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Danish CO₂ Technology Leaders Strategic Seminar – Part II

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In Denmark, where taxes on HFCs have increased by another 50%, CO₂ is set to become the only solution to be found in future supermarket refrigeration. Other issues raised on 14 May: the current situation for CO₂ in MAC, unknown risks from breakdown products of competing chemicals, latest CO₂ system solutions, and a new simulation tool to calculate the performance of transcritical R744 systems.

The one-day event hosted by manufacturer Nilan updated on the rapid market uptake of R744 (CO₂) in the Danish refrigeration industry, and latest technological advances in the design of CO₂ system solutions. Organised by the industry network KVCA, the event held presentations from Danfoss, Rema 1000, Johnson Controls, Hydro, IPU, Advansor, Greenpeace, and shecco, before participants engaged in discussions about how the Danish industry could raise the profile of natural refrigerant solutions beyond its borders.



Hydro/Piflex: Representing Hydro Precision Tubing and Hydro-Danfoss joint venture Piflex, Henry Petersen provided a most comprehensive overview of the situation for CO₂ in Mobile Air Conditioning (MAC) today. Starting from the 1990s, when first R744 systems were developed, to the year 2001 when Piflex patented its flexible hose solution, up until today when more politicised discussions have threatened the R744 MAC industry, Petersen summed up the state of play for CO₂. While global OEMs have not yet officially decided for any refrigerant, the financial turmoil has led to a loss of 50% of all contact persons in the MAC area. The Piflex solution, for the moment “boxed”, could, however, be re-activated within short notice.

Johnson Controls: Based on the new GWP values from the last IPCC report, and a regular increase rate in import taxes on HFCs, the price for R134a has reached 28,67€/kg in Denmark where within the next five years CO₂ could have been taken over from HFCs as the only solution in commercial refrigeration. Until today, Johnson Controls has delivered 104 projects involving the natural refrigerant CO₂, among them 4 projects for ships, and 94 for supermarkets. Without bans and a lack of policy vision, only a change in competition within the industry could lead to a shift in product portfolios towards R744. The refrigerant would have proved to be a “game changer in many markets”, Alexander Cohr Pachai confirmed. He then rejected HFOs as a solution for the commercial refrigeration sector due to the high activity levels and high lifetime of up to 50,000 years of breakdown products from 1234yf and 1234zf. Given the high concentration of other breakdown products already in the atmosphere, adding unknown substances could involve unforeseeable consequences for humans and the ecological system.

IPU: Morten Skovrup from Danish research institute IPU presented a new tool currently under development to determine the yearly energy consumption of transcritical CO₂ plants compared to other solutions. The simulation tool, designed under a joint project supported by leading Danish manufacturers from 2007-2009, was necessary as systems seldom run in dimensioned conditions but most of the time at a part load and at differing ambient conditions. The IPU simulation programme will thus help to estimate the energy consumption of a system over a year's course and compare two alternatives, as well as different compressor and fan options available. The tool takes account of the specifics of CO₂ systems, including the higher efficiency of R744 compressors and the lower condensing temperature than for traditional systems.

Advansor: Kim Christensen from CO₂-only manufacturer Advansor updated participants on technical solutions for CO₂ in supermarket refrigeration, industrial applications, heat pumps, and air-conditioning. He also talked about new system layouts for commercial refrigeration systems, as well as operation, maintenance and installation issues. Regarding the energy efficiency of CO₂ transcritical solutions versus subcritical units, Christensen presented graphs calculated using the IPU simulation tool. In Northern and Central Europe transcritical systems would hence outperform subcritical ones, while Southern Europe would be better served with subcritical R744 systems. Christensen confirmed that the discussion in Denmark has moved beyond the question of which system to choose, but would now be down to questions on reliability, delivery times, and quality of CO₂ systems only.

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