



Technology

SUSTAINABILITY AND ECONOMY



KLEEMANN
SUSTAINABILITY



RESPONSIBILITY FOR NATURE AND THE ENVIRONMENT

Innovative concepts for climate protection.



KLEEMANN
SUSTAINABILITY



For years, we at KLEEMANN have been working on developments and innovations to make the operation of our machines more environmentally friendly and sustainable. Powerful electric drives lower the CO₂ emissions, fuel-saving models operate with a high level of efficiency and thereby save resources. Such developments benefit everyone. The environment wins, lower fuel costs make operation more economical. Efficient noise protection and dust-reducing concepts protect our health. Here, we demonstrate our commitment to both people and the environment - technologies that make KLEEMANN a trailblazer with regard to employee responsibility and environmentally friendly systems.

Reducing CO₂ emissions

- > Innovative drive concepts result in significantly lower fuel consumption
- > Reduction in emissions with electric motors
- > Number of lorry trips are reduced thanks to on-site processing

CO₂ savings that benefit the environment (example):

2 litres diesel → 6.3 kg CO₂
317 litres diesel → 1 ton CO₂

Reducing noise and dust

- > Noise protection packages and dust reduction to protect people and the environment
- > Improvement of working conditions in the long term

Innovative drive concepts



Efficient noise protection



Effective dust reduction



OUR DRIVE CONCEPTS - EFFICIENT AND SUSTAINABLE

Tailored solutions to meet all requirements.

Our objective is to find the most environmentally friendly drive concept for every application. Because unique tasks require unique solutions.

The best drive concept? Of course there is no single solution. Whereas electric drives perform very well in terms of the CO₂ footprint, in some situations a fuel-saving diesel drive is the better solution. KLEEMANN machines are available in different variants: with diesel-electric, diesel-direct and diesel-hydraulic drive and, optionally, with the option of an external power supply.

The decision in favour of the most efficient solution depends on many factors: for example, on the power supply options on site, whether the machines are used in an urban environment or which local environmental protection stipulations apply.

OVERVIEW OF DRIVE CONCEPTS

Drive concept	E-DRIVE	D-DRIVE	H-DRIVE
Crushing/screening unit drive by Auxiliary component drive Generation of drive output	Electric motor Electric Mains operation/ diesel engine	Diesel engine Electric Diesel engine	Hydraulic motor Hydraulic Diesel engine/ mains operation
Crushing and screening plants	MC 120(i) PRO MR 130(i) PRO MCO 110(i) PRO	MC 100(i) EVO MC 110(i) EVO2 MR 110(i) EVO2 MR 130(i) EVO2 MCO 90(i) EVO2	MSC 702(i) EVO MSC 703(i) EVO MSC 952(i) EVO MSC 953(i) EVO MSS 802(i) EVO



E-DRIVE - EMISSION-FREE THANKS TO ELECTRIC DRIVE

Environmentally friendly with diesel-electric drive.

E-DRIVE stands for full flexibility: the drive is 100 percent electric or, alternatively, possible with diesel fuel. Depending on the situation on site, the ideal solution is always available.

E-DRIVE opens up many possibilities. The most sustainable variant: the machine can be operated completely electrically – environmentally friendly and without CO₂ emissions. Nevertheless, E-DRIVE also offers an option for diesel-electric

operation without an external power supply. In this case, power comes from the fuel-efficient diesel engine. The crusher and all conveyor belts continue to be driven electrically via a generator (see illustration on the right).



The advantage: depending on the situation on site, full flexibility remains. If a good infrastructure is in place and power supply is available, the plant meets all requirements for sustainable operation. If there is only an insufficient power supply, or none at all, diesel fuel continues to be used – in an engine with very

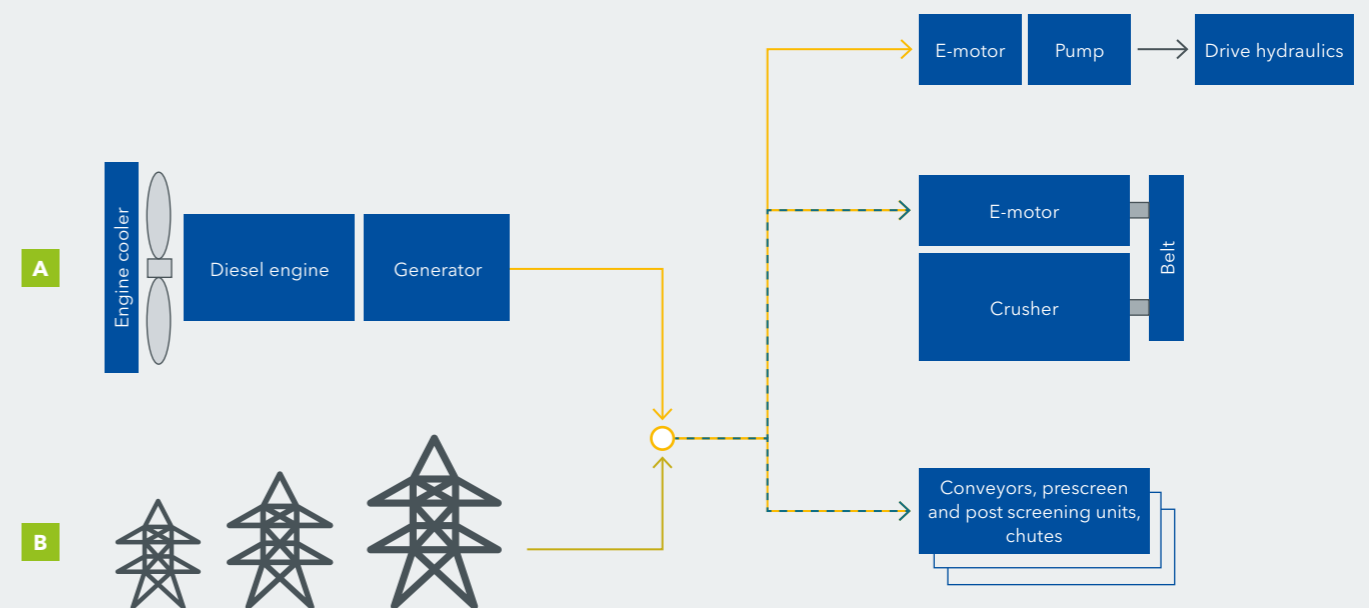
good consumption values and high efficiency. A further positive feature: because there is significantly less hydraulic oil in the plants, the risk and the impact of a leak are considerably reduced. This also contributes to environmental protection.



KLEEMANN > E-DRIVE TECHNOLOGY

> Drive via diesel engine **A**

> Drive via an external power source **B**



E-DRIVE in the quarry

In the quarry, the E-DRIVE concept can demonstrate the full range of its advantages in terms of flexibility: many work sites have a good power supply infrastructure, which enables supply with high-power current. In such cases, all-electric, environmentally friendly crusher production is possible on site and without CO₂ emissions.

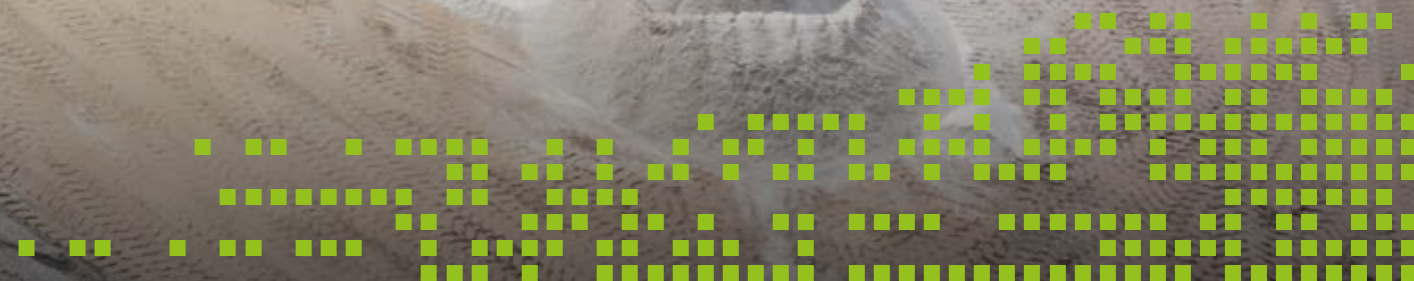
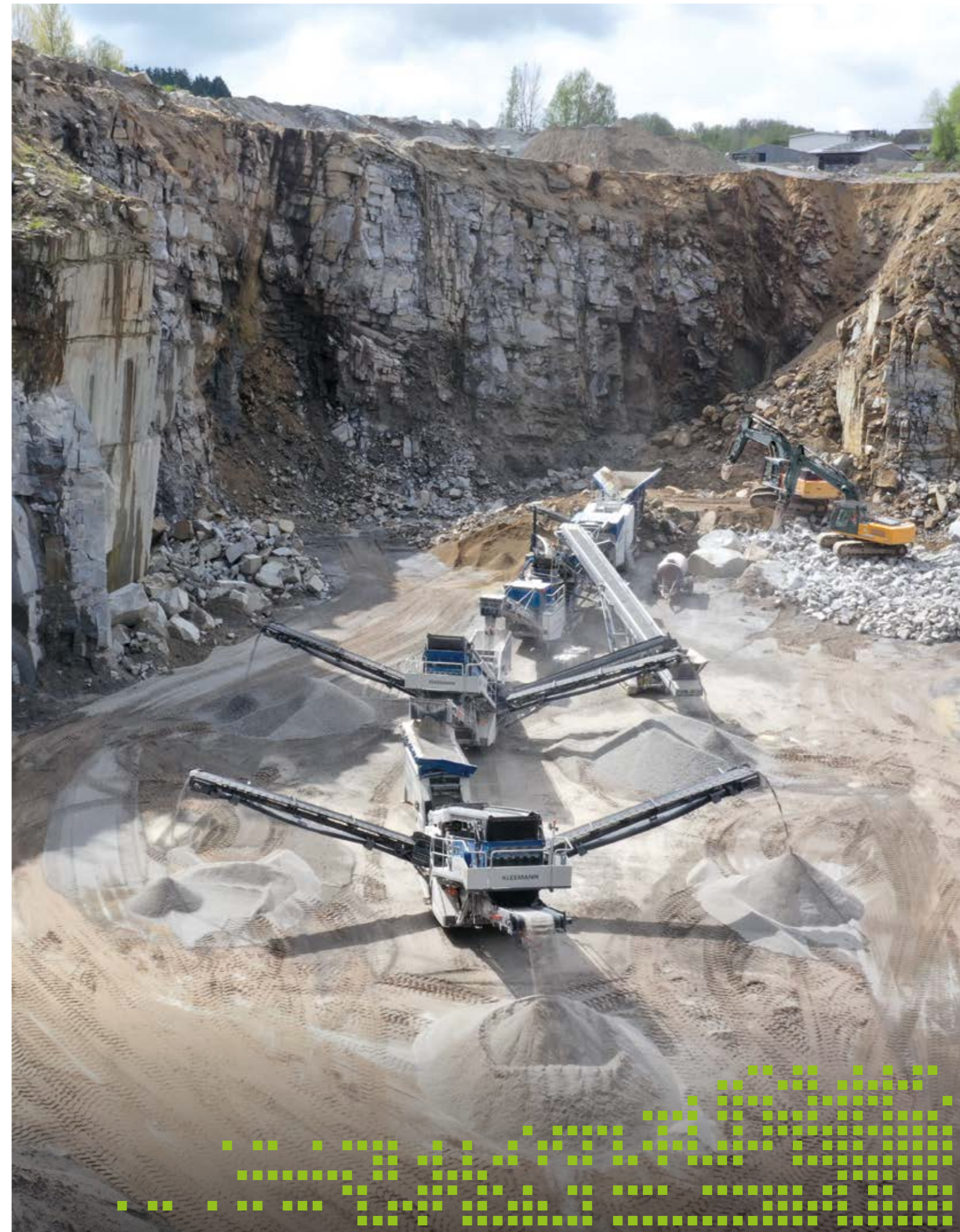
Thanks to the supply of diesel fuel, however, the machine can be used elsewhere in the quarry without any problems – for example, if the entire plant is moved along the rock face. In this case, power supply via long cables is often too costly or not possible at all.

However, moving the plant train along the rock face offers other advantages that also have an impact on the carbon footprint: short distances make the processes fuel-efficient and sustainable because the stone does not have to be transported to a stationary plant for processing. The example shows that it is always necessary to weigh the various factors to determine and work out the best possible efficiency – and therefore the most resource-saving work processes. The diesel-electrical systems offer the best prerequisites in this regard because, depending on the location and availability, it can be decided which power source is used.

E-DRIVE in stationary recycling

Processing and retention in the raw material cycle – recycling systems make an important contribution to environmental protection. This often includes the production of green energy through photovoltaic systems. If this is then used to power the E-DRIVE drive, the overall sustainable concept is perfect. Recycling plants usually have a good infrastructure, such as

power supply and water connection. The machines often stay in one place because the material is delivered by lorry. All this creates the ideal prerequisites for all-electric operation. With the diesel-electrical systems from KLEEMANN, however, you still have the flexibility to work with the machines at other locations as required.



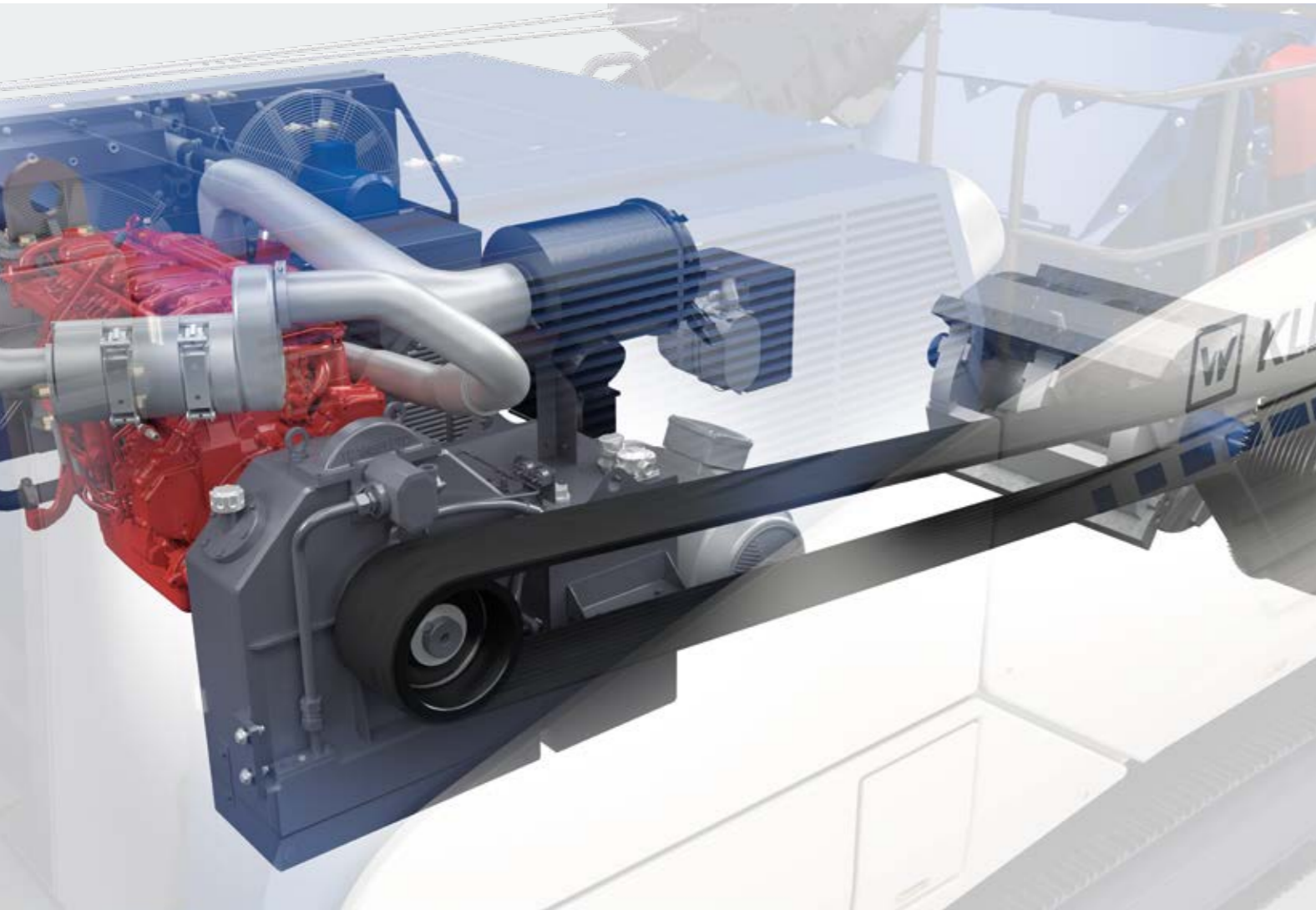
D-DRIVE - THE DIRECT AND POWERFUL SOLUTION

Fuel saving with diesel-direct drive.

The prerequisites for electric operation are not always met. In order to produce in an environmentally-friendly manner in spite of this, lower fuel consumption is decisive - as with our D-DRIVE power packs.

The diesel-direct D-DRIVE delivers efficient power directly from the engine to the crusher. The powerful diesel engine with fluid coupling excels with low efficiency losses. Consumption has been further optimised in recent years, so that today D-DRIVE achieves very low fuel consumption with high crushing performance.

In terms of the degree of efficiency, the diesel-direct drive has energetic advantages and fuel consumption is up to 20 percent lower: if continuous use of the all-electric drive is not possible, the D-DRIVE is the better, more sustainable option. It is efficient, direct and saves fuel.



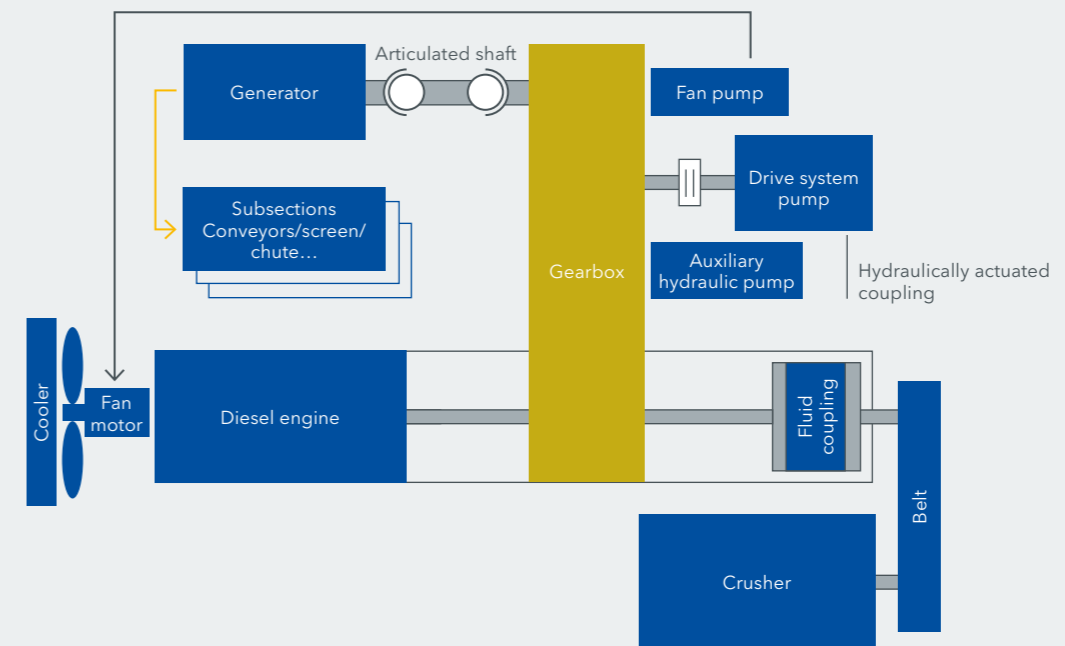
Short-term deployment in the quarry

The efficient diesel-direct power packs can be used to cover short-term peaks in the quarry or to crush smaller total volumes. For such temporary deployments, it is often impossible to install a power connection, or it would require too much time and effort.



KLEEMANN > D-DRIVE TECHNOLOGY

D-DRIVE crusher direct drive: The fluid coupling ensures high operational safety - for operator and machine. All auxiliary drives such as the prescreen, chutes or conveyor belts are electrically operated.



D-DRIVE in mobile recycling

Demolition and processing work in inner-city areas are a special challenge. Access roads are usually narrow, noise and dust can become a burden on local residents. There is usually no infrastructure, for example in terms of electricity supply. The stipulations can also vary considerably depending on the local authority. Many customers are critical of processing the material directly on site - even if this is the most ecological and efficient option, for example because lorry journeys are saved. In short: maximum flexibility is required in an urban environment.

This is where D-DRIVE can make full use of its advantages. Thanks to the compact size and well thought-out transport options, the machines are quickly ready for operation and can be positioned flexibly on the building site. The low diesel consumption contributes to a good eco-balance. Noise emissions are reduced via the use of appropriate measures. The material pre-sorted during demolition is crushed on site to the desired final grain sizes. This saves many lorry journeys. In turn, this results in significantly lower CO₂ emissions and less noise and dust pollution.

**D-DRIVE for infrastructure projects**

Building sites in road construction are not restricted to one location, but rather shift according to construction progress. Conditions are always changing, and here, too, the prerequisite for efficient use is maximum flexibility. A suitable current supply is usually not possible under these conditions - but the use of fuel-saving, environmentally sound technology is. Irrespective of whether the task involves natural stone or the dismantling of old material, the machines with D-DRIVE drive are the

best choice. During motorway construction, for example, the extracted final products can be produced and reused in large volumes directly on site. Here, the concept also saves numerous lorry transport trips. Logistics therefore become much easier and fuel consumption is kept to a minimum. The high operational reliability of the machines also pays off here. Less downtimes and a maximum crushing capacity contribute to efficiency.

 **KLEEMANN** > GOOD TO KNOW
**Specialists in clean processes**

Demolition work in inner cities is always a challenge. On-site processing is the most ecological and economical option, because short distances reduce emissions. If the construction waste has to be processed in densely built-up areas, the crushing and screening technologies need to meet the highest demands - especially when it comes to noise and dust generation. KLEEMANN machines are prepared for such challenges thanks to right equipment and advanced technology.

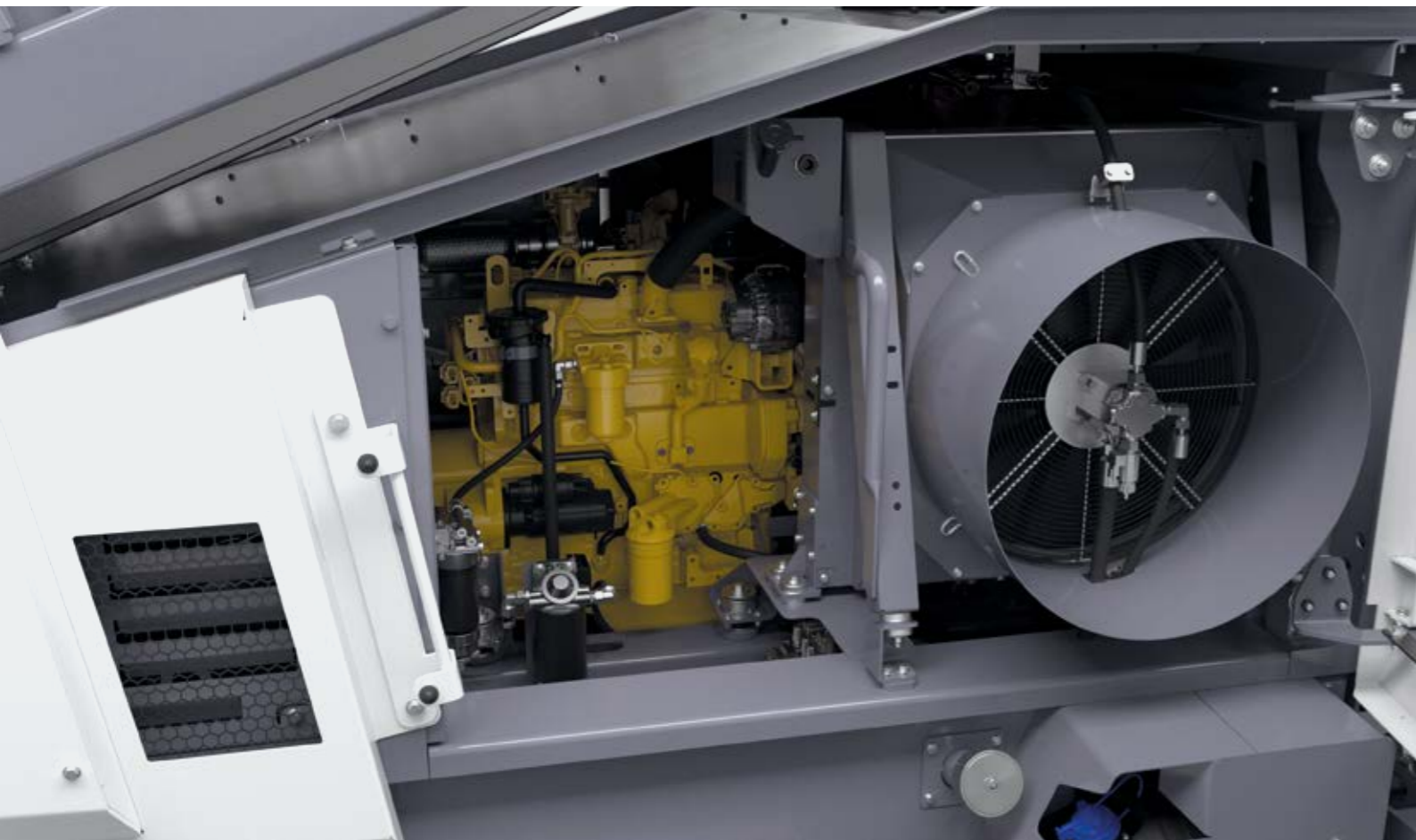
H-DRIVE - LOADS OF POWER FOR MOBILE SCREENING PLANTS

Efficient and economical with diesel-hydraulic drive.

KLEEMANN screening plants use an effective diesel-hydraulic drive. As an option, the plants are available with Dual Power - an external power supply then guarantees local emission-free operation.

The diesel-hydraulic system uses powerful technology: hydraulic pumps operate all machine parts such as screen, belts and drive system. The power requirements for the screens are considerably lower than for a crusher, for example - fuel consumption during operation is therefore more favourable. The optionally available Start-Stop system can reduce consumption even further: if there is a gap in the feed material, the machine significantly reduces the engine speed and therefore the speed of the hydraulic drives. This saves diesel fuel and reduces wear. If the wheel loader is needed elsewhere for a

long period, e.g. loading a lorry, the plant switches off automatically. The MOBISCREEN MSS 802(i) EVO, for example, has a temperature-controlled fan for reducing noise development and diesel consumption. With the configuration with Dual Power, KLEEMANN screening plants have an option for all-electric power supply. If a mains connection is available, the plant operates on site emission-free (see graphic on the right) - for example, in ecologically sensitive areas with strict stipulations.



Ecology - a question of the overall concept

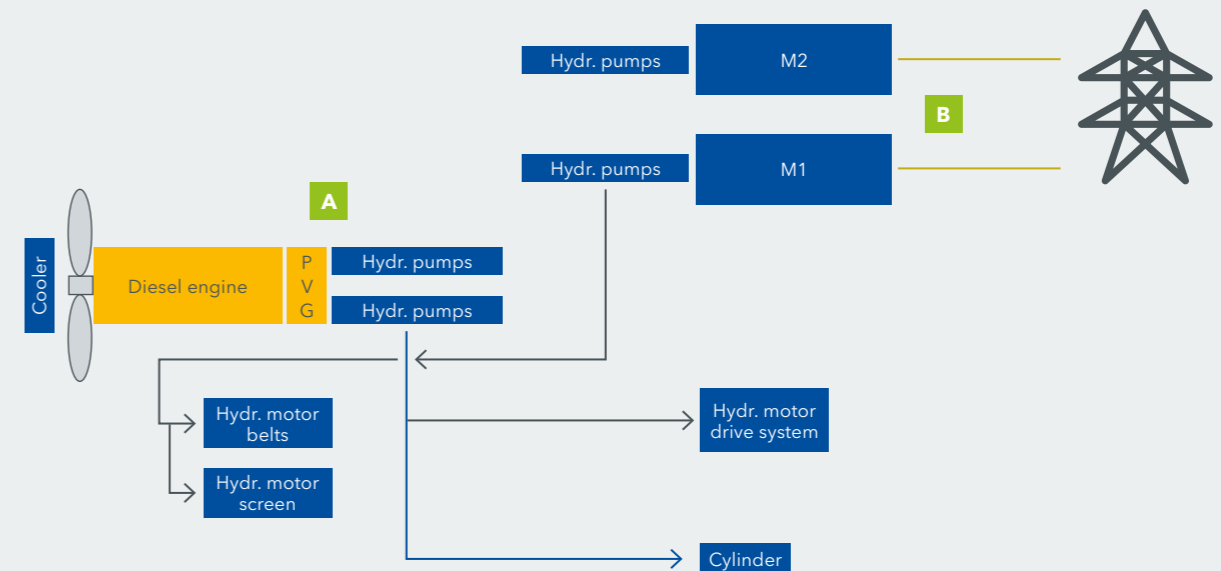
Many factors play a role in the area of sustainability. Energy required for production, transport, storage, sales and disposal are all incorporated in the ecological footprint of the production process. The bottom line is that not only the fuel supply is decisive. You have to weigh up, for example, whether supply

via an external power source, which is associated with high equipment and material costs, is more constructive at the end of the day than technology with lower fuel consumption. Ecology can also mean placing your trust in low material usage and high durability.

KLEEMANN > H-DRIVE TECHNOLOGY

> Drive via diesel engine **A**

> Drive via an external power source **B**



NOISE PROTECTION SOLUTIONS

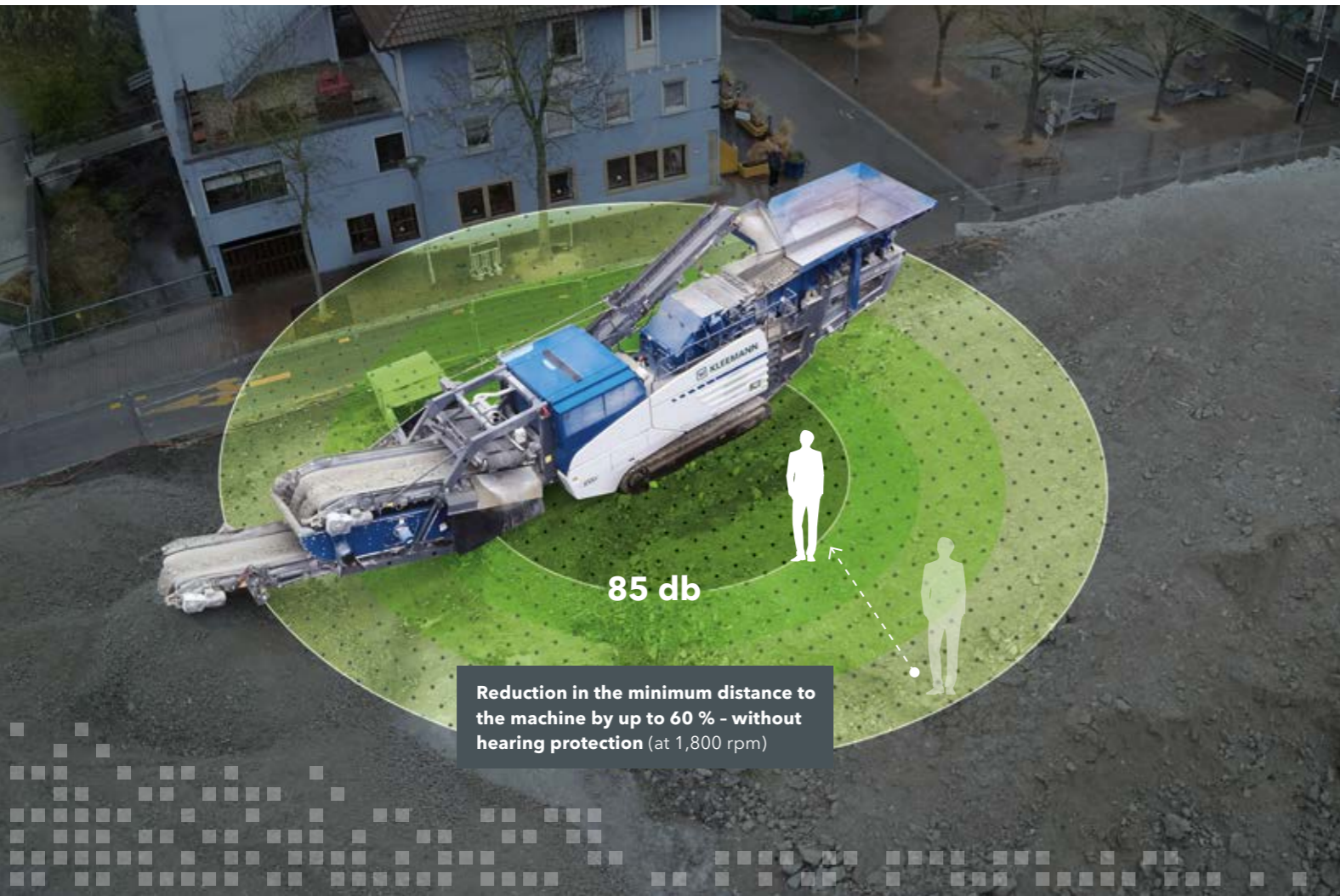
Less noise - more environmental protection.

Noise pollution can be stressful. For this reason, KLEEMANN machines operate at low-noise levels. Optional noise-protection packages guarantee even lower noise levels - to protect users and residents.

The reduction of noise and dust also makes a contribution to environmental protection. This is particularly relevant in urban areas where many people are exposed to the emissions. Depending on the local authority, different regulations regarding noise levels of building sites apply. For this reason, KLEEMANN has invested substantial development work in noise reduction. As a result, even the basic configuration of the

current machines is up to 60 percent quieter than predecessor models. The graphic below illustrates that this results in significantly more comfort for users. Residents are also exposed to less noise. The optional noise protection equipment provides even more protection. It reduces the perceived sound volume by a further 6 dB - a reduction of 3 dB means a reduction in noise perception by half.

Noise development with the MOBIREX MR 130(i) EVO2



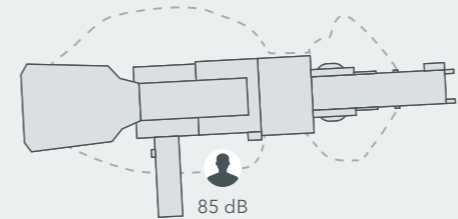
KLEEMANN > TECHNOLOGY

Comparison of different noise sources with the MOBICAT MC 110(i) EVO2 jaw crusher

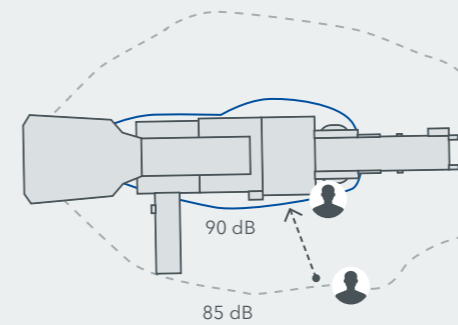
- > Plane take-off: 140 dB
- > MC 110(i) EVO2 with noise protection package: 85 dB
- > Pneumatic hammer: 120 dB
- > Vacuum cleaner: 70 dB

Thanks to the power- and load-dependent fan, the MOBICAT MC 110(i) EVO2 mobile jaw crusher already has very low noise levels - even in its basic configuration. **With the additional noise-protection package, the plant can be operated without noise-damping headsets - depending on ambient conditions and local regulations.**

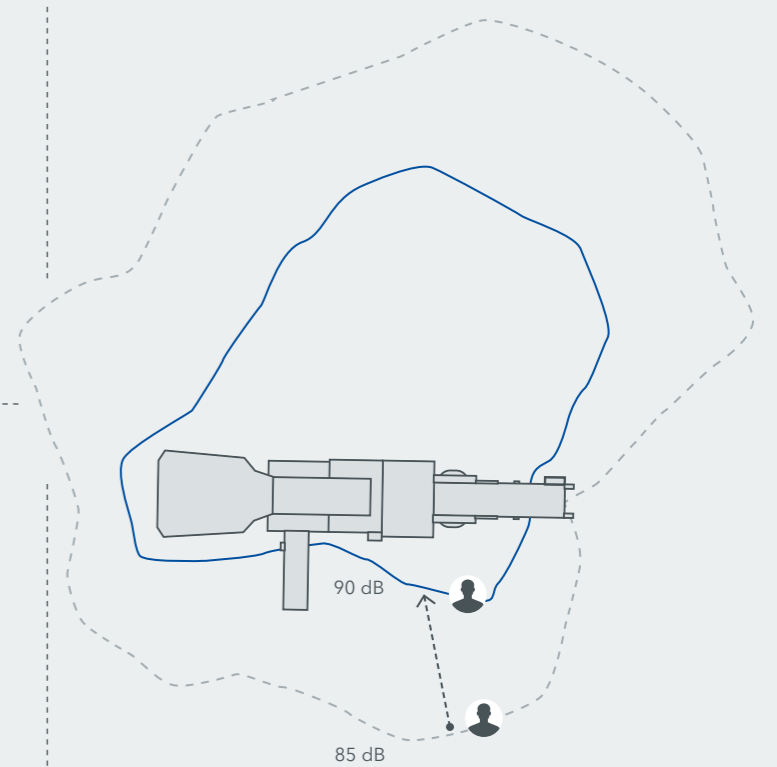
The noise protection package includes power pack sealing and a power pack housing made of noise-insulating material with an upwards sound conduction system. The graphics below depict the operating radius. If users move along the blue line, they are exposed to 90 dB; on the dashed line, 85 dB.



MC 110(i) EVO2 with noise protection package



MC 110(i) EVO2 without noise protection package



MC 110 EVO (predecessor model)

SOLUTIONS FOR EFFECTIVE DUST CONTAINMENT

Cleaner air for users and residents.

Building material recycling and natural stone extraction can involve relatively high dust development. For such cases, KLEEMANN has developed dust reduction measures that efficiently contain dust pollution.

The images speak for themselves: the first one shows a plant in operation without dust protection and, in comparison, a plant with water spraying at various points - a good way to bind dust where it is created. Also effective: special belt covers that contribute to dust reduction. The spraying concept allows

different water pump systems to be connected; stationary water bodies or tanks can therefore be used. The dust reduction protects users and residents - and, ultimately, such measures also ensure greater acceptance of urban building sites.



02



01



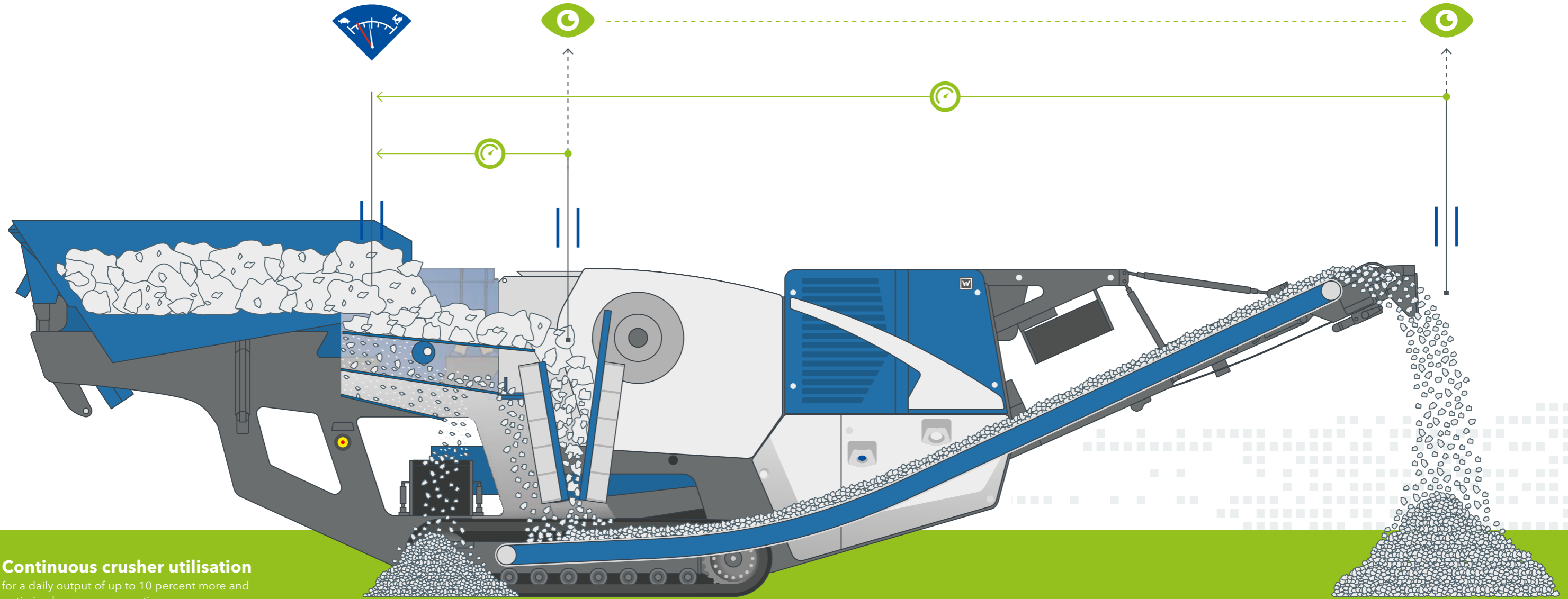
03

- 01 Operation with active spray system
- 02 Operation without spray system
- 03 Fastening for belt cover



OPTIMAL PROCESSES - THANKS TO THE CONTINUOUS FEED SYSTEM (CFS)

An optimised crushing process saves resources.



Continuous crusher utilisation
for a daily output of up to 10 percent more and optimised power consumption

The innovative continuous feed system (CFS) saves power and resources.

Sustainability also means optimising processes. After all, if components wear quickly, new components have to be produced with a high material and energy input. The innovative continuous feed system (CFS) ensures that the feed material is always conveyed with maximum efficiency through the

machines. The filling level of the crushing chambers is monitored continuously and the feed is adapted to the process. This optimised process ensures that material wear is as low as possible. Furthermore, fuel consumption is also reduced - which is also beneficial for the environment.



 **KLEEMANN** > PROCESS KNOWLEDGE

Both economical and sustainable

The CFS is an intelligent system that learns independently. It reacts to an uneven material flow, for example due to a delayed feed or mixed feed material. The system automatically adjusts the feed speed and thus ensures constant utilisation.

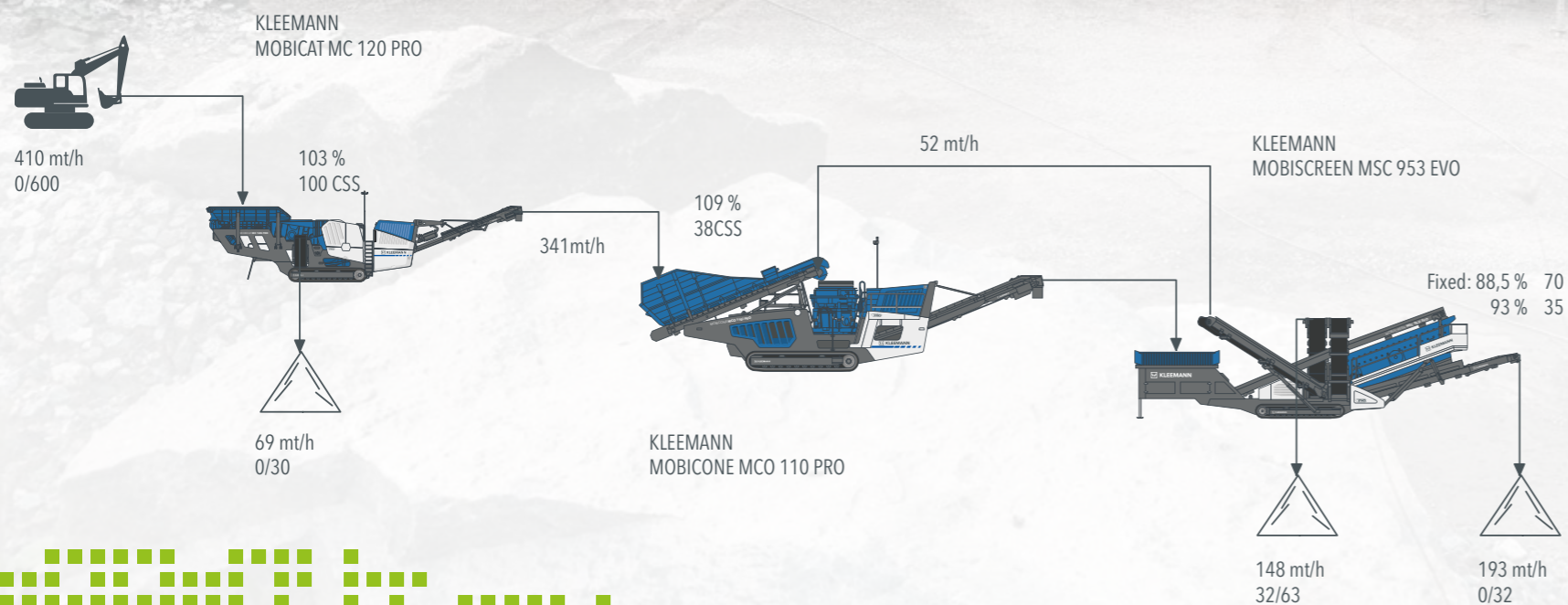
APPLICATION CONSULTING GUARANTEES EFFICIENT SOLUTIONS

Well thought-out processes and good planning saves resources.

KLEEMANN Application Technology: Further developments to protect the environment.

The topic of environmental protection is of great concern to KLEEMANN - and to many of our customers as well. They want to be able to operate plants with as few emissions as possible. Furthermore, many regions and municipalities impose strict environmental regulations.

In all development work, our application technicians keep a close eye on consumption, wear and tear, as well as the protection of employees - making our machines not only more efficient, but also safer and more sustainable.



The best advice for environmentally friendly processes

Only when processes are perfectly designed can plants operate in a way that is material- and fuel-saving with low wear. It is always crucial to find the right machines and solutions to meet a job's specific requirements. To be effective and therefore resource-saving, the system should be neither too small nor oversized. Our customers can rely on our employees to plan all processes in great detail, for example with an AggFlow, which can simulate the process in advance. This is how KLEEMANN, together with its customers, makes a valuable contribution to protecting the environment.





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