

Kobra Formen GmbH, 08485 Lengenfeld, Germany

Mould construction in transition – three decades of innovation for concrete paving stone products

■ Andreas Gebauer, Kobra Formen GmbH, Germany

Most people in the concrete paving stone industry are familiar with this phenomenon: As soon as you get out of the car, bus or train, your gaze involuntarily turns to the floor - and you start analysing paving stones, laying methods, joint patterns and surface structures. This passion has its origins in a tradition dating back thousands of years: Even the Romans laid roads with natural stone to create permanently stable traffic routes. In the 20th century, the concrete paving stone brought a revolutionary innovation - with systematic, efficient and economical solutions, a new era of paving construction was born. While concrete paving stones are now an integral part of the cityscape, mould construction has also changed fundamentally over the last three decades. Kobra Formen GmbH has been at the forefront since 1991 - with innovative technologies and a deep understanding of the needs of concrete paving stone manufacturers. From manual work to high-precision industrial processes, the company is constantly setting new standards.

From manual craftsmanship to industrial production

In the past, mould construction was a complex, largely manual process in which each mould was unique. Mould inserts were fired in a water bath - this automatically created a surface hardening layer. However, this hardness was partially lost as manual finishing was necessary to level out any unevenness. Spacers, which served as transport protection and as a laying aid for an optimised joint pattern, were often adapted by welding. The heat generated in the process permanently changed the hardness structure. Tamper shoes were individually inductively heated and hardened in an oil bath, which led to an uneven distribution of hardness - so much so that uneven wear became visible on the paving stones after a few tens of thousands of production cycles. On some areas, indications of the period from which the paving stones probably originate can still be recognised today.



*Kobra Formen GmbH
in Lengenfeld,
Germany*

Kobra fundamentally changed this picture with the use of CNC milling technology. Milled paving, kerb and block moulds quickly established themselves as a new standard - despite all the initial scepticism. Precise machining enabled consistent dimensional accuracy and optimised hardening treatment in specially developed high-performance ovens. This decisive advance significantly extended the service life of the moulds and made the production process more efficient in the long term.

Kobra Formen GmbH has always played a pioneering role here. As early as the early 2000s, the company consistently focused on case hardening in mould construction - a feature that is now considered a quality standard in the industry. While competitors often offered cheaper but lower quality alternatives, Kobra remained committed to very high quality.

Service, maintenance and development - Kobra Tools & Care

The technological revolutions also changed the requirements for the service and maintenance of moulds. Where cut-off grinders, hammers and welding equipment were once used for repairs, today replaceable wear parts, precise torque spanners and digitally supported maintenance concepts are used. It was recognised early on that high-quality moulds deserve just as sophisticated handling as their manufacture.

The company offers its customers a comprehensive service - from on-site repairs and regular training to the provision of specialised tools. For example, the Kobra vibrating bar measuring device is used, which records the position of all vibrating bars and the horizontal table alignment on the vibrating table much faster and more precisely than manual measuring methods. Combined with high-speed camera recordings and special lighting, details of the production process in the



Setup of the high-speed camera

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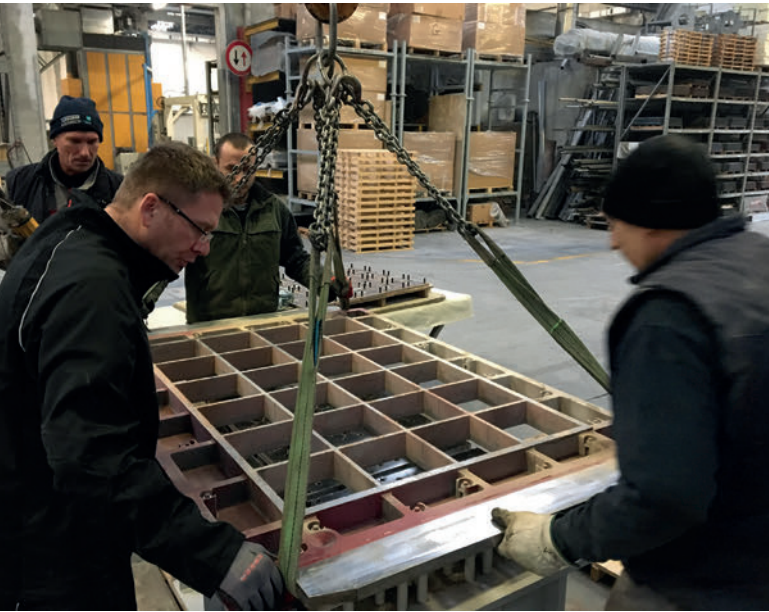
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Tamper shoe change on site at the customer's premises

concrete block making machine become visible that would otherwise remain hidden from the human eye. These findings prove that a reduced vibration with an adapted frequency and amplitude often achieves better stone qualities. This is made particularly impressive by DynamicView™, in which special probes measure the vibration force and acceleration on the vibrating table and mould. Graphic evaluations show the frequency, amplitude, acceleration and synchronisation of the vibration during mould filling and also during the main compaction - almost like an X-ray image of the production process, which is both fascinating and helpful.

In addition to the technical service, design is also an essential part of the service portfolio. The Kobra stone design team, which can look back on over 60 years of combined experience in the development and realisation of innovative paving stone designs, provides customers with advice and support. Whether implementing new ideas, optimising existing designs or solving complex challenges - only those who know their customers and their products inside out can optimally design the tool. In block design, the demoulding behaviour, the packability and stackability of the paving stones, as well as the sequence of the stone clamp in the gripper on the dry side, are also important.

The sales team also takes a global view of the use of moulds - from the installation drawing of the entire production facility (from the wet side to the dry side) to the loading of the paving stones. Long-term customer relationships are based on the fact that the tool not only fits, but also works reliably. And if something does not meet the requirements, the dedicated Kobra service team is available on site - worldwide.



Polishing the stone fields in the 1990s

In addition to the innovative service and maintenance concepts, the company also offers a classic repair service. Worn stone fields are rebuilt with high-quality, wear-resistant welding material and precision ground flat, while used tamper shoes are completely replaced with new ones. All components are thoroughly checked in the repair department: They are blasted, checked for possible damage over the course of their service life and, if necessary, professionally repaired - minor cracks are welded, spacers on the load system are replaced and, if necessary, running rails are also exchanged. A new, protective coating rounds off the repair so that the moulds are returned to the customer in perfect condition.

This comprehensive repair approach significantly extends the service life and reduces the costs per cycle or per square metre. The principle that price does not equal cost is clearly evident: The actual costs of a mould are manifested in its service life, reliability and ease of maintenance - ultimately in the high-quality output for the customer. Although favourable offers can seem tempting, they often mean that you have to invest twice.



Dispatch warehouse with new moulds



Incoming warehouse of the repair department

**Transfer of knowledge:
technology symposia and workshops**

Innovation thrives on exchange - and Kobra Formen GmbH has relied on direct dialogue with customers and partners for decades. In addition to its international presence at trade fairs such as bauma in Munich and CPI's ICCX events, the company regularly organises technology symposia with accompanying workshops. These events not only offer fascinating insights into the latest developments in production, but also facilitate an intensive transfer of experience and knowledge between concrete paving stone manufacturers from all over the world.

Developed during the pandemic, when it was important to maintain contact despite the lack of a trade fair presence, this concept has continued to evolve dynamically. The Technol-



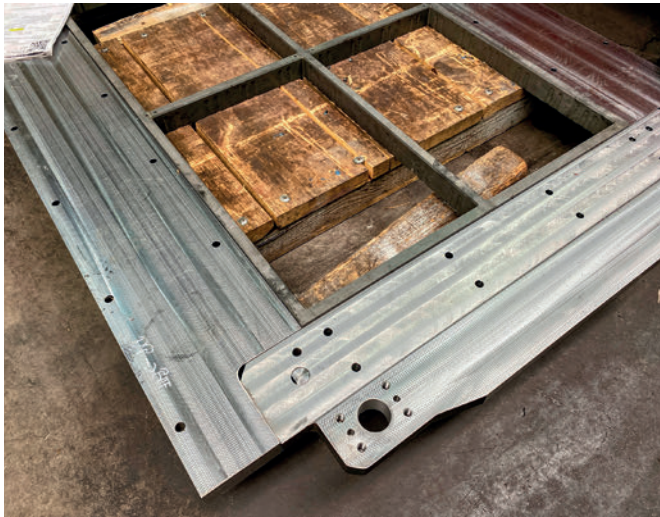
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Contemporary mould construction - Kobra Boltline™

ogy Symposium was last held at the main site in Lengenfeld in September 2023 - with over 200 participants, who also inaugurated the newly built Kobra Campus. In addition to presentations on mould construction, customers also presented their projects, while other companies in the industry showcased their products and services. Numerous registrations for the next symposium were already made during the event.

Particularly noteworthy here is the first Kobra Technology Symposium in Hudson, Wisconsin, which took place in October 2024. More than 60 participants attended the event at the North American site, where around 45 employees produce Kobra moulds specifically for the US and Canadian markets. Although the concept, little known in this region, was initially met with hesitation, the feedback was all the more overwhelmingly positive. Numerous registrations for future events emphasise the importance of this format and prove

how valuable the exchange of technical know-how and practical experience is in the concrete paving stone industry.

Digitalisation and modularity

While predictive maintenance systems and AI-controlled moulds are still dreams of the future, Kobra Formen GmbH has already taken a decisive step towards digitalisation and modularity. With the development of the paving stone mould system, the company is focusing on flexible and 1:1 reproducible solutions. The bolted frame construction method was optimised at the end of 2018 with the Boltline™ system frame to such an extent that it is now even possible to swap mould frames between different concrete block making machines and production sites in an emergency - an advantage that is particularly valuable for large groups of companies with several locations. This system also proves its advantages time and again at individual sites with several machines. Variable frame heights allow the same mould frame to be used for the production of solid bricks or hollow blocks without the need to purchase completely new moulds. This special construction method not only reduces the use of steel, but also ensures uniform product quality - this can provide a competitive advantage in the globalised concrete paving stone industry. Kobra always focuses on offering solutions that maximise the practical benefits for users.

Sustainability and the future

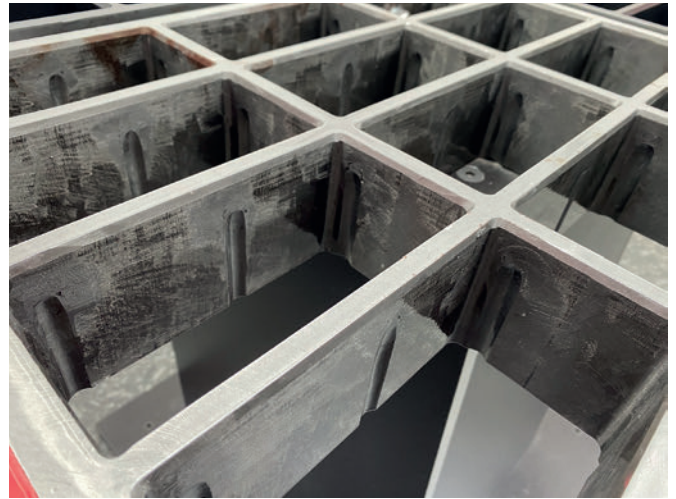
At Kobra Formen GmbH, sustainability is far more than just a buzzword - it forms an integral part of the company's philosophy. Thanks to the modular design of the mould parts, for example by separating the load box and part tampers, the moulds can be used much more efficiently. This separation makes it possible to combine numerous part tampers with just a few load boxes, which reduces the amount of material used, lowers the transport volume and thus saves not only costs but also CO₂ emissions.



The Kobra repair and service team



Kobra service for changing wearing parts on site



Classically polished stone fields

In addition, the load boxes can be used as adapters so that moulds can be used on different machines in one or more concrete block plants - with minimal effort. The Boltline™ design, which has been established for almost 25 years, also emphasises the early direction of technological development: The first kerb moulds with bolted frames and replaceable wear parts were initially received with great scepticism by the market, but their success quickly dispelled any doubts -

the 10,000th Boltline mould was delivered within a few years. To this day, replaceable wear parts in a frame that can be dismantled are a unique selling point that no other mould maker has implemented to the same extent.

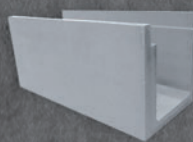
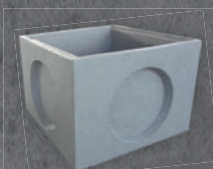
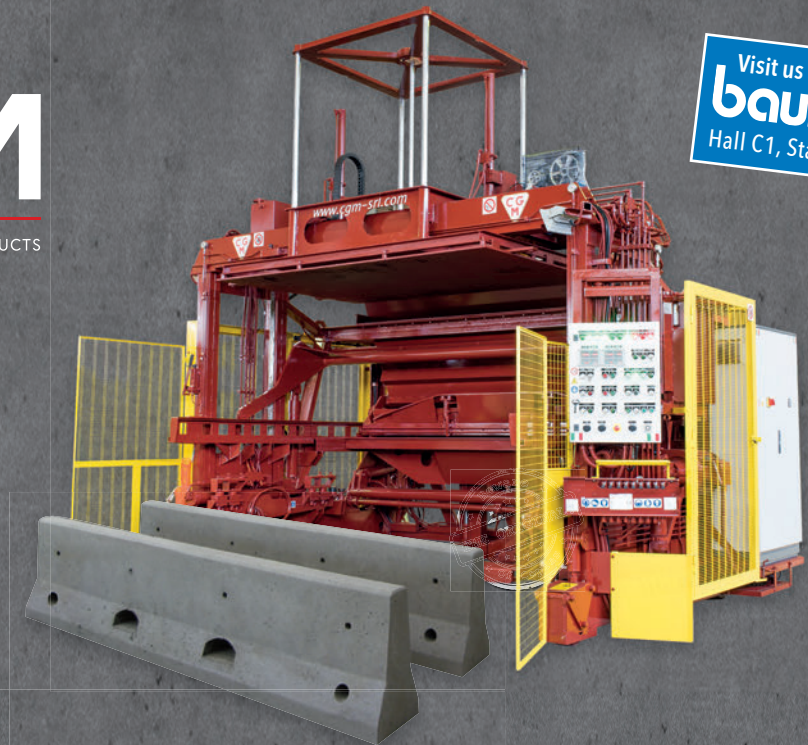
Another key issue is the energy supply. 500 kWp of photovoltaics are already in use on the production roofs at the Lengelfeld site - this capacity will be expanded to 1.3 MWp by mid-



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Change of use for the Kobra system frame



The Kobra sales team

2025, covering around 20% of the company's own electricity requirements. The next milestone in terms of sustainability lies in a pioneering project that goes far beyond conventional manufacturing approaches. Kobra Formen GmbH has long invested heavily in the development of material-saving production processes and new concepts that are designed as a circular economy in the production process. Some approaches had to be reinvented for mould construction - such as the development of 100% recyclable monomaterials, energy-reduced production processes and waste-free technologies. This long-term development process aims to drastically reduce the use of materials and significantly cut both CO₂ emissions and resource consumption. The resulting added value for customers and for the company heralds the next revolution in mould construction. Initial impetus and exciting insights into these pioneering approaches will be presented at bauma 2025 in Munich.

Conclusions

The last three decades in mould construction have impressively demonstrated that progress is not a product of chance, but the result of vision, innovation and continuous development. As a market leader, Kobra Formen GmbH has redefined the industry time and again - from manual production and precise CNC processes to sustainable, modular systems and pioneering technologies with a circular economy - always with the customer's needs in mind. With a clear commitment to innovation and sustainability, the company is looking to a future in which technical progress and environmental awareness go hand in hand. bauma 2025 will once again be a showcase for these developments - because the best thing about progress is that it never ends. ■



Natural paving in Erfurt's historic city centre



Different concrete block pavement in the city centre



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