



VACON AC DRIVES
FOR MINING & MINERALS

vacon
DRIVEN BY DRIVES

STRONG EXPERIENCE IN MINING & MINERALS

Vacon AC drives are robust to handle your most demanding requirements from simple ventilation to the most complex load sharing of high-power, regenerative conveyor and plant systems. Vacon's long and versatile experience of AC drives guarantees the desired results and complete customer satisfaction.

Fuel economy and automation control of various processes support the use of variable speed AC drives in the highly competitive Mining & Minerals processing sector. For years, Vacon has been establishing strong partnerships with leading system integrators in the field.

Vacon enhances process control and boosts cost-effectiveness and energy savings for its customers by designing and manufacturing first-class AC drives. We are passionate about the AC drive industry and dedicated to our work. Our products and services are targeted at customers who do not settle for conventional solutions and appreciate the benefits offered by AC drives.



Vacon AC drives technology is designed to fulfill the requirements of all Mining & Minerals processing applications with a single product family. The Vacon AC drive product line ranges from 0.25 kW to 5 MW, with supply voltages up to 690 V. Medium voltages can also be achieved by the use of step-down and step-up transformer solutions.

Robust and reliable

- Each drive is fully tested at Vacon's state-of-the-art production facility at maximum operating temperature at full motor load prior to shipment
- All drives are made of highest and most advanced semiconductor technology to provide maximum service life
- Comprehensive run-time self-supervision and alarm system for enhanced reliability and safety

Versatile control and integration

- Single drive and complex load sharing possible
- Flexibility in communication via multiple fieldbuses
- Expandable I/O connections with quick terminals
- Control logic can be externally powered – secured communication possible
- Wide selection of application software available
- Easy to use PC connections

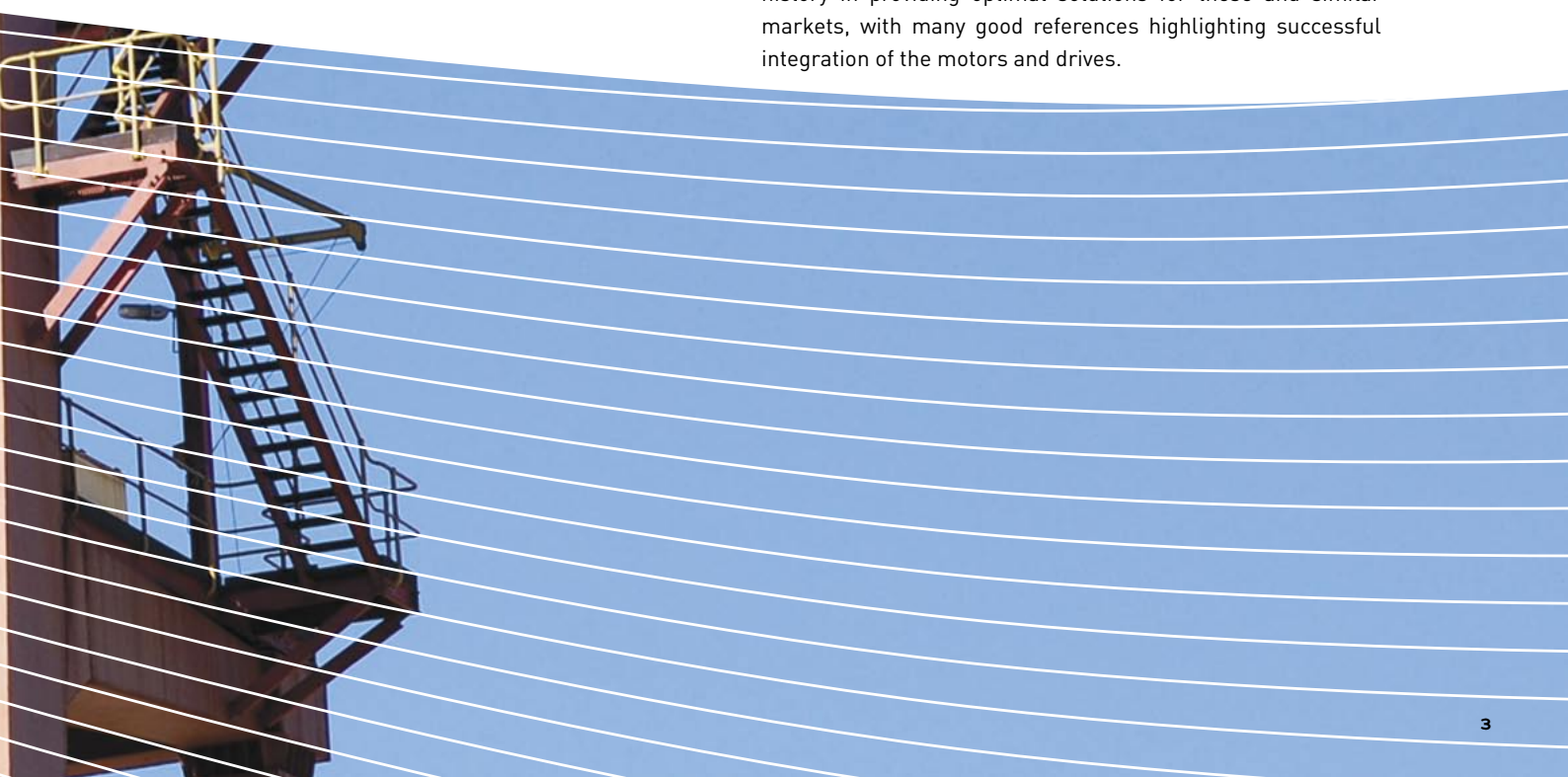
Innovative and modern

- Quick and easy installation
- Start-up wizard for easy commissioning
- Compact size
- Motor parameter identification capability
- Engineering tool that follows the IEC61131-3 standard
- Parameters and applications can be copied between drives and panels

Fully redundant control of high-power drives

Vacon has introduced a new control concept, Vacon DriveSynch, for paralleling high-power drives, suited to the control of single- and multi-winding AC motors. Large-size (over 2 MW) motors can be built using several sets of windings that have a zero-degree phase shift. The drive topology can consist of 1, 2, 3 or 4 drives running the same motor, for example sharing the same load. This means that redundancy benefits can be included as the motor can be partially loaded with one or several drives disconnected.

Permanent magnet motors on lifts are coming to the motor market. Cargo cranes, lifts and offshore drills in particular are often equipped with this motor technology. Vacon has a proven history in providing optimal solutions for these and similar markets, with many good references highlighting successful integration of the motors and drives.



THE OPTIMUM FOR UNDERGROUND ENVIRONMENTS

Hot, dirty and dusty ambient conditions, as well as the electrical supply network, define the design elements of AC drives suited to Mining & Minerals processing that can also save energy and meet the tight space requirements of underground applications.

Thousands of Vacon AC drives from 0.25 kW to more than 5 MW operate equipment from dosing pumps to complex plant drives within a variety of different mining and minerals processes – and all of them are designed to last and save energy.

Running AC motors with variable speed drives instead of constant or fixed speeds can save up to 50 % in your energy consumption. Vacon AC drives bring considerable energy savings to mining and mineral processing sites, especially when operating pumps, fans and compressors, not to mention the unseen savings for the environment.

Advantages with AC drives

AC drives provide substantially lower levels of noise than traditional hydraulic alternatives, and motors can be run up to three times faster than with hydraulic systems in applications such as slack rope handling. For example, the advantages of converting winch systems to AC drives can make a significant impact on energy consumption. The electrical system only requires the

power that is needed for the work while the hydraulic system has to provide full torque at all speeds and therefore will operate at full power all the time. Conveyors also benefit from AC drives by perfectly matching speed with the process. Whether it be feeding into furnaces or wash plants, loading or unloading at port facilities, or simply inspecting belts for maintenance, Vacon AC drives are there to assist in saving time and money.

Vacon drives in ventilation

In ventilation, AC drives offer the possibility for stepless control of air flow in different areas depending on ever-varying number of persons, vehicles, or exhaust gases present from blasting. Whether it is for pressurising shafts, or air/gas extraction, matching the air flow required enables a safer environment for all.

Fast installation and commissioning

The compact size and full modularity of Vacon AC drives together with well designed mechanical construction and instructions minimise your installation time. Informative PC tools reduce commissioning time and optimise machine tuning for a successful start-up.



Less noise

In general, AC drives and systems generate less noise than hydraulic systems and have fewer restrictions on the environment where machinery can operate. The use of electric drives allows the use of several smaller generator sets, which can individually be limited when the need for power decreases and therefore cause less audible noise to the surrounds. In addition, the use of frequency converters for large power consumers can eliminate the need to reserve power specifically for the start-up peak currents. For example, engaging auxiliary generators in order to start-up some processes can now be avoided, saving fuel, minimising noise and eliminating costly maintenance on this auxiliary equipment.

Additional benefits include less cabling, more flexibility and better efficiency – all working towards saving money and resources, and minimising effects to the environment. An added benefit of noise reduction provided by AC drives will see an improved work environment for employees and general safety around the workplace. This will be achieved by a quieter work place which will improve communication between employees which creates a safer workplace.

Comprehensive support

Vacon's experienced AC drives technical specialists keep your production running. Our local and global service network gives a fast, professional and comprehensive response wherever or whenever it is required, 24 hours a day, 7 days a week, and the Vacon internet site provides easy access to downloadable PC tools, manuals and software applications.

Make the perfect choice

Among the critical points to consider are the use of a low or medium voltage system, liquid cooled solutions, active front-end or regenerative solutions, the choice of a 6-pulse or 12-pulse, and the choice between electric and mechanical systems, regardless of your application. You will find the solution in the Vacon range to suit your requirements. Vacon can tailor a solution to suit your specific requirements.

Vacon AC drives come in a wide range of voltages suitable to most applications. Vacon has solutions to cope with medium voltage installations up to 11 kV using low voltage drives, and can also interface to medium voltage motors.

6-pulse, 12-pulse and 18-pulse options are available for reduced harmonic effects. Another method of reducing damaging harmonics that can cause equipment failure and expensive downtime and repairs is by using active front-end and regenerative solutions. Active front-end solutions are able to reduce harmonics levels (THD) to 5 % or lower, due to the advanced technology used in these units. These drives are very efficient and significant energy savings over the life cycle can be seen. See next page for more information regarding minimising harmonic distortion.

Vacon also has an extensive range of liquid cooled AC drives, providing you space reductions up to 70 % compared to air cooled systems, removal of up to 95 % of system heat generated, and reduction in the load on air-conditioning and ventilation systems, saving on installation costs and on-going energy and maintenance costs for air-conditioning systems.



MAKING HARMONIC DISTORTION A NON-ISSUE

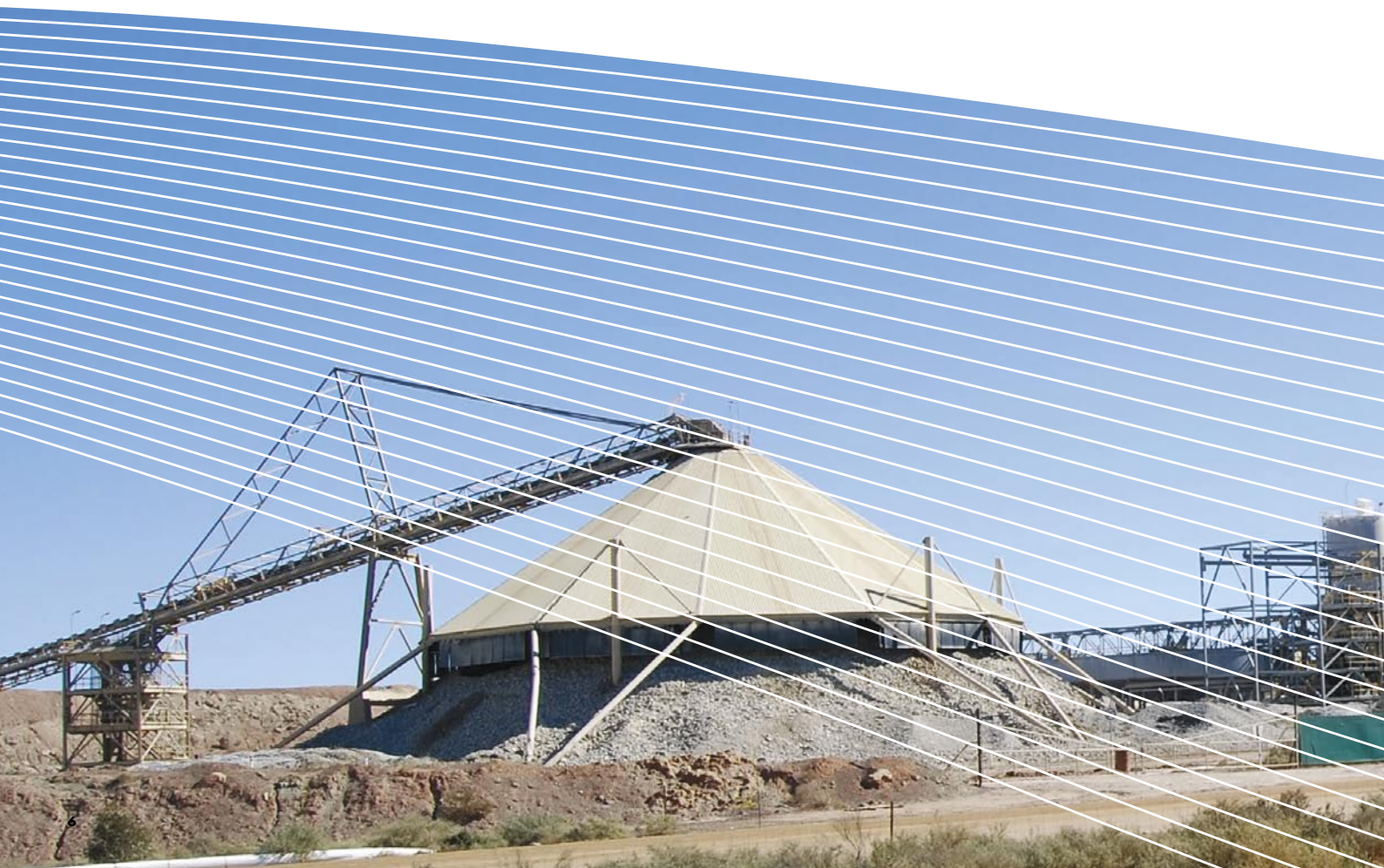
Total harmonic distortion (THD) is regulated by standards such as IEEE 519. The standards specify the voltage distortion, which is generated in the inductance of the network, transformer and generator. The current distortion is typically generated by chopping current sources such as frequency converters. The transformers and generators providing power have to tolerate the harmonic distortion caused by the frequency converters. This is specifically of note in systems where the frequency converters are the major consumer.

Vacon has reduced the harmonic distortion to a non-issue by introduction of its active front-end (AFE) solution. The drive actively connects the internal DC bus to the network when appropriate, and with efficient filtering, limits the level of the voltage THD to below 5 %. The IT networks with no grounding require earth-leakage supervision. This supervision system will trip if the drives used are not suitable for insulated networks.

Other advantages that the Vacon AFE solution provides are that the size of transformers, cables and switchgear can be much smaller, creates less distortion that may affect other equipment connected to the same mains, and the ability to raise the voltage out to the motor, especially for installations where long cable runs are required.

In Mining & Minerals processing applications AC drives can be used in:

- Conveyors
- Ventilation
- Pumps
- Fans / blowers / compressors
- Wash plants
- Fresh and waste water applications
- Steel extruders
- Vertical and horizontal movement
- Crushers
- Ball mills
- Tunnel boring / drilling
- Acid generating and pumping
- Agitators
- Lighting
- Drill rigs
- Mobile equipment
- Port loading / unloading equipment



CONSIDERATIONS WHEN CHOOSING AN AC DRIVE

1 AC drives should ideally be located in dry heated places such as control rooms, electrical rooms, engine rooms or accommodation areas. Drives can be used underground as long as they are intrinsically safe or are in spark-proof casing.

2 Vacon AC drives are available with IP ratings of IP21 or IP54. The choice will be dependent upon the environment the drive is operating in.

3 In choosing Vacon AC drives, be sure that the EMC classification is suitable for the network as we have different versions for all common networks.

4 Brake choppers and resistors are necessary for cranes and fans when the changes in rotational speed are rapid.

5 An active front-end solution allows numerous advantages with regards to harmonic distortion and for dimensioning components on the supply side because of the following:

- the power factor is almost 1
- THD is as low as below 5 %
- heat losses are minimal
- less steelwork, foundation, termination and cabling work because there are no phase-shift transformers
- the weight and space needed by transformers is saved
- improved fuel economy and generator power utilization





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