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Sustainable transport refrigeration pays off: ECOOLTEC technology offers low operating costs

- **Natural refrigerants for minimal environmental impact and high efficiency of the refrigeration process**
- **F-Gas Regulation drives up costs for synthetic refrigerants**
- **Low maintenance and service costs for ECOOLTEC systems**

In addition to the significant benefits for both the environment and the climate, ECOOLTEC transport refrigeration units deliver to all customers considerable economic benefits. Natural refrigerants cost less than F-gases, the maintenance costs of ECOOLTEC systems are lower and the high efficiency of the electrically driven system reduces energy and fuel costs. Thanks to its particularly quiet operation, the ECOOLTEC transport refrigeration also helps to facilitate new business opportunities.

“In the transport industry, too, technical innovations are particularly successful when they also offer advantages in terms of cost-effectiveness and sustainability. The ECOOLTEC technology combines low operating costs with high climate and environmental friendliness,’ says Henning Altebäumer, CEO of ECOOLTEC Grosskopf GmbH. The technological highlight of the system is the use of sustainable refrigerants. Instead of the fluorinated refrigerant blends (hydrofluorocarbons) R452A and R410A, which are predominantly used in transport refrigeration and have GWP (Global Warming Potential) values of approximately 2,000; ECOOLTEC relies on natural refrigerants with negligible GWP values and no harmful effects to the environment.

In order to reduce the impact of F-gases on the climate, the EU adopted a significantly more ambitious F-Gas regulation at the beginning of the year. This is intended to ensure the realisation of the plan to make Europe into a climate-neutral continent by 2050 as part of the European Green Deal. According to the new version of the F-Gas Regulation (EU) 2024/573, the consumption of hydrofluorocarbons (HFCs) will be completely phased out by 2050. The new version also provides for a significant acceleration of the reduction in residual quantities (phase-down) up to the general ban on their use

Shortage significantly increases prices of F-gas-based refrigerants

"Due to inevitable shortage of commercially available F-gases, the cost of operation and maintenance of conventional transport refrigeration units will rise unpredictably", explains ECOOLTEC CTO Dr Jürgen Süß. The previous, less restrictive F-gas regulation has already led to a tenfold increase in prices at peak times. In addition, there are laws in some EU countries that go beyond the F-Gas Regulation, and HFCs are also made more expensive there through various levy models or are already banned altogether. In contrast, natural refrigerants are available at affordable prices and for the long term.

ECOOLTEC systems do not require recurring leak tests

In addition, the F-Gas regulation demands mandatory, recurring leakage tests for all refrigeration units. Due to the typical design and operating conditions of transport refrigeration systems, they are particularly prone to refrigerant leaks. According to operators of large, refrigerated vehicle fleets, up to 30 per cent of the refrigerant charge of a transport refrigeration system escape every year, of which e. g. common bulkhead units for trailers contain up to 14 kilogrammes, depending on the specification. This means that up to nine tonnes of CO_2 equivalent can be released into the atmosphere per vehicle per year. Furthermore, in the event of a partial loss of refrigerant, the operator very often has to extract the remaining quantity of F-Gas, dispose of it and top up with a new refrigerant blend. According

to all previous experience, the financial expenses for this re-charge will increase significantly. Bans on F-gases will jeopardise the operational safety of conventional refrigeration units if refrigerants are no longer available for servicing or repairs. This can lead to a complete economic loss of the entire refrigerated truck.

ECOOLTEC has secured its system against leakage by means of a patented, hermetic refrigeration circuit and has also reduced the quantity of refrigerant by 90 per cent compared with conventional transport refrigeration systems, so that only 0.7 kilograms of propene (R1270) and around one kilogramme of CO_2 (R744) circulate per circuit. Even in the event of accidental damage with a total loss of refrigerant, there is no impact on the environment.

High energy efficiency due to very good efficiency

In terms of size and weight, the ECOOLTEC refrigeration units have an enormous refrigerating capacity to meet the extreme temperature safety demands in food distribution. They use specially developed scroll compressors in a horizontal design. Thanks to their infinitely variable speed control, the electrically driven system achieves very high capacity, controllability and high energy efficiency. Therefore, the energy consumption of the unit is low despite its high performance. Another advantage is the way in which power is generated with the alternator directly connected to the truck engine. As a result, the ECOOLTEC refrigeration system requires 60 to 80 per cent less energy than a conventional system for the same cooling capacity powered by a stand-alone diesel engine.

Highly efficient, natural refrigerants, the careful selection and the design of the system components as well as a direct power connection to the truck engine using ECOOLTEC's in-house alternator ensure high efficiency. The energy efficiency is particularly impressive in combination with an electrically powered commercial vehicle given energy conversions are then no longer necessary. As the ECOOLTEC roof-mounted refrigeration system is integrated at the front and at the top of the body, it receives a direct flow of fresh air during the journey instead of the hot

exhaust air from the truck's engine compartment. This creates optimum conditions for the system, as it is extremely energy-efficient and reliable thanks to low air intake temperatures.

Fully hermetic, very lightweight and highly integrable

Despite its high performance, the unit is particularly compact. The ECOOLTEC transport refrigeration unit has an extremely low overall height of just 250 millimetres and has therefore been designed for complete integration into the vehicle roof of a refrigerated vehicle, trailer or semi-trailer without significant loss of load capacity. At the same time, the refrigeration unit weighs less than 200 kilogrammes plus around 25 kilogrammes for each remote evaporator, so that the vehicle operator benefits from an optimised payload and better weight distribution which should lead to increased profitability.

Quiet running and CO_2 footprint decisive for business model

Another advantage that can pay off is the quiet running of the ECOOLTEC units and their low noise emissions. The noise level is significantly lower than that of comparable diesel systems. In combination with the fully electric drive and a zero emission vehicle, this also enables night deliveries to residential areas and, in the future, the transport of goods in particularly restrictive environmental zones, which are likely to prevent access for diesel vehicles.

As the CO_2 footprint of trucks will be significantly reduced in the coming years thanks to zero-emission drives and low CO_2 fuels, the emissions generated by transport refrigeration systems will become increasingly important and included in sustainability reporting. Financial disadvantages may arise for large fleets in particular, as financial institutions will in future grant funds at more favourable conditions, the lower a company's carbon footprint is as part of the so-called ESG rating (Environmental, Social and Corporate Governance).

Caption:

Sustainable technology pays off: ECOOLTEC systems offer optimised total costs of ownership.

ECOOLTEC Grosskopf GmbH is a European manufacturer of future-oriented, environmentally friendly transport refrigeration systems. The mission of the company is to offer the refrigerated transport industry transport refrigeration units which are particularly sustainable, efficient and powerful. Key features of the ECOOLTEC technology are the use of natural refrigerants exclusively without greenhouse warming potentials and the all-electric alternator or battery drive. The company's headquarter and production site is in Mülheim a. d. Ruhr (North Rhine-Westphalia). The management board consists of Henning Altebäumer, CEO, and Dr Jürgen Süß, CTO. ECOOLTEC also owns ECOOLTEC UK Ltd. which is located in Buckingham (Buckinghamshire), Managing Director is John Winter.

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