RECP Best Practice Catalogue

Improving the performance & upgrading the cooling system

Developed within the framework of MED TEST II

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

switchmed

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Best Practice - Improving the performance & upgrading the cooling system

SECTOR:	**Food & Beverage**
SUBSECTOR:	Bakery and farinaceous products
PRODUCTS	Puff Pastries
CATEGORY	Process control or modification
APPLICABILITY	Utilities

COMPANY NAME	---
COMPANY SIZE	Large

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Description of the problem (Base scenario):	The factory uses two cooling stations consisting of 3 NH_3 compressors and one cooling tower to cool the water/glycol and pump it to different heat exchangers in the production lines. The cooling system is old and needs to be upgraded. The main noted problems that cause the low measured COP for the NH_3 stations are as follows:1- lack of insulation on the plate heat exchanger between the Ammonia refrigerant and the glycol. 2- Lack of insulation on the Cold Glycol tanks and headers.3- bad and corroded evaporator coils. Also the factory has Fritsch cooling tower that uses four air cooling units for product cooling with total power of 75 kW. The actual thermal performance, such as cooling capacity, cooling load, COP of the cooling units were measured and analyzed, where the values of COP for 4 cooling units are 2.24, 1.21, 0.46 and 1.83. Some main problems were noted on the outdoor units such as lack of insulation and the suction fins are clogged. Also, it was noted that the surface of the cooling tunnels of some production lines is cold relative to the surrounding air temperature, which points out to a lack of insulation. Knowing that the tunnel passes through two zones, where the first one is hotter with ambient temperature of 41.3 °C, compared to the other zone with an ambient temperature of 31.4 °C. The COP for both cooling units revealed different values form 1.78 in the hot zone and a COP 2.5 for the cold area. This can be explained with the higher suction air temperature that affects the heat transfer in the refrigeration cycle for the unit.

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Description of the solution	To improve the COP of the system and to reduce electricity consumption, the following measures were identified: • Insulating the plate heat exchangers and installing a control system for partial loading • Using of high pressure condensate ammonia for the cooling of oil instead of the cooling tower • Insulating the chilled water tanks, the chilled water header, and the cooling tunnel • Upgrading the evaporator coils in the chilled water tank • Cleaning the condenser fins and well insulating the coils • Using a non-cycling air dryer instead of the conventional dryer to reduce its operating time • Isolation of the suction air for 5 cooling units located in the hot zone for the cakes cooling tunnel

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Economic Benefits	Energy Saving: 1- NH_3/Glycol refrigeration system: 690,762 kWh/year (7.4%) 2- Fritsch tunnel cooling system: 48,288 kWh/year (0.49%) 3- Products cooling tunnel: 45,584 kWh/year (0.47%) Total energy saving: 784,634 kWh/year Annual Saving: € 98,340/year
Environmental Benefits	Energy Saving = 784,600 kWh/year (8.36% of the electrical energy) Reduced CO_2 emission= 439 ton/year
Health and safety impact	---

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Capital investments & financial indicators	€20,400 Payback period = 0.2 year
Suppliers	Local
Other aspects	------
Implementation	Under implementation