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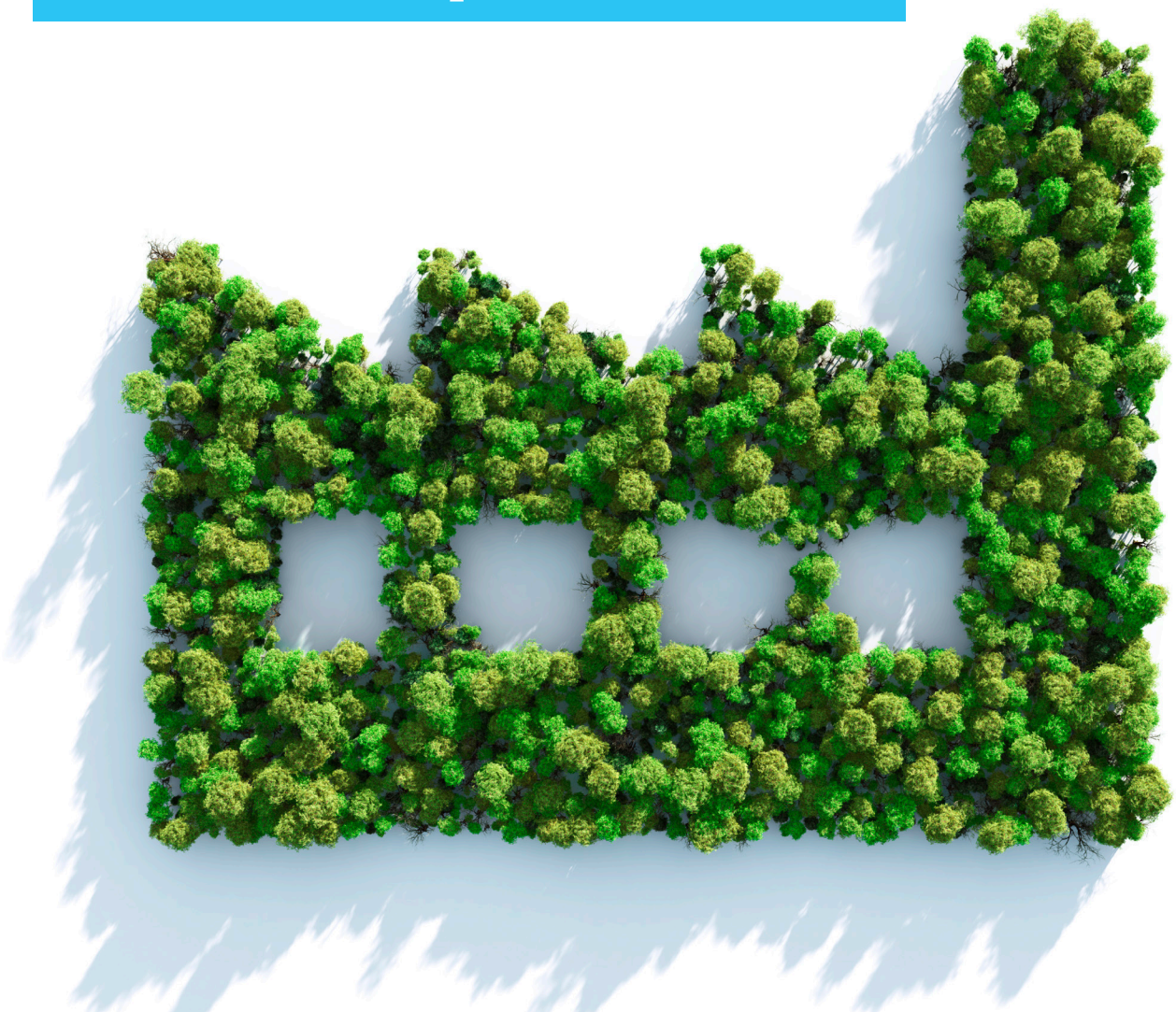
INTERVIEW:

Progress and promotion:

What contribution can mechanical engineering make to climate protection?



Dr. Max Ludwig from the Boston Consulting Group and Guido Hettwer, Senior Vice President Sales Industrial Hydraulics at Bosch Rexroth, explore this question. In addition to specific funding opportunities, the experts also name current innovations in the field of industrial hydraulics that ensure greater energy efficiency and thus shorten the path to climate neutrality.

Herr Dr. Max Ludwig, why do manufacturing companies have to concern themselves intensively with climate protection?

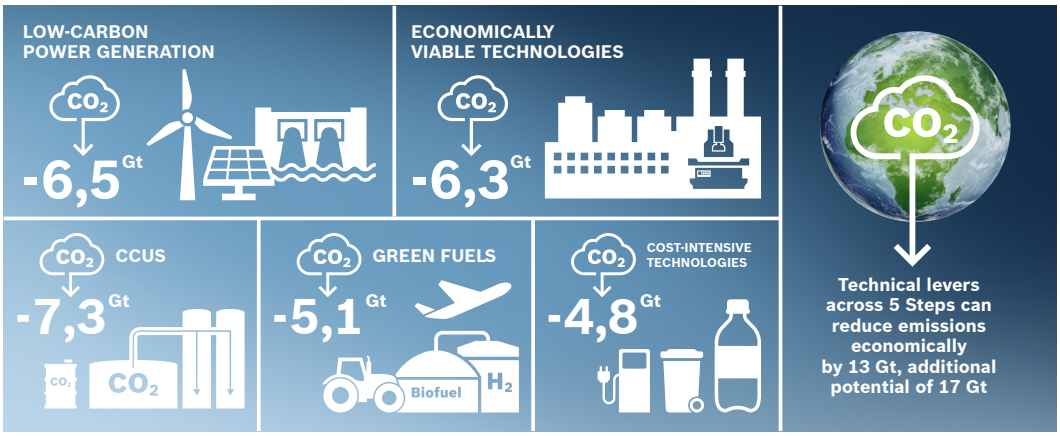
First, this is required by their social responsibility as companies; second, they are confronted with concrete demands from consumers, industry, governments and investors. We are observing that climate protection is becoming increasingly important in political decision-making. The recent elections in South Korea and the USA demonstrate that this applies not only to Europe. Investors and companies, in turn, are increasingly committing to climate-friendly actions and concrete targets. Prominent representatives are, for example, the asset manager Blackrock and major car manufacturers.

Dr. Max Ludwig
Principal der Boston Consulting Group in München

What role does technological progress play in this? How much greenhouse gas can be avoided this way and how much will it cost?

> **The savings potential through technical levers is enormous: According to a study carried out together with the VDMA, emissions can be reduced by up to 30 gigatonnes per year from around 51 gigatonnes by 2050."**

However, this requires continuous technical improvements, cost efficiencies and, above all, investment in equipment. Over the next 30 years, this will require around 10 trillion euros. At first glance, this sum seems gigantic, but it is quickly put into perspective when we compare it with the economic stimulus programs to overcome the coronavirus crisis. Estimates in this regard amount to over 11 trillion euros for the next three years alone.



What about specific funding initiatives?

We see many initiatives and objectives, but most of them are still rather vague. There are grand plans for 2030, 2040, or even 2050, but without a clear path to get there. More concrete drivers include the Green New Deal in South Korea, the Zero Emissions Vehicle program in California, and the new 5-year plan of the People's Republic of China. In Germany, the government issued a first funding decision for 8.2 million euros at the end of 2020 as part of the National Hydrogen Strategy. The funding recipient is a German-Chilean-Italian consortium which is building a plant in Chile to produce fuel from green hydrogen.

How important is mechanical engineering for climate protection?

Mechanical engineering plays a crucial role because it is in demand wherever existing processes are to be made more efficient or new products, such as fuel cells, are to be manufactured on an industrial scale – not only in industrial production, but also in energy generation or the mining of raw materials.

Where does it make sense for mechanical engineers to start?

First, the company's own product range, which needs to be trimmed for energy efficiency. And by that I don't just mean the latest generation of machines, but also inventory optimization at the customer, for example through retrofits. The second field of action is the early development of new technologies. These can be green technologies themselves – for example, efficient recycling plants or electrolyzers – as well as new plants for the production of green technologies. An example would be bipolar plates which are used in electrolyzers or fuel cells.

Guido Hettwer: Bosch Rexroth supplies machine and plant manufacturers worldwide with hydraulic components. Where do you see the relevant efficiency levers?

In the case of hydraulics, the decisive lever is power consumption. In order to reduce it sustainably, machine builders must design the hydraulic system as precisely as possible. The individual components must also be optimized so that they provide the required power with minimum current consumption. A particularly large potential lies in the way hydraulically driven movements are controlled. Positive displacement drives are gaining ground. They are a suitable alternative for many applications and can also be easily retrofitted. Not infrequently, this even means that previous cooling equipment can be dispensed with, which saves even more energy.

Guido Hettwer
Senior Vice President
Industrial Hydraulics

If hydraulic systems are to become more sustainable and at the same time more economical, the manufacturers can achieve this with the following three levers: less energy, less fluid and less material.

LESS ENERGY	LESS FLUID	LESS MATERIAL
Less energy through optimization of systems in the development phase, variable-speed pump drives and kinetic buffering	Reduction of the tank volume for power units at the same performance	Additive manufacturing methods
Less power consumption **Less operating costs** **Less CO_2 emissions**	**Lower insurance costs** **Less costs for fluid** **Less consumption of fluid**	**High efficiency factor** **Less installation space** **Less cost**

New software tools and manufacturing processes provide a further lever for energy-efficient system design. With the help of simulations, the actual power requirement can be determined so precisely that it allows for smaller hydraulic tanks and oil quantities. CFD simulation and 3D sand core printing can also be used to produce flow-optimized valves and control blocks that achieve higher efficiency. In specific situations, it is also possible to store hydraulic energy released during braking processes mechanically or electrically and feed it back into the system at the appropriate point. This means that pumps and motors can be dimensioned smaller.

Which of these technologies are already available, which will become important in the future?

The technologies and services just mentioned are already part of our offering today. In the important category of displacement-controlled drives, we distinguish between axial piston pumps and variable-speed drives. Axial piston pumps control the volume flow continuously via a swivel angle. They have been in use for a long time, but reach a new level of efficiency in combination with digital control units. The even younger, but also established variable-speed drives generate the volume flow through a combination of electric motor and hydraulic pump. In contrast to a conventional hydraulic drive with a power unit, pump and high-response valve, this electro-hydraulic solution can supply a consumer with the power it currently requires with pinpoint accuracy and switch it to standby in idle phases. Depending on the respective work cycle, up to 80 percent of the previously required energy can be saved. For this reason, variable-speed drives also form the new drive basis for highly compact servo-hydraulic axes, including cylinders, as well as for new, intelligent hydraulic power units that also make energy-on-demand usable for machine tools and larger systems with multiple consumers.

In the future, we want to network the individual hydraulic components even more strongly and intelligently. This significantly increases the actuality and quality of the machine data. Predictive maintenance approaches are thus becoming increasingly accurate and target-oriented. This increases the efficiency of the machine over its entire life cycle.

Herr Dr. Max Ludwig, innovative technology is usually more expensive. What possibilities do you see for subsidies?

Germany has been providing funding for a number of years, but so far companies have not used it to a satisfactory extent.

> **”For example, within the framework of the federal promotion of energy efficiency in the industry, the BMWi supports measures for the energy-related optimization of existing production plantswith up to 40 percent.”**

Cross-sectional technologies and investments for the replacement or new acquisition of highly efficient plants or aggregates are also eligible for funding.

How can machine manufacturers and their customers refinance climate-friendly measures?

In the industrial environment, efficiency measures usually pay for themselves within a few years through the lower energy costs in operation. Support programs such as the one offered by the BMWi can shorten this period even more. In addition, KfW Bank offers development loans with a repayment bonus. An exciting question for the future is to what extent regulatory measures such as CO2 prices or new platforms such as Efforce will positively influence the financing of efficiency measures.

Guido Hettwer, how do you communicate to your customers that green technology pays off?

Our decades of experience in the industry help us with this. With the knowledge gained from a wide range of reference projects, we can calculate the energy savings with cycle accuracy and show a concrete monetary advantage through the electricity savings. For retrofits, we have also developed standardized retrofit kits that keep the time, effort and cost of retrofitting to a minimum, taking into account OEM specifications and the machine type. In addition to complete documentation, including hydraulic and electrical diagrams, we also provide our customers with information on suitable subsidies to accelerate the ROI.

How is Bosch Rexroth setting a good example in its dual role as machine builder and user?

As a member of the Bosch family, we pay attention to energy-efficient production. The Group has been CO2-neutral since last year. With the aim of reducing energy consumption and CO2 emissions not only relative to value added, the Group is also investing one billion euros in the energy efficiency of its plants and buildings over the next ten years.

Bosch Rexroth’s special role here is to convert existing production plants within the Group. At the Whujin plant in China, for example, we were able to save between 70 and 80 percent energy by retrofitting with compact units. Within Bosch Rexroth, demand-controlled hydraulics contributed more than 50 percent to achieving climate neutrality in 2020.

Herr Dr. Max Ludwig, what recommendations for action do you have for the manufacturing industry and its partners in mechanical and plant engineering?

> **We can only recommend to all machine and plant manufacturers that they take a close look at the green technologies of tomorrow already today and ask themselves what role they can play in them."**

To this end, it helps to gather knowledge and ideas within your own company, but also to enter into discussions with customers, other machine builders and research institutes. For the far-reaching changes will certainly only be achieved in the ecosystem.

Herr Guido Hettwer, how do you assess the situation? How open is the mechanical engineering industry to change?

I think it is clear to all players that there is no way around the issue. We all need to take action to tackle climate change. However, the fact that climate protection and economic efficiency are not mutually exclusive is also decisive for determined action. We try to give the movement even more momentum by designing our components, solutions and services in the field of industrial hydraulics in such a way that both objectives go hand in hand and offer relevant added value in every respect. We continually review current and future requirements in constant dialog with our customers.

Herr Dr. Max Ludwig: Is the industry on track to make its contribution to achieving the Paris climate targets?

Even if many questions remain unanswered and the path does not always seem straightforward, I am fundamentally optimistic that the goals of the Paris climate agreement can be achieved. This is supported by the fact that more and more decision-makers are recognizing the challenges and that green technologies are developing rapidly.