



# Reference Report

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## The Weihenstephan Brewery Committed to Environmentally Friendly Production

### The Operator

The Bavarian State Brewery Weihenstephan, founded in the year 1040, is the world's oldest brewery in constant production. As a concern controlled by the Free State of Bavaria, it is operated as a modern enterprise and produces premium quality beers that are successfully marketed in more than 35 countries around the world. As a brewing facility with high energy demands, economic and ecological aspects play a significant role in the mission statement of the Weihenstephan Brewery.

### The Project

The Bavarian State Brewery Weihenstephan realized and implemented an exemplary energy concept between April and October 2010. The existing fuel-oil-fired boiler system was replaced by a forward-looking Universal UL-S type three-pass flame-tube smoke-tube boiler, with heat exchanger I for feed water preheating and condensing heat exchanger II for heating water for the brewing process. A state-of-the-art, natural-gas-fired industrial burner from the Bavarian company RAY Energietechnik GmbH & Co. KG guarantees maximum efficiency and low emission values. If required, liquid or gaseous biofuels may be additionally combusted in a mixed-fuel combustion cycle. A state-of-the-art O<sub>2</sub>/CO combustion control system reduces residual oxygen in flue gases to < 1 vol%. In addition, an air-air heat exchanger was installed in the combustion air intake system. This preheats the air required for combustion with the waste heat from an existing compressor system. This results in reductions in both the fuel required and emissions.

### Implementation Phases of the Energy-Efficiency Measures

- ▶ Replacement of the old fuel-oil-fired boiler
- ▶ Installation of a CO control system
- ▶ Installation of a heat exchanger for feed water preheating, complete with all pipework
- ▶ Installation of a condensing heat exchanger for preheating of brewing water, complete with pipework and modification of the exhaust gas system
- ▶ Installation of an air preheater exploiting the waste heat from existing compressors, complete with pipework (operational only outside heating periods)
- ▶ Speed control for the combustion air blower



The RAY industrial gas burner with air preheater for the utilization of waste heat from compressors



System with economizer for feed water preheating and condensing economizer for preheating of brewing water connected in series

### Cost Savings – approx. 162 500 Euros

The measures implemented here have created one of the most modern, energy-efficient, and environmentally friendly boiler systems in the brewing industry segment. The implementation of this project for the maximization of energy efficiency results in annual energy savings of about 2 845 000 kWh and corresponding annual cost reductions of around 162 500 euros. The installation of an O<sub>2</sub>/CO-combustion control system alone, an investment amounting to 11 200 euros, saves the Weihenstephan Brewery around 640 000 kWh of gas per year.



Innovative CO control with a regulated residual oxygen content of around 0.5 vol %.

### Results Achieved

Measure	Fuel/emissions reduction [kWh/year or t/year, etc.]	Cost reduction [€/year]	Savings [%]	Investment volume [€]
Fuel oil to natural gas conversion	NO <sub>x</sub> > 60% reduction SO <sub>x</sub> > 90% reduction Particulate matter > 95% reduction NH <sub>3</sub> = 100% reduction			
O <sub>2</sub> /CO control	approx. 640 000 kWh p.a. (gas)	approx. 35 200	approx. 2.3	11 200
Feed water preheater	approx. 1 000 000 kWh p.a. (gas)	approx. 55 000	approx. 3.7	35 000
Exhaust gas condenser	approx. 920 000 kWh p.a. (gas)	approx. 50 000	approx. 3.4	83 000
Air preheater	approx. 240 000 kWh p.a. (gas)	approx. 13 300	approx. 1.1	25 600
Blower speed control	approx. 45 000 kWh p.a. (electricity)	approx. 9 000	approx. 45.5	5 500



Partial view of the brewery and brewhouse

### Participating Companies

Operator:  
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Consulting, planning, construction:  
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**Factory 3 Bischofshofen**  
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