EUROVENT
EUROPEAN INDUSTRY ASSOCIATION

Secretariat PP – 2020-05-15

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Position Paper

In a nutshell

Eurovent requests the inclusion of cooling towers in the Ecodesign and Energy Labelling Working Plan 2020-2024. Ecodesign requirements for cooling towers could significantly reduce the carbon emissions of refrigeration systems.

Preamble

The Ecodesign Directive 2009/125/EC and the Energy Labelling Regulation (EU) 2017/1369 are crucial instruments to lower the environmental externalities of products placed on the Single Market, improve energy efficiency, and ultimately move to a circular and carbon neutral economy. In addition, a transparent future oriented Ecodesign and Energy Labelling framework can form the basis of a new growth strategy for Europe and boost competitiveness and innovation in the EU with spill over effects on global markets.

Eurovent therefore supports the ambitious further development of the Ecodesign and Energy Labelling framework, and hereby provides input to the EC Consortium for the upcoming Ecodesign and Energy Labelling Working Plan 2020-2024.

Position

Based on the analysis below, Eurovent recommends including cooling towers in the upcoming Ecodesign and Energy Labelling Working Plan 2020-2024. Any policy option covering cooling towers would need to include requirements that take into account the energy saving due to the products' characteristics and due to the related thermal energy efficiency.

Policy background: Ecodesign and Energy Labelling Regulations

Cooling towers are not covered by any Ecodesign and Energy Labelling Regulation. Fans used in cooling towers are covered by the Ecodesign requirements of Regulation (EU) 327/2011. The study to evaluate this regulation was finalised in April 2015. Since then progress towards a revised Regulation has been slow.

Manufacturers of cooling towers have over the five past years provided the elements to consider cooling towers as a separate group, focussing on the cooling tower thermal energy efficiency and not just on the fan that is incorporated in the cooling tower. Depending on the type of cooling tower and the type of fan energy efficiency targets can be defined.

Products to be covered by the Ecodesign and Energy Labelling Working Plan 2020-2024

Eurovent suggests including only factory assembled (not field erected) mechanical draught evaporative cooling products (which transfer heat to the atmosphere primarily by the evaporation of water (latent heat transfer)) in the Ecodesign and Energy Labelling 2020-2024 Working Plan. Mechanical draught evaporative products include open wet cooling towers as well as closed-circuit cooling towers and evaporative condensers in the forced and the induced draught configuration using either axial or centrifugal fans.

Products of which the thermal performance is predominantly driven by sensible heat transfer and where the evaporation of water is only occasionally used for adiabatic pre-cooling of the air should be

excluded from the Ecodesign and Energy Labelling 2020-2024 Working Plan. Also excluded should be those products using latent heat transfer equipped with accessories, which create resistance to the air flow and hence reduce the thermal efficiency of the product.

In summary, the exclusions could be as follows:

- Air-cooled heat exchangers with adiabatic pre-cooling of the air.
- Wet/dry closed-circuit heat exchangers incorporating two modes of heat transfer, evaporative (latent) and dry (sensible), whereas the performance during the operating period is predominantly driven by sensible heat transfer (i.e. the majority of the operating hours are in the dry mode).

Products definition and field of application

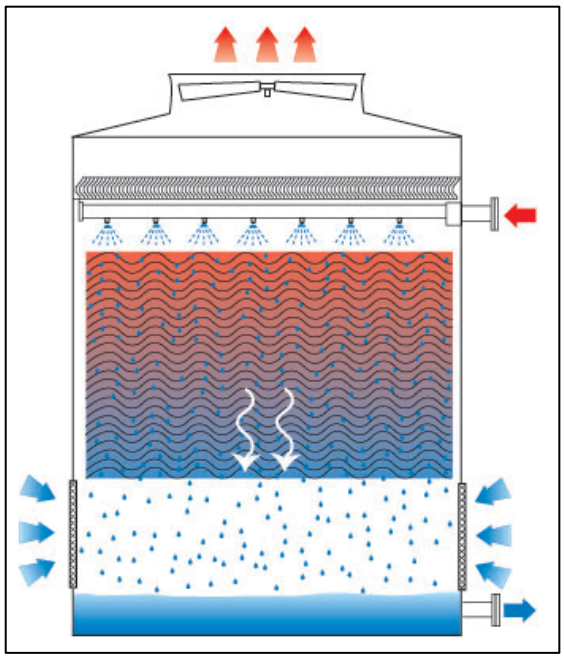
Product definition

Evaporative cooling products are used to remove waste heat from processes and reject it to the atmosphere. Unlike with other heat rejection equipment, the thermal performance of evaporative cooling products largely depends on the evaporation of water caused by effective mixing of water and air. The latent heat transfer, caused by evaporation, is not governed by aerodynamic principles only. In fact, aerodynamic efficiency plays only a minor role in the total heat transfer efficiency.

Different types of equipment

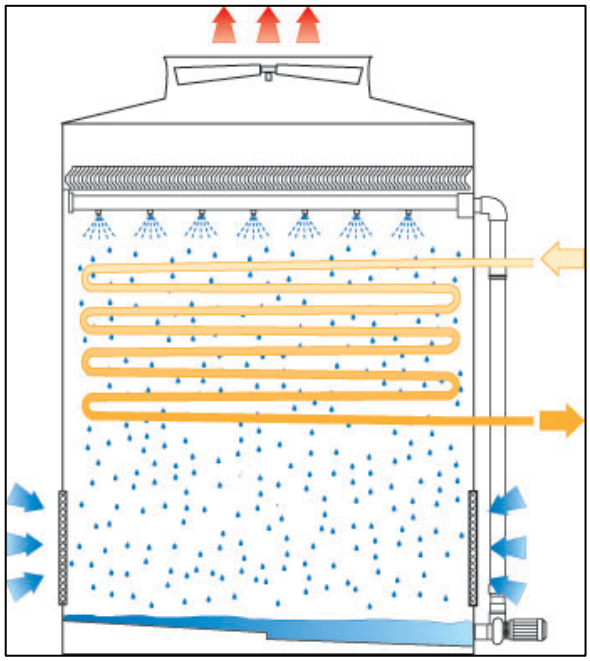
Open circuit cooling tower

Water from the heat source enters an inlet connection and is distributed over the fill pack through a spray distribution arrangement. Simultaneously, ambient air is induced or forced through the tower, causing a small portion of the water to evaporate. This evaporation removes heat from the remaining water. The cooled water falls into the tower sump from where it is returned to the heat source. It is 'open circuit' as the water to be cooled is in contact with the atmosphere.



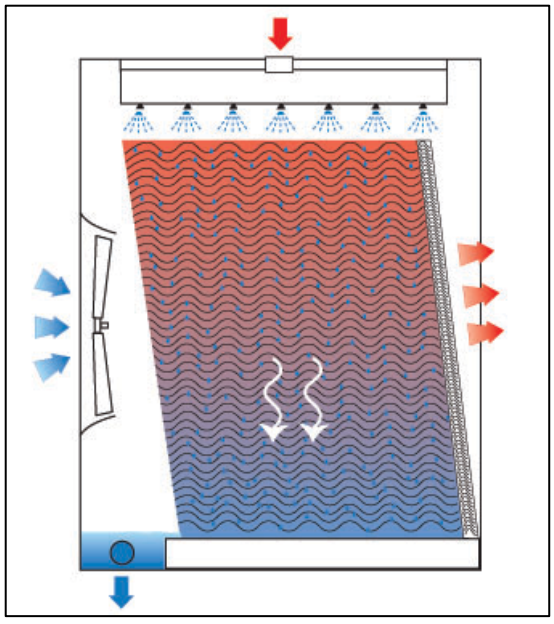
Closed circuit cooling tower

The fluid to be cooled is circulated inside the tubes of the heat exchange coil. A secondary system distributes water over the tubes of the coil. Simultaneously, air is forced or drawn through the coil causing a portion of the secondary water to evaporate. This evaporation removes heat from the fluid inside the coil. The secondary water falls to the sump from where it is pumped over the coil again. This is called 'closed circuit' as the fluid to be cooled is in a sealed loop and does not come into contact with the atmosphere.



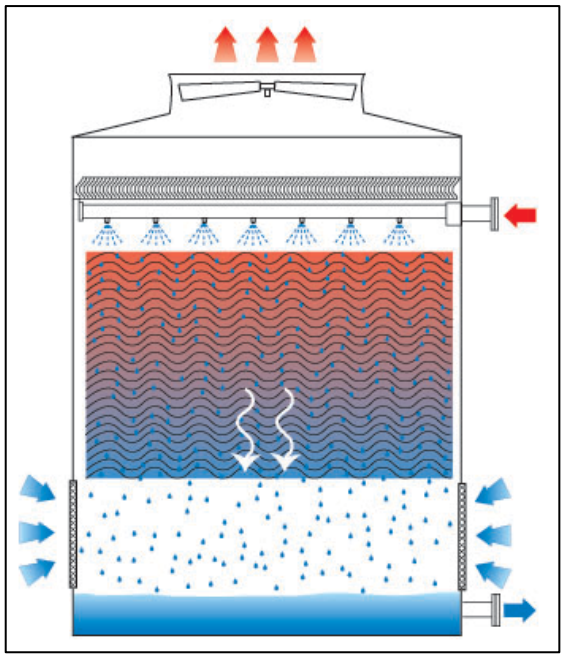
Mechanical forced draft cooling towers

These cooling towers are characterised by the fan located in the entering air stream.



Mechanical induced draft cooling towers

These cooling towers are characterised by the fan located in the discharge air stream.



Field of application

Evaporative cooling equipment find their field of application in all those processes which have better system efficiency due to the decreased process temperatures that are typical for evaporative cooling. These are the so-called "temperature sensitive" processes.

Examples of these processes include:

- HVAC applications
- Industrial applications
- Industrial refrigeration application

Thermal energy efficiency definitions and minimum targets

The thermal energy efficiency for mechanical draught open wet cooling towers is defined as the amount of heat rejection at specified inlet and outlet and entering wet bulb temperatures, expressed in kW heat rejection per kW absorbed shaft power at the fan drive system using water as the fluid type.

The thermal energy efficiency for mechanical draught wet closed circuit cooling towers is defined as the amount of heat rejection at specified inlet and outlet and entering wet bulb temperatures, expressed in kW heat rejection per kW absorbed shaft power at the fan and spray pump drive system using water as the fluid type.

The thermal energy efficiency for mechanical draught evaporative condensers is defined as the amount of heat rejection at specified condensing and entering wet bulb temperatures, expressed in kW heat rejection per kW absorbed shaft power at the fan and spray pump drive system using R717 (NH_3) as the refrigerant.

Example thermal energy efficiency calculation

Thermal capacity (kW_{th}) = water flow (kg/s) * (T_{IN}°C -T_{OUT}°C) * c_P (kJ/kgK)

A mechanical draught open wet cooling tower with an absorbed fan shaft power of 42,3 kW, that can cool 4.627 kW of water down from 35,0°C to 29,4°C with an ambient wet bulb temperature of 23,9°C, has a thermal energy efficiency of 109,4 at these reference conditions:

$$\text{Thermal energy efficiency} = \frac{4627 \text{ kWth}}{42{,}3 \text{ kW}} = 109{,}4 \text{ kWth/kW}$$

Minimum thermal energy efficiency targets

In the course of the cited project, Eurovent also assessed the possible minimum thermal energy efficiency targets for the following product categories:

- Open wet cooling towers with centrifugal fans,
- Open wet cooling towers with axial fans,
- Closed-circuit cooling towers with centrifugal fans,
- Closed-circuit cooling towers with axial fans,
- Evaporative condensers with centrifugal fans,
- Evaporative condensers with axial fans.

We hold that this approach should be considered by the EC Consultants.

Achievable CO2 saving due to evaporative technologies and related figures

The average installed base of air-cooled chillers (cooling capacity >1.000 kW) in EU28 is about 530 units per year[1].

Eurovent has conducted an extensive study, which has simulated, on a year-round base, the typical behaviour of a refrigeration system using an air-cooled condenser and a water-cooled condenser using wet cooling towers.

This study has resulted in average CO_2 emission savings of about 15,5% for industrial applications and 16% for HVAC applications.

By converting the above estimated installed base of air-cooled chillers (530 units/year in EU28), it is possible to conclude that by using evaporative cooling equipment CO2 emission savings of about 56.000 tons of CO2/year are fully achievable.

The above estimated possible CO_2 savings can be translated in[1]:

- Greenhouse gas emissions from 10.800 passenger vehicles driven for one year
- CO_2 emissions from electricity use of 8.800 for one year
- CO_2 emissions from 118.000 consumed barrels of oil
- Carbon sequestered by 24.000 hectares of forest

[1] Source: Eurovent Market Intelligence

Market and industry data

Estimated number of manufacturers in Europe

The European evaporative cooling industry is almost entirely made up of SMEs (Small and Medium Enterprises). By considering manufacturers coming from EU28, Russia, and Turkey, it is possible to estimate a final number of about 45 manufacturers active in Europe[2].

Production sites all over Europe

According to the above estimated number of manufacturers active in Europe, it is possible to estimate that in EU28, Russia, and Turkey there about 50 production sites[2].

Estimated combined annual turnover

Based on declared and reassessed data, the EU evaporative cooling industry has a direct yearly combined turnover of about 265 MEUR[2]

Employment figures

Based on declared and reassessed data, the EU evaporative cooling industry has an aggregated direct number of employees of about 1.420 people[2].

Products installed in Europe per year

Based on declared and reassessed data, the total aggregated number of installed evaporative cooling equipment (not including the field erected equipment) in EU28, Russia, and Turkey in 2017 is about 4.000 sold units[2].

Final proposals

Based on the above analyses, Eurovent recommends including cooling towers in the upcoming Ecodesign and Energy Labelling Working Plan 2020-2024.

Eurovent would also like to suggest that any possible policy option **covering cooling towers would need to include requirements that take into account the energy saving due to the products' characteristics and due to the related thermal energy efficiency.**

Enclosed:

Eurovent Recommendation 9/12

Eurovent Industry Monograph 9/1

Eurovent communication flyer: Think today Save tomorrow

[2] Source: Eurovent Market Intelligence

Eurovent and transparency

When assessing position papers, are you aware whom you are dealing with?

Eurovent's structure rests upon democratic decision-making procedures between its members and their representatives. The more than 1.000 organisations within the Eurovent network count on us to represent their needs in a fair and transparent manner. Accordingly, we can answer policy makers' questions regarding our representativeness and decisions-making processes as follows:

1. Who receives which number of votes?
At Eurovent, the number of votes is never determined by organisation sizes, country sizes, or membership fee levels. SMEs and large multinationals receive the same number of votes within our technical working groups: 2 votes if belonging to a national Member Association, 1 vote if not. In our General Assembly and Eurovent Commission ('steering committee'), our national Member Associations receive two votes per country.

2. Who has the final decision-making power?
The Eurovent Commission acts as the association's 'steering committee'. It defines the overall association roadmap, makes decisions on horizontal topics, and mediates in case manufacturers cannot agree within technical working groups. The Commission consists of national Member Associations, receiving two votes per country independent from its size or economic weight.

3. How European is the association?
More than 90 per cent of manufacturers within Eurovent manufacture in and come from Europe. They employ around 150.000 people in Europe largely within the secondary sector. Our structure as an umbrella enables us to consolidate manufacturers' positions across the industry, ensuring a broad and credible representation.

4. How representative is the organisation?
Eurovent represents more than 1.000 companies of all sizes spread widely across 20+ European countries, which are treated equally. As each country receives the same number of votes, there is no 'leading' country. Our national Member Associations ensure a wide-ranging national outreach also to remote locations.

Check on us in the European Union Transparency Register under identification no. 89424237848-89.

We are Europe's Industry Association for Indoor Climate (HVAC), Process Cooling, and Food Cold Chain Technologies – thinking 'Beyond HVACR'

Eurovent is Europe's Industry Association for Indoor Climate (HVAC), Process Cooling, and Food Cold Chain Technologies. Its members from throughout Europe represent more than 1.000 companies, the majority small and medium-sized manufacturers. Based on objective and verifiable data, these account for a combined annual turnover of more than 30bn EUR, employing around 150.000 people within the association's geographic area. This makes Eurovent one of the largest cross-regional industry committees of its kind. The organisation's activities are based on highly valued democratic decision-making principles, ensuring a level playing field for the entire industry independent from organisation sizes or membership fees.

Eurovent's roots date back to 1958. Over the years, the Brussels-based organisation has become a well-respected and known stakeholder that builds bridges between the manufacturers it represents, associations, legislators and standardisation bodies on a national, regional and international level. While Eurovent strongly supports energy efficient and sustainable technologies, it advocates a holistic approach that also integrates health, life and work quality as well as safety aspects. Eurovent holds in-depth relations with partner associations around the globe. It is a founding member of the ICARHMA network, supporter of REHVA, and contributor to various EU and UN initiatives.