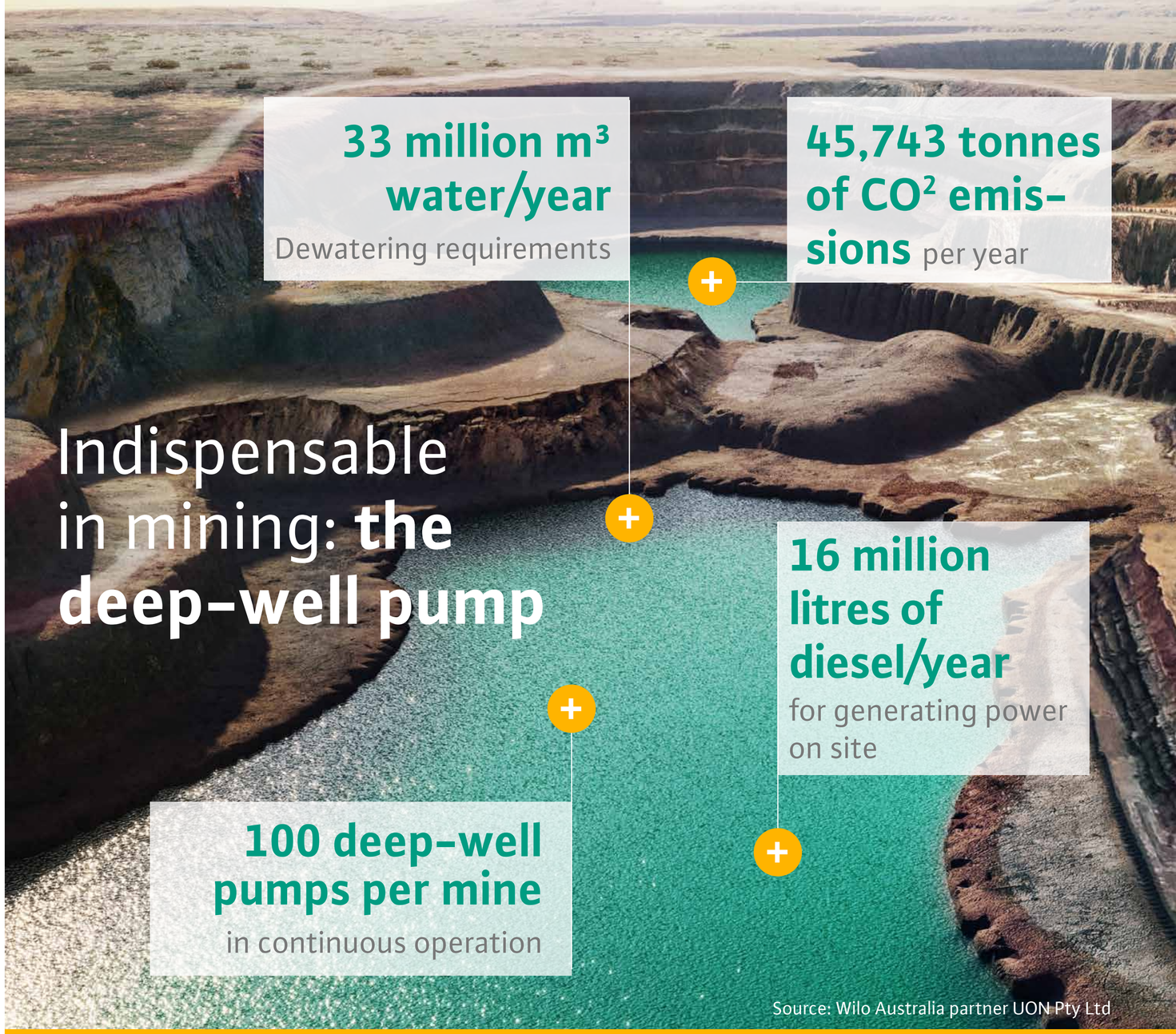
Focus paper:

Game-changing deep-well pumps from the Wilo-Actun ZETOS series

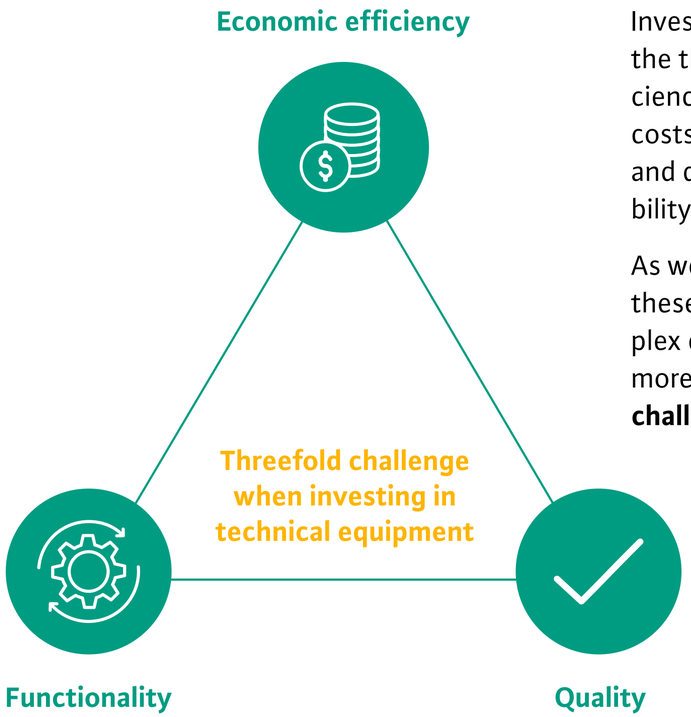
Highly efficient Wilo pumps lower power consumption and reduce the risk of downtime in mining operations worldwide.

Image source: Wilo Australia partner UON Pty Ltd

When it comes to mine dewatering, both climate change and the need for sustainability are posing fundamental challenges worldwide. An important role in meeting these challenges is played by application-specific pump solutions that combine maximum energy efficiency with the longest possible service life, even under challenging climatic and operating conditions.



Specific demand and consumption data using the example of a mining operation in Western Australia highlights how mine operators around the world are confronted with huge environmental challenges. Demands with regards to carbon footprints will increase significantly as a result of global emission reduction targets.

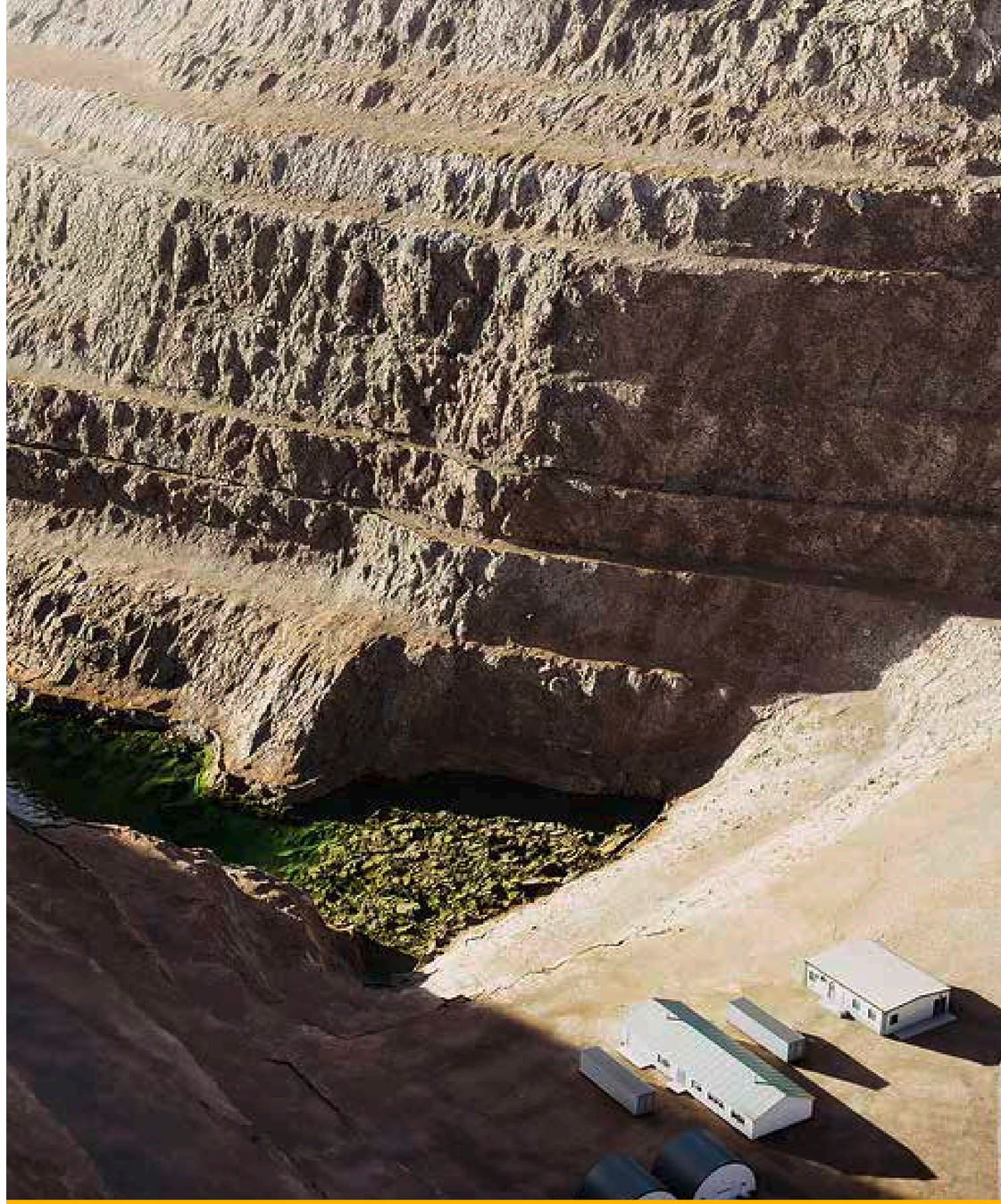


Investments in technical equipment generally face the threefold challenge of balancing economic efficiency (mainly related to procurement and operating costs), functionality (with the original task in mind) and quality (in terms of long-term operational reliability, for example).

As well as this, there are direct interactions between these requirements that imply an even more complex decision-making process. This applies all the more when capital goods are used in a particularly **challenging environment with extreme operating conditions**, as is the case with dewatering pumps in underground and open cut mining.

The pump experts at Wilo provide a solution here in the form of the **Wilo-Actun ZETOS pump series.** The design and operation of this product family are consistently aligned to provide a solution to key problem areas in mine dewatering. In this way, the customer reaps substantial benefits from the pump series:

- **Robust design resulting in longer running times**
- **More economical due to high energy efficiency (best-in-class)**
- **Application-specific design**



Open cut mines are being dug deeper and deeper. This makes dewatering more energy intensive. Operational disruptions also have a much greater impact here.

The fundamental challenges

Regardless of the location in the world, the materials being mined and whether it's an underground or open cut mine, operators always face one fundamental problem: the issue of removing the water from the mine (dewatering).

This is not just about the ground water that is produced during the excavation process, but also about process water and any rainwater that may flow in. As a result, the dewatering process is subject to **quantitative influences that are difficult to predict,** which must be reacted to according to the situation. This is particularly true in regions like Western Australia, where heavy localised rainfall can lead to significant short-term changes in how mine dewatering systems are operated.

Further challenges arise from the environmental conditions. For example, the water is contaminated with considerable amounts of abrasive and corrosive or adhesive elements (such as sand, iron oxide, salt, chloride or sulphate). **The abrasive and corrosive properties of water have the potential to affect the performance and service life of the pumps.**

On top of everything, **climatic conditions** place high demands on the mines' water management systems: While outside temperatures of up to -20 °C are frequently measured in the Arctic Circle when mining copper ore, on the other side of the globe, in Western Australia, weeks-long heatwaves keep daytime temperatures at 45 °C or more. The water needing to be pumped reaches temperatures of 30 to 35 °C.

Against the backdrop of the ecological impact associated with any type of mining, the **energy required** for pump operation is also coming more and more into focus.

In many regions of the world, such as Australia or South America, there is no public power grid available for operating dewatering systems. Instead, diesel-powered generators are mostly used, which worsen the mine's ecological footprint due to their emissions. At the same time, mine operators are subject to public pressure to drastically reduce the negative environmental impact of their activities. Sustainability is a crucial keyword here.

Any **operational disruptions** that may result from these framework conditions are all the more significant as almost all mines have one thing in common: they are usually located far away from any infrastructure. Procuring and replacing pumps for dewatering is complex.

Any operational disruptions cause corresponding downtimes. In extreme cases, a total halt of all mining operations can result with losses running into the millions. For this reason, more than anything else, the top priority is that the pumps are low maintenance.

Image source: Wilo Australia partner UON Pty Ltd

Concepts for more sustainability

The mining landscape in Western Australia is used as an example here to outline the massive impact of the described influencing factors on mines. The open cut mines there mainly extract ore, but sometimes gold is extracted too. According to calculations by UON Pty Ltd, a company specialising in decentralised water and energy solutions, it's necessary to pump out more than one billion cubic metres of water each year and return a considerable amount of this to the process.

Estimates indicate that by 2050, the amount of water will increase significantly– and with it the cost of the power supply (which is also largely decentralised). This currently amounts to around 160,000 litres of diesel per year to generate electricity for just one (!) submersible pump. This corresponds to an annual CO_2 equivalent of 457 tonnes (source: UON) – for running just one pump.

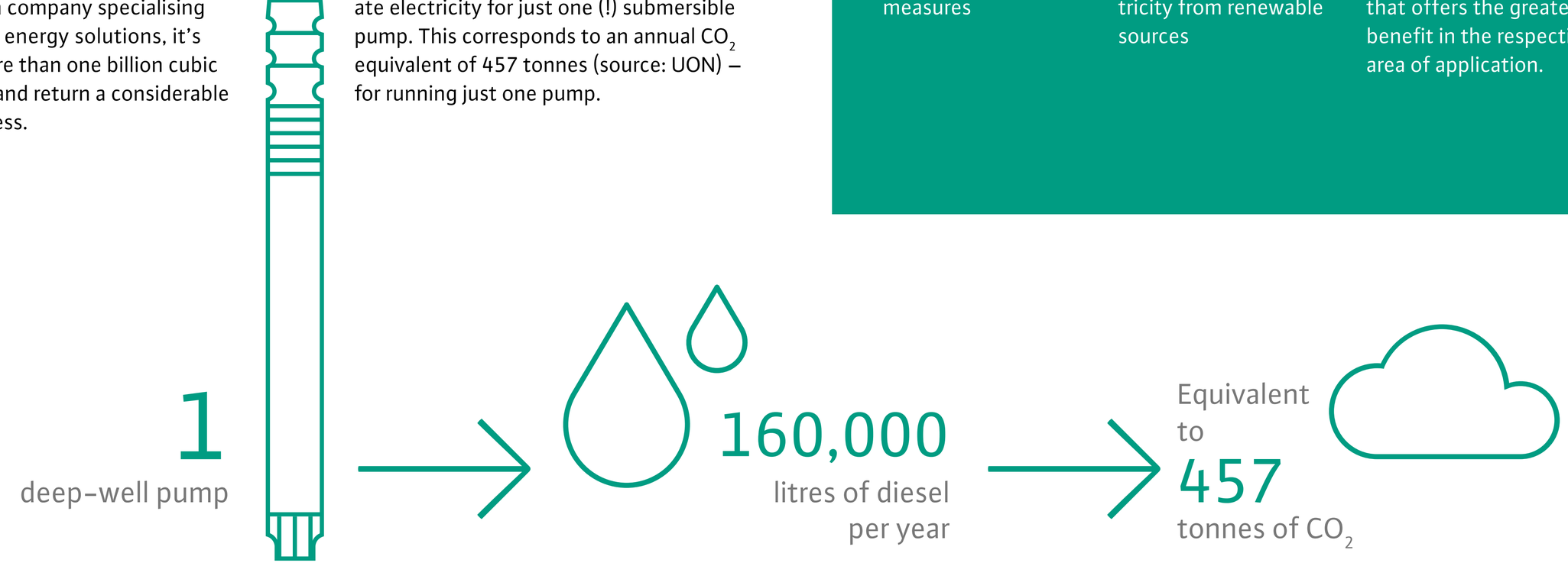
There is an urgent need for action in terms of sustainable and ecological water management in the mines.

There are **three central starting points here:**

1. **Increasing the service life of the pumps** through constructive measures

2. **Reducing the energy required** to allow pump systems to use electricity from renewable sources

3. **Customised product configuration** to find exactly the pump solution that offers the greatest benefit in the respective area of application.



Integrated energy management solutions

To face these challenges, companies like Australia's UON Pty Ltd are increasingly working on integrated energy management solutions based on renewable energies.

Climate targets drive development forward

This development has gained considerable momentum as a result of the climate targets. The more data the pumps or the associated drive units provide, the easier it will be in future to analyse the energy efficiency of the pump systems. A complete record of data – such as volume flows, energy consumption and downtimes – enables a qualified assessment of energy consumption. This allows a direct qualitative and quantitative comparison to be made about the dewatering technology available on the market.

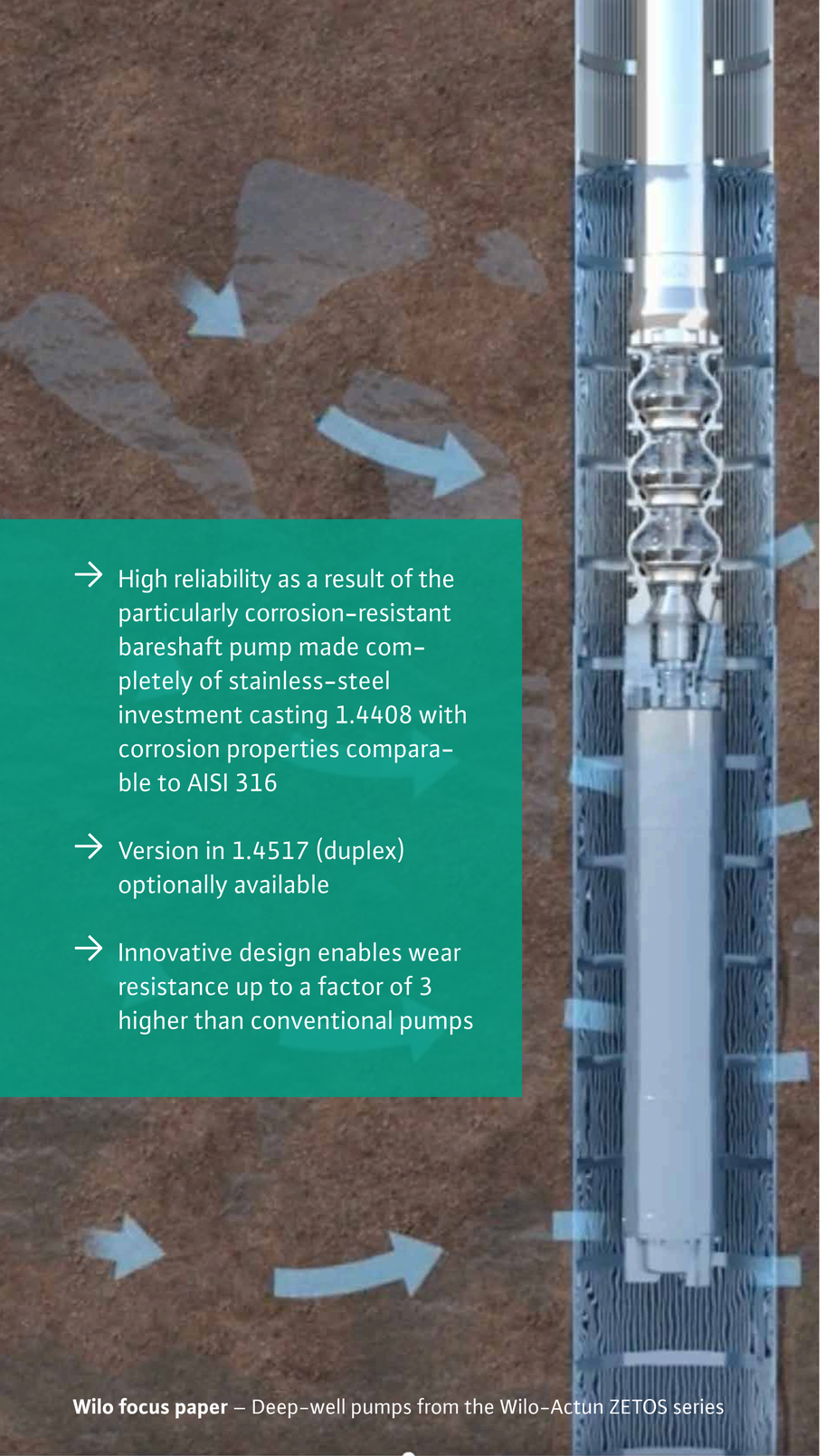
In order to fulfil the demanding requirements of mine operators for deep-well pumps that are individually adapted to the necessary duty point, Wilo has been highly dedicated in developing the Wilo-Actun ZETOS pump series. The **robustness** of the pump has been the main area of focus. The second most important area of focus was clearly **energy efficiency**, i.e. achieve **"best-in-class" efficiency**.

The practical comparison:

Conventional deep-well pump with asynchronous motor	→	**Wilo-Actun ZETOS with a highly efficient permanent magnet motor**	**Wilo-Actun ZETOS with a highly efficient permanent magnet motor using renewable energies**
Diesel consumption per year 160,000 l		**Diesel savings** **32,000 l**	**Diesel savings** **128,000 l**
CO_2 emissions per year 457 t		**CO_2 savings** **91 t**	**CO_2 savings** **366 t**
		Savings **20%**	**Savings** **80%**

The motor power of the compared pumps is 80 kW, which is typical for mines.

The savings compared to the conventional deep-well pump are compared.



- High reliability as a result of the particularly corrosion-resistant bareshaft pump made completely of stainless-steel investment casting 1.4408 with corrosion properties comparable to AISI 316
- Version in 1.4517 (duplex) optionally available
- Innovative design enables wear resistance up to a factor of 3 higher than conventional pumps

Advantages of the Wilo-Actun ZETOS:

1. High degree of robustness enables longer running times

The material used for casting the **bareshaft pump** of the Wilo-Actun ZETOS series (stainless steel 1.4408 with corrosion properties comparable to AISI 316) is ideally suited to the extreme loads in mine dewatering. In contrast to welded housings or those made of other stainless steels (such as AISI 304), Wilo pumps are **more resistant to corrosion and wear**. If the pumps are exposed to highly saline or corrosive fluid, as is often the case in open cut mining, Wilo also offers a duplex version made from the 1.4517 material. The same applies to the mechanical **wear resistance,** which is up to a factor of 3 higher for these pumps compared to competitor products. Aside from the material, the main reason for this is the pump design. The **neck rings** of the Wilo-Actun ZETOS, for example, are not made of metal but of the elastomer EPDM in order to minimise wear. In addition, the **bearings are fully load-bearing and also encapsulated,** which minimises the amount of sand that gets in and therefore reduces wear on the shaft. As a theoretical reference value, the maximum **permissible sand content** for pumps in the Wilo-Actun ZETOS series may be up to 150 g/m³. With conventional pumps, the value is only 50 g/m³.

Their design, as well as the materials used, mean the pumps in the Wilo-Actun ZETOS series are characterised by a particularly high degree of robustness, especially against aggressive fluids or fluids with a high solids content.

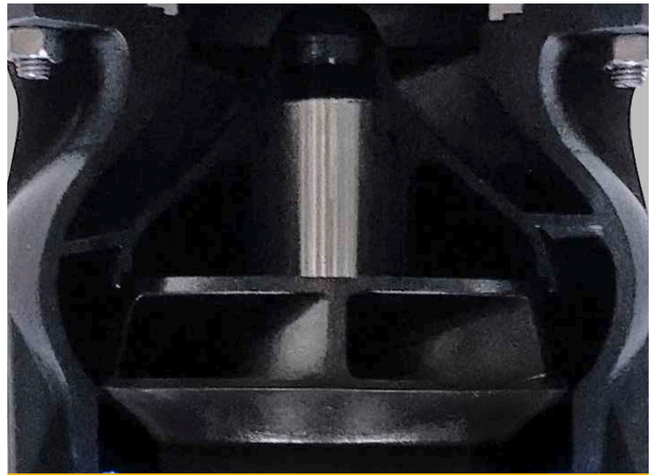
- → High manufacturing quality makes the pump particularly durable
- → Internal active cooling provides maximum motor service life
- → Optional Ceram CP coating prevents deposits and extends maintenance intervals

If the pumps are used in applications with fluid containing high levels of iron or lithium, it is possible to apply a Ceram CP coating to the impellers and housing parts of the deep-well pump. The pump is adhesive-repellent and **directly protects against deposits**, e.g. iron oxide deposits.

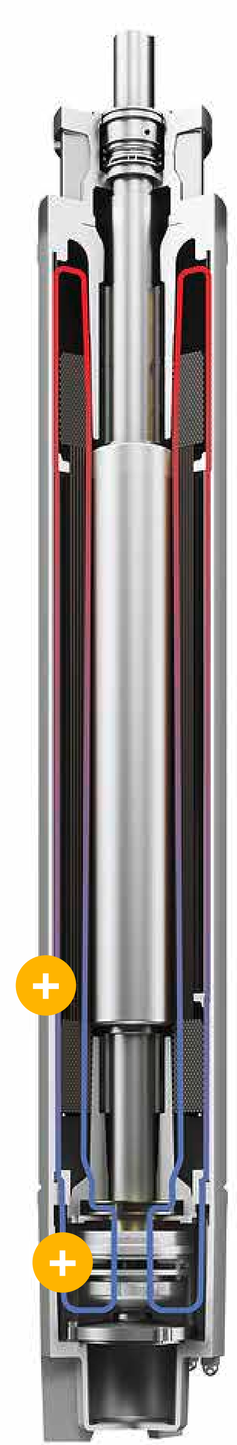
The semi-axial impellers of the Actun ZETOS are finely balanced on an individual level. The **high balancing quality** of the impeller also ensures that the pump runs particularly smoothly – with a correspondingly lower load on the encapsulated bearings. In contrast to this, impellers made of welded sheet metal cannot be balanced.

In order to utilise the performance potential of the pumps over long operating times, the pumps must be professionally dimensioned and installed. Particular attention must be paid to effective motor cooling which takes the fluid temperature and flow conditions into account. If equipping the pump with a cooling shroud is not possible due to limited space, we recommend using motors with internal active cooling. An impeller which runs permanently on the motor shaft is used to guide the cooling fluid directly through the winding. This allows the waste heat to be optimally absorbed and passed on to the circulating fluid via the outer motor jacket in a targeted way. This protects critical areas from overheating, especially the upper winding head.

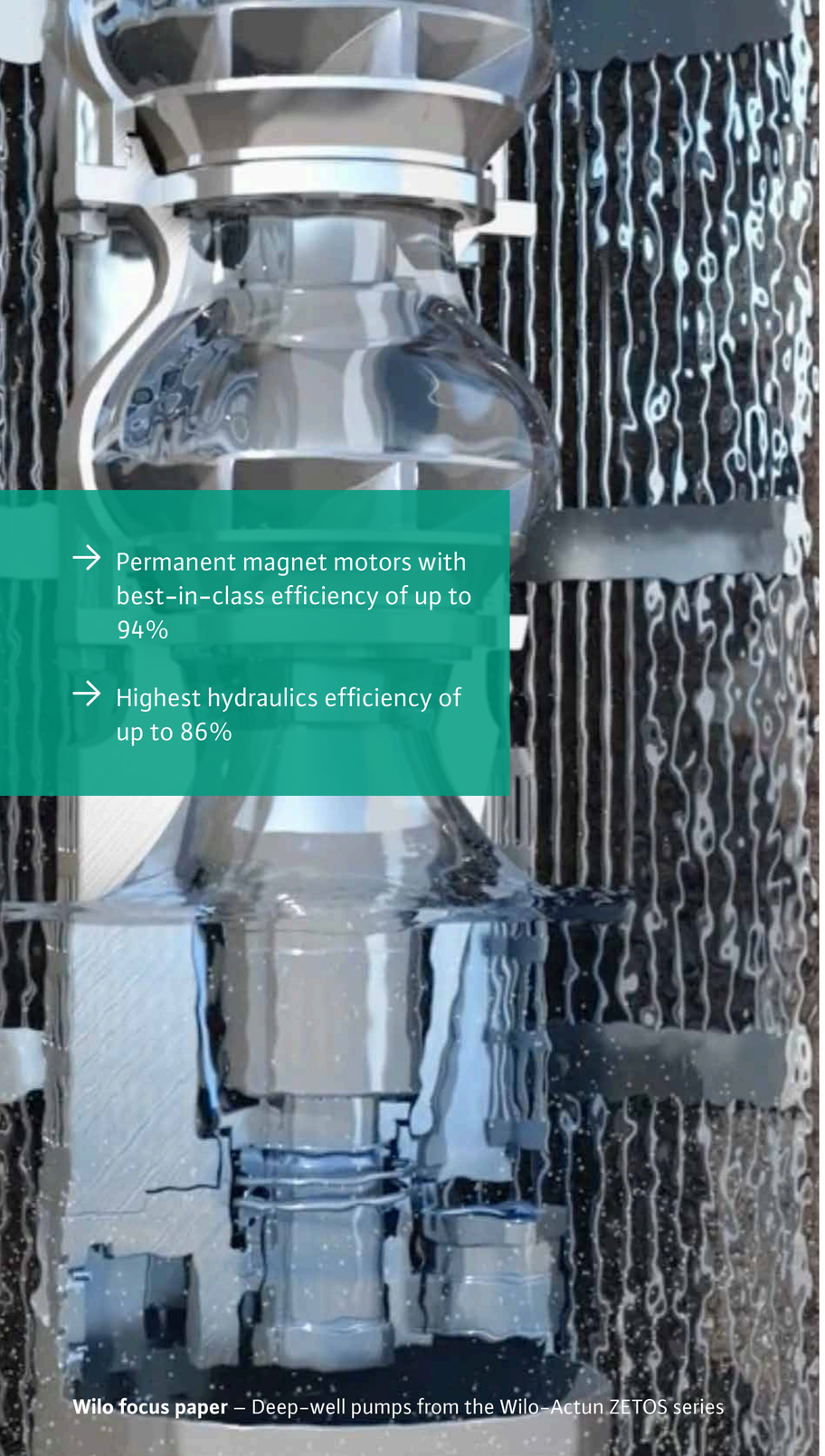
Pump with heavy iron oxide deposits



The Ceram CP coating offers excellent adhesive-repellent properties. This directly protects against deposits, leading to longer service life and lower maintenance costs.



Wilo motor with CoolAct internal active cooling



- Permanent magnet motors with best-in-class efficiency of up to 94%
- Highest hydraulics efficiency of up to 86%

Advantages of the Wilo-Actun ZETOS:

2. High level of energy efficiency makes the pump more economical

The hydraulics of the Wilo-Actun ZETOS, which are optimally adapted to the respective application in terms of number of stages and impeller diameter, provide the foundation for an efficiently running pump. **The best-in-class hydraulic efficiency is up to 86%.** The performance increases further by using a **permanent magnet motor**. The motors have an efficiency of up to 94% (best-in-class), which pays off in terms of a significant reduction in power consumption during operation: Savings of up to 20% were measured under test conditions.

This reduction in power demand is all the more important as the search for renewable energy solutions is underway in the field of mining around the world. The background: Supplying diesel fuel to the generators still in use today is extremely costly (not to mention the associated environmental impact) due to the long transport routes, among other things. As a result, mine operators want to reduce energy requirements and replace fossil fuels with energy generated from renewable sources. In Australia, UON Pty Ltd. has developed an integrated energy management system that will provide up to 100% of the power required for mine operations via large-scale photovoltaic and battery storage systems tailored to requirements. Currently, up to 80% is already being achieved.

However, in addition to digital connectivity, precisely coordinated systems are an essential prerequisite for this kind of environmental relief. These include highly efficient deep-well pumps, which account for a considerable amount of a mine's total energy requirements due to their large number at the respective open cut mining sites. For effective energy management, it's therefore particularly expedient to configure the pumps individually for the respective application using the appropriate Wilo configuration tools and to optimise their **efficiency potential**.

Advantages of the Wilo-Actun ZETOS:

3. Directly available, customised products mean fewer operational disruptions

The **modular design** of Wilo pumps not only pays off in terms of overall energy efficiency (in relation to the respective application) but also in terms of availability: Instead of pre-assembled pumps from the factory, it's possible to keep sufficient quantities of the necessary pump components (such as housings, impellers, bearings or motors) on site or at least on the respective continent and to carry out the assembly "just in time" as required.

This gives mine operators and system providers, such as UON Pty Ltd. in Australia, maximum flexibility and speed of response when additional demand arises in mines or when new mines are being developed.

At the same time, the modular design of the Wilo-Actun ZETOS pump series makes them **easier to repair**, which is particularly important in terms of sustainability.

Mines are often located in very remote regions. This makes concepts that guarantee the prompt availability of equipment, such as deep-well pumps, even important.

The Wilo-Actun ZETOS series

- Energy-saving water supply with a pump efficiency of up to 86%
- Highest overall efficiency in this class with permanent magnet motor make operation cost-efficient
- High reliability as a result of the particularly corrosion-resistant pump housing made completely of stainless-steel investment casting 1.4408 with corrosion properties comparable to AISI 316.
- High wear resistance: max. sand content of up to 150 g/m³
- ACS approval for use with drinking water
- Straightforward maintenance, easy installation and dismantling

More information at www.wilo.com

Through its practical, individually configurable design, the Wilo-Actun ZETOS pump series enables an optimal combination of performance, cost-effectiveness and operational reliability.

Wilo-Actun ZETOS-K8

Wilo-Actun ZETOS-K10

Wilo-Actun ZETOS-K12

Summary

The modular Wilo-Actun ZETOS pump series provides mine operators with a range of deep-well pumps for dewatering, which actively supports the journey towards more sustainable solutions. The high efficiency of the pumps, combined with significantly longer service lives compared to conventional pump solutions, contribute directly to reducing energy consumption. At the same time, they minimise operational disruptions – for example for short-term pump replacement due to breakdowns.

In conjunction with customised services, which primarily concern the availability of the pumps alongside the application-specific configuration of the deep-well pumps, **it will be possible to operate the mines much more resource-saving in future** than has been the case to up to now. However, in order to achieve this effect in full, a holistic view of the entire process chain is necessary, from the dimensioning of a pump through its operating phase to refurbishing.

Based on its close cooperation with system integrators and mine operators worldwide, Wilo can provide valuable support here as a solutions provider: from product dimensioning to practical use in the mine with the aim continuously optimising processes.

The image shows a Wilo-Actun ZETOS borehole pump in a deep well. Left hand side is the traditional solution, where power is provided by a diesel-powered generator. Right hand side shows the sustainable solution where power is supplied by PV modules and a Battery Energy Storage System (BESS).

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