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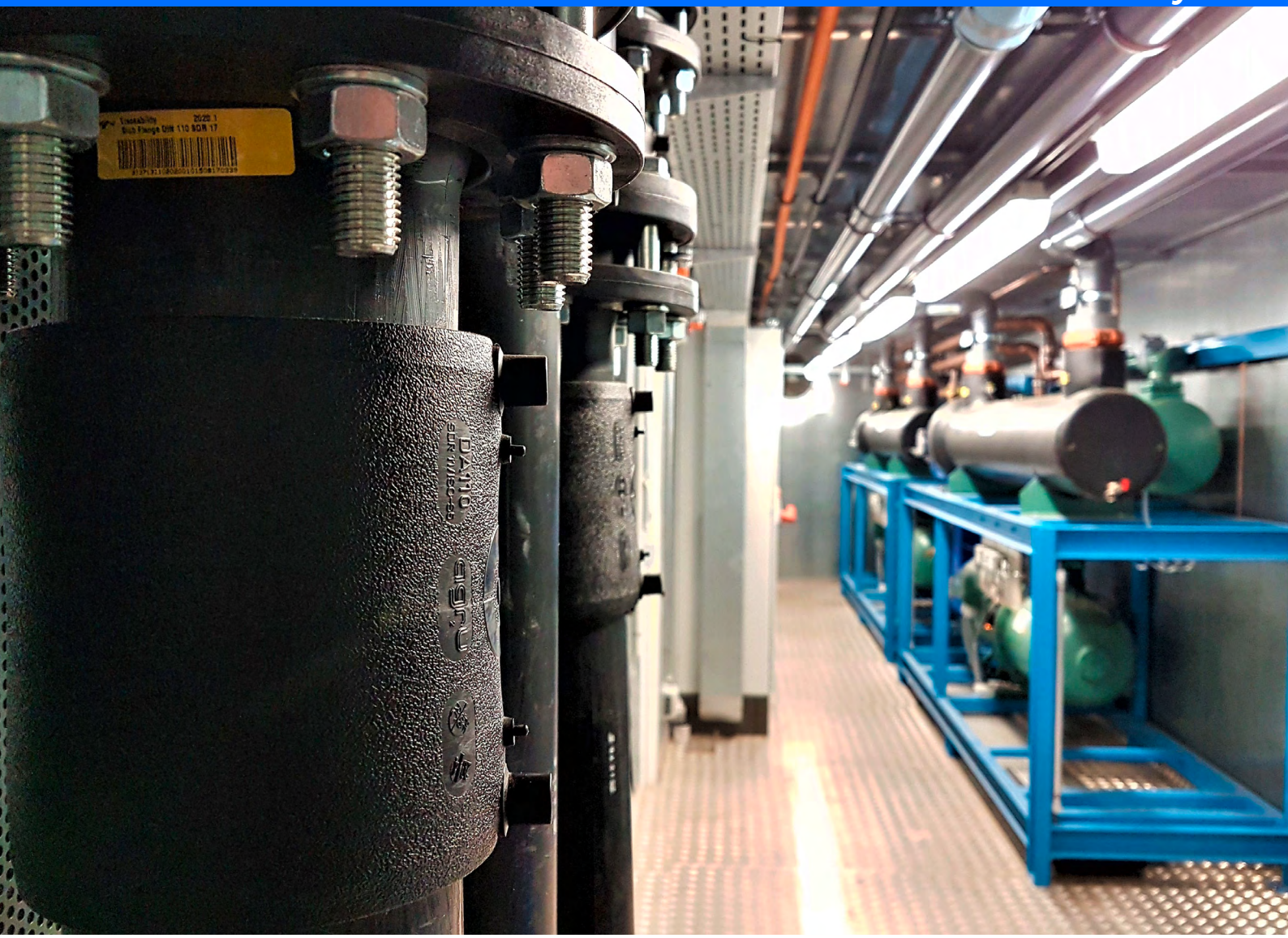
Refrigeration system in a container: a flexible and sustainable cooling solution

AGRU-FRANK GmbH wants to expand its production and relies on an energy-efficient container-based cooling solution made by Reisner Cooling Solutions GmbH

Case study



Reisner COOLING SOLUTIONS

Maximum refrigeration capacity and unique energy-saving technology

Water filter
Water filter and PE100-RC pipes with fittings made by the FRANK group.

Container plant
Container-based cooling solution with a dry cooler on the roof: The fact that the refrigeration unit is located outside of the production area frees up space inside the company's own halls.

In the plastics extrusion field, the bar is continually being raised, and efficient and resource-saving production is becoming increasingly important. Refrigeration technology plays an important role as modern cooling solutions lead to considerable energy cost reductions and clearly lower CO_2 emissions during production. The example of AGRU- FRANK GmbH, a manufacturer of plastic pipes, shows that investments will pay off within a very short period. Due to their general expansion, the company invested in a container-based solution made by Reisner Cooling Solutions GmbH, a technotrans group company. In addition to lower costs, AGRU-FRANK also benefits from more space in its own production facilities thanks to the smart container integration and reserve capacity of its new, energy-efficient solution.

AGRU-FRANK GmbH, with its headquarters in Wölfersheim, Germany, is one of the eleven companies of the FRANK group. The shareholders of the group are FRANK GmbH in Mörfelden and AGRU Kunststofftechnik in Austria. AGRU-FRANK produces polyethylene pipes for the drinking water and gas supply, sewage disposal, and industrial applications. In addition, the company offers special pipes as well as multi-layer pipes. The year 2020 was a particularly successful year for the company with their production output and turnover increasing by more than 10%. In order to be able to meet the growing demand in the future, AGRU-FRANK has invested in several new machines and systems.

Pressure pipes, molded parts and downhole heat exchangers are produced in several steps. For the pipe extrusion process, small plastic pellets are melted and then shaped by a special tool. Then, the plastic material, which is heated up to approximately 220°C, is cooled so that it maintains its shape. However, as a result of the expanded production capacity, the available refrigerating capacity was insufficient, especially during the summer months. The high temperatures led to strong fluctuations of the cooling water temperature. This is why, in addition to the expanded production machinery, the demand for an efficient cooling technology also grew: “We required a higher refrigerating capacity, and as we were already using several Reisner cooling systems at our sister company DRS-Rohrwerke Sachsen, we put our trust in Reisner Cooling Colutions GmbH and their competence,” says Benedict Stribrny, technical manager and authorized signatory of AGRU-FRANK GmbH.

Reisner’s sustainable cooling solution convinces AGRU-FRANK

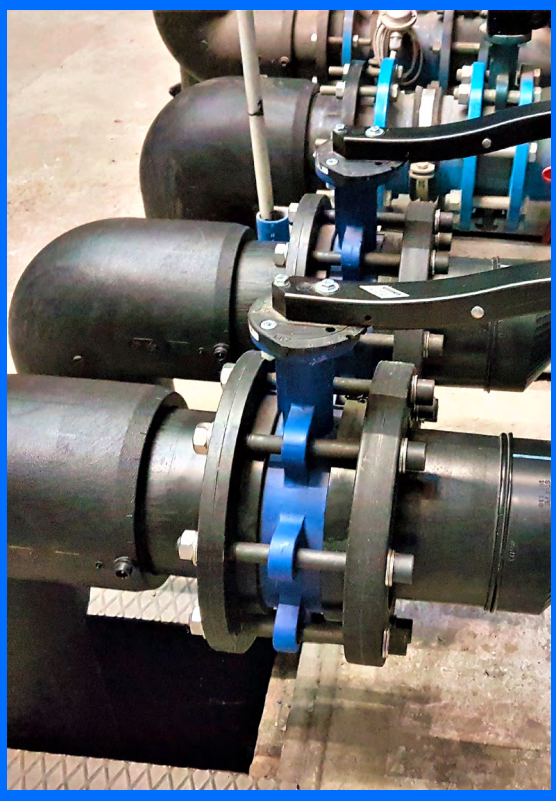
For the selection of the perfect cooling solution concept, AGRU-FRANK defined a range of requirements. The cooling solution had to be able to control the cooling water temperature also during summer thanks to a higher capacity. Energy efficiency and heat recovery also played a major role in the purchase decision. In addition, the system had to have sufficient capacity reserves in view of an ongoing positive development of the company and expansion of the production facilities. Last but not least, a small footprint was desired.

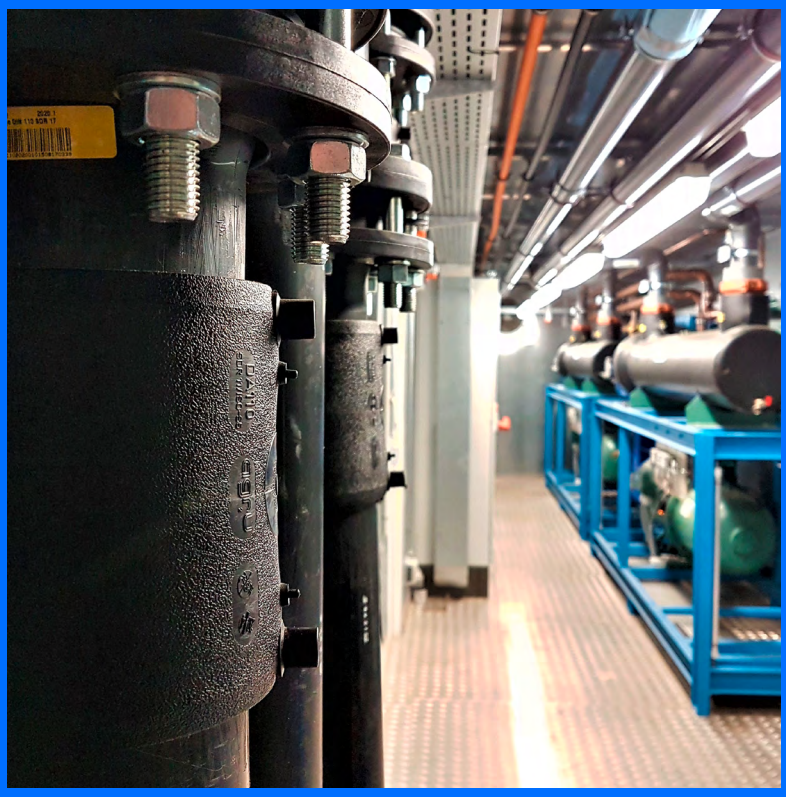
The concept presented by Reisner convinced AGRU-FRANK in every respect: “Reisner was able to fulfill several of our requirements as early as during the planning phase. Thanks to a customized refrigeration system with its outstanding VARIO energy-saving technology, gliding condensation pressure control, and a heat recovery solution, Reisner ensured optimum conditions,” says Stribrny. The solution, which fits into a container, consist of two KWR-S 400-17/KS refrigeration systems with a cooling capacity of 400 kW each and two condensers with energy-saving EC fans, and has been adapted to the specific requirements of the customer. The service provided by Reisner is another plus: “We felt very well advised and were supported expertly and reliably throughout the entire project,” says Stribrny.

Maximum refrigeration capacity and unique energy-saving technology

The level of efficiency played a major role in the decision as the plastic extrusion process consumes a lot of energy: “As a company with a high use of energy, we see it as our duty to use resources responsibly,” explains Stribrny. This is why they have been certified as per the DIN EN ISO 50001 energy management standard for several years. It requires a continuous efficiency increase in the production field as well as the realization of energy saving potentials and compliance with specific CO_2 emission values. This is why the company focuses on low resource consumption whenever it purchases a new refrigeration system. “The increase in efficiency will continue to play an important role in the years to come.

»Relocating the refrigeration technology outside the building freed up valuable space in our production halls.«





Pipes neatly
The pipes neatly laid by Reisner are PE100-RC pipes made by the FRANK group.

Inside the container
The new cooling solution includes two Reisner refrigeration units with a refrigeration capacity of 400 kW each plus refrigeration unit condensers with EC fans.

New drives for the production machinery, more effective pipe cooling concepts and a holistic circular economy approach will be the major drivers in the plastic pipes sector in the next few years," explains Stribrny. Maximum refrigeration capacity combined with a high level of energy efficiency and sustainability are important to AGRU-FRANK. As a result, Reisner integrated its unique energy-saving technology, thereby considerably reducing the current consumption and operating costs.

The bespoke refrigeration system consists of two separate cooling units with a maximum refrigeration capacity of 400 kW each so that a total of 800 kW is available. The R513A refrigerant, which is used by the systems, has excellent thermodynamic properties and a considerably lower GWP (global warming potential) than conventional refrigerants. Another advantage is the use of the so-called Vario technology. Thanks to special valves and an equally special electronic control system, the Reisner cooling solution adapts the condensation temperature to the outside temperature. This saves up to 477,490 kWh per year. The Reisner project team explains: "The electronic control system measures the outside or condensation temperature. The colder it is outside, the stronger the condensation temperature will be decreased, thereby reducing the power consumption of the electric compressors."

During winter, an additional dry cooler takes over the complete load of the two systems and supports them between the seasons. This results in annual savings of approximately 900,000 kWh or 480,000 kg of CO_2. Last but not least, AGRU-FRANK recovers the heat of one of the refrigeration units and uses it to heat a production process during summer when the winter relief system, i.e. the free cooler, is not active. In order to make optimum use of the waste heat, Reisner developed a concept based on which the heater water can be heated by way of a heat exchanger in the refrigerant circuit.

Space-saving container as the machine room

Due to the conditions on site, the two refrigeration units would not have fit into the existing production halls of AGRU-FRANK. This is why Reisner's team developed a container with a length of 12 m and a width of 2.5 m as the machine room. This container holds the two refrigeration units, a control cabinet with a Siemens PLC, ventilation and exhaust air grilles, a gas leak detection system, several exhaust fans, an electric heater, and a lighting system. When the system was set up and installed, Reisner also provided the entire cabling inside the container as well as the cabling of the external units on the roof of the container. "The container-based solution is perfectly adapted to our needs. Due to the fact that the refrigeration equipment is located outside of the building, we were able to free up valuable space in our production halls," explains Stribrny. For the connection of the container to the tank, Reisner used the modern PE100-RC pipes of the FRANK group. Unlike PVC pipes, these pipes are permanently welded.

Thanks to the closed design, the refrigeration system can be easily relocated and used at a different site. Stribrny explains: "The Reisner container solution is very well engineered. The fact that the entire unit could be set up in front of our production hall convinced us. This enables us to free up additional space if our production output continues to rise." As AGRU-FRANK decided in favor of a large container, there will be sufficient space for realizing a further expansion of the system in a fast and effortless manner. As a result, the container can be easily expanded and the company can promptly benefit from a higher refrigeration output. The Reisner project team explains: "Our systems are future-ready thanks to numerous flexible expansion options."

Good collaboration pays off

The entire project covered a period of nearly six months before the system was commissioned in summer 2020. Stribrny is highly satisfied with the result: "From the very first day after commissioning, we noticed the improvements. The temperature fluctuations of our production water are a thing of the past." With the modernization project, AGRU-FRANK and Reisner have laid the foundation for further cooperation. Their excellent service and availability are two additional strong features because of which the customer is keen on pursuing further joint projects. The next step for Reisner will be the replacement of its water pumps, for example. Once again, the active control concept combined with energy-efficient, frequency-controlled pumps enable a considerable reduction of the current consumption of the pumps. In addition, AGRU-FRANK is in the process of building a new production hall: "We will continue to grow, which is why refrigeration continues to play an important role for us," explains Stribrny.

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Factsheet

Refrigeration technology 2020 for AGRU-FRANK GmbH

Project partners	– AGRU-FRANK GmbH – Reisner Cooling Solutions GmbH
Requirement	– Additional cooling capacity of 2 x 400 kW – To maintain a specific cooling water temperature during summer – Energy efficiency and heat recovery – Reserve capacity – More free space in the company's own production halls
Solution	– Two Reisner refrigeration units with a refrigeration capacity of 400 kW each – Refrigerant R513A with a GWP value of 631 – Two refrigeration unit condensers with EC fans – Container as the machine room – Control equipmentk
Energy-saving features	– Winter relief ensured by a dry cooler – Refrigeration unit with Reisner Vario technology – EC fans
Period	– From the quotation phase in January 2020 until the final acceptance in July 2020

Portfolio

Refrigeration up to 5MW
Split/compact refrigeration systems, refrigeration systems for outdoor installation, container systems, cooling towers and dry coolers

Energy saving technology
Variable condensation, winter relief, Heat recovery, speed control, EC fans

Heat exchanger systems
Heat exchangers, bath heat exchangers, bath pumps for electroplating technology

Cold water circuit
Tanks, pumps, pipework

Control technology
PLC programming, control cabinet construction, Efficiency monitoring, remote diagnostics, online Program correction

Service/cooling water maintenance
24/7 emergency service, repairs, leak tests,performance measurement, filter systems, dosing systems, water chemistry.

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