Schäfers Backstuben GmbH, Biedenkopf

Energy plays a key role when redesigning and rebuilding a bakery, as the example of Schäfers Backstuben GmbH shows. The refrigeration area of the new production site, which went into operation in February 2008, is equipped with an innovative system by the MIWE system and solution provider, based in Arnstein. "We've already seen positive benefits in our energy costs," Heinz Lichtenthäler notes.

After a careful planning phase, the new operation building was realized in ten months. "My son, especially, didn't want to build an addition onto the existing building again," Lichtenthäler recalls. His grandfather Ewald Schäfer founded the bakery in 1931. In the 30 years since Heinz Lichtenthäler took over operations, he has gradually expanded the number of branch locations. This has required a regular expansion of production capacity. The most recent addition was a new 1,400 square meter production area, which went into operation in 1996.

"Although our tight production area didn't lead to quality issues, of course we can now work in a much more productive and efficient manner," Heinz Lichtenthäler notes. Schäfers bakery has always emphasised quality, and makes no compromises when it comes to the choice of flour and other raw ingredients.

The new bakery building figures:

Size of property:	15,000 square meters
Building alterations, surface area:	4,000 square meters
Building operations, area:	14,000 cubic meters
Production space:	3,000 square meters

A number of different leavenings are kept in vats for bread production. A cooling cell from the old operation building is used as a climate-controlled room, where leavened doughs with rye or wheat rise at exactly +24 °C. Another cooling cell at +16 °C is used as a rising room for the starter doughs.

Most of the cooling technology is outsourced from the production halls. The doors to the cells are located on one of the →

The branches are equipped with MIWE condo deck ovens.

Heinz Lichtenthäler in front of the MIWE cooling unit.

The bakery's baking and climate-controlled chambers.

long walls; the cells are not surrounded by walls, and require only a roof covering. In the expansion, MIWE employed modular cell walls. The components are fixed together using a toggle-lock construction with a tongue and groove system. Since there was plenty of available surface area, the cooling unit condensers were located immediately adjacent to the units, which also minimises conduit length.

Units from the existing inventory were integrated into the operational concept of the new cooling units. "However, we wanted to get away from the most commonly-used deep-freezing method," Heinz Lichtenthäler remembers. Extended dough proofing processes that do not require deep-freezing provide better energy-use as well as quality benefits.

Operational head Clemens Jakoby agrees: "In the products where we were able to switch to long-time proofing, we've noticed sales growth." For this reason, a smaller MIWE TLK dough piece preservation unit was chosen rather than the one in the old operation. However, it remains an important part of the baking process. It is especially important during peak production times, when the other cold cells do not have sufficient capacity. There are two rapid coolers (rapid freezers), each with five rack trolleys, connected upstream. The TLK is also accessed indirectly in order to reduce the amount of heat and humidity that enters the frozen storage area.

The fully automatic proofing machine (MIWE GVA) and proofing interruption unit (MIWE GUV) are significantly larger. For example, an existing GUV was converted to a GVA. These units provide a broad temperature range, from -20 °C to proofing conditions over +40 °C. The GVA also includes an active humidity system to ensure high humidity, which keeps the dough pieces from drying out during the proofing process.

The reconfiguration was necessary because these days, all products apart from bread are cold-processed, primarily through long-time proofing. The philosophy of quality in Schäfers bakery requires that dough pieces are proofed with a very slow proofing rate over a long time-period. The slow proofing rate in the GVA ends at a maximum of +28 °C. MIWE bakery refrigeration control systems are flexible and easy to operate, which makes it possible to program and utilise specially-programmed cooling and proofing curves. "This was crucial to our operation," as the master baker Clemens Jakoby notes. "It allows us to set programs specifically adapted to the operational requirements."

The refrigeration area in numbers

Cooling cells from the old operation are used as climate-controlled rooms for leavened doughs and starter doughs, or as cooling areas for pastry production.

The new construction includes the following dough piece equipment:

- two MIWE SF flash freezers (each with five rack trolleys),
- one MIWE TLK dough preservation unit (approx. 85 rack trolleys),
- three MIWE GVA fully automatic proofing machines (112 rack trolleys),
- one MIWE GUV proofing interruption unit (32 rack trolleys),
- one MIWE KR climactic chamber (18 rack trolleys) and
- two MIWE GR proofing units (24 rack trolleys).

Some of this equipment was taken from the old inventory and converted, when necessary for re-use in the new operation.

At Schäfers, the dough pieces are not kept in the GVA until they are fully proofed. "Our oven capacity is not equipped to

deal with all the dough pieces becoming fully proofed at the same time," Jakoby explains. The baking takes place in several MIWE roll-ins as well as thermal-oil heated rack and multi-deck ovens. In order to free up the ovens for baking, the GVA program includes an additional step after the slow proofing. "We call it recooling." The system cools back down to +10 °C. This stabilises the dough pieces so that they can be baked in sequence.

This process can also be used to good advantage in the MIWE climactic chamber (KR). In contrast to a proofing chamber, the KR is fully insulated. It can also be used for cooling. It includes additional evaporators that can achieve a temperature reduction up up to +5 °C.

All cooling units are require a costly energy investment. Energy is required to remove heat from the cooling cells, for defrost heating of the freezer cells, and for heating during proofing. This means that some processing steps release energy that can be utilised in other steps. "So we asked, why not join together the two processes," said Stefan Kutska, who heads the MIWE bakery refrigeration department. In Schäfers bakery,that's exactly what was done.

In the freezer cells, the electric thawing process in the condenser was replaced with a glycol defrosting system. The condenser includes integrated glycol conduits. The glycolic liquid does not freeze. When the condenser needs to be defrosted, the glycol circuit is heated.

But Heinz Lichtenthäler does not need to use electricity to heat the glycol. That's because cooling is achieved by removing heat from the space that needs to be cooled. Instead of releasing this heat into the environment, it is released into water. The water is heated to a temperature between 40 and 45 °C.

However, this temperature isn't sufficient for defrosting. So the heated water is heated further with heat released from the ovens during the baking process. Large buffer storage units in the technical room of the bakery building collect the energy at no cost. The crate washing machine can also be operated with water warmed through this heat recovery process.

The glycol mixture heated with this waste heat can also be used for heating purposes. This means that the MIWE GVA does not need an electric heating unit. Instead, the heated glycol mixture is brought to the cells' heating element and heats them at no cost.

The freezer cell frost protection unit is operated with a glycol mixture in the same manner. A frost protection heating process is needed to keep cold from escaping through the cell floors. Otherwise the building and the cell material would be damaged by condensed water and cold. If the temperature drops below a pre-set threshold, the frost protection unit automatically turns on and prevents the escape of heat – much like an underfloor heating unit.

All of these measures, taken together, yield substantial energy savings. "It's hard to say how long it took for the plant to amortise the investment," Heinz Lichtenthäler says. The calculation has to take into account factors like energy →

View of the pastry production.

View of the technical room, which contains the buffer stores, among other things.

Günther Hartmann, Clemens Jakoby, Heinz Lichtenthäler and Bastian Stromberg (from left).

The bakery's cooling areas are located next to the production hall.

costs and plant capacity utilisation. "However, we're already at higher capacity than originally planned." Lichtenthäler is certain that the investment would pay for itself within a few years.

He's already achieved significant savings with the electrical technology for the cooling unit. The glycol defroster and heater has already resulted in substantial electrical energy savings. "This has substantially reduced the connected load," the MIWE department director, Stefan Kutska, notes. In addition, the bakery can avoid expensive power spikes, which would otherwise arise when the defroster heaters are switched on.

But Heinz Lichtenthäler knows that's nothing he needs to worry about. The system operates smoothly and effectively. "We save energy and the long dough times improve quality," says the company head. A win-win solution.

A brief view of Schäfers Backstuben GmbH	
Proprietor: Heinz Lichtenthäler Zur Wolfskaute 14 35216 Biedenkopf, Germany	
Branch outlets:	36
Employees	
Production:	90, of which 9 are apprentices
Sales:	230, of which 19 are apprentices
Distribution:	10
logistics:	6
Administrative:	8
Price examples:	
Bread rolls	0.30 - 0.60 EUR
Split rolls	0.28 EUR
Rye bread 1,000 g	2.80 EUR
Opa Ewald (Stone-baked rye bread) 1,250 g	3.30 EUR
Danish-style pastry	1.25 EUR

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