



**Kälte. Wärme.
Innovationen.**

DK-REFERENCES

**Together
to efficient
results**





NO COOLING PLANT WITHOUT DK HEAT RECOVERY

Every consumer wants a resource-efficient refrigeration system. During the process of cooling, waste heat is generated, which can be used with the aid of DK heat recovery, primarily for heating water. This is a very proven way to minimize energy costs and reduce the carbon burden on the environment.

Unfortunately, far too many refrigeration systems still go into operation without heat recovery. Based on references, this brochure shows that cold and heat harmonize perfectly – in many companies!

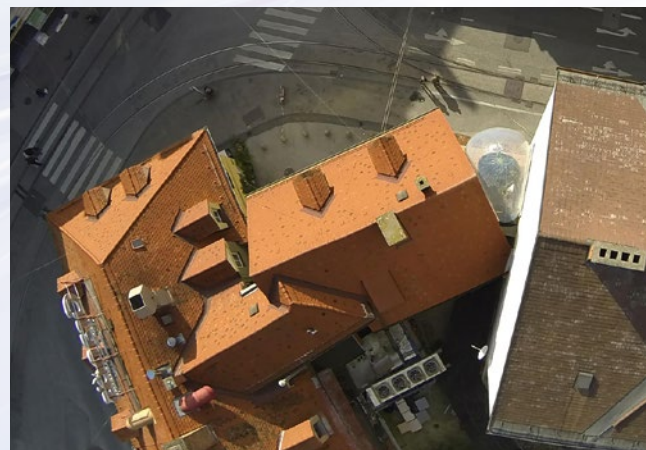
COOLING PLANTS LET BANANAS GROW

Let us start with a very unconventional example: the artist Markus Jeschaunig created a waste heat greenhouse in the heart of Graz, Austria. To grow tropical fruits in European winter, the waste heat from two freezers (from a bakery and a restaurant) was used. With this waste energy was a huge plastic bubble – the oasis no. 8 – heated. The whole City of Graz experienced the growth of bananas and marveled that this could be achieved with a very low heat output of only about 5.2 kW.

Never before have unused waste heat potentials from refrigeration systems been made so impressively visible, as demonstrated by the project "Oasis no. 8". DK were impressed, as too, was an international jury, which awarded the project the winner of the renowned Bauwelt Prize.



Project:
Markus Jeschaunig –
Agency in Biosphere,
Graz Austria
(2015 – 2016)
Photos: Reiser, Oberhofer



HIGHEST FLEXIBILITY IN PRODUCTION

This impressive DK project demonstrates why, our systems continue to be installed by the refrigeration industry in many other diverse applications. The largest market is within the food processing, and the food retail trade with supermarkets, hypermarkets as well as discounters and petrol stations. A strong and steadily growing application is within the hospitality industries such as restaurants, catering, hotels, refectories and large kitchens. The most common installation options are for the food processing companies such as butchers, bakers, slaughterhouses, and also milk cooling and heat recovery in the agriculture and dairy industries.

For all these diverse industries, DK offers the complete solution:

In addition to 40 years of experience in the field of waste heat recovery, and the benefits from a high degree of flexibility in production. Through our own tank production and countless heat exchanger combinations, there is a great deal of vertical integration, which makes it possible to meet customer exact requirements in full.



Heating of potable water



With internal, double-walled heat exchangers (storage system)



With internal, single-walled heat exchangers and stainless steel spiral tube heat exchanger (continuous flow principle)



With external, double-walled heat exchangers (storage system)



With internal, single-walled heat exchangers



With internal, single-walled heat exchangers and stainless steel spiral tube heat exchanger (continuous flow principle)



Drinking water warming in Auerbachs Keller

For most of us in Germany, Auerbachs Keller is associated with Faust; a tragedy by Johann Wolfgang Goethe. Many people know the scene where the depressed Faust was brought into Auerbach's Keller directly after he sold his soul to the Devil. When they reached the cellar the Devil shows some magic tricks and teased drunken students to free Faust from his unsatisfaction.

Uncountable further famous visitors like Bishop Tutu, Bill Clinton and Queen Silvia of Sweden visited Auerbachs Keller to be entertained, too. Since the opening of the pub these famous people plus 100 million guests made it to one of the 5 most famous in the world.

ONLY A FEW KNOW OF ANOTHER REGULAR AT AUERBACHS KELLER. THIS REGULAR IS HIDDEN IN THE PLANT ROOM. IN FACT IT IS THE DK HEAT RECOVERY SYSTEM!

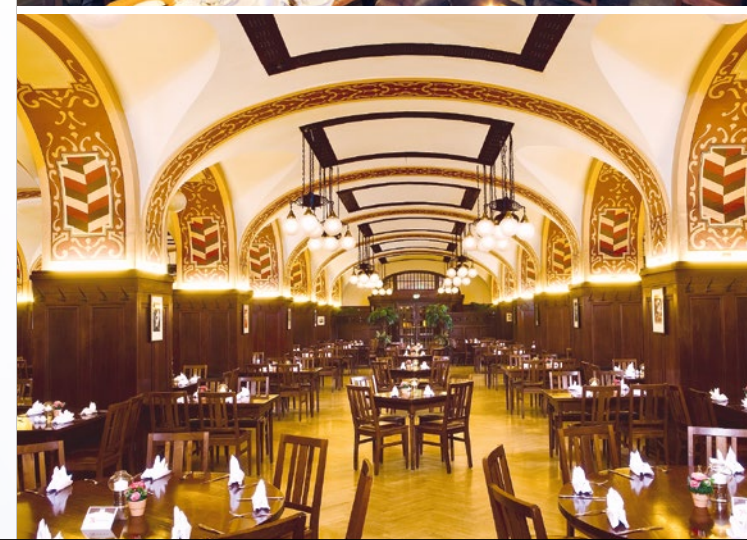


Hardworking and tireless this system heats the potable water in an enamelled 750 litres storage tank with double walled heat exchangers. The heat recovery system was installed by the company "Der freundliche Eisbär". Making use of the refrigeration equipment waste heat is both: effective and economic.



Der freundliche Eisbär...

The busy staff gets through a large volume of warm water for dish washing and food preparation. For example 14.000 kg of red cabbage are handled in these 2 restaurants per year. The water consumption of the restaurants and the staff showers can fluctuate between 13 and 30 m³ each day.



The DK-Heat-Recovery uses the complete waste energy and provides 2 large horizontal tanks as a preheater to the main boiler, providing enormous efficiency.

Each hour more than 400 litres of water can be preheated from 15 to 45°C using just 18 kW of free waste refrigeration energy. The daily amount of water heating is approximately 4,000 litres; and totalling at over 1.5 million litres per year. An enormous annual saving of 50,000 kWh is achieved for the client.

The long life time of the DK products is another advantage. Frequently, heat recoveries of DK have worked more than 20 years. The system at Auerbachs Keller has already worked tirelessly now for 9 years.

And in that time has notched up more than 14 million litres of hot water! Saved approximately 480.000 kWh respectively 52.000 m³ gas and has relieved the environment of 96.000 kg of harmful CO₂ emissions.

AND OF COURSE THE UNIT KEEPS RUNNING





Waste heat utilization at Fahlenbock Bakery

THE FAHLENBOCK BAKERY, LOCATED IN THE HANSEATIC CITY OF WIPPERFURTH IS A REAL SHOWPIECE.

Set amongst other competing gourmets in the Oberberg district, the Fahlenbock products are at the top of every foodies shopping list. The high quality maintained by this 5th generation artisan baker keeps them ahead of cheaper competition and mass produced offers. But tradition does not mean old fashioned – quite the contrary; in 2013 Fahlenbock built a new modern production facility for their quality products.

The master baker, Klaus Fahlenbock, had a clear vision for the new factory, in maintaining the highest quality, introducing innovative dough fermentation without unnecessary additives and a clear vision to explore all avenues of energy and resource efficiency. DK was involved from the outset and played a major role in delivering the energy efficiency goals.

Rather than follow the standard procedure of releasing the waste heat energy from the refrigeration equipment to the atmosphere – DK designed a system that utilises every kW of this “unwanted waste heat” to provide a continuous supply of freely heated potable water for the business operation – and more!



- The DK system offers many advantages; including
- A patented design principle that guarantees perfect heated water stratification purely by thermal action with no mechanical assistance.
 - The double-wall heat exchanger manufacture that prevents any ingress of water into the refrigeration system.
 - Full legionella protection to the highest standard of certification of the WESSLING-Seal.



The Technical Bit

In addition to the DK system providing all of the potable hot water for the business, our Engineers looked for further available uses for the “waste heat energy”. And two further areas were identified. Heating of glycol to warm the fully automatic fermenters and heating of a second glycol circuit to defrost the evaporators.



Rather than go down the standard route of using electric defrost elements, the DK system provides heated glycol to 70–80°C to enable rapid energy efficient defrosting to take place, without the cost of high priced electricity and the regular replacement of defective heater elements.

These impressive designs and the innovative approach from DK, enabled funding of 80,000 Euro to be granted for the project from Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

The system was designed jointly by Ungermann Refrigeration, North Rhine – Westphalia Efficiency Agency and DK.





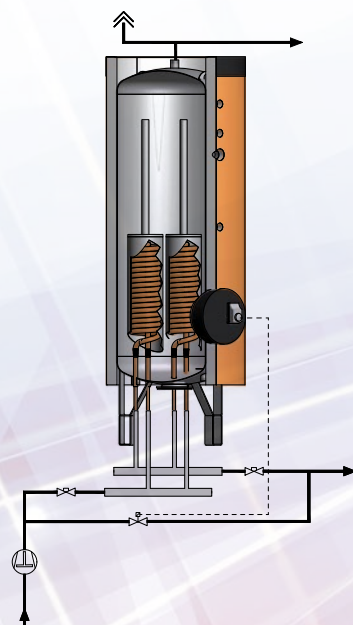
Using waste heat energy from CO₂ cooling units at EDEKA supermarket

The history of EDEKA Meyer's Frischecenter is similar to the history of DK Kälteanlagen. Both companies are now in their thirties and are family owned.

In 1980, Bert Meyer founded a delicatessen store in Pinneberg. By now, the company developed to a medium size food chain with seven locations for example in Hamburg, Pinneberg and on the island of Sylt. Bert Meyer involved his daughter and his son successfully in the company to correspond this positive development. In April 2004, his son Jörg Meyer overtook a former Inter-marché store in the Ölmühlenweg in Hamburg-Wandsbek. With this acquisition Jörg Meyer built the largest supermarket in the Meyer group with a sales area of 3,100 sqm.

Since the end of the last year after comprehensive renovation, the EDEKA market Meyer's shines like new. The new designed sales area provides the customers a sales experience with a multitude of choice: fresh fish and meat as well as cheese and dairy products. Large investments in the sales area were also mirrored in sustainability improvements to the back of house areas. Carrier Commercial Refrigeration Germany planned and installed the new CO₂ booster unit including an innovative application of waste heat energy.

Carrier



DK-HEAT RECOVERY FOR CO₂ COOLING UNITS

Since 2008, DK has been offering systems (maximum operation pressure 130 bar at 150°C) for optimal waste heat recycling from CO₂ cooling plants. DK has already been successful with 600 delivered units and with more than over 2,000 heat exchangers (status as of August 2018). Two DK storage tanks take care of warming drinking water as well as heating water free for the EDEKA Meyer's market. The warming of potable water is carried out directly by double walled internal CO₂ heat exchangers in an enamelled storage tank of 450 litres.



POTABLE WATER

With a sales area of more than 3,000 m² and the focus on fresh products, the market needs a high cooling capacity (approx. 160 kW). The chosen concept contains a tailor made storage tank of 900 mm in diameter, including nine double walled heat exchangers connected by a 1 5/8" K65 pipe. The heat exchangers can transfer 21 kW waste heat and can produce more than 300 l/h for free from 10°C to 60°C.

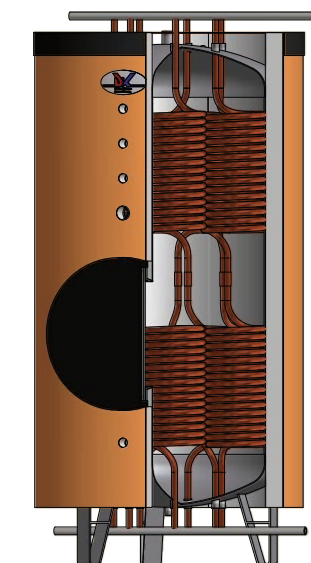


HEATING WATER

The second storage tank with single walled finned tube heat exchangers directly warms up heating water, without the need of a loading pump. For this purpose, seven heat exchangers are built along the complete height of the storage tank and transfer at a total mass flow of 3,806 kg/h an effective waste heat capacity of 100 kW in winter.



In summary; the EDEKA "Meyer's Frischecenter" solved two comprehensive challenges. First the decision to future-proof the refrigerant issue by adopting the refrigerant CO₂ as a long-term solution. Secondly taking a responsible resource and environmental decision to invest in an energy saving and environment friendly use of waste heat, which will minimise the energy costs and carbon emissions for many years to come.



DK cold brine preparation, DK heat recovery and much more at the ham manufacture Klumper

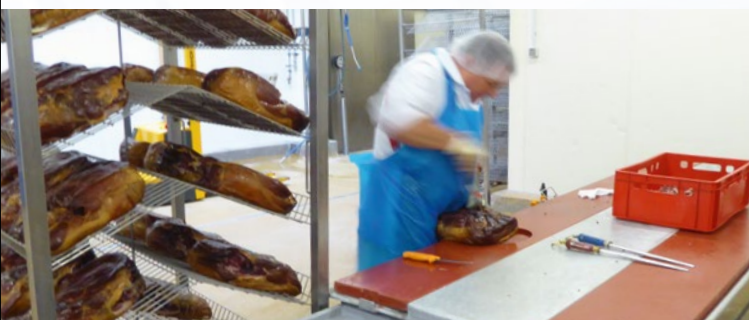
Representatives of specialist refrigeration company HEIFO & DK (including DK-CEO M. Kappenberg, DK-sales representative Daniel) enjoyed a memorable visit to the renowned ham manufacturer – Klumper in Schüttorf, Germany.

Klumper is a renowned family-owned company, producing high quality products, and only one of a few meat producers to meet the strict import standards of the USA. Now almost 200 years old, the company continues to expand, and collects numerous awards on the way.

Of special interest to Michael Kappenberg was the number of DK products installed on the site – the very first being supplied almost 24 years ago.

A brief look at the inventory of DK at Klumper

- seven DK DHW cylinders with five external heat exchangers
- six cold water/cold brine tanks with nine evaporators
- seven suction gas heat exchangers
- two special components (1x for degassing and 1x hot brine/water)



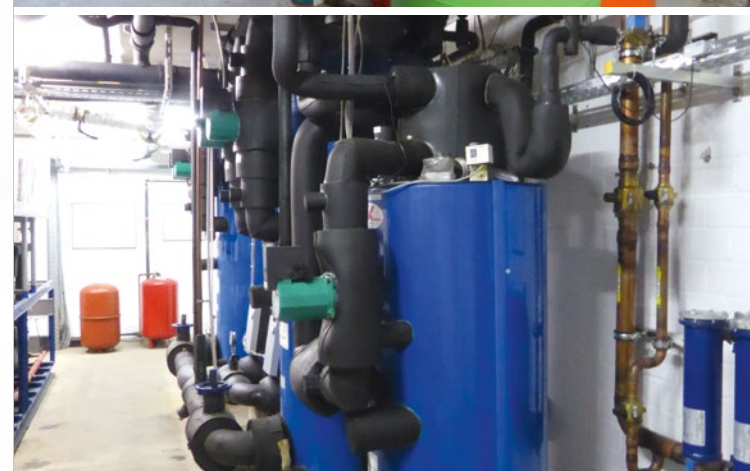
It could not be summed up better than by the testimonial of the technical director Bernd Egbers of Klumper: DK can offer everything for the ham manufacturing industry from their extensive catalogue – plus a little more (the two custom-made components to Klumper specification).



From left to right:
Mr. Egbers of Klumper, Mr. Mrdovic of HEIFO
and Mr. Kühn of DK

But in turn... In 1821, the “special ham-salt smokehouse H. Klumper” was founded in a Westphalian farm. The almost 200-year history is marked by the continuous growth of the family business, which is now in its seventh generation. In addition, the products were awarded several times. For example, Klumper is one of the few companies of the German meat producer that meets the strict import standards for the US market.

With the construction of the new production facility 24 years ago, the installations of DK products began in the machine rooms of Klumper. DK's first tank was a heat recovery unit for DHW heating. In 1999, the production area was extended by a further 3,000 m². For this, new cold rooms with direct expansion cooling were added. In this work period, DK storage tanks were installed to heat the heating water and to provide heated brine defrost.



From 2007 Klumper improved the cooling system – section-by-section – to a cold brine/hot water system. Vastly improving the control of the cooling/heating process, giving a perfect degree of ripeness of the ham. The deep-freeze rooms continue as direct expansion, including an environmentally friendly defrost with warm brine. During the refurbishment work, two further DK chillers of 950 litres each with internal evaporators were installed in addition to further double-walled, external DK-tubular de-superheater/condensers. These heat exchangers units heat food grade standard hot water for wash down facility and ham storage boxes cleaning. In addition, seven DK suction gas heat exchangers were installed on the existing compound plants, which are placed adjacent to the evaporators. These ensure complete evaporation of all still liquid particles to prevent liquid carry over to the compressor and increase refrigeration efficiency.

In 2015 HEIFO installed a 2,000 litres of chilled bank-storage, hopefully not the last DK product. The two integrated evaporators, each with 120 kW, provide cold brine for the smoke and climate chamber as well as for processing.

This is probably the most comprehensive catalogue of installed DK products for a single customer, working alongside a long-term installer partner.

A perfect testimonial of:

- Listening to the customers needs
- Designing and manufacturing the bespoke solution
- Working with trusted quality installers.

DK WOULD LIKE TO THANK KLÜMPER AND HEIFO FOR THE DECADES OF TRUSTING CO-OPERATION AND MUTUAL SUPPORT



Heating potable and heating water in a single storage tank for the Westfalen Petrol Station in Olfen/Germany

Westfalen AG is well known as a specialist in the cooling sector and supplier of refrigerants. Many people recognize the striking white horse symbol on a red background with more than 260 petrol station outlets in North-Rhine-Westphalia and Lower Saxony operated by the family owned business in Münster.

With the continuing trend of fuel stations developing additional services, such as small convenience stores, with cafes and food – to-go offers, more and more refrigeration is needed and with it the ability to access valuable waste heat energy for use on site.

In November 2010, our customer (the refrigeration specialist, Michels) installed a DK system for waste heat utilisation in a Westfalen petrol station in Olfen. The DK-Energy Storage Tank provides both: potable hot water and heating water in one single tank. The drinking water is heated to high temperatures in a demand flow principle and as a result there is full legionella protection as no potable water is stored.



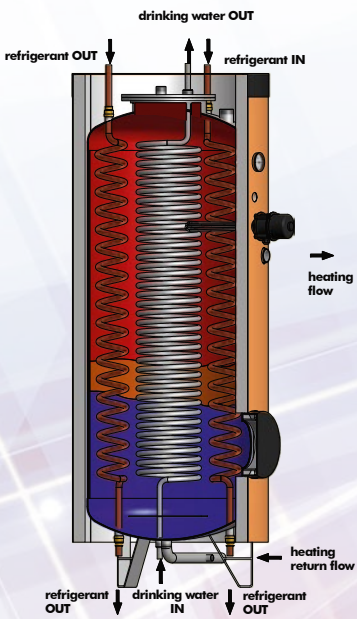
DK Kälteanlagen has remained true to its origins for the last 39 years. From the outset it was our aim to produce tailor-made storage tanks with the highest flexibility for our customers. Maximum flexibility is achieved through our own tank production and countless heat exchanger combinations.

The picture on the left shows the twin solutions in a single tank. The heating water flow line is located in two thirds of tank height and a buffer of hot water is stored in the upper part of the tank which is separated from the heating water circuit. The upper part of the tank is heated by the de-superheating energy of the cooling units to temperatures above condensation temperature as a result that potable water can be heated to higher temperatures than the condensing temperature.

Internal heat exchangers are fitted over the total height of the buffer tank. This arrangement will ensure two different water-temperatures in the tank. The result is to store the de-superheat energy in the upper part of the tank.

The following cooling machines are installed in the Westfalen petrol station:

Freezer cell	Qo = 1.63 kW	Qc = 2.90 kW
Freezer cupboard	Qo = 1.12 kW	Qc = 2.00 kW
Normal cooling cell	Qo = 2.20 kW	Qc = 3.20 kW
Total performance	Qo = 4.95 kW	Qc = 8.10 kW

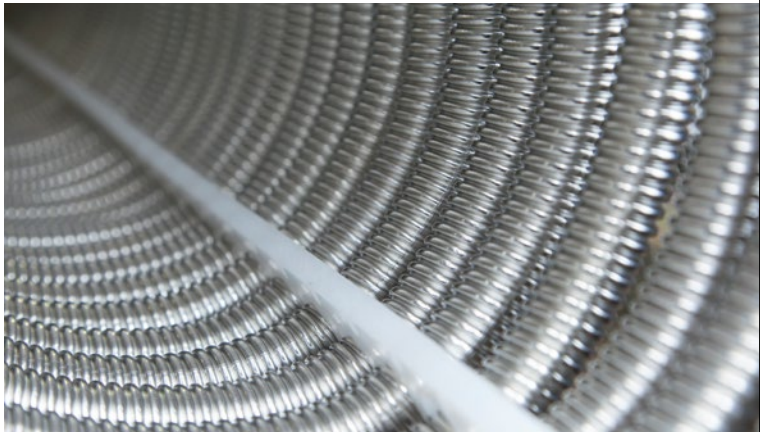


The heat-recovery for this application is a DK-Energy Storage Tank with a volume of 400 litres. Fitted in the tank are three single-walled heat exchangers (2x22 mm/ 2.5 m² + 1x16 mm / 0.8 m²). For heating the potable water there is a dedicated internal stainless-steel spiral-heat exchanger ¾ inch, measuring 15m in total length. In addition the potable water solution, further waste heat energy is used for heating the staff areas of the petrol station.

Warehouse	39 m ²
Personal room	11 m ²
Rest rooms	20 m ²
Preparation room	13 m ²
Total area	83 m²

The cooling specialist Michels, recorded technical data for a five month period following the installation (Nov 2010 till March 2011). The data shows that the energy heat recovery was sufficient to ensure the majority of the heating for the rooms and for the hot water preparation. During this colder than average winter the electrical consumption was 90 kWh for the additional electrical heater back-up use. The 6kW electrical heater was in operation for only 15 hours during the entire winter period.

The recorded data is proven evidence that the DK-Energy Storage Tank is an economic and environmentally friendly solution for similar projects. This measuring data allowed for the Westfalen-petrol station in Olfen/ Germany to remove the connection from the mains gas grid.



Drinking and heating water heating at EW Button & Son

This application example is meant to symbolize thousands more. After all, DK delivers about 35% of the heat recovery systems abroad, such as almost every day one system to Switzerland. However, one by one...

DK, founded in 1979, is a family-owned company based in Emsdetten in Westphalia. „Strongly anchored in the home country and open to new things in Europe“ is and remains the DK philosophy. The first interest abroad in the DK heat recovery was in the early eighties. In 2018, we are pleased to be able to deliver to 30 countries. We are particularly proud that in 2018 the first heat recovery for a CO₂ refrigeration system was shipped to the other end of the world – to Australia.



From left to right
Bogdan Bednarczyk of DK-Kälteanlagen (Eastern Europe Manager),
David Haughton of DK Heat Recovery Limited of England, Jean-Michel
Gaillard of ROLESCO in France, Bernd Schröder of DK-Kälteanlagen,
Felix Bräutigam of DK-Kälteanlagen

Therefore, it is clear - the process of internationalization will continue. In recent years, we have been able to find new partners in France and England and establish a business relationship. At DK-Heat Recovery Limited in England, DK- Kälteanlagen GmbH is even a shareholder. On the British island, David Haughton and Ken Riley sell the DK products with utmost dedication, such as the Cornwall EW Button orchard in the south of England. This farm, located on the edge of the beautiful Bodmin Moors, sells its fruits to the leading supermarkets in the UK.

In addition, EW Button is a true showpiece in terms of sustainability. With the help of waste heat recovery from DK two challenges of the operation could be solved optimally.



1 The heating of hot water for the showers of the 300 harvest workers.

When the waste heat was still unused, the electricity was heated for a price of 11 pence/kWh. Now, a 1,500 liter tank from DK with four double-walled heat exchangers directly supplies warm drinking water.

2 The heating of a new building

The use of waste heat also heats a newly constructed complex of buildings. With the help of underfloor heating, both the offices and social rooms are heated in winter. For this purpose, a DK storage tank with a volume of 300 liters and three single-walled heat exchangers was installed, so that nobody has to freeze in the winter.

In addition, it is currently being considered how to make good use of the warm water in the time when there are no harvest workers on the orchard. A promising idea is to irrigate the plant roots directly in order to increase the yield. But even without these measures, the savings are already very high. Therefore, the company was able to reduce its bill for heating water and the heating of drinking water from £ 12,000 to zero.

Of course, the environment has also been relieved and Button EW is even more sustainable. Ultimately, the newly installed systems save 45 tonnes of CO₂ per year.



Cool Solution – Hot Performance – DK

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