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ASSESSMENT OF FUTURE ECODESIGN REQUIREMENTS FOR AIR HEATING AND COOLING PRODUCTS

Massimiliano Ferrario,
Technical and Regulatory Affairs Officer
Eurovent

This session will explore the upcoming Ecodesign requirements for air heating and cooling products under the Lot 21 Regulation (2016/2281), which is currently under review.

The presentation will assess key changes in energy efficiency standards and evaluate the challenges and opportunities for manufacturers, stakeholders, and policymakers in ensuring compliance.

Additionally, the industry's position on this evolving regulation will be discussed, providing insights into how market players are responding to the proposed changes and preparing for their future implementation

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THE PATH TO SUSTAINABILITY IN UNCERTAIN TIMES

John Lanier,
Chief Operating Officer
AHRI

Recent elections in the United States, Germany, Italy, and elsewhere have demonstrated voter concern about energy supplies and prices, which must inform our sustainability strategies going forward.

High prices, whether they be for electricity, natural gas, or essential heating, cooling, and water heating equipment threaten sustainability goals all over the world.

This means we must work together in a realistic way to find sustainable solutions to emission targets that are technologically feasible and economically attainable.

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THE IMPACT OF ECODESIGN LEGISLATION AND OTHER INITIATIVES ON HEAT PUMPS MANUFACTURERS

Maurizio Marchesini,
President Assoclima - Costruttori sistemi di climatizzazione

Two years ago, we highlighted how a regulatory tsunami was pushing for the development of the heat pump sector but needed to be managed. The most important directives of the Fit-for-55 package have completed their revision process and will impact the energy scenario of the upcoming years.

On the other hand, manufacturers will be asked to update their product portfolio due to the revision of ecodesign and energy labelling regulations for air conditioners, heat pumps, ventilation units, air heating and cooling equipment.

Such reviews won't only target the improvement of the energy efficiency of the product it-self but also the efficiency of the resources employed to manufacture it and the availability of spare part components and instructions for a better circular economy.

The design of the new heat pumps will also need to consider the impact of the F-gas regulation, and the requirements related to the demand flexibility that they can provide to the electricity grid.

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INTEGRATION OF LATENT THERMAL STORAGE WITH HEAT PUMPS: CHALLENGES AND FUTURE DEVELOPMENTS

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This presentation will discuss the integration of heat pumps with latent thermal storage systems. Currently, latent thermal storage technologies are gaining traction in the market, but they are often sold as standalone systems that must be integrated with heat pumps on-site. This approach frequently leads to malfunctions, reducing the overall efficiency of the heat pump and compromising its intended performance. To address this issue, it is essential to develop and commercialize fully integrated systems that ensure optimal operation. Furthermore, the European market is increasingly demanding heat pumps operating with propane, a natural refrigerant with lower environmental impact. This shift requires the adaptation of existing systems to hydrocarbon-based refrigerants in compliance with the new F-Gas regulations. Converting heat pumps to propane presents technical challenges but also offers opportunities for higher efficiency and sustainability. In this presentation, we will highlight some European Projects in which the University of Padova collaborates with companies and research institutions to develop innovative solutions. These initiatives aim to provide guidance and recommendations on how to effectively address the challenges associated with integrating latent thermal storage systems and adapting heat pumps to propane-based refrigerants.

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STANDALONE PROPANE MICRO HEAT PUMP FOR PERSONALIZED THERMAL COMFORT

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This study explores a Personalized Environmental Comfort System (PECS) designed to meet individual thermal comfort needs in office environments. PECS provides heating and cooling directly to the occupants and creates a conditioned microenvironment around them. It allows for relaxed setpoints in central Heating, Ventilation, and Air Conditioning (HVAC) systems, leading to significant energy savings.

The proposed system features a compact water-to-water desktop micro heat pump that uses propane as a refrigerant. It operates in a standalone configuration with a water/phase change material (PCM) rejection tank, enabling the storage of condensation heat generated during eight hours of continuous operation. This eliminates the need for ducted outdoor heat rejection while delivering an average cooling capacity of approximately 200 W and achieving an energy efficiency ratio (EER) above 2.

The micro heat pump is equipped with a twin rotary compressor powered by a DC motor, which allows continuous speed control. Combined with an electronic expansion valve, this enables precise regulation of both power and temperature to respond dynamically to the personal thermal demand of users.

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EFFECTIVE UTILIZATION OF WASTE HEAT TO PROVIDE AFFORDABLE GREEN HEATING

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The success of the green transition is unavoidably connected to the cost effectiveness of the measures implemented. Without cost effectiveness affordable heating is impossible.

The utilization of waste heat is an untapped source of various very cost effective opportunities by applying heat pumps.

During the last 5 years a lot of real cases have been developed and the outcome has been analysed to show the effectiveness in combination with the operation of the District heating system.

A special software tool has been developed to make a fast prediction of the feasibility of a potential waste heat source and is described.

The paper also shows the results of various installations in the MW range and can be used as inspiration for developing the heating plans prescribed in the Energy Efficiency Directive.

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HVAC/R EFFICIENCY: MAKE IT LAST WITH ADVANCED CHEMISTRY

Marco Carminati,
Technical Director – Cleaning Division
ERRECOM SPA

The HVAC/R industry is committed to maximising system efficiency and minimising environmental impact. Innovations such as low-GWP refrigerants, low-energy consumption systems operating with natural refrigerants, and the increasing integration of clean, renewable energy sources are shaping the sector's future. However, once installed, HVAC/R systems are inevitably exposed to environmental factors that compromise heat exchange efficiency, increase energy consumption, and accelerate component wear, ultimately degrading the original performance standards set by OEMs.

This paper examines the role of specialised chemical formulations in eliminating performance-inhibiting residues, restoring thermodynamic efficiency, and preventing premature failures. The discussion will highlight easy-to-apply yet advanced methodologies that play a crucial role in preventive maintenance strategies for HVAC/R installations.

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INTEGRATED SOLAR-ASSISTED HEAT PUMP TECHNOLOGY FOR SUSTAINABLE ENVIRONMENTAL CONDITIONING

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Integrated Solar-Assisted Heat Pumps (ISAHPs) represent a promising evolution in the synergy between solar thermal collection and heat pump technology. The efficiency of heat pumps, typically measured by the Coefficient of Performance (COP), is highly sensitive to the temperature lift between the evaporator and condenser. In winter conditions, performance often degrades due to low ambient temperatures. To address this issue, the ISAHP configuration employs a solar collector that functions directly as the evaporator in the refrigeration cycle. This arrangement enables the system to absorb both ambient heat and solar radiation, effectively reducing thermal losses and improving overall energy efficiency. Notably, the system remains operational even under diffuse solar radiation, extending its applicability to varying weather conditions. The environmental benefit is significant, stemming from reduced reliance on fossil fuels and a consequent decrease in CO_2 emissions. This paper presents experimental insights from the ISAHP prototype developed at the DIME-TEC laboratory of the University of Genoa. The system includes a solar collector, variable-speed compressor, condenser, and a thermal storage tank, optionally integrated with phase change material (PCM). Performance metrics such as COP, heat capacity, compressor power, and operating temperatures are evaluated under diverse environmental conditions. The results confirm the suitability of ISAHP systems for regions with low ambient temperatures and favorable solar irradiance, such as parts of Italy, highlighting its potential in the development of sustainable technologies for environmental conditioning or domestic hot water production.

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PASSIVE RADIATIVE COOLING A NEW TOPIC FOR STANDARDIZATION

Roberto Nidasio
Head of Building Energy Performance Area
Italian Thermotechnical Committee Energy & Environment – CTI

Passive Radiative Cooling is a cooling strategy by which an object on Earth can cool below ambient temperature – even under direct sunlight – by reflecting all solar radiation and emitting its thermal energy through the atmospheric transparency window of the atmosphere.

Within the PaRaMetriC Metrology Partnership, several prototypes have been realized across Europe to quantify the radiative cooling power of specialized coatings under different climatic conditions. This contribution will review the latest results obtained by the PaRaMetriC consortium, with a particular focus on the realization and testing of a full-scale demonstrator located in Arganda del Rey, community of Madrid, Spain.

The facility combines a large sky-facing radiating surface (>10 m^2) with a cold storage and indoor radiant-capacitive modules to guarantee thermal comfort conditions inside a controlled test cell, even under adverse conditions with external temperatures approaching 40°C.

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