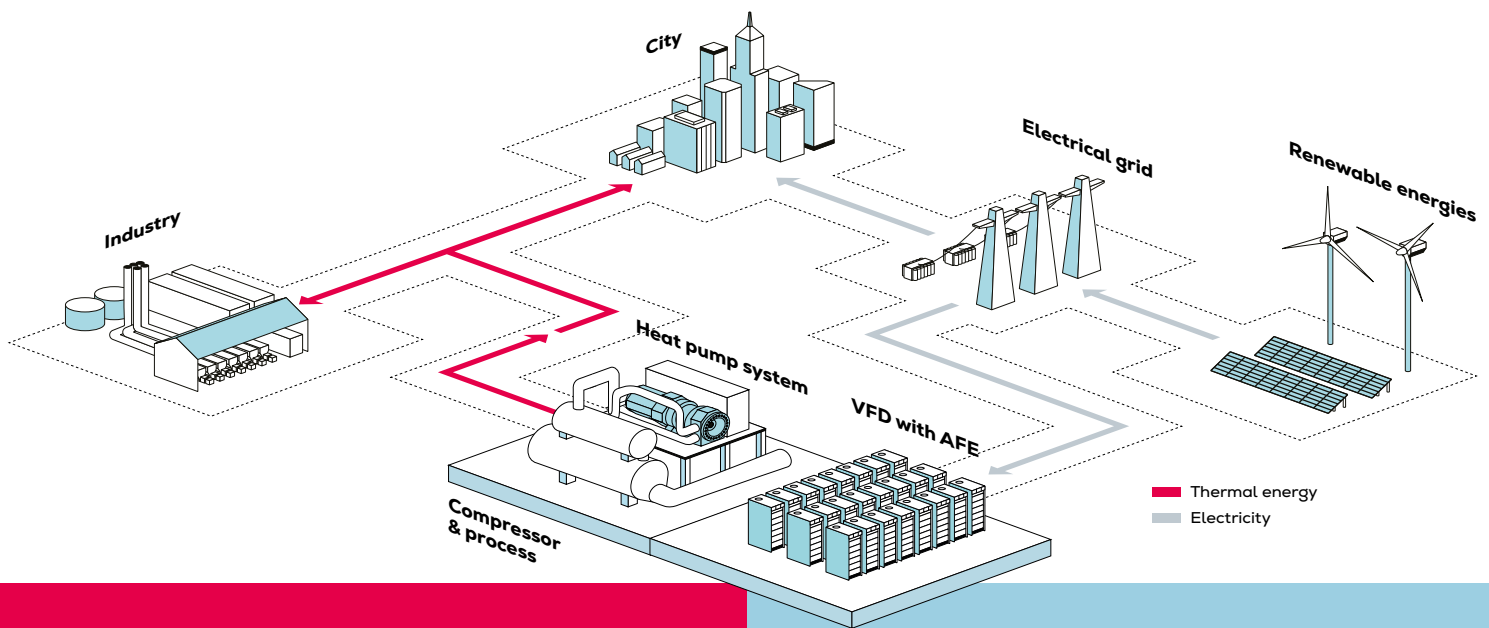


Reactive power compensation

How to enable large compressor systems to reduce planning costs, enhance electrical grid quality, and unlock future benefits



Integrating Variable Frequency Drives (VFD) with Active Front End (AFE) technology into large compression systems enhances grid quality by enabling active regulation of reactive power and maintaining a constant power factor. This offers a transformative solution for electrical system planning and implementation, reducing the need for bulky network filters and freeing up space – providing more flexibility for compliance with grid quality standards and adjustable power factor control. This technology not only optimizes current planning and installation but also positions your system as a key player in future smart grid initiatives because it is able to contribute to voltage regulation in the public grid.

Benefits at a glance

- Enhanced grid quality: AFE VFDs deliver better power quality than diode front end (DFE) drives by significantly reducing harmonics and enabling adjustable power factor operation. (By contrast, DFE drives are limited to a fixed power factor of about 0.96).
- Space and cost efficiency: AFE VFDs reduce system costs and optimize space usage by minimizing the need for additional electrical network filters and eliminating the need for complicated and expensive multi-winding transformers.
- Smart grid integration: These systems enable active power factor regulation, allowing your compressor system to become a valuable participant in the broader electrical grid, contributing to grid stability and efficiency.
- Future-proof: The flexibility and advanced capabilities of AFE VFDs ensure your system is well-prepared for future smart grid applications.

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Empowering smart grids with advanced AFE VFD technology

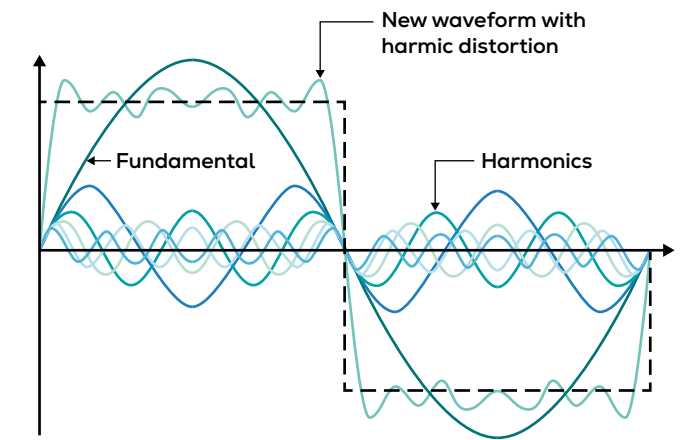
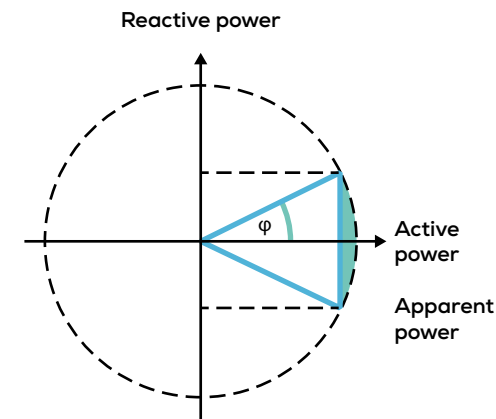
Traditional electrical system planning often involves high costs and extensive physical space for network filters to meet grid standards. Such challenges are especially relevant in sectors demanding high power quality and efficiency. By integrating AFE VFD technology, these sectors can overcome issues such as harmonic distortion, poor space utilization, and fluctuating power factors.

AFE VFD technology revolutionizes electrical system planning by reducing the need for extensive electrical network filters and physical space. This technology enhances grid quality by maintaining a constant power factor and is able to actively regulate reactive power. As a result, your compressor system can contribute to grid stability by adjusting reactive power compensation based on the energy supplier's requirements. This capability is particularly beneficial for systems serving processes involving high-inertia loads, where operational flexibility can be leveraged to meet electrical demands more effectively. The decentralization of energy supply and the reduction of large-scale plants

necessitate innovative solutions like AFE VFDs to actively influence reactive power in the grid, elevating your system from a passive load to an active contributor to grid stability.

The system is composed of several key components: a variable frequency drive with active front end technology, an electric motor, a compressor, a downstream process, and a control unit. The electric motor drives the compressor, which is integral to the downstream process. The control unit manages all the important system and process parameters. Additionally, the control unit features a communication interface that enables real-time grid adjustments – a key advantage for future smart grid technologies. This integrated system offers significant benefits, including improved power quality, reduced energy consumption, and enhanced operational flexibility. By maintaining a constant power factor and actively regulating reactive power, the system can contribute to grid stability and efficiency.

The integration of variable frequency drives with active front end technology offers versatile applications across various sectors. Here, we outline the key application areas, focusing on gas transport/storage systems and heat pump systems.

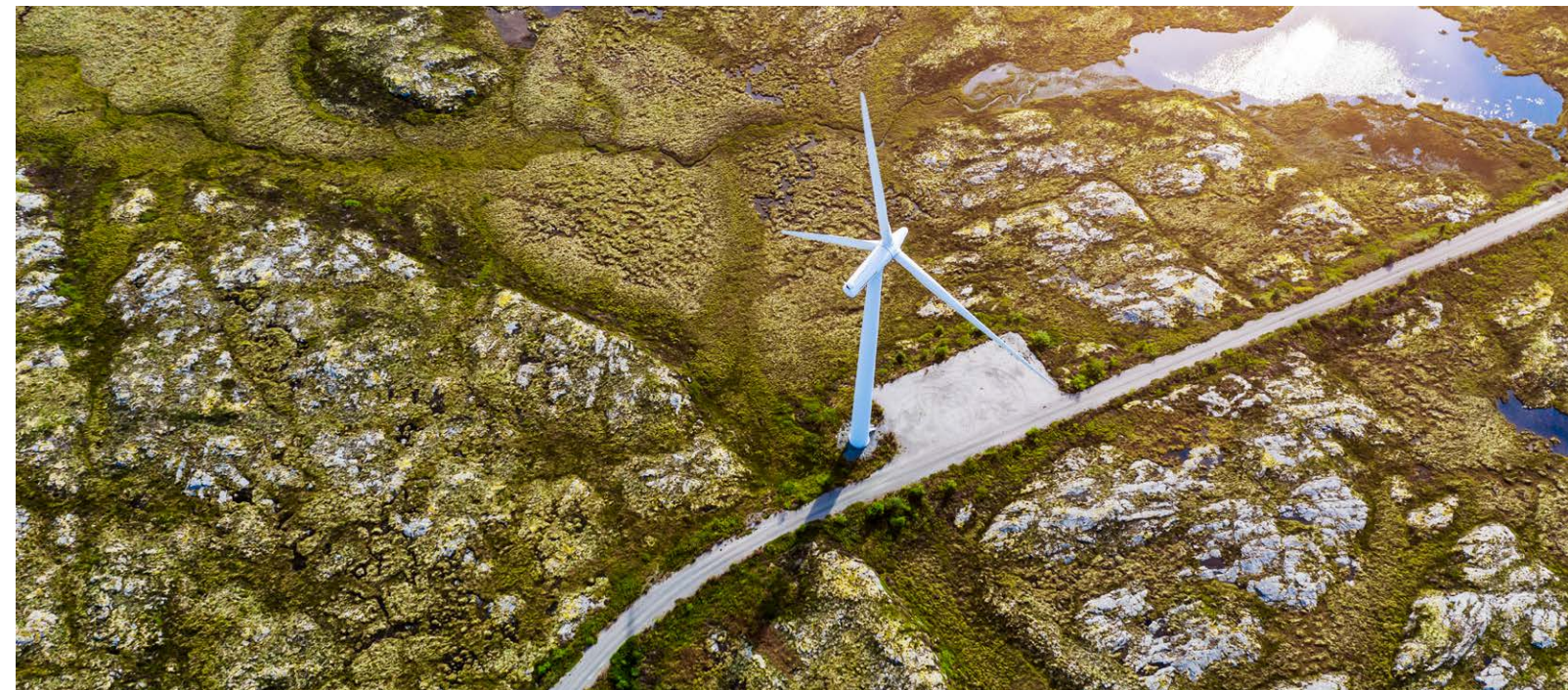


Gas transport and storage systems

Gas storage systems benefit significantly from the flexibility and efficiency provided by AFE drive technology. Compressors in these systems experience varying loads and seasonal fluctuations. The inherent flexibility of the process enables it to accommodate electrical grid demands, even on short notice. This adaptability ensures that gas storage systems can respond to grid requirements, providing services such as reactive power compensation and load balancing. The ability to adjust operations based on grid needs enhances overall system efficiency and contributes to grid stability.

Heat pump systems

Heat pump systems are expected to represent a significant future application area for AFE drive technology. These systems handle seasonal load fluctuations and operate with high inertia, making them ideal for offering various grid services. Heat pumps can provide rapid load shedding, frequency regulation, and reactive power compensation. The seasonal nature of heat pump usage, particularly in warmer months, frees up capacity for higher reactive power compensation. This capability ensures that heat pump systems can support grid stability and efficiency throughout the year. The flexibility and advanced control offered by AFE drive technology open up numerous possibilities for future applications, making it a solution which is strategically positioned for modern energy systems.



Everllence

Everllence
86224 Augsburg, Germany
P + 49 821 322-0
info@everllence.com
www.everllence.com

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