



A new image with a chamois buck: The beers from the Laško brewery

## First-class beer needs first-class cold

Every child in Slovenia knows him: Zlatorog, the mythical white chamois buck with the golden horns, who according to legend guards a vast hoard of gold on Mount Triglav.



Beer-drinkers far beyond the borders of Slovenia are familiar with "Golden-Horns" – as Zlatorog is known in German. This is because one of the most successful breweries in the former Yugoslavia chose the fantastic golden-horned creature as its symbol and the heraldic animal for one of its beers: the Pivovarna Laško. In addition to numerous others, it brews Zlatorog beer in the town of Laško in the heart of Slovenia, one of the most important spa and tourism centres of the young nation. Tourist brochures like to portray it as a town of flowers, health – and of course beer! Like that of its isothermal spring, the history of Laško beer extends far back into the time of the Austro-Hungarian Empire, in the records of which Laško was still known as (Bad) Tüffer. Once, in the mid-nineteenth century, the thermal spring water and the beer were even very closely associated with each other when the so-called "Thermal Beer", which was said to have been especially

strong and sweet, was brewed using spring water from the "Emperor Franz-Josef Bath", which had a reputation for particular purity.

### A brewery on a growth curve

Pivovarna Laško no longer has a thermal beer of this type in its product range. Yet it remains extremely successful. Its dynamic image reflects the mood of a new beginning that has gripped the entire country. The brewery lost about 40 % of its market when Slovenia became independent and Yugoslavia broke up. However, as quickly as 2001 it again achieved a beer output in excess of 1.3 million hectolitres. This success is based on a strategy drawn up by the Laško management that is as simple as it is clear: Gaining and keeping customers by making top-class beers. One important pillar of this strategy is targeted investment in modern brewery plant, control system and computers. >

### Stricter requirements

The brewery's ammonia refrigerating plant was a critical point in its further development. It had its beginnings in the 1970s and could no longer keep pace with either the rapid growth of the brewery or the increasingly strict environmental protection regulations of the EU state of Slovenia. The managers in Laško therefore decided on a complete overhaul of the refrigerating plant. Apart from a few particularly long-lasting components such as compressors, the plant was earmarked for a complete redesign and set-up. However, there was no leeway for production shortfalls caused by the renovation work. And it was therefore very clear: The new plant would have to be installed with production ongoing.

This places far more exacting demands on the plant constructor, because quite apart from possessing purely technical know-how, in such a case he must be extremely familiar with and be able to master all the other processes involved in a brewery and their interdependence – a complex multiple qualification which – following detailed investigation – the Slovenian brewery found to be most convincingly represented by the Huppmann refrigeration plant specialists. And so the contract to overhaul the ammonia refrigeration plant went to the Franconian town of Kitzingen – Huppmann's first contract from the Slovenian brewery. Besides the overall concept and all the important system components, Huppmann was also responsible in Laško for commissioning the plant. The brewery assumed responsibility itself for the assembly work. Huppmann took care of the assembly engineering, planning inspection, assembly instruction and the pipe-laying inspection with approval.

### Conversion with operation ongoing

Conversion with operation ongoing also meant having to work step by step in clearly defined work phases – and mainly using the winter months as the conversion period, when parts of the old plant could be shut down without affecting production because of the lower ambient temperatures.

### The main aim: Saving energy

The investors specified the greatest possible energy savings and the lowest possible water consumption as the core aims for the overhaul. The aim was to significantly improve the efficiency of the refrigeration plant.

## The Huppmann refrigerating plant guards a hoard of gold

Another aim was to greatly exceed all requirements of the relevant European standards. Such rigour with regard to the subject of energy consumption is of course based on a clear business analysis: The refrigeration plant is the brewery's largest energy-consumer. It alone accounts for slightly more than one third of the electrical power consumed by the brewery. At a time of dramatically increasing energy cost and generally greater sensitivity towards the careful exploitation of natural resources, intelligent refrigeration technology is therefore of great importance. Every kilowatt of energy that can be saved and every degree Celsius

to which it is not necessary to cool the product allows more cost-effective and therefore more competitive products to be made.

The desired effects were achieved in Laško using a combination of three improvement approaches developed jointly between Huppmann and the Slovenian brewery: By employing the most modern standards in brewery refrigeration technology, by optimising all process parameters and plant components, and by establishing an intelligent control concept covering the entire brewery.

The project was started in early 2004. The first two conversion phases have already been completed and the relevant parts of the plant have been put into operation. Implementation of the third extension phase has begun.

### Better for the environment, greater safety

The fact that careful use of valuable natural resources benefits the environment as well as the budget was warmly welcomed at the Laško brewery, because treating nature with care is essential for a brewery that lies in the centre of an up-and-coming thermal spa town. Strict environmental regulations had to be observed as early as in the conversion work. For example, a special ammonia suction plant ensured that the environment suffered no ammonia pollution during the conversion work. But the plant showed its cleanest side in ongoing operation too: All relief lines of the ammonia safety valves are combined so that in the event of a fault, escaping ammonia is absorbed in water centrally and with absolutely no effect on the environment. Unusually high standards are observed in Laško for the same reason. Today, control technology monitors far more parameters and, on top of everything else, has a much higher degree of automation, which eliminates incorrect operations and ensures additional safety.



The careful handling of natural resources is absolutely essential for a brewery that lies right in the centre of an up-and-coming thermal spa town.

Because the planners at Huppmann have an overview of all the processes in a brewery, they were able to configure the control technology so that it had a certain degree of its own intelligence in order to increase efficiency. For example, consumers are assigned priorities completely in accordance with the current operating situation. Depending on the refrigeration consumption, only those machines that are absolutely essential to the present requirements profile are selected in the refrigerating plant. The others are switched off. Far-sighted concepts of this type save a lot of money. They are a result of the networked approach of the system supplier Huppmann, a company that is not satisfied to simply connect individual components but which instead is able to realize a combination that is optimized for the particular application against the background of the foreseeable brewery processes while also being familiar with all parameters and control variables.

### 3 instead of 2 temperature levels

In Laško, the introduction of a third temperature level is a significant development with regard to both technology and energy. The previous refrigerating plant operated with two circuits at  $-5\text{ °C}$  (for cooling the cylindrical-conical tanks with ammonia and for brewing water pre-cooling) and at  $-10\text{ °C}$  (for cooling all other refrigeration appliances and the glycol water cooled cylindrical-conical tanks). In future in Laško, approximately one third of the total refrigeration capacity will be used for each of the three temperature levels  $\pm 0\text{ °C}$  (for brewing water pre-cooling),  $-5\text{ °C}$  (for supplying refrigerant to the cylindrical-conical tanks for fermentation refrigeration with direct evaporation) and  $-10\text{ °C}$  (for the glycol water cooling for all remaining refrigeration requirements, particularly room cooling and beer refrigeration as well as pasteurising). All refrigeration circuits are operated with new, maintenance-free ammonia pumps.

**Phase 1: Saving space and energy**

In Phase 1 of the overhaul, 2 ammonia evaporation condensers were set up first in place of the existing 9 pipe bundle condensers and the associated 8 water recooling towers. From the very beginning, this meant far less water and energy consumption and a noticeably smaller space requirement – an important factor in the case of a town centre brewery that has limited possibilities for extension. The completely new supply lines and the installation of an automatic ventilation system in the ammonia circuit also improved the plant's efficiency as far as energy is concerned. At the same time, the oil cooling of the screw compressors was changed over from an open cooling water circuit (that used to carry a lot of dirt into the system like an air washer) to a closed refrigeration circuit with glycol water, the pleasing results of this being less need for servicing and a longer service life.

The new fully-hermetic ammonia pumps are also maintenance-free. They are responsible, in place of the previous open ammonia pumps, for cooling the tanks, and neither couplings nor any stuffing boxes on them are susceptible to wear.

In the interests of greater plant safety, block section valves combined with an ammonia alarm system have been installed to safeguard the ammonia separators and the individual ammonia lines of the

cylindrical-conical tanks. All ammonia forward and return lines can thereby be individually regulated while closed.

Preventative measures were also taken for monitoring the water circuit for the evaporation condensers and the cooling towers (with a closed circuit): Here, an automatic desalination system (to counteract thickening) and a dosing unit for chemicals were installed to protect the plant against corrosion and algae growth. Fewer deposits ensure that efficiency is maintained and increase the system's service life.

Finally, the existing controller for the refrigerating plant, CO<sub>2</sub>-recovery and the compressed air system were replaced by a S7 controller that is itself controlled by the universal control system brewmaxx. Because brewmaxx is software intended specifically for brewers (and because this software illustrates the entire brewing know-how of Huppmann), it allows many special solutions that are optimally tailored to the brewer's needs. For example, it enables the condensers to be controlled particularly economically and advantageously for the product in question, according to the prevailing ambient conditions (e.g. temperature, humidity, day/night).

Even just these measures in the first project phase enabled the Laško brewery to save over 10% of the energy that it originally required, and the new controller also reduced water consumption. The second phase of the overhaul, which has already commenced



The compressors of the existing system continue to be used.

**Phase 2: More energy advantages**

Instead of 5 pipe bundle evaporators (with level-controlled ammonia high-pressure injection), two plate and frame heat exchangers now work with ammonia pump operation. This solution not only offers more energy-related advantages, it also requires much less space. In the case of the refrigerant collectors too, the solution lay in simplification: Instead of 4 small ones,

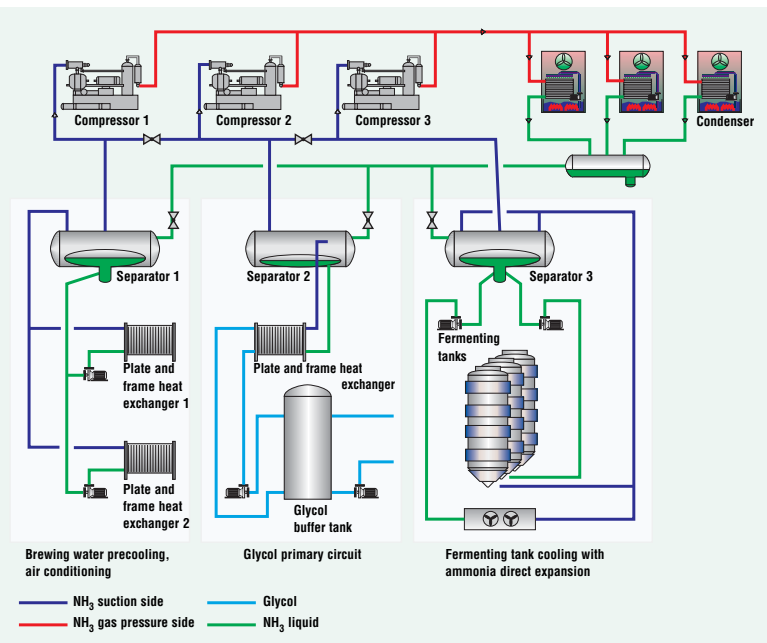
the brewery now has one large collector. This simplifies the entire installation, reduces the total filling quantity at the same time (which saves money), and on top of everything else also increases the safety of the plant.

In the interests of plant safety, the ammonia absorption system mentioned above was also installed, reliably preventing ammonia from escaping into the atmosphere if one of the safety valves responds. The complete refrigerant distribution system that is responsible for the present (and also the future) ammonia supply was also optimized in the overhaul and the glycol water cooling was incorporated into the brewmaxx control. This improvement yielded further savings with respect to the energy originally required (amounting to 10%) and at the same time the entire glycol water quantity was reduced by 2/3.

**Phase 3: The third temperature**

The temperature circuits mentioned above are now coming into play in the third phase: The brewing water pre-cooling that was previously performed via the -5°C circuit (unfavourable in terms of energy because it was cooled to an unnecessarily low temperature) has now been switched to a separate circuit at ±0°C with its own separator and compressor, with particular attention being paid to ensure that technical complexity and savings potential are in a sensible ratio to each other. Instead of the old piston compressor, a new screw compressor has now been installed for

brewing water pre-cooling. Finally, all chillers have been fitted with ammonia valves so that every compressor can be switched to the respective refrigerant temperature circuit with program monitoring. This gives the plant a whole new degree of flexibility, and service is greatly simplified in this area. Implementation of the phase resulted in savings of 13% of the energy originally required. All of this means that the brewers in Laško, with their new Huppmann refrigerating plant, have something in common with the legendary golden-horned chamois: Both are guarding a valuable hoard of pure gold.



Adapted refrigerant temperatures, as shown here in the three separate circuits, reduce the operating costs.



All refrigeration circuits have been fitted with new, maintenance-free ammonia pumps.

