

Kraft Curing Systems GmbH, 49699 Lindern, Germany

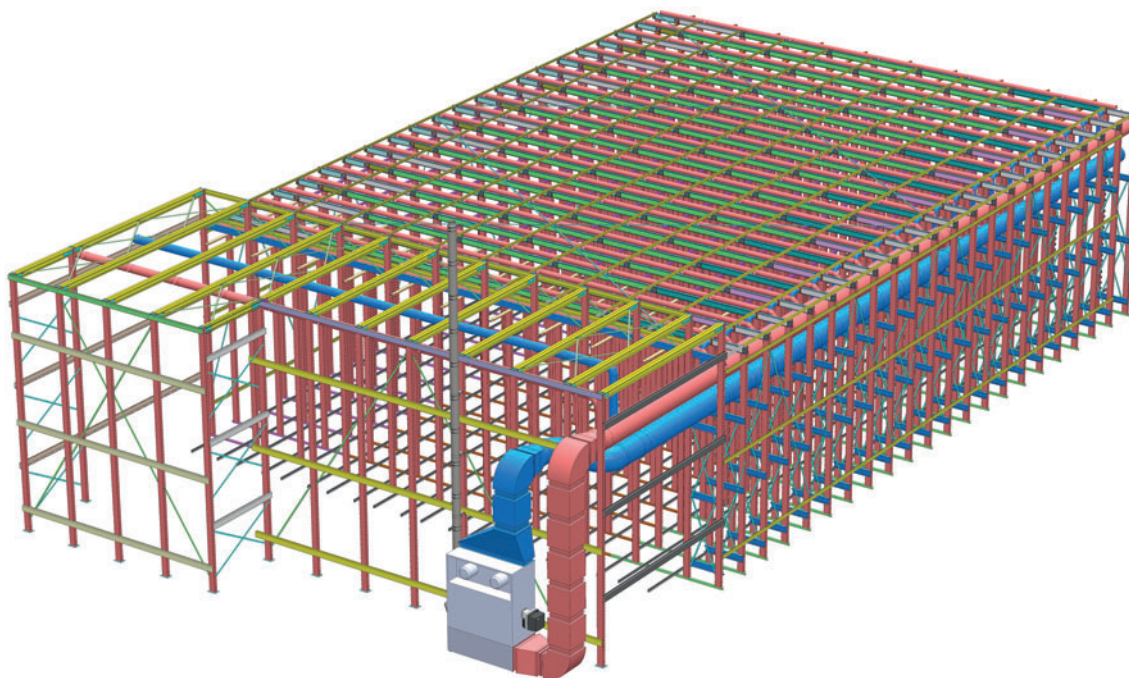
“Made in Germany” curing rack with computer-optimised design and integrated curing climate control

■ Stefan Rick, Kraft Curing Systems GmbH, Germany

“Concrete should be cured, not dried.” Kraft, located in Lindern in Lower Saxony, have consistently followed this principle for over 25 years and committed their complete product and service portfolio to the goal of higher quality concrete products. During this time, Kraft Curing Systems have gained a worldwide reputation for stressing high value equipment and increased concrete quality. Factors such as high early strength, dense surfaces, in-line secondary processing, strong and uniform colours and a reduction in cement and admixture costs, all speak for Kraft. Depending on the concrete product, from precast and pipe to concrete hardscape products, the company offers curing systems specifically designed for the concrete product and the production parameters to attain the above listed benefits during the curing process. Indeed, “concrete dries out later of its own accord but can only be cured in the right climate,” emphasises managing director Michael Kraft.

Racks are a company's foundation

A rack system is basic equipment for each and every manufacturer of concrete blocks, paving blocks, slabs and moulded concrete products. Fresh concrete products are stored in such a system, after production, to harden. Over the past 25 years, Kraft has combined racks from various suppliers with its own curing systems. The limitations of available rack systems were clearly visible during almost every project. Their designs were beset with issues and were often unable to fulfil the high-quality demands of Kraft and their customers. Issues include insufficient corrosion protection, weak support connections, inability to easily and quickly level the rack and transport rails – also to on another, an inadequate transport rail support structure which allows rails to become loose and doesn't allow for easy replacement when rails are worn and so on and so forth.



Rack design with fully integrated Quadrix curing system. The insulated chamber provides storage for concrete products on 6,000 production boards and more to harden.

THE RACK THAT BREATHES

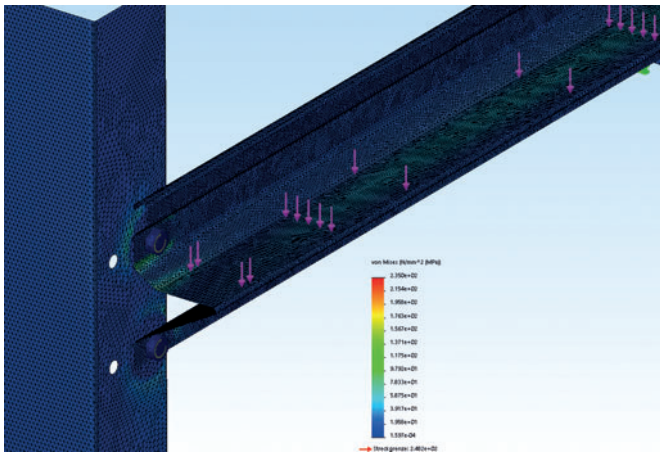
KRAFT reinvents the RACK.

- Air circulation system fully integrated into steel rack structure
- FEM computer optimized design for extreme stability and strength
- Shelf profile design prevents "pancaking"
- Shelf profile design incorporates production board guide
- 50-Year corrosion warranty when incorporating the Quadrix® curing system

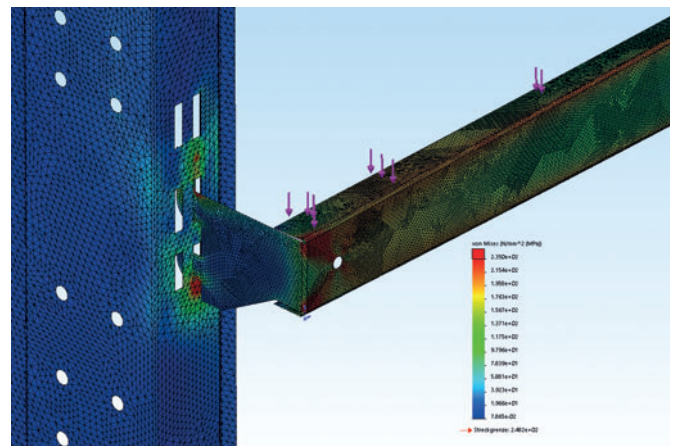
Learn more at: www.kraftracks.com

KRAFT CURING





Shelves in the newly developed Kraft design. Its appreciably greater loading capacity is clearly shown up in the FEM analysis. The shelf's profile and height generate the high load capacity. The integrated guide rails over each passage's entire length make it impossible for the production boards to shift out of line - something that can otherwise cause irreparable damage to the rack columns.



The FEM calculation indicates the weak points in a traditional rack shelf. Using the identical load as previous, this unit is substantially weaker and more prone to deformation and failure.

Design not upgraded for years and years

"There have been innovations and improvements in all areas of concrete production. Yet, racks are still today what they were 50 years ago - just pure storage on which concrete products dry out. And drying out is simply no longer up-to-date," says Michael Kraft, who also founded the firm.

The difference between drying and curing comes back to utilising a controlled concrete curing system. "It is only in controlled curing conditions that the hydration process - combining hydrophilic components of cement with water to develop a concrete-forming adhesive - can take place completely. At this point, the weaknesses of existing rack designs show up," says Michael Kraft. "A conventional rack is obviously not the same as a curing system. A conventional rack is just that - a rack. Air circulation ducts, humidification, dehumidification and other heating and ventilation components must be added, compromising what could be the best solution."

Storage rack and curing system = Curing Rack

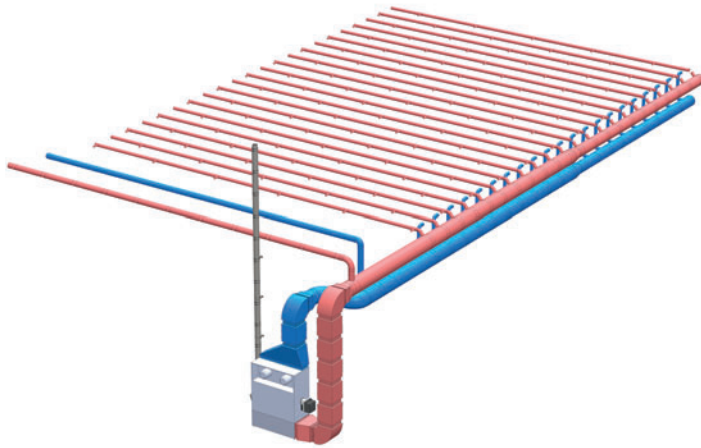
It is hardly surprising, then, that innovation regarding this main piece of equipment has come via the specialist in concrete curing from Lindern, Germany. "No concrete manufacturer with an eye for quality still uses a rack without some kind of climate-conditioning system for curing concrete. The next logical step for us was to combine these two components," explains Michael Kraft.

Computer-optimised design - FEM

Kraft employed the benefits of cutting-edge technology in order to improve the load-bearing structure itself. The rack components were designed and developed by Kraft using the finite-element-method (FEM). All loads, to which a structure may be subjected, were calculated by means of com-

puter simulation in Kraft's mechanical engineering department. Each calculation took several hours and, some, days for calculating each component. The entire process lasted several months. From these computations, the programme developed an optimised design, which is adapted to all design requirements as well as being extremely load-carrying, robust and durable. The steel rack columns C-section with a wall thickness between 3 and 5 mm are galvanized post fabrication for the highest corrosion protection. The steel shelves, with a wall thickness equal to 1.75 mm, incorporate guide-rails which prevent production boards from getting jammed between rack columns, are supplied in long lengths for quicker rack assembly and offer greater strength than any steel shelf available. Not only have Kraft redesigned the columns and shelves, but also the manner in which these two components are connected. Borrowing fastening technology from industrial racking systems used by bricks-'n-mortar and on-line distribution warehouses, Kraft utilizes high-strength self-forming fasteners according to DIN 7500. Self-forming fasteners differ from the self-cutting version by actually forming an opening from the galvanization material in the column around the fastener's threads - without material loss, while a self-cutting fastener cuts through a material resulting in material loss and a sub-optimal connection. The special means of fastening the steel shelves also makes it impossible for "pancaking" to occur - a double failure when production boards get hooked up and fall down. A maximum load/failure test conducted at Kraft Curing's facilities showed no deflection of the shelf and no fastener failure with a load of 2 tons of concrete product per production board.

Finally, prior to erecting the rack, it is levelled via a steel base, developed by Kraft, with levelling bolts installed on the customer supplied concrete slab. The steel base is designed as a grid, fastened together and, due to its stability, levelled as one complete level base. The steel base incorporates pre-assembled column insertion elements ("shoes") and transport



Installing the Quadrix curing system is made easier and less expensive thanks to less distribution duct and fewer different cross sections

rail fitting points. Once the base is levelled, the columns and rails are automatically level and level to one another - reducing the time for levelling each column individually and preventing misaligned or unlevel rack components. The complete design and development of the rack and its components was accompanied by a prominent structural engineering institute. The rack design and its implementation is certified and approved by this registered engineering organization.

No corrosion

An improved structure is not the only advantage. The rack is designed in such a way that the air distribution system for the curing chamber is incorporated in the load-bearing structure. This means that Kraft's Quadrix® Accelerated Concrete Curing Systems and Nautilus™ Air Circulation Systems are connected directly to the rack structure without the need for air supply or return ducts. The supports and cross-pieces distribute air, humidity and heat in a consistent manner throughout the curing chamber, making for a precise, uniform distribution of the targeted curing parameters (heat, humidity and low air velocity), independent of the chamber's size. "This artful manoeuvre means that the entire load-bearing structure remains dry on a permanent basis despite optimum moisture for the curing process. The structure is protected from corrosion and will not have to be replaced even in the long term. All of our rack structures incorporating the Quadrix system include a 50-year warranty against corrosion." says Michael Kraft.

Patented Design

For the curing of hardscape concrete products, Kraft is now a full-range supplier by adopting its own-design rack systems into its product portfolio. "We are certain that this rack system points the way to the future in controlled concrete curing. And it is for this reason that we have registered our design for a patent," adds Michael Kraft. "There is definitely a demand for rack systems 'Made in Germany.' The specifications are very high in terms of precision, durability, flexibility and functionality. And the rack still has to be affordable. Kraft is the only supplier to meet this demand and include the 50-year warranty!"

FURTHER INFORMATION



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**HOW FLEXIBLE
CONCRETE
CAN BE**



- Semi- or fully automatic manufacturing systems for both dry cast and wet cast concrete products
- Dry cast & wet cast moulds for the precast industry