

Air Cycle Air Conditioning

The Next-Generation Technology for Rail Vehicles



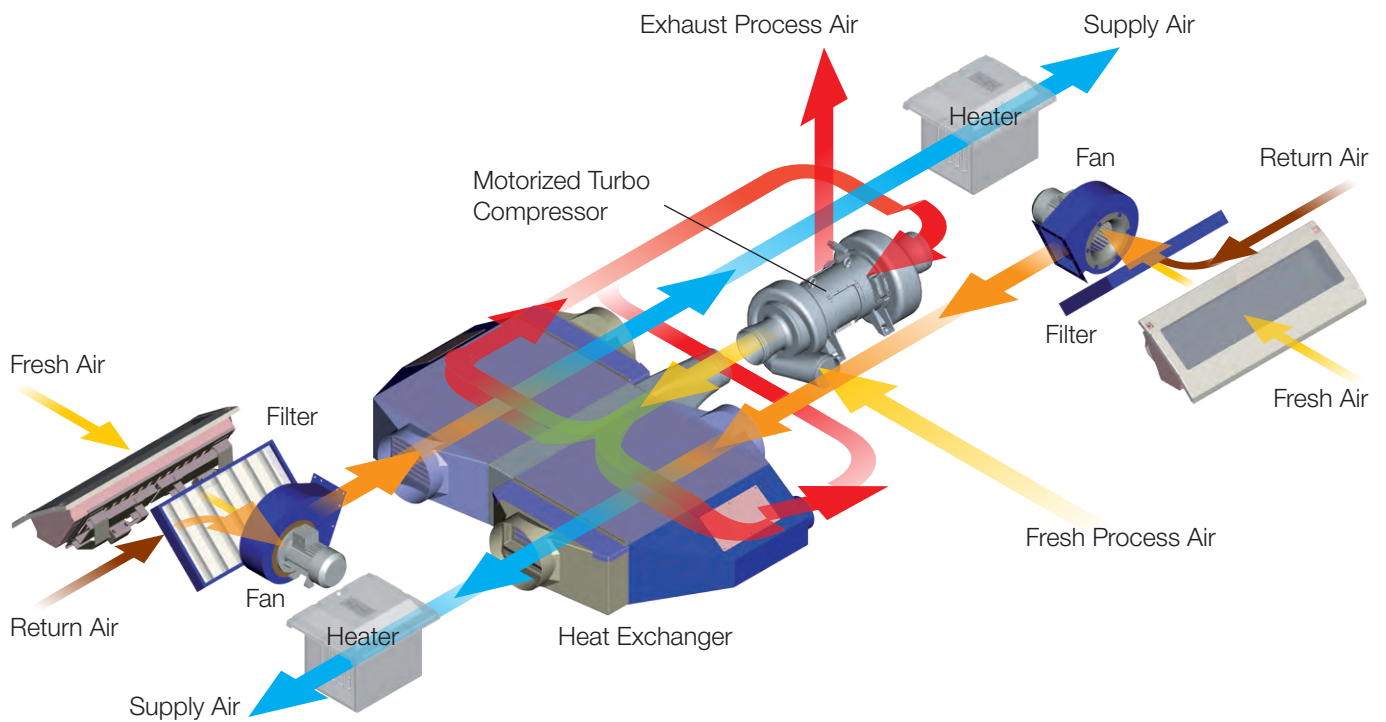
LIEBHERR

Air Cycle Technology

An Advanced Concept

Features

- Open loop, subpressure concept
- Motorized, speed-controlled turbomachine
- Regenerative use of condensate water
- Regenerative use of saloon exhaust air
- Flexible integration with vehicle: e.g. roof top, underfloor
- Optimized accessibility
- Comparatively lower dimensions and weight
- New design with increased performance and efficiency
- Based on latest developments in the aerospace industry



Air Cycle Architecture

The Liebherr-Systems

Advantages

“Green” technology:

Environmentally friendly, no future risk of refrigerant leakage

A high level of comfort

assured by continuously speed-controlled air cycle machine

Reduced parts count

and simplified accessibility and replacement

No storage,

handling and management of refrigerant on site

Absolute and unlimited compliance

with any future legislation regarding the use, storage or disposal of refrigerants

Operation at high ambient temperatures

and under exceptionally severe conditions (no high pressure load switch off)

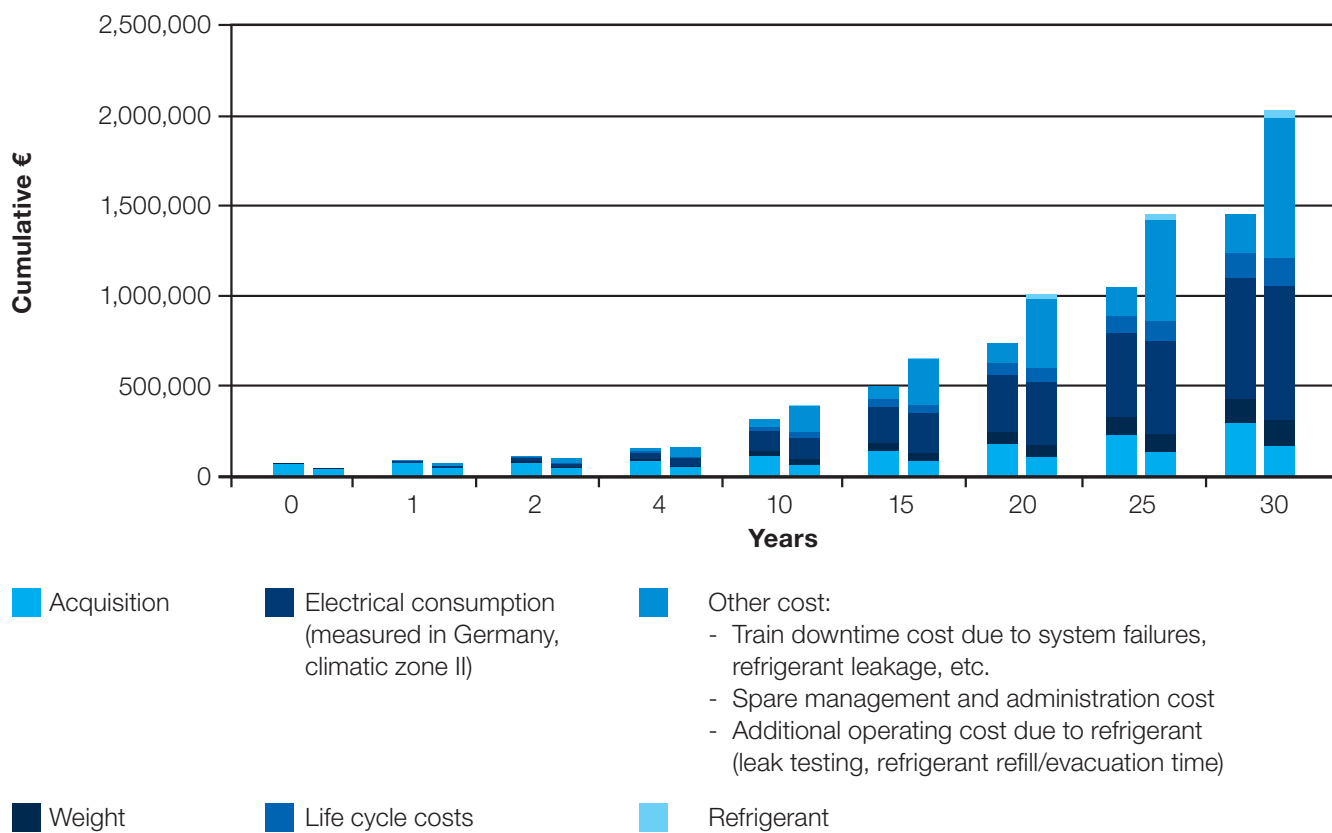
The only alternative to chemical refrigerants

with real and proven in-service experience

Low maintenance and life cycle costs

Low Total Cost of Ownership

Cumulative Life Cycle Costs per Unit Air Cycle System (left bars) vs. Vapour Cycle System (right bars)



Liebherr-Transportation Systems

Overview

System Supplier for the Railway Industry

Liebherr is a leading manufacturer of equipment for rail vehicles. Liebherr-Transportation Systems develop, test, manufacture, supply and service heating, ventilation and air-conditioning (HVAC) systems as well as hydraulic systems for railway vehicles. The product range also includes system components such as power supply, pressure protection, air ducts, diagnosis and control equipment. Liebherr's purpose-designed systems are operating successfully in high-speed, mainline and suburban trains, streetcars, locomotives and other rail vehicles. The currently designed products already meet known future standards and regulations. Environment protection plays a substantial role in design and manufacturing practices of Liebherr-Transportation Systems.

Stations Worldwide

The production facilities of Liebherr-Transportation Systems are located in Korneuburg, near Vienna (Austria) and in Radinovo (Bulgaria). In addition to its own sales and service outstations in Korneuburg, Mannheim (Germany), Sunderland and London (United Kingdom), Paris (France), Saline, Michigan (USA) and Laval (Canada). The company has a joint venture in Zhejiang province (PR China). Liebherr-Transportation Systems also benefits from the worldwide locations of Liebherr's aerospace companies.

Aftersales Service

As a reliable partner Liebherr supports its customers during the whole life cycle of a train. Liebherr's comprehensive services cover prototyping, initial tests, on-site installation of equipment, commissioning, maintenance and repair as well as overhaul. To complete the portfolio, individual customer training concepts are offered. All service areas and the entire service organization around the globe are being constantly optimised and enhanced.

Member of Liebherr-Aerospace and Transportation Systems Division

Liebherr-Transportation Systems, headquartered in Korneuburg (Austria), is a member of Liebherr's Aerospace and Transportation Systems Division which is based in Toulouse (France). Within the Liebherr Group, Liebherr-Aerospace & Transportation SAS is responsible for the coordination of all activities in the fields of aviation equipment and transportation systems, employing more than 4,900 people worldwide. Thanks to the deep integration within the division, Liebherr-Transportation Systems is able to transfer the latest aerospace technologies to custom-made complete solutions for the rail vehicle industry.

Synergies from other product lines of the Liebherr Group are also integrated and utilised where practical in order to offer the most optimised and up to date products and services at all times.

