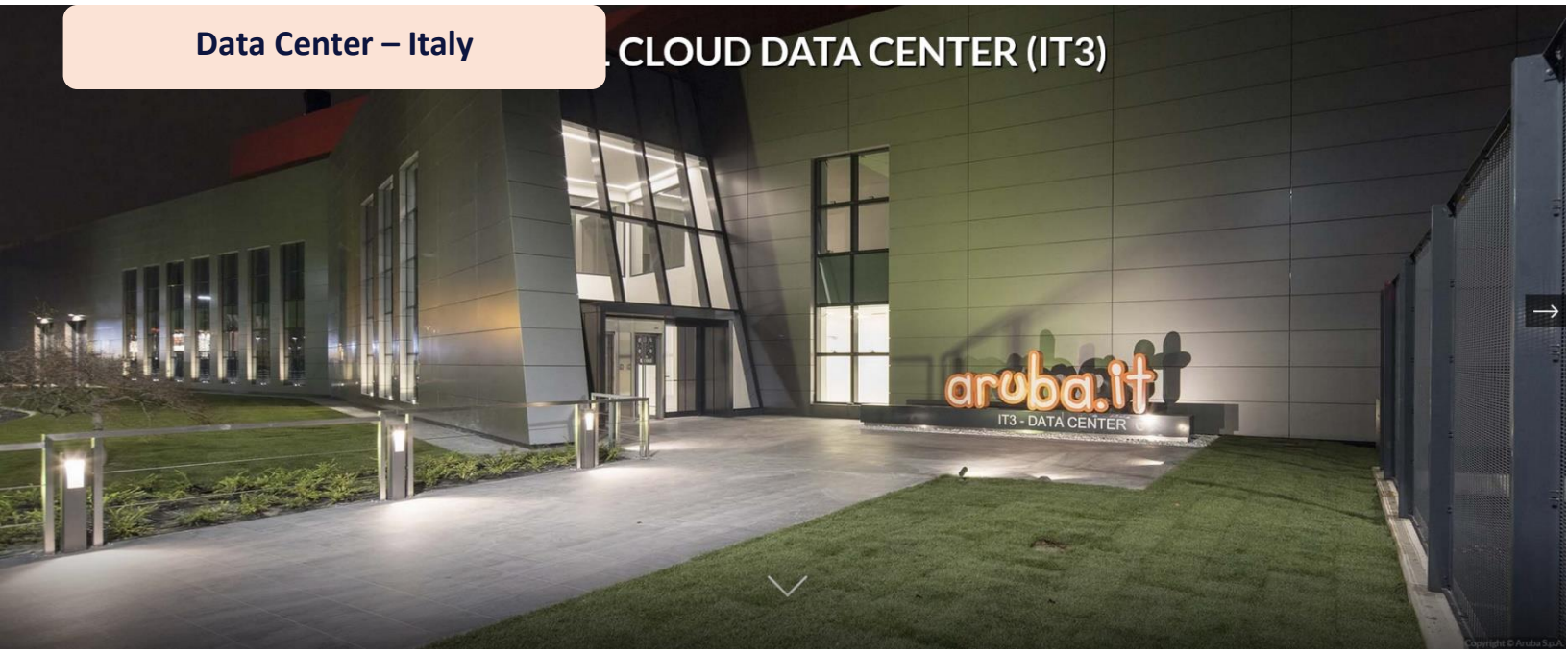
Stellantis, a global car producer aims for net-zero by 2038. The company has set up various measures to do so such as green campuses, solar installation and more. Geothermal is one of their commitments to reduce carbon emissions.

Early 2025, Stellantis started operating the first geothermal installation for industrial application of its kind in France. Located in Caen, the power plant will provide 30% of the site's energy. 80,000 m² will be heated, machines will be cooled. This reduces 70% of gas consumption, 75% of CO2 emissions and 15% of water use.

The construction of the geothermal power plant took 10 months to complete. 3 kilometres of pipes were installed, 12 air handling units and 3 heat pumps. Financial support came from the French Environment and Energy Management Agency (ADEME) and EU funds. Potentially the project could also profit from the France 2030 aid.

Stellantis has other geothermal projects in France and Germany as well. Agreed in May 2023, another geothermal project by Stellantis and Vulcan Energy Resources in Mulhouse, France will be operational in 2026 and contribute. Further, in Rüsselsheim, Germany, an Opel factory will use geothermal power for a meaningful part of the site's needs from 2026 onwards.

Data Center – Italy



Source: aruba.it

Data centre: Euronext in Bergamo

Use	Cooling
Technology	Geothermal cooling
Commissioning	2022

With increasing digitalization, data centres become central players. Yet, their emissions and energy requirements are huge. Consequently, geothermal cooling can be key to ensure a smooth transition of new and existing data centres to sustainability. Active cooling requires the use of energy specifically dedicated to cooling the component. Passive cooling utilizes natural conduction, convection, and radiation to cool a component. In 2022, Euronext, the pan-European market infrastructure, has completed the migration of its Core Data Centre and related services from Basildon, UK, to the Aruba Global Cloud Data Centre IT3 in Bergamo, Italy. The data centre has a surface of 200,000 m² and a capacity of 165,000 physical server. Using different renewable sources, geothermal energy covers the cooling needs of the building. In this new Euronext Data Centre, the cooling system uses groundwater extracted from redundant wells and sent to redundant heat exchangers.

The piping system serving each data room is made with 4 lines with a quarter of the total Computer Room Air Handler (CRAH) connected to each line. Using groundwater as the main cooling energy source enables Euronext data centres to reduce energy waste. The main advantage is having a constant temperature of the water which, at groundwater level, remains at around 9°C all year round. On completion of the cooling process and with no chemical alteration, the water is returned to the ground, thus excluding any environmental impact.

Data Center – France

Source: Université de Strasbourg

Data center in the University of Strasbourg

Use	Cooling
Technology	Geothermal cooling
Commissioning	2022
Number of wells	4
Cooling production	50 kWh

Geothermal solutions to cool the data centre in the University of Strasbourg: The data centre benefits from an innovative and highly energy-efficient design based on the use of renewable energy. Geothermal energy has been chosen to cool the data centre using free cooling throughout the year.

Two geothermal doublets (2 boreholes + 2 discharges) ensure that the facilities continue to operate. Free cooling is based on the direct use of the subsoil as a source of coolness, without the need for a heat pump, and provides exceptional energy efficiency, reaching levels of 50/1, i.e. 50 kWh of cold production for 1 kWh of electricity. This performance is unmatched by other energy systems and means that the environmental impact of the project is kept to a minimum.

Energy Industry – Bulgaria

Source: Schneider Electric Bulgaria smart factory

Schneider Electric Bulgaria electrical equipment manufacturer in Plovdiv, Bulgaria

Use	Space heating and cooling, domestic hot water
Technology	Geothermal heat pumps
Commissioning	2023
Energy savings	70%

Schneider Electric Bulgaria has recently opened a geothermal heating and cooling system at its smart factory in the Trakia Economic Zone, Plovdiv. This innovative system, inaugurated in 2023, marks a shift away from traditional natural gas usage in line with Schneider Electric's commitment to achieving carbon-neutrality by 2025 and reducing CO2 emissions by 25% across their entire value chain by 2030. The geothermal heating and cooling system at the smart factory is equipped with a closed loop geothermal system. Heat pump units connected to the system generate hot water for heating in winter and year-round domestic use. During transitional seasons, the system offers passive cooling by circulating water from the boreholes in the building, while active cooling, powered by the refrigeration cycle, kicks in on particularly hot days. By harnessing heat from condensation, the system maximizes efficiency, directing it towards domestic hot water production. The integrated approach enables the plant to achieve over 70% savings in electrical energy for heating and cooling.

Energy Industry – France

Source: ENGIE

The Engie Campus – Geothermal for Office Buildings

Use	Heating and Cooling
Technology	Geothermal heat pumps and ATES
Commissioning	2025/26
Number of boreholes	9
Borehole depth	90 meters
Capacity	1.9 MW heating and 1.6 MW cooling
CO_2 savings	100% for heating and cooling

Geothermal for industry also includes office buildings. Engie, a French energy supplier decided to move forward with a geothermal project for its future headquarters in La Garenne-Colombes, called “The Campus”. This contributes to the company’s goal of decarbonisation. Coupled with other renewables, the site will be 100% supplied with local renewable energies. The headquarters will host 9,000 employees on a surface of 95,000 m².

For this geothermal installation managed by Storengy, 9 wells were drilled of 90 meters depth. Geothermal heat pumps transform the geothermal energy into the needed 1.9 MW heating and 1.6 MW cooling. The installation also uses Aquifer Thermal Energy Storage, the first of its kind in France. This reversible system allows have heating in winter and cooling in summer. It is an autonomous installation and Engie provided a significant amount of the installation from its own capacities and fabrication.

Cosmetics Industry – Iceland

Source: Geosilica

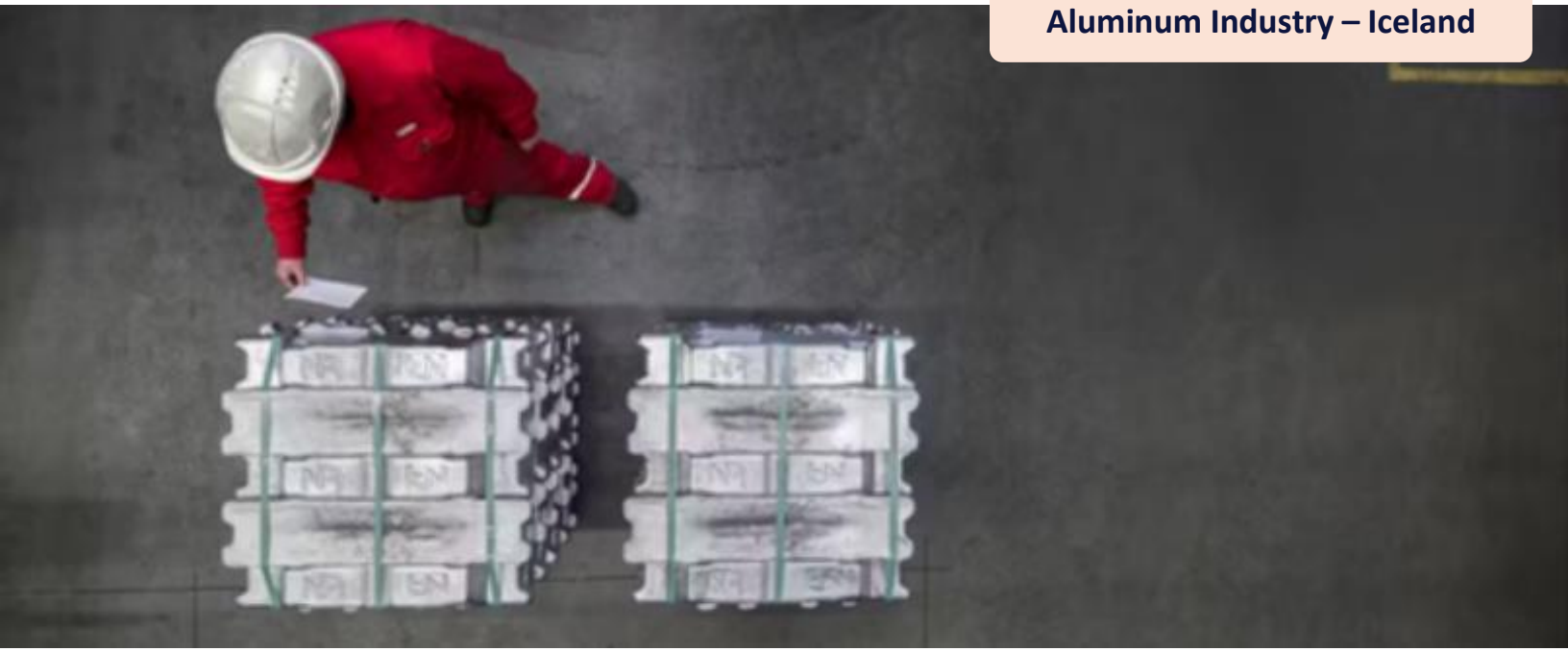
Geothermal Skin-care Products from Iceland

Use	Cosmetics
Technology	Geothermal silica
Commissioning	2020

Geothermal use can go beyond power or heating and cooling. In 2020, MýSilica and the Icelandic national power company Landsvirkjun joined forces to develop silica-rich skin and cosmetic products with geothermal waters. The latter is sources from Landsvirkjun‘s geothermal stations in the North of Iceland. The project is part of Landsvirkjun’s ambition to support multi-use geothermal and innovative projects that improve efficiency of natural resource utilisation. Given that geothermal water is particularly mineral-rich, natural skincare products can be produced. This creates an opportunity for local communities to make use of their resources for innovative projects.

Today, GeoSilica® develops products with silica supplements for cosmetics. They use advanced technology to harvest and process the minerals found in Iceland's geothermal energy for their products. Silica is one of the world's most common minerals found in rocks and the human body.

Aluminum Industry – Iceland



Source: Nordural (Green by Iceland)

Norðurál aluminum smelter

Use	Aluminum smelter
Technology	Geothermal electricity
Commissioning	1997
Total capacity	500 MWe
Borehole depth	1,000-2,200 meters
Capacity	303 MWe and 400 MWth

A large portion of the geothermal energy produced in Iceland to supply electricity for nearby aluminum refineries, in particular the Norðurál aluminum smelter owned by Century Aluminum. Norðurál consumes around a quarter of all electric power produced in Iceland

Norðurál has made long-term power purchase agreements with three power providers amounting to a total of ca 500 MWe. There are four contracts currently in force: Jointly with HS Orka and OR since 2005, with OR since 2008 and Landsvirkjun since 1997 and 2009. The 1997 contract with Landsvirkjun was last revised and extended in 2016. The amended contract entered into force in 2019. Landsvirkjun first contract delivers firstly 107 MWe then increased to 161 Mwe over a period of 20 years, for the annual production of 60,000 tonnes of aluminium. A second contract allows to deliver now 25 MWe from Landsvirkjun. OR and HS Orka have a contract for a total delivery of 292 MWe.

Geothermal electricity supplies power to aluminium with long-term contracts, at a price delivered in USD/MWh (energy and transmission) between 33 and 37 USD/MWh.

Chemical Industry – Germany

Source: BASF

BASF chemical production facility

Use	Heating
Technology	Geothermal heat
Expected number of boreholes	12 production and 12 re-injection wells
Expected Capacity	2,000-2,500 GWh/y
Expected CO_2 savings	800.000 tonnes per year

BASF chemical production facility in Germany will receive geothermal heat for industrial use from a deep geothermal installation by Vulcan Energy.

Located in Ludwigshafen in Rhineland-Palatinate, the geothermal site for BASF will also be able to supply households in cities close-by via a district heating system. The project aims for 2,000-2,500 GWh per year of heat.

The project aims to supply sufficient lithium, geothermal energy and hot brine, approximately 12 production and 12 re-injection wells will be drilled at 5 different sites. Each well grouping will have a heat transfer station to connect them to Vulcan's Lithium Extraction Plant on BASF's site in Ludwigshafen and its heating station via a new pipeline system. BASF will act as a facilitator for this. The geothermal installation is expected to reduce 800.000 tonnes of CO2 per year. Research on potential lithium extraction from geothermal brine is also under discussion.

Chemical Industry – Belgium

Source: European Commission

Janssen Pharmaceuticals Campus in Beerse, Belgium

Janssen Pharmaceuticals has installed a geothermal heating system at its Beerse Campus research facility in Belgium making it the first industrial player in the country to utilize deep geothermal energy on this scale for its own energy requirements. The project significantly contributes to the energy transition in Flanders. The plans for this geothermal heating project were started in mid-2018, with drilling operations commencing by the end of 2019. This initiative aligns with Johnson & Johnson's commitment to reducing carbon emissions by 80% by 2050.

Use	Space heating, heat for laboratory processes
Technology	Geothermal heat
Commissioning	2022
CO_2 reduction	30% per year
Well depth	2.4km
Temperature	85°C

In October 2022, Janssen successfully generated its first heat using this deep geothermal system. With geothermal energy as a primary heat source, Janssen anticipates a 30% reduction in CO_2 emissions from its Belgian operations. At the Beerse Campus geothermal project, hot water at 85°C is extracted from a groundwater layer located 2.4 kilometres beneath the Earth's surface. The heat from this water is transferred through a heat exchanger and distributed via a 3.5-kilometer heat network.

Tools&Machines Industry – France

Source: Würth Proxishop Erstein

Würth France tool manufacturer in Erstein, France

The tool manufacturer Würth France has inaugurated its geothermal plant at its production site in Erstein, Alsace in 2024 which was developed together with ÉS Energy Services. On its way to climate neutrality by 2050, Würth has invested €7.2 million in the geothermal plant. The company has already achieved CO_2 emissions reductions of 31% in the past 10 years.

Use	Space heating and cooling
Technology	Geothermal heat pumps
Commissioning	2024
Number of wells	2 production, 3 reinjection
Well depth	21m
Expected production	5 GWh heating, 1.2 GWh cooling
Surface heated	65,000 m2

By installing geothermal, Würth France hopes to drastically reduce its energy bill. The open geothermal system consists of two production and three reinjection wells with a depth of 21 meters as well as three 1,450 kW heat pumps. The total expected production amounts to 5 GWh for heating and 1.2 GWh for cooling. The new heat network connects all buildings on the Erstein site covering a total surface of 65,000 m^2.

Tools & Machines Industry – Poland

Source: Sandvik Coromant Center

Sandvik Coromant tool manufacturer in Katowice, Poland

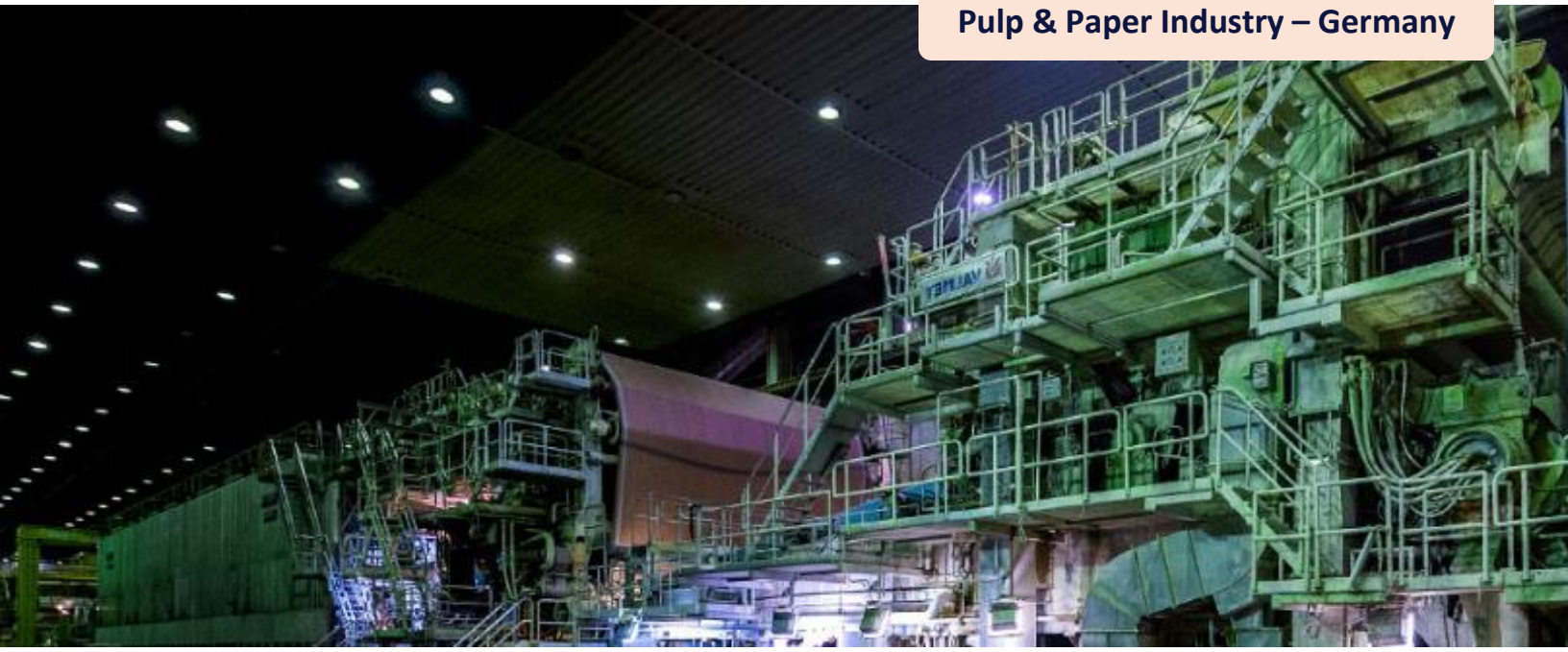
The manufacturer of metal cutting tools Sandvik Coromant has upgraded its energy system with a borehole thermal energy storage to expand the factory's energy savings. The solution was developed by the Danish company Energy Machines that had already implemented an integrated energy system in the factory five years earlier decreasing electricity usage by 24% and natural gas usage by 40%.

Use	Space heating and cooling, seasonal thermal storage
Technology	Geothermal heat pump
Commissioning	2023
Number of boreholes	33
Borehole depth	140m
Electricity savings	25-30%
Natural gas savings	90%

The geothermal energy storage finalised in late 2023 complements the existing system with an underground thermal energy reservoir to further minimise the production site's energy use. It consists of 33, 140m deep boreholes which were drilled next to the building. After integrating the storage in Sandvik's energy system, gas consumption went down further, by 90% compared to pre-2019 levels, and electricity consumption to 25-30% below the initial level.

The integrated energy system was completed in 2019 replacing individual chillers for each machine with a central chiller combined with a heat pump. The same system is used for cooling of the factory building in summer. The waste heat from these cooling processes is used for domestic hot water and heating in the offices. Before the installation of the underground thermal storage excess heat was directed outside, but since the expansion of the system it can be stored in the ground around the boreholes during summer and extracted for heating during winter months.

Pulp & Paper Industry – Germany



Source: Kabel Premium Pulp & Paper GmbH

Kabel Premium Pulp and Paper in Hagen, Germany

The paper industry is one of the five most energy intensive industries in Germany with necessary temperatures ranging between 100 °C and 200 °C for paper drying. The pulp and paper producer Kabel Premium is working together with Fraunhofer IEG and Fraunhofer UMSICHT on a first of its kind project in Europe, "Kabel ZERO", to harness geothermal heat for paper drying and thus drastically reduce its emissions. It is supported by the European Fund for Regional Development and the state of North Rhine Westphalia.

Use	Process heat
Technology	Geothermal heat
Expected well depth	About 4.000 m
Expected capacity	20 MWth
Expected CO_2 savings	30.000t CO_2 per year

Currently, 12% of Kabel's energy in Hagen come from biomass and 88% from a natural gas-powered cogeneration unit. The aim of the "Kabel ZERO" project is to produce steam for pulp and paper production from geothermal resources which are available on site. The geothermal plant is expected to have a capacity of about 20 MWth and to reduce CO_2 emissions by 30.000 t per year.

Starting in 2020, a feasibility study and geological exploration were conducted confirming the availability of a potential geothermal reservoirs at a depth of 3.200 m to 4.100 m. The drilling of an exploration well to collect more geological data began in 2022.

Tools & Machines Industry – Poland

Source: NORD DRIVESYSTEMS

Nord Drivesystems electric motor manufacturer in Wiechlice, Poland

Nord Drivesystem has established its factory for electric motors in Wiechlice, in western Poland in 2019. Due to the increasing demand for its motors such as the IE5+, the production site with 220 employees producing 10.000 motors per week had to be extended from 11.000 m^2 auf 32.000 m^2 in 2023.

Use	Space heating
Technology	Geothermal Heat Pump
Commissioning	2024
Heated surface	32.000 m2
Number of boreholes	52
Borehole depth	Up to 250 m

As part of its sustainability strategy, Nord has decided to implement a closed loop geothermal system for the CO_2 free heating of its new factory. It consists of 52 boreholes with a depth of up to 250 m. Construction started in April 2023 and the new buildings as well as the geothermal system are expected to be commissioned in the second quarter of 2024.

Agro-food Industry – France

Roquette Frères starch plant in Beinheim, France

Since 2016, the French company Roquette Frères obtains heat from the nearby Rittershofen geothermal plant for its energy intensive starch production in Beinheim. Every day, Roquette processes 2.000t of corn and wheat. The total heat demand of the starch plant is 80 MW of which 24 MW are supplied by geothermal. The remaining heat demand is covered by a biomass and a natural gas boiler.

Use	Process heat
Technology	Geothermal heat
Commissioning	2016
Well depth	2.700m
Temperature	168°C
Capacity	24 MWth
CO_2 savings	43.000t CO_2 in 2019

The Rittershofen geothermal plant was built by Électricité de Strasbourg, Roquette and the Caisse des Dépôts with the financial backing of the French Energy Agency ADEME. At the wellhead, the geothermal brine has a temperature of 168°C. After passing through heat exchangers, the heat from the 2.700m deep hydrothermal doublet is transported through a 15km pipeline to the starch plant with a heat loss of only 4°C.

The geothermal plant produces heat all year round with an overall 96% availability. Thanks to its use of this reliable, renewable heat source, Roquette substantially reduced its emissions. In 2019 alone, it saved 43.000t of CO_2 compared to using natural gas boilers.


AGRI-FOOD

Food & Beverage Industry – Italy

Vapori di Birra Brewery in Sasso Pisano, Italy

Vapori di Birra is the first brewery in Italy that uses geothermal steam as primary source of energy. The company was founded in 2014 in the municipality of Sasso Pisano in Tuscany, a region rich in high temperature geothermal resources. Every year, 40,000 bottles of craft beer are produced. The brewery has been modified to use the geothermal energy produced by two nearby geothermal plants operted by Enel Green Power. An exchanger transforms the steam received from the plants into water at about 135°C, which is used in the various stages of the production process. No fossil fuels are used during the production and CO_2 emissions are reduced to zero. Compared to a brewery that uses traditional energies, Vapori di Birra avoids the emission of about 4 kg of CO_2 per hectoliter produced.

Use	Process heat, steam
Technology	Heat use from geothermal power plant
Commissioning	2014
Temperature	about 135°C
CO_2 reduction	4kg CO_2 per hectoliter beer
Energy cost reduction	25%

All the exhausted steam used for production in the brewery is returned to the Enel power plant to be used into the plant's cooling cycle and finally reinjects underground. This prevents water pollution and ensures a sustainable use of the geothermal reservoir.

Greenhouse Industry – Hungary

Source: Árpád Agrár Zrt.

Árpád-Agrár Greenhouses in Szentes, Hungary

The Hungarian agricultural company Árpád-Agrár operates several greenhouses in Szentes and its surroundings in the south-east of the country. Árpád-Agrár is the largest vegetable seedling producer in Hungary and an important producer of tomatoes, peppers and other vegetables.

Use	Greenhouse heating, food processing, washing and drying
Technology	Open loop
Commissioning	First wells drilled in 1960s
Well depth	About 2km
Temperature	80°C

Since the discovery of geothermal resources in Szentes in the 1960s they have been supplying heat to greenhouses and public buildings. The wells are usually about 2 kilometres deep and the temperature of the thermal water is around 80°C.

Geothermal energy is used for greenhouse heating throughout the year as well for food processing such as washing and drying to produce high quality spices. It is also utilised in grain drying.

Greenhouse Industry – Austria

Source: Frutura

Frutura Greenhouses in Styria, Austria

The Frutura Group is a producer of fruits and vegetables and an operator of geothermally heated greenhouses in Styria. The brand is well known in the region and according to a survey, produces the best-tasting tomatoes in Austria.

Use	Greenhouse heating
Technology	Geothermal heating
Commissioning	2016
CO_2 savings	28,000 t CO_2 per year
Well depth	3.5km
Temperature	125°C

The first thermal greenhouse was constructed in 2016. First to produce organic fruit and later also conventional vegetables like tomatoes and peppers. In 2020, the geothermal greenhouses have been extended. Thermal water with a temperature of 125°C is pumped to the surface from a depth of 3.5 kilometers and heats 26 hectares of greenhouses so that regional vegetables can be grown all year round. After cooling down, the water is reinjected underground. Compared to fossil fuel heating, 28,000 tons of CO_2 are saved per year tanks to geothermal. Up to 9,000 tons of tomatoes, peppers, cucumbers, melanzani and radishes are grown in the geothermal greenhouses in a year.

Food&Baverage Industry – France

Source: Tripadvisor

Geothermal winemaking in Orschwiller-Kintzheim, France

The wine cellar of Orschwiller-Kintzheim was founded in 1957 and is today a cooperative with 80 members. The winery underwent renovation in 2013 and chose to use a geothermal system in order to reduce costs and maintain quality. The wine is still made in the traditional way but cooled or heated in stainless steel tanks by a geothermal system. A new technology known as B.R.O.T.S. is coupled with vertical borehole heat exchangers and a ground source heat pump. The 23 borehole heat exchangers of 100m each underneath the winery represents an energy reservoir of 170,000m^3. The two reversible heat pumps are designed for use with source temperatures from 15°C-25°C and can deliver 110 kW of heat and 90 kW of cold, with a COP of between 7-10 at 45°C. A patented hydraulic unit (B.R.O.T.S) and a process management system allow simultaneous and direct heat and cold production. Today, geothermal covers 100% of the wine cellar's process heating and cooling demand. Thanks to the geothermal system, 194t of CO_2 are saved annually.

Use	Process heating and cooling
Technology	Geothermal heat pump
Commissioning	2013
Number of boreholes	23
Borehole depth	100m
Capacity	110 kW heating, 90 kW cooling
CO_2 savings	194t CO_2 per year

At the time of its commissioning, the new system reduced energy costs by €15,000 compared to a gas heating system, and by €23,000 compared to electric heating per year. This allowed for a payback period for the energy system of only 6 years.

Agro-food Industry – Netherlands

Source: Drilling rig in between greenhouses, Netherlands (Huisman)

Geothermal Horticulture Greenhouses in Netherlands

Use	Heating
Technology	Geothermal Heat
Commissioning	2012
Brine temperature	73-74 °C
Borehole depth	2 km
CO_2 savings	116,000,000 kg since 2012

Geothermal installations for greenhouses are increasingly emerging throughout the Netherlands. More than 30 greenhouse are already using geothermal energy to heat their greenhouses.

As an example, In IJsselmuiden in Overijssel, the first geothermal well of 1950 meters depth was drilled in 2012. It pumps hot water of 73-74 °C. This installation provides local horticulturists with heating.

Consequently, 70-90% of natural gas consumption have been reduced, saving 5 million m^3 of natural gas annually. This attracts further costumers that want to decarbonize their supply.

For example, the restaurant chain La Place buys its cucumbers from one of the greenhouses provided with geothermal.

Following other horticultural companies' interest in geothermal heating, an additional geothermal well of nearly 2 km was drilled in 2022, within only 26 days. Thanks to the additional well, 9 million m^3 of natural gas are now saved per year. Since 2012, 116,000,000 kg of CO2 emissions have been saved.

Agro-food Industry – Romania

Source: HortiGreenTech

HortiGreen - Geothermal Greenhouses in Romania

Use	Heating
Technology	Geothermal heat
Commissioning	2019
Number of greenhouses	4
Area covered	43 hectares
Cost reduction	€4 million annually

Romania has a significant import deficit when it comes to tomatoes, with 59,000 tonnes imported per year. The main vegetable production is done outside, making it dependent on weather conditions. To address this challenge, 4 greenhouses (43 hectares) with individual geothermal installations over 2 locations have been commissioned in 2019 at the HortiGreen site. Both locations can produce separately all year long with own heating, CO2 and energy producing with a computer-controlled climate system

The heating costs are thereby reduced by more than €4 million annually on gas/electricity costs.

Video link: https://www.youtube.com/watch?v=yyI1DCt7M_8

Agro-food Industry – Greece

Source: Thrace Group

Geothermal Greenhouses, Tomatoes in Greece

Use	Heating
Technology	Geothermal heat
Commissioning	2014
Number of boreholes	8
Borehole depth	210-330 meters
Capacity	14.64 MW thermal
Heat production	45.8 GWh

At Thrace Greenhouses around Xanthi, geothermal energy fulfills all heating requirements, ensuring a sustainable operation that significantly reduces carbon footprints.

Behind the project, two leading Greek corporations, THRACE GROUP and ELASTRON, have harnessed the geothermal fields of Neo Erasmio in Thrace, North Greece, to create the most sustainable hydroponic greenhouses in Southeast Europe. Thrace Greenhouses, spanning an impressive 18.5 hectares, stand as the largest hydroponic greenhouses in the region. Since 2014, Thrace Greenhouses has been cultivating the essential vegetables of the traditional Mediterranean diet, including a diverse range of tomatoes (600 tons) and cucumbers (1000 tons). The operation leverages 14.64 MWth of geothermal fluids at temperatures of 60-70°C, delivering 45.8 GWhth of heat annually from eight production wells, each 210-330 meters deep. Plans are underway to expand with additional wells and piping networks to achieve 36.7 MWth of geothermal heat utilization, for an additional 13 hectares of greenhouses and an

investment of €14.66 million. Additionally, the company has secured the concession for the northern part of the nearby Nea Kessani geothermal field. This project aims to produce 12 MWth of 73°C geothermal fluids from wells 400-450 meters deep, which will heat 13 hectares of greenhouses, yielding 10,000 tons of vegetables (tomatoes and cucumbers). The investment for this initiative amounts to €12.6 million and is expected to create 90 job positions

By utilizing geothermal energy, Thrace Greenhouses not only reduces its carbon footprint but also sets a precedent for other agricultural enterprises to follow with a turnover of EUR 8 million per year.

Food Industry – Italy

Pizza in Napoli

Use	Heating stove
Technology	Geothermal Heat

With the birthplace of geothermal being in Italy and the continued activities of the Vesuvio volcano, a pizzeria in Naples decided to use geothermal heat for the production of their famous Neapolitan pizza. Created by Archaeologist Vincenzo Albertini, President of Naples Underground, the pizzeria is located in the area of Theatines at the heart of Naples.

The kitchen has tuffaceous chambers where the dough can leaven for 24-48 hours. Afterwards its baked in ovens of the same material and finally customers can enjoy the geothermal pizza at the terrace of the Sorelle Bandiera Pizzeria – a unique place combing history, geology, archaeology and cuisine.

The tuffaceous – Neapolitan Yellow Tuff is a rock of high porosity with high capacity for thermal insulation and moister control. It is able to absorb water molecules, regulating the temperature depending on the outside temperature. These characteristics are particular favourable for leavening pizza dough as the temperature remains constant.

Food Industry – Spain

Source: Tripadvisor

Restaurant in Lanzarote Canary Islands

Use	Cooking
Technology	Natural heat discharge
Commissioning	1970s

The Canary Islands stand out for their extensive volcanic activity. Lanzarote, located in the northeast of the islands is known as the *island of 1000 volcanoes.* Consequently, the area is particularly suitable for geothermal installations given that the heat of the magma is very near to the Earth's surface.

In Lanzarote, the well-known El Diablo Restaurant in the Timanfaya National Parc uses geothermal heat for their cooking since the 1970s. Serving traditional Canarian cuisine, the restaurant is very sustainable as it relies on the heat from the earth. Indeed, the volcanic heat is accessed via a naturally formed "grill" out of sandstone from the previous volcanic eruptions. Temperatures reaching up to 500 °C provide a unique way to prepare meats and seafood. It is important to note that the Teguise volcano is inactive since 1842, yet it continues to give heat without erupting.

Leisure Industry – Slovakia

Source: Termálne kúpalisko Podhájska

Geothermal Spa in Slovakia

Use	Spa
Technology	Geothermal heat
Temperature	80°C
Borehole depth	1,900 meters
Capacity	12.6 MWth

Geothermal energy can be found in various places. In the village of Podhájske in Slovakia, an old well, initially drilled for an – unsuccessful - oil extraction project in the 1960s, is today providing geothermal water to a large thermal spa park. The spa has 10 pools with water temperature ranging from 26 to 38 degrees. The geothermal installation also provides heat to a greenhouse near-by growing flowers and tomatoes.

The well used was drilled in 1973, has a depth of 1,900 meters and reaches a temperature of 81 C with a flow rate of 30 litres per second. This heat translates into suitable potential of 12.6 MW thermal. While today the spa park is one of the most well-known water parks in Slovakia, the geothermal installation went through different stages to reach its current viability. For instance, the geothermal water was initially released into a creek, resulting in environmental problems. Consequently, a reinjection well was built, ensuring the water was treated correctly and pressure of the geothermal water remained constant.

Today, regular maintenance of the well is taking place. The last one was in 2018.

Source: Celsius project

Cornish Geothermal Distillery Company – UK

Use	
Technology	Geothermal heat & power
Commissioning	2022
Temperature	180 °C

"Celsius" is a project by the Cornish Geothermal Distillery Company where research is conducted for sustainable distilleries. It is directly connected to the geothermal power plant at United Downs in the nearby city of Cornwall. The aim is to create an entire infrastructure including a visitor center, cooperage and a production site with a capacity of 1.2 million liters of pure alcohol per year. At this stage the distillery produces rum called the next generation spirit, a fully sustainable and carbon neutral alcohol.

United Downs was the first geothermal power plant in the UK, with a well depth of 5,275 meters and an injection well of 2,393 meters. The water brought to the surface is approximately of 180 C. The process of heat transformation will itself release waste heat which can be used for other local heat projects before being reinfected.

In UK, another distillery can be showcases. The Glentauchers distillery in Speyside, Scotland, serves as a prime example of how integrating modern geothermal techniques.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