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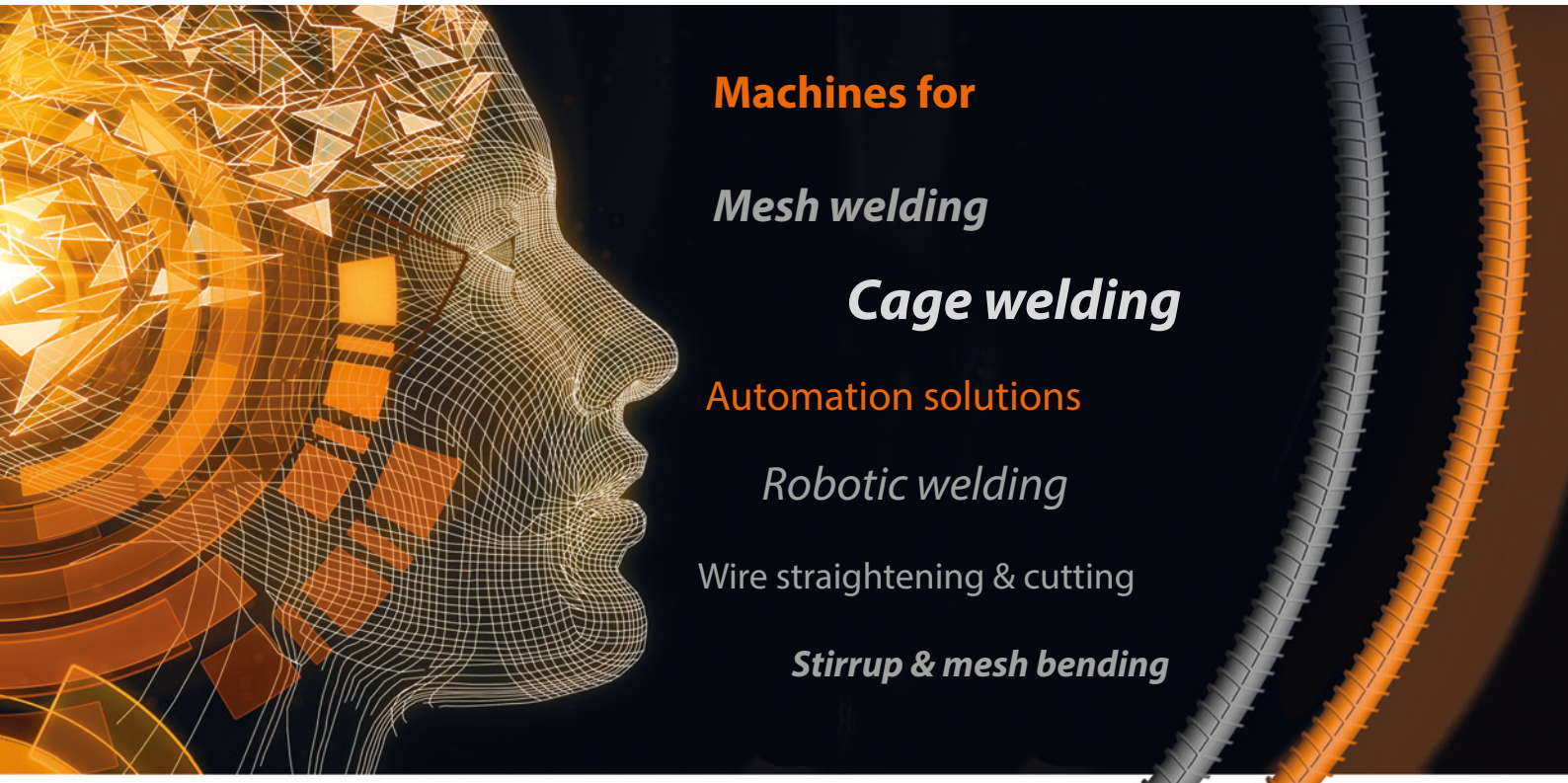

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Dr.-Ing. Holger Karutz

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Precast concrete elements – innovation and sustainability in the UAE and Saudi Arabia

The precast concrete industry in the Middle East is experiencing a significant resurgence, with the United Arab Emirates (UAE) and Saudi Arabia taking centre stage. These two markets are driving demand for innovative and sustainable solutions with ambitious visions for infrastructure and urban development - a scenario that is ushering in a new era for precast concrete parts in the region.

In the UAE, projects such as Expo City Dubai, the expansion of harbour facilities and residential construction initiatives in particular have led to high demand for precast elements. The focus on sustainable construction makes precast concrete elements an indispensable component of the construction industry. The advantages are obvious: shorter construction times, precise quality and a reduced ecological footprint.

Saudi Arabia is also setting standards with Vision 2030 being realised, setting new standards for urbanisation and technology. These projects require a degree of modularity and precision that only precast concrete elements can offer.

CPI Concrete Plant International provides companies in the precast concrete industry with regular information on technologies and suppliers of software and plant engineering needed; it is therefore essential to utilise this source of information!

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عناصر الخرسانة الجاهزة – الابتكار والاستدامة في الإمارات العربية المتحدة والمملكة العربية السعودية

تشهد صناعة الخرسانة الجاهزة في الشرق الأوسط انتعاشًا كبيرًا، حيث تحتل الإمارات العربية المتحدة والمملكة العربية السعودية مركز الصدارة. وتدفع هاتان السوقان الطلب على الحلول المبتكرة والمستدامة مع الرؤى الطموحة للبنية التحتية والتنمية الحضرية - وهو السيناريو الذي يبشر بعصر جديد لأجزاء الخرسانة الجاهزة في المنطقة.

في الإمارات العربية المتحدة، أدت مشروعات مثل "مدينة إكسبو دبي"، وتوسيع مرافق الموانئ ومبادرات البناء السكني على وجه الخصوص إلى ارتفاع الطلب على العناصر الجاهزة. كما أن التركيز على البناء المُستدام يجعل العناصر الخرسانية الجاهزة مكوّنًا لا غنى عنه في صناعة البناء. تعتبر المزايا المترتبة على ذلك واضحة: تقليل الأوقات المُستغرقة في البناء، والجودة الدقيقة وتقليل الأثر البيئي.

كما تعمل المملكة العربية السعودية على وضع معايير جديدة مع تحقيق رؤية 2030، والتي تضع معايير جديدة للتحضّر والتكنولوجيا. تتطلب هذه المشروعات درجة من النمطية والدقة التي لا يمكن أن توفرها إلا العناصر الخرسانية الجاهزة.

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7

CONTENTS

SECTIONS

20

28

NEWS

CONCRETE TECHNOLOGY

CONCRETE PRODUCTS / CAST STONE

CONCRETE PIPES AND MANHOLES

PRECAST CONCRETE ELEMENTS

44

56

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Place of publication: Cologne, Germany
ISSN: 1862-3662
Managing Directors:
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Printed in Germany
©1998 by ad-media GmbH

Printed product CO_2 compensated
klima-druck.de
ID-No. 24162018

PEFC
PEFC/04-31-1020

Further publication:

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Difer Impianti becomes part of the mbk group

شركة Difer Impianti تنضم لمجموعة mbk

The mbk group is growing and integrating the Italian pile cage welding machine manufacturer Difer Impianti. Founded in 2007 by Leo Ferrari, the company specializes in the development and manufacture of its own piling machines. The machines on offer cover the entire range of sizes up to 3 m in diameter, including an extensive portfolio of accessories.

إن مجموعة mbk آخذة في النمو وتدمج شركة Difer Impianti الإيطالية المصنّعة لآلات لحام صناديق الركائز. تأسست الشركة في عام 2007 على يد السيد ليو فيراري، وهي متخصصة في تطوير آلات الركائز الخاصة بها وتصنيعها. وتغطي الآلات المعروضة مجموعة كاملة من الأحجام التي يصل قطرها إلى 3 أمتار، بما في ذلك مجموعة واسعة من الملحقات.

Difer Impianti and mbk are united by a very similar corporate philosophy of offering customers a high-quality, reliable and durable product. Combined with strong customer orientation and focus on after-sales service.

"After decades of dedication to the design and marketing of piling machines that have improved the production of foundation piles around the world, the time has come for me to retire. It is with great pleasure that I have sold my company Difer Impianti to Mario Pfender of mbk, safe in the knowledge that he will be able to continue it with great success," says Leo Ferrari.

Mario Pfender, Managing Partner at mbk comments: "I am looking forward to the new challenge and the opportunities we have together. The Difer gas shielded arc welding machines complement mbk's resistance welding machines perfectly. Together we are able to cover almost all requirements in the field of cage welding machines for bored pile cages. With the gas-shielded arc welding machines, the resistance welding machines and the patented Dual Weld Option (which combines both technologies in one machine), we offer a range that no other supplier can match."
Both companies benefit from their respective experience in this segment and want to utilize synergies in the future, not only in the areas of sales and service. ■

Mario Pfender (l) and Leo Ferrari

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Next step in a strategic alliance

Robotics Added to Besser Company's Core Capabilities

تعزيز القدرات الأساسية لشركة Besser بالاستعانة بالروبوتات

Besser Company CEO and President, Ryan Suszek, and Slab Innovation President, Benoit Slavinski, are pleased to announce Besser Company's acquisition of Slab Innovation. The acquisition of Slab's assets, completed on 6 September, formalizes the next step in a strategic alliance forged between the companies in 2017. Since that time, Besser and Slab have successfully completed many joint product handling projects throughout North America.

يسُر المدير التنفيذي لشركة Besser ورئيسها، السيد ريان سوزيك، ورئيس شركة Slab Innovation، السيد بينوا سلافينسكي، الإعلان عن استحواذ شركة Slab Innovation بيسر على شركة Slab. يشكّل الاستحواذ على أصول شركة Slab، الذي اكتمل في 6 سبتمبر، الخطوة التالية في التحالف الاستراتيجي الذي تم تشكيله بين الشركتين في عام 2017. ومنذ ذلك التاريخ، فقد نجحت شركة Besser وشركة Slab في إكمال العديد من مشروعات مناولة المنتجات المشتركة في جميع أنحاء أمريكا الشمالية.

"It's exciting and fitting that in the same year we're celebrating our 120th anniversary of serving the global concrete products industry, we're expanding our commitment to innovation by welcoming Slab Innovation into the Besser family," commented Suszek. He continued, "The addition of Slab provides our customers access to robotic solutions that are proven to increase plant efficiency, improve worker safety, and expand product lines."

Slavinski shared, "Officially joining the Besser team is an honor and a tremendous accomplishment for us. We're bringing our 20+ years of experience and our passion for crafting custom robotic solutions for the concrete industry. The opportunities ahead are unlimited in all segments of the industry, including those beyond Besser's current scope." Slavinski will join the Besser Team as Vice President of Robotics, leading Besser Company to the next level of innovation in robotic solutions.

The Slab Team expands Besser capabilities with a workforce highly skilled in mechanical and electrical engineering, equipment fabrication, and customization of controls and programming for robotics. Besser will also add two brick-and-mortar facilities in Saint-Hubert, Quebec, Canada to its existing footprint across North America. These facilities will focus on identifying, building, and integrating flexible and robust robotic applications to meet each producer's specific needs.

About Besser Company

Besser is headquartered in Alpena, Michigan and has equipment operating in more than 120 countries worldwide. The company supplies complete manufacturing systems for the masonry, hardscape, pipe, precast and ready-mix segments of the industry. In addition, Besser manufactures curing systems for all segments of the concrete industry. The company manufactures parts, provides service, and offers specialized training for industry members. Visit besser.com for more information.

About Slab Innovation

Slab Innovation is an expert in automation for the concrete products industry. The company works with producers to design, build, and integrate flexible and robust automated solutions. The company is headquartered in Saint-Hubert, Quebec, Canada. ■

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Text (max. 500 words) as .PDF
Paper Application form
Author's Biography

30 JUNE, 2025
NOTIFICATION OF ACCEPTANCE

01 AUGUST, 2025
REGISTRATION
ACCOMMODATION DETAILS
FINAL PROGRAMME

31 DECEMBER, 2025
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Low-carbon concrete solutions for Saudi Arabian market

Saudi Readymix and Betolar co-operate

التعاون بين شركتي السعودية للخرسانة الجاهزة وBetolar

Betolar and Saudi Readymix (SRMCC), a leading producer and supplier of ready-mixed concrete products in Saudi Arabia, have partnered to achieve a significant milestone in sustainable concrete technology. The joint project has successfully developed breakthrough low-carbon concrete recipes, tailored to meet the growing demand for sustainable solutions in Saudi Arabia. This collaboration reinforces both companies' alignment with Saudi Arabia's Vision 2030 and the Saudi Green Initiative, demonstrating their commitment to transforming the construction landscape with environmentally responsible practices.

أبرمت شركة Betolar وشركة السعودية للخرسانة الجاهزة (SRMCC)، وهي شركة رائدة في إنتاج منتجات الخرسانة الجاهزة وتوريدها في المملكة العربية السعودية، شراكة لتحقيق إنجاز مهم في تكنولوجيا الخرسانة المستدامة. وقد نجح المشروع المشترك في تطوير وصفات تصنيع خرسانة منخفضة الكربون متقدّمة، مصممة خصيصًا لتلبية الطلب المتزايد على الحلول المستدامة في المملكة العربية السعودية. يعزّز هذا التعاون من توافق الشركتين مع رؤية المملكة العربية السعودية 2030 ومبادرة السعودية الخضراء، ما يدل على التزامهما بتحويل مشهد البناء من خلال الممارسات المسؤولة بيئيًا.

The project led to the development of two advanced low-carbon concrete formulations:

- A fully cement-free mix, offering a significant reduction in carbon emissions and contributing to greener construction practices.
- A mix with an ultra-low cement dosage of 2.5%, driving further sustainability in concrete production.

These innovative solutions were achieved by incorporating alternative binder materials such as ground-granulated blast furnace slag (GGBFS) and natural pozzolans. Betolar's proprietary Geoprime technology played a pivotal role in activating these binders, allowing the new concrete formulations to meet key performance metrics. Extensive slump and compressive strength tests confirmed the practicality and scalability of these solutions for the Saudi Arabian market.

Ahmad Alzaza, Senior Researcher at Betolar, expressed enthusiasm about the collaboration: "This project pushed the boundaries of innovation by bringing low-carbon technology into the ready-mix concrete space. We are proud to have contributed to a solution that will help advance sustainable construction across Saudi Arabia."

Chris Leptokaridis, Technology & Strategy Director at Saudi Readymix, highlighted the project's importance to local market dynamics: "Saudi Readymix has been at the forefront of developing new technologies to meet our customers' increasing demand for eco-friendly, low-CO_2 solutions. Our partnership with Betolar has enabled us to successfully deliver on this goal, offering groundbreaking concrete recipes that significantly reduce carbon emissions."

The low-carbon concrete solutions developed by Betolar and Saudi Readymix are not only addressing the immediate needs of the construction industry but are also contributing to the Saudi Arabias' broader efforts to achieve net-zero carbon emissions by 2060. ■

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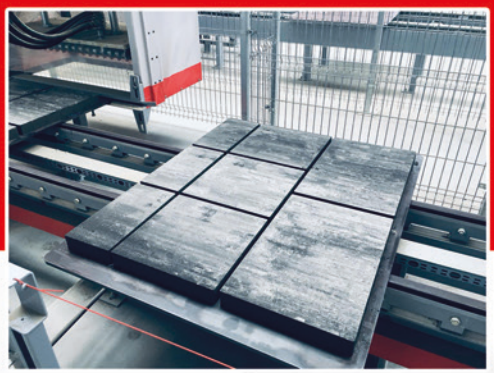

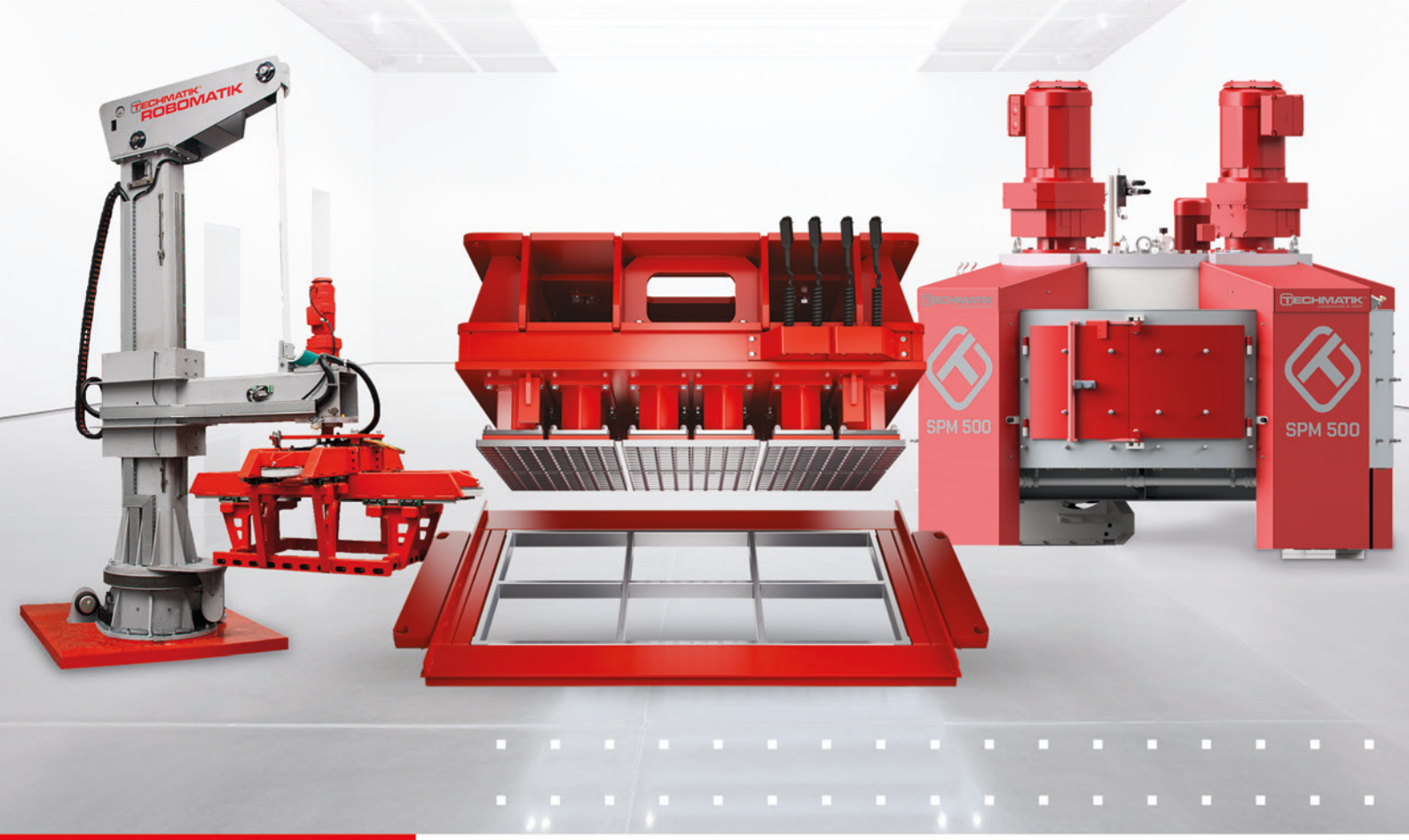

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Investigating the use of treated domestic wastewater in concrete production

بحث استخدام مياه الصرف الصحي المنزلية المعالجة في إنتاج الخرسانة

Hans Beushausen, Joanitta Ndawula and Zaid Manuel, Department of Civil Engineering, University of Cape Town, South Africa

Freshwater scarcity is projected to become a major global issue, with the construction industry currently responsible for approximately 30% of worldwide freshwater consumption throughout the life cycle of civil infrastructure. As a result, water management and its potential to alleviate water scarcity while enhancing the sustainability of concrete require greater attention in scientific research and practical application. Existing studies indicate that non-potable water, such as treated domestic wastewater, could be viable for producing structurally sound concrete in the construction sector.

من المتوقع أن تشكّل ندرة المياه العذبة مشكلة عالمية كبرى، حيث تستهلك صناعة التشييد والبناء حاليًا ما يقرب من 30% من المياه العذبة في جميع أنحاء العالم على مدار دورة حياة البنية التحتية المدنية. ونتيجة لذلك، فإن قضية إدارة المياه وإمكانية التخفيف من ندرتها مع تعزيز استدامة الخرسانة تتطلب اهتمامًا أكبر في قطاعي البحث العلمي والتطبيق العملي. تشير الدراسات القائمة إلى أن المياه غير الصالحة للشرب، مثل مياه الصرف الصحي المنزلية المعالجة، يمكن استخدامها في إنتاج الخرسانة السليمة هيكليًا في قطاع التشييد والبناء.

The presented research was conducted as a pilot project to evaluate the feasibility of using treated domestic water for creating high-quality, durable concrete in South Africa. The study included chemical analyses of TDW samples, assessments of concrete setting time, slump retention, and compressive strength tests at 7 and 28 days, as well durability testing.

The global water demand is ever-increasing to such an extent that water scarcity will be one of the biggest problems facing the world in the coming years. Both in South Africa and abroad, water is rapidly becoming a scarce resource. The World Economic Forum ranked both the water crisis and social instability as the third highest threats to conducting business in South Africa in 2021 [1]. The Western Cape in South Africa experienced severe water scarcity from mid-2017 to mid-2018, which also forced the local concrete industry to look for alternative solutions for water supply, and more recently in the hydrological year from 2021 to 2022, below-average rainfall resulted in 19% lower dam levels than the previous year [2]. Currently, local dam levels in and around Cape Town are back to full capacity and water supply is secured, also in the construction industry, but it is just a question of time until the concrete producing industry will face its next water crisis.

An often overlooked factor that may contribute to the alleviation of water scarcity and increase the sustainability of concrete is water management. The United Nations Environmental Program has indicated that over the entire life cycle, the construction industry accounts for as much as 30% of global freshwater use [3]. Water is used throughout the concrete production process, from the generation of power to washing the aggregates, mixing and transportation of fresh concrete and concrete curing. With proper planning and management, the strain on freshwater resources could be reduced globally by using alternative water sources for many of these activities in the concrete construction industry.

The use of wastewater in concrete production

Research suggests that non-potable water such as treated domestic wastewater (TDW) could be used to produce concrete of suitable quality for the construction industry, thereby reducing the industry's demand for potable water resources [4]. TDW is domestic wastewater that has been treated to a level that it can safely be discharged into water bodies. TDW is typically 99.9% pure water with the remaining 0.1% being made up of suspended and dissolved solids, and microorganisms [5]. TDW has the potential to substitute the water requirements of the concrete industry, provided it fulfils the requirements for concrete production.

Common substances found in non-potable water which can at certain concentrations be deleterious for concrete include chlorides (may affect the setting time of fresh concrete and promote reinforcement corrosion in hardened concrete), sugar (can result in set retardation), sulphates and acids (chemical attack), and organic matter (may influence cement hydration or cause air entrainment) [6].

While various secondary water resources can be considered for concrete production, each alternative source needs to be investigated with regard to the requirements set in national standards. In South Africa, SANS 51008 [7] (equivalent to ASTM C1602 [8] and BS EN 1008 [9]) stipulates acceptable levels of harmful substances in concrete mixing water, including chlorides, sulphates, alkalis, sugar, phosphates, ni-

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trates, lead and zinc. According to [7], water recovered from processes in the concrete industry, water from underground resources, natural surface waters, and industrial wastewater can all be considered for use in concrete manufacture, if successfully tested against the limiting values for the harmful substances mentioned above. In cases where the limits set in [7] are not met, the standard stipulates that the water can still be used to produce concrete if certain values of setting time and compressive strength are met.

The research, parts of which were presented in [10], was conducted as a pilot project to assess the feasibility of utilizing treated domestic water to produce structurally sound and durable concrete in South Africa. The study was intended to inform local long-term water management strategies and in turn secure water supply for the concrete industry in times of water scarcity. The primary aim of the experimental investigation was to determine if TDW could be used for concrete manufacture according to SANS 51008 [7]. This included chemical analysis of the TDW samples, evaluation of the setting time, slump retention and compressive strength and oxygen permeability index assessment.

Methodology

Four samples of treated domestic wastewater were collected from WWTPs around Cape Town at the effluent stage, labelled A, B, C and D and representing different treatment techniques. Sampling was done in two intervals – initial and secondary sampling – to investigate the consistency in water quality and concrete properties obtained. Details on the waste water treatment processes used in Cape Town and the corresponding water resources used in this research are discussed in [10]. The results of the chemical investigation were compared to the requirements of [7] to check the suitability of the TDW for concrete manufacture.

The effect of TDW on concrete fresh and hardened properties was investigated for two different w/c ratios, namely 0.40 and 0.60. The mix designs are summarized in Table 1.
Testing of fresh properties included setting time using a Vicat Apparatus according to [11] and slump testing according to [12]. For compressive strength testing and Oxygen Permeability Index (OPI) tests, 100-mm cubes using TDW were cast within 2 days of water collection and cured. Concrete cubes cast using potable water were used as controls for all the results obtained from various tests. The cube specimens were taken out of their moulds 24 hours after casting, placed under plastic sheets for an additional 72 hours and then stored in an environmental room at 50% relative humidity and a temperature of 23°C until testing. The curing regime was intended to mimic practical curing procedures and adverse site conditions. Compressive strength was tested at 7 and 28 days following [13]. The OPI tests were conducted after 28 days of curing, following the procedures stipulated in SANS 3001-CO3:2015.

Results and discussion

TDW chemistry

Table 2 summarizes the results of the initial wastewater chemical analyses and compares these to results from the literature and the requirements given in [7]. As seen in Table 2, the TDW samples passed SANS 51008 [7] requirements. Consequently, the TDW used in this research was expected to produce concrete with acceptable fresh and hardened properties.
On retesting (secondary water samples), it was observed that some samples of TDW C had an extremely high Chemical Oxygen Demand (COD) value. COD generally indicates the organic content in the water that may lead to retardation in concrete setting time and thus impacts early age strength. Consequently, a high COD value can severely affect concrete properties. SANS 51008 [7] does not provide any limiting values for COD, nor does any other standard and therefore, it is unknown when COD begins to negatively affect concrete quality.

Setting times

To comply with SANS 51008 [7], initial and final setting times of cement paste samples made with TDW must exceed 60 minutes and may not exceed 12 hours, respectively, and may not differ by more than 25% when compared to paste samples made with potable water. The results of the initial setting time tests using the different TDWs are presented in Figure 1.

Having recorded an initial setting time of 120 minutes for the control samples, it was required that the samples made using TDW have an initial setting time between 90 and 150 minutes. The samples that failed to meet these criteria were

Table 1: Concrete mix compositions.

w/c	CEM II A-M 42.5N (kg/m³)	Dune sand (kg/m³)	Crusher dust (kg/m³)	19 mm Greywacke (kg/m³)	Water (l/m³)	Superplasticizer (l/m³)
0.4	425	740	0	1050	170	0.667
0.6	283	441	441	1050	170	0

Table 2: Chemical analysis results of the initial samples of TDW and tolerable limits [7].

	TDW				Average from literature	Tolerable Limits [7]
	A	B	C	D		
pH	7.2	6.9	7.1	6.5	7.7	>4
Sodium (Na)	232	179	140	111	29	
Chlorine (Cl)	320	250	149	139	149	1000
Sulphate (SO_4)	108	95	114	97	104	2000
Phosphorus (P)	6.7	0.3	0.3	0.4		
Ammonium (NH_4)	37.4	20.7	33,9	<0.3	36.0	
Nitrate (NO_3)	<0.4	6.9	5.7	23.9	6.0	500
Chemical Oxygen Demand (COD)	210	52	100	45	61	
Phosphates (PO_4)	5.6	0.1	0.1	0.3		100
Total solids (TS)	944	602	671	605	516	2000
E. Coli	>2420	159	>2420	16		<10

[All impurities are measured in mg/l; except acidity and alkalinity (mg/l as $CaCO_3$), E. coli (CFU/100ml) and pH]

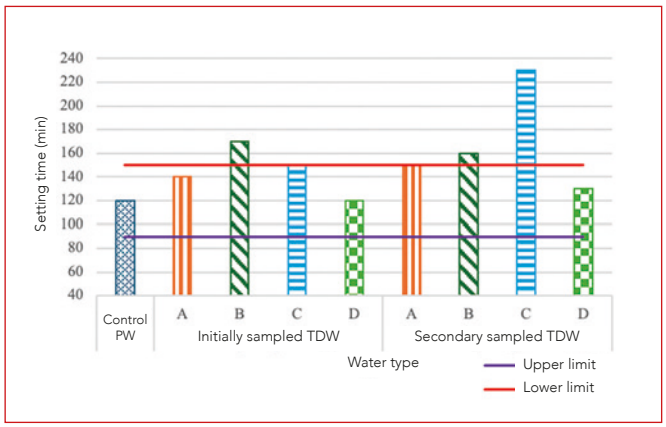

Fig. 1: Initial setting times for all sampled TDW.

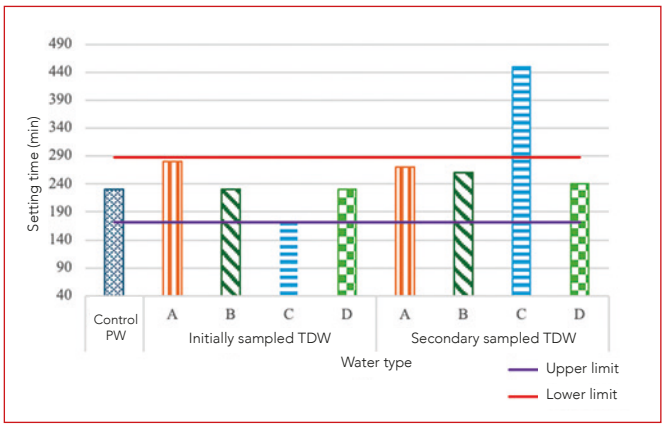

Fig. 2: Final setting times for all sampled TDW.

those made using TDW B and the sample made using the secondary TDW C. While the delayed initial setting time for the second TDW C may be attributed to its high COD value, TDW B has significantly lower COD values. The delayed initial setting time for TDW B could, however, be a result of its chemical composition, as WWTP B treats industrial wastewater in addition to domestic wastewater. Industrial wastewater may contain metals such as lead and zinc which are known to retard concrete setting time. It would thus be beneficial to test for these impurities in TDW from this specific WWTP and the other WWTPs that treat industrial wastewater.

The results of the final setting time tests using the different TDWs are presented in Figure 2. The significant increase in the final setting time of TDW C may be attributed to the corresponding measured levels in phosphorus, phosphates and COD, which are known to retard setting time.

Workability

The design slump values were 85 ± 15 mm and 65 ± 15 mm for the 0.4 w/c ratio and 0.6 w/c ratio concrete mixes respectively. Figures 3 and 4 present the slump values for both the

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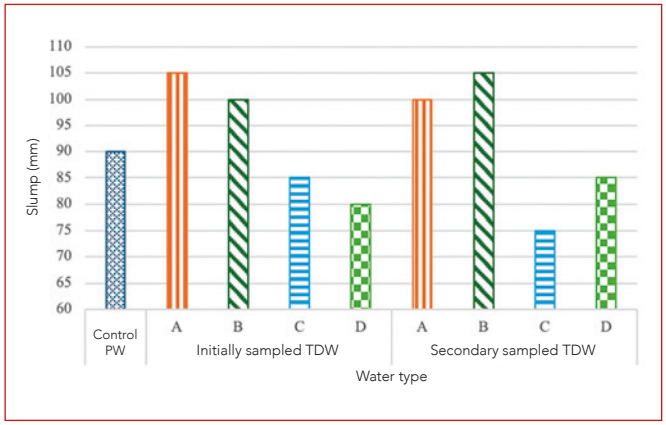

Fig. 3: Slump values for initially and secondary sampled TDW for w/c = 0.4.

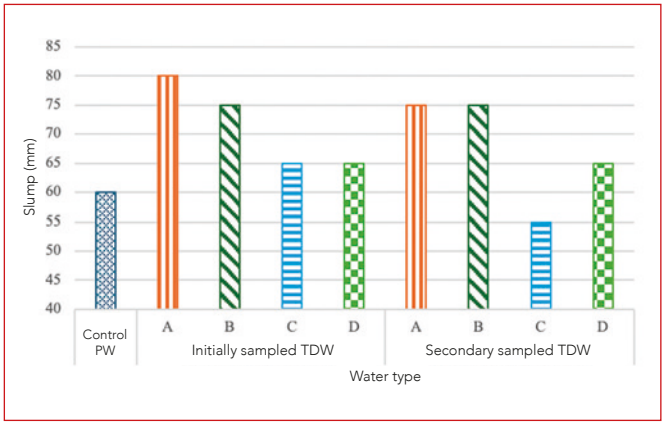

Fig. 4: Slump values for initially and secondary sampled TDW, w/c = 0.6.

initial and second samples of TDW for the 0.4 w/c mix and the 0.6 w/c mix respectively.
In comparing between the initial and second samples of TDW to assess if any adverse effects arose as a result of water quality inconsistencies, it was observed that the results were similar. It was observed that TDW A and B always had a higher slump than the control and a higher slump than TDW C and D, which could however not be explained with the chemical analysis results of the TDW samples.

While the cause of the observed trend in the slump test values requires further investigation, the test results do show that TDW does not adversely impact concrete workability as all the results were within the tolerance limits of the design slump. This is further supported by the results obtained by [4 & 14-16].

Compressive strength

Concrete compressive strength is one of the main guidelines used to assess whether non-potable water is suitable for use as mix water in concrete manufacture according to SANS 51008 [7]. In this study, 7- and 28-day compressive strengths were used for this purpose.

To pass the 7-day compressive strength check stipulated in SANS 51008 [7] which requires a compressive strength within 90% of the control, a compressive strength of 46.6 MPa was required for the 0.4 w/c ratio concrete mix. The results of the 7-day compressive strength test for the 0.4 w/c mix are presented in Figure 5.

Only the initial sample of TDW A and the TDW B samples achieved compressive strengths above 46.6 MPa. No clear trend was observed in the 7-day compressive strength results to explain the shortfall for the TDW samples that did not achieve the required compressive strength. However, it was postulated that the much lower compressive strength of the second TDW C concrete samples may be due to the high concentrations of phosphorus, phosphates and COD which in addition to retarding the setting time also delay the compressive strength development of the concrete.

The results of the 7-day compressive strength test for the 0.6 w/c mix are presented in Figure 6. A compressive strength of 24.9 MPa was required for samples to meet the 7-day strength criteria. All TDW concrete samples passed this requirement, except for the secondary TDW C with 23.0 MPa. Again, this result may be cautiously attributed to the chemical

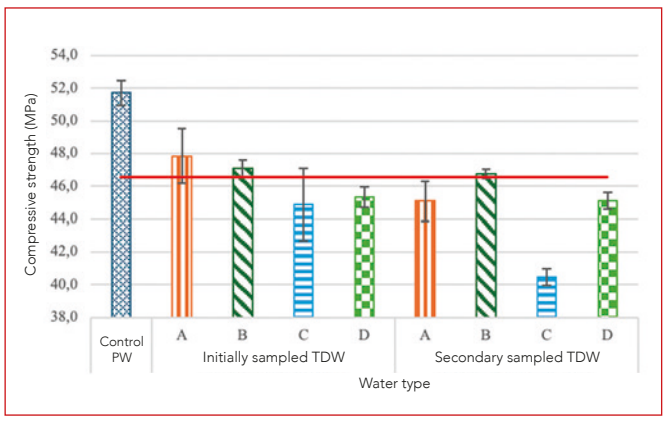

Fig. 5: 7-day compressive strength results with standard deviations for TDW concrete, w/c = 0.4.

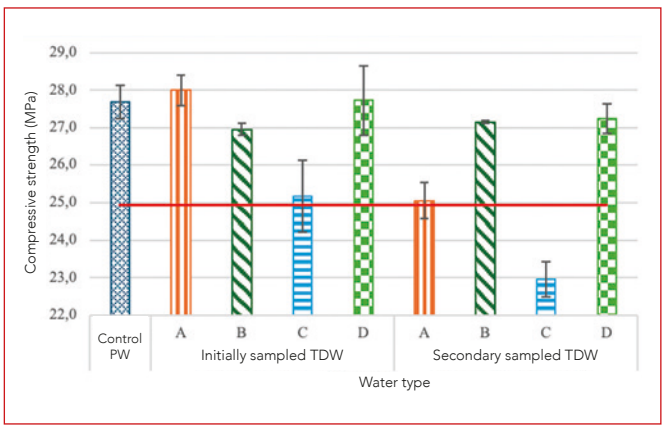

Fig. 6: 7-day compressive strength results with standard deviations for TDW concrete w/c = 0.6.

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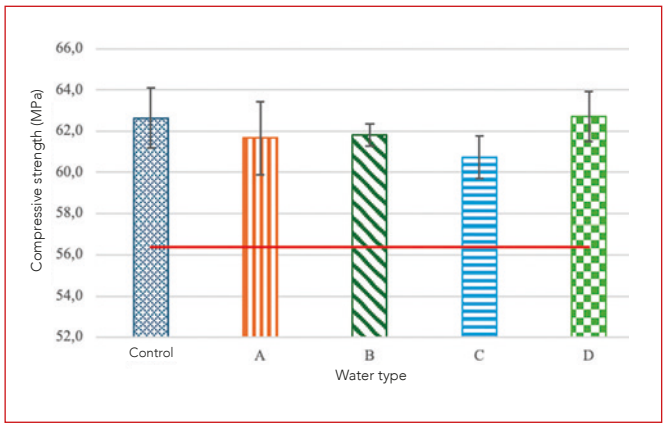

Fig. 7: 28-day compressive strength results with standard deviations for TDW concrete, w/c = 0.4.

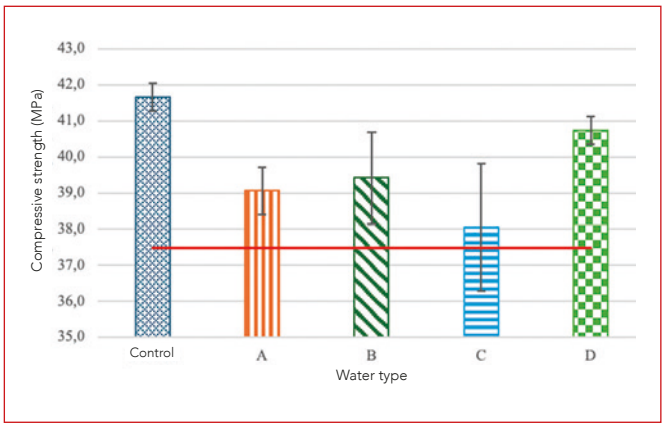

Fig. 8: 28-day compressive strength results with standard deviations for TDW concrete, w/c = 0.6.

species present in the TDW causing set retardation and delaying compressive strength gain.

The 28-day compressive strength test was performed on only the samples made using the initial samples of TDW due to the time constraints and are presented in Figures 7 and 8. The 0.4 w/c ratio concrete mix required samples to have a compressive strength of 56.4 MPa to pass the 28-day compressive strength requirement outlined in SANS 51008 [7]. At 28 days, all TDW concrete samples passed the requirement with the lowest compressive strength recorded being 60.7 MPa for TDW C. For the 0.6 w/c ratio concrete mix, the TDW concrete samples were required to possess a compressive strength of 37.5 MPa. All samples passed this check with the lowest compressive strength being 38.1 MPa for TDW C. Potable water produced the highest compressive strength at 41.7 MPa.

While not all the TDW concrete samples passed the 7-day compressive strength test for both w/c ratios, all the samples passed the 28-day compressive strength requirements stipulated in SANS 51008 [7]. In comparing the 7-day to the 28-day compressive strength test results, it was evident that using TDW as mixing water delays the compressive strength development of the concrete.

Permeability

In South Africa, the results from Oxygen Permeability Index (OPI) testing are used for durability prediction, specification and quality control of concrete structures. OPI values represent the negative logarithm of the permeability index and are thus expressed on logarithmic scale, with higher OPI values relating to lower permeability.

The obtained OPI values are shown in Figures 9 and 10. Common OPI values range between 8.5, for poor-quality concrete with high permeability, and 10.5 for dense, relatively impermeable concrete. Values obtained in this research ranged from 10.36 to 10.90, which are well within the typical values expected. Concrete containing TDW had results ranging from 95 to 98% from the control for the w/c = 0.4 mix and 99 to 104% for the w/c = 0.6 mix. These results indicate that TDW produces good quality concrete in terms of permeability.

Concluding remarks and way forward

Various tests were conducted to investigate the effects which treated domestic wastewater has on concrete properties when used as mix water. Recorded setting times appear gen-

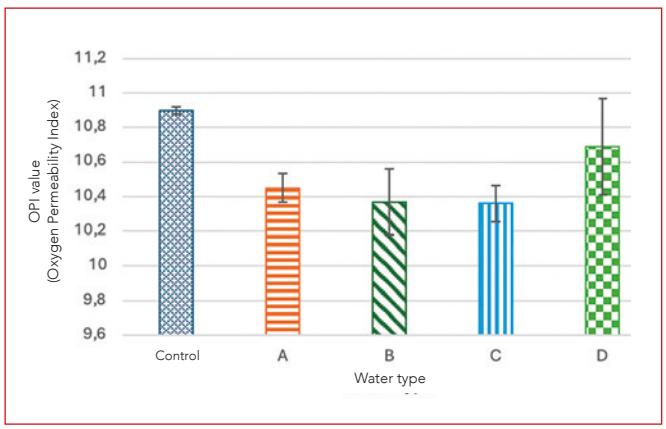

Fig. 9: OPI values for mixes with w/c ration of 0.40.

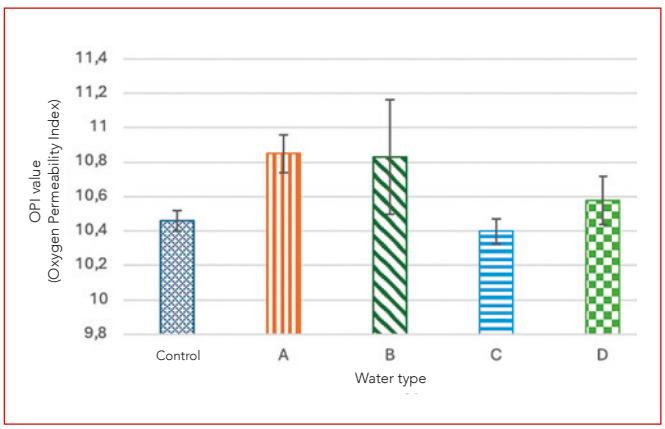

Fig. 10: OPI values for mixes with w/c ration of 0.60.

erally practically acceptable for industry application, especially if accelerating admixtures are used to reduce the setting time where required. Similarly, a correlation between the measured slump and the chemical composition of the TDW could not be determined. However, all the measured slumps were within the stipulated ranges.

While no clear trend was observed in the results to explain the shortfall for the TDW samples that did not achieve the required 7-day compressive strength, all the samples had gained sufficient compressive strength by the 28th day to pass the requirements stipulated in SANS 51008 [7]. It was thus concluded that using TDW as mixing water delays the compressive strength development of the concrete but has no negative influence on long-term strength. Permeability test results indicate that the use of TDW has no negative influence on concrete durability properties.

The findings of this study show that TDW produces concrete with sufficient workability, setting time, and compressive strength when comparing it to literature and the control. However, quality control of the TDW is of prime importance to ensure the consistent production of good quality concrete.

Acknowledgements

Prof. Dyllon Randall, University of Cape Town is acknowledged for his contribution to this research and his co-authorship of the initial compilation of test results [10].

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Concrete cooling equipment for the largest ready-mix plant supporting The Line project in Saudi Arabia

معدات تبريد الخرسانة لأكبر مصنع للخرسانة الجاهزة لدعم مشروع "ذا لاين" في المملكة العربية السعودية

Michael Walleter, KTI-Plersch Kältetechnik GmbH, Germany

KTI, a global leader in temperature-controlled concrete production solutions, has been awarded by ASAS Al-Mohileb (MHC) the contract to supply cutting-edge concrete cooling equipment for one of the largest ready-mix plants ever built. MHC, a leading Saudi Arabian construction and engineering company, has announced the completion of the ready-mix plant, with a total investment of SAR 700 million. This state-of-the-art facility, constructed to support The Line, an ambitious sub-project under the Neom umbrella, sets new standards in capacity and technological innovation. The plant is strategically designed to meet the colossal demands of The Line, a revolutionary urban development in the Kingdom of Saudi Arabia that represents the future of sustainable living.

فازت شركة KTI، وهي شركة عالمية رائدة في حلول إنتاج الخرسانة التي يتم التحكم في درجة حرارتها، بعقد من شركة أساس المُهيّلب لتوريد معدات تبريد الخرسانة المتطوّرة لأحد أكبر مصانع الخرسانة الجاهزة التي شُيدت على الإطلاق. وأعلنت شركة أساس المُهيلب، وهي شركة سعودية رائدة في مجال البناء والهندسة، عن اكتمال أكبر مصنع للخرسانة الجاهزة على الإطلاق، بإجمالي استثمار قدره 700 مليون ريال سعودي. يضع هذا المرفق المتطوّر، الذي تم تشييده لدعم مشروع "ذا لاين"، وهو مشروع فرعي طموح تحت مظلة مشروع "نيوم"، معايير جديدة في القدرة والابتكار التكنولوجي. صُمم المصنع استراتيجيًا لتلبية المتطلبات الهائلة لمشروع "ذا لاين"، وهو مشروع حضري متطوّر في المملكة العربية السعودية يمثل مستقبل المعيشة المستدامة.

The Line: A bold vision for the future

As part of Neom's innovative framework, The Line is a linear city stretching kilometers, designed to revolutionize urban living with zero cars, zero streets, and zero emissions. The project aims to accommodate millions of residents in a highly sustainable, human-centered environment. Supporting this bold vision, the ready-mix plant ensures an uninterrupted supply of high-quality concrete for The Line's construction, which demands both scale and precision in its execution.

KTI concrete cooling solutions

MHC has designed the ready-mix plant with cutting-edge production capabilities in unparalleled scale ensuring the continuous supply of concrete necessary for the construc-

KTI has been awarded by ASAS Al-Mohileb (MHC) the contract to supply cutting-edge concrete cooling equipment for one of the largest ready-mix plants ever built.

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KTI's equipment plays a pivotal role in ensuring the high quality and durability of the concrete produced at the plant.

tion. At the heart of the ready-mix plant each batching plant will be equipped with innovative concrete cooling equipment supplied by KTI, a leader in temperature-controlled concrete production. KTI was selected for this project not only for its proven track record but for its forward-thinking, eco-conscious approach that aligns with the sustainability goals of Neom.

KTI's equipment plays a pivotal role in ensuring the high quality and durability of the concrete produced at the plant. KTI's Plate Ice Plants (PLIP's) are the core of the cooling process, 12 PLIP's on 6 Mobile Ice Storages (MIS), deliver a staggering total of 1,200 tons of ice each day. Integrated into the entire concept, these units are essential for providing the perfect temperature-controlled concrete that The Line's construction requires.

All PLIPs are designed with an ammonia refrigeration circuit, which offers several advantages over traditional freon-based systems. Ammonia is not only a highly efficient refrigerant, but it also boasts significant sustainability benefits. Ammonia is a natural refrigerant that does not contribute to ozone depletion or global warming, aligning with Neom's sustainability goals. Furthermore, ammonia-based systems are renowned for their superior energy efficiency, making them a greener choice in industrial refrigeration.

A complete concrete cooling solution by KTI

In addition to the Plate Ice Plants, KTI is providing 9 Containerized Ice Water Plants (CIWP), each capable of delivering water chilled from 45°C to an impressive low 0.5°C. These ice water systems deliver the freezing mixing water to the batching plant directly and to each plate ice plant. Pre-chilling of the hot available water within multiple stages is crucial to achieve the high efficiency requirements.

KTI's selection for this project was also influenced by its highly skilled service team, composed of experienced refrigeration technicians who are based in Saudi Arabia. Currently KTI operates service branches in Jeddah, Riyadh, Dammam and most recently Tabuk to ensure the closest proximity to Neom's exiting projects. This team ensures seamless coordination and execution of the installation, commissioning and after sales processes, working hand in hand with our valuable partner MHC.

Shaping the future together

With this collaboration, MHC and KTI are not only building the infrastructure for The Line but are also setting new benchmarks for sustainability and efficiency in large-scale construction projects. This ready-mix plant stands as a testament to the power of innovation, pushing the boundaries of what's possible in the concrete industry, and reinforcing Saudi Arabia's commitment to a more sustainable future. ■

FURTHER INFORMATION

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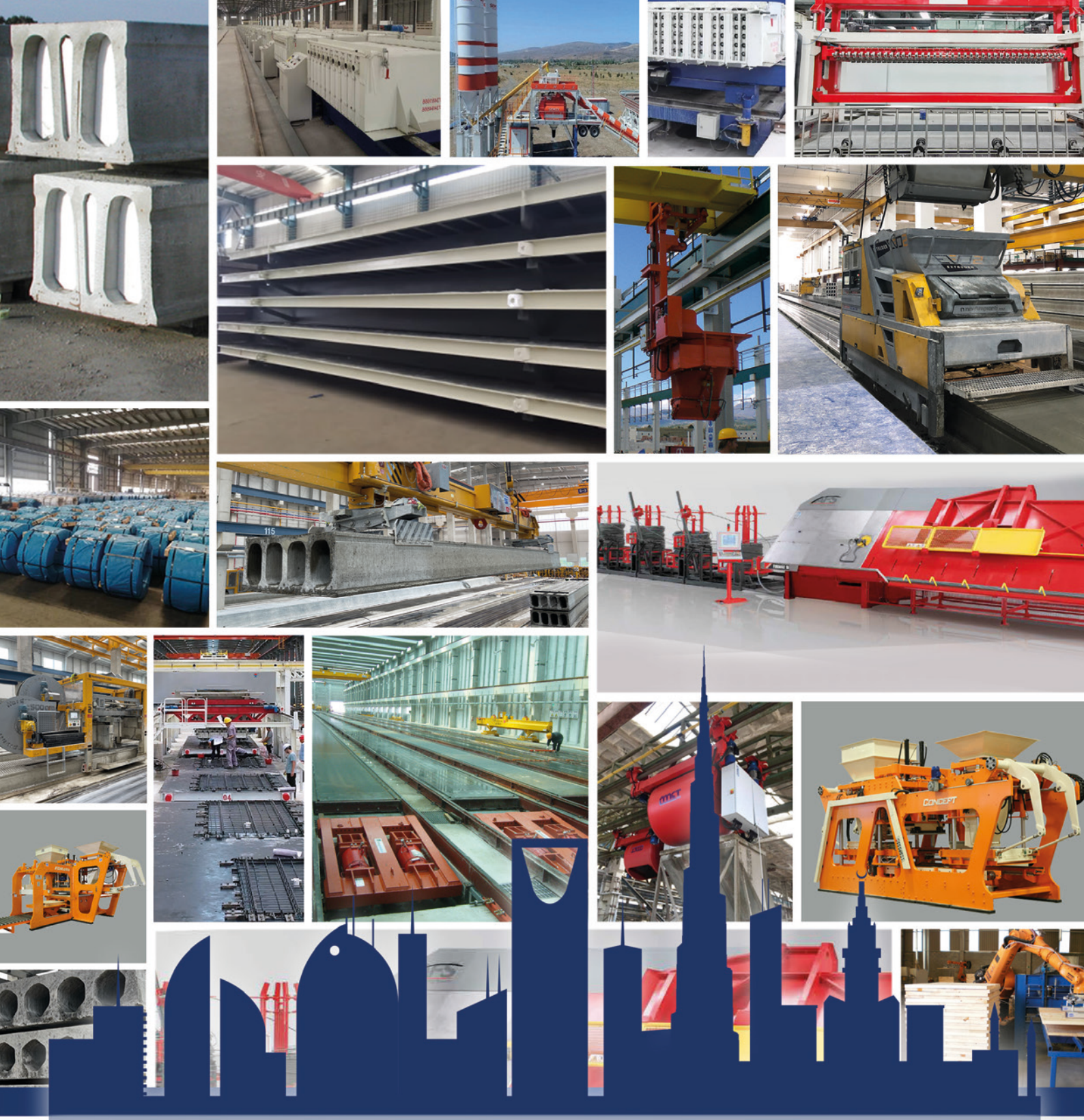

Tabone تابوني

HOLLOWCORE - PRECAST - CUT & BEND - BLOCKS

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Wasa AG, 64293 Darmstadt, Germany

Ecomix Ltd. from Bulgaria with ground-breaking investment for the future

شركة Ecomix Ltd. من بلغاريا باستثمارات رائدة للمستقبل

Alexander Simos, Wasa AG, Germany

Ecomix Ltd. is a well-respected, family-run company with its headquarters in Zhitnitsa, Bulgaria, that has specialised in manufacturing construction materials and construction chemical products. The company can proudly look back on more than 25 years of history in producing ready-mix concrete, mortars and concrete products. Since its foundation in 1996, Ecomix Ltd. has made a name for itself in Bulgaria as a leading manufacturer of products such as cement mortars, tile adhesives, renovation materials and sealing systems.

Ecomix Ltd. هي شركة عائلية مرموقة، يقع مقرها الرئيسي في مدينة زينيتسا في بلغاريا، وهي شركة متخصصة في تصنيع مواد البناء ومنتجات المواد الكيميائية المُستخدَمة في البناء. وتفخر الشركة بتاريخها الذي يمتد لأكثر من 25 عامًا في إنتاج الخرسانة الجاهزة والملاط ومنتجات الخرسانة. ومنذ تأسيسها في عام 1996، اكتسبت شركة Ecomix Ltd. شهرة واسعة في بلغاريا كشركة رائدة في تصنيع منتجات مثل الملاط الأسمنتيّ والمواد اللاصقة للبلاط ومواد الترميم وأنظمة معالجة الشقوق.

Sites for ready-mixed concrete are operated at both Chisarya and Karlovo. Zhitnitsa is home to its production facility for manufacturing concrete products. Ecomix Ltd. has established itself as one of the most important manufacturers of concrete and lime mortar plus concrete products in Bulgaria and has proven to be a reliable partner in co-operation with investors, construction companies and end customers.

At its site in Zhitnitsa, Ecomix carries out production with a concrete block machine made by Ermak, a Turkish manufacturer. The company decided to build another production line on a greenfield site in 2022 with a view to further expanding its market position and increasing production capacity. The company remained loyal to the Turkish machine manufacturer when it came to system technology and opted for an-

View of the new concrete block production facility in Zhitnitsa

View of the new production hall

other system from the same manufacturer as a consequence. Ecomix had previously relied on classic softwood production boards made from pine. Increasing market requirements and an ever-growing, highly flexible concrete product portfolio prompted the company to reconsider. The decision was taken to break new ground in this area as a result. Ecomix found that replacing the softwood boards after only four years was unsatisfactory. This, together with the clear differences in the new production boards' vibration transmission compared to boards that had been in use for 2-3 years, was no longer a viable option.

The performance and vibration properties of classic softwood boards initially exhibit good transmission values but these generally decrease steadily over their service life. This then inevitably has an effect on the compaction of blocks and thus on their quality.

Concrete products often deteriorate in quality with otherwise identical machine settings and unchanged concrete mix due to variations in vibration transmission and compaction effects with ageing wooden production boards. The wood, as a natural raw material, is simply the reason for this, as it is exposed to great stresses and strains especially when there are fluctuations in moisture content and varying temperatures.

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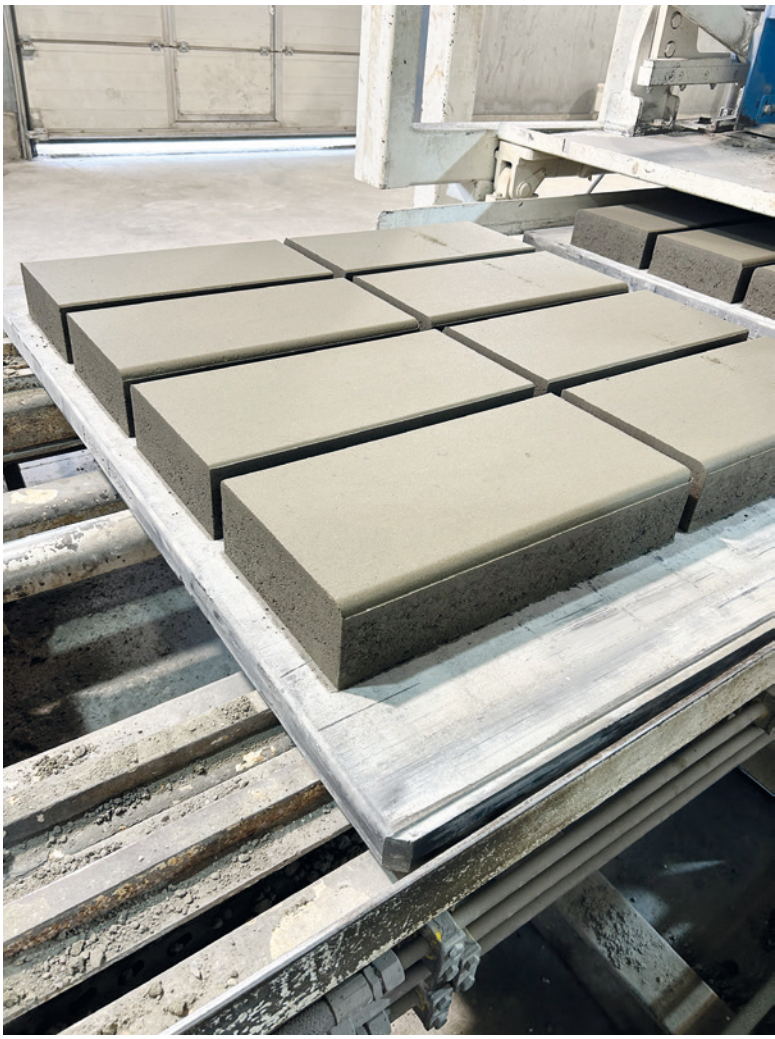
The existing system is already operating with Wasa boards



Wasa Uniplast Ultra glass fibre reinforced all-plastic production boards in operation at Ecomix

The Wasa Uniplast Ultra glass fibre reinforced all-plastic board

This is why Ecomix opted for glass fibre-reinforced all-plastic boards made by Wasa. Not just the new system at Ecomix will carry out production on solid all-plastic boards. The decision was also taken to replace the softwood boards on the existing production line with Wasa all-plastic boards. Ecomix was persuaded by the advantages these homogeneous all-plastic boards exhibit in respect of constant vibration transmission over their entire service life as well as their excellent compaction results.

However, the greatest difference to all solid wooden or coated wooden board types is the fact that the plastic/glass fibre mix demonstrably remains virtually unchanged over the entire service life of such boards, whereas wood or wood-plastic composite boards can become softer over time with the result that vibration transmission can decrease – which would then lead to longer cycle times or poorer compaction results. This phenomenon cannot be observed with all- plastic boards. Their production parameters are almost the same in Wasa's experience after ten or more years as on the day of delivery.

Wasa has a proven track record of over 30 years in manufacturing all-plastic boards. Over six million units have been delivered worldwide since this type of board was invented and launched on the market. The first generation of the board, the Wasa Uniplast, was formerly reinforced with steel profiles on its outer edges. This gave the board its necessary rigidity. Continuous further development and the use of ultra-modern technology have enabled steel profiles to be dispensed with on the board since 2007. Since then, Wasa Uniplast Ultra boards have been reinforced with glass fibres, which are added to the homogeneous all-plastic mixture.

Uniform vibration transmission ensures excellent compaction even under very tough production conditions. The all-plastic board's solid material also has a very positive effect on cycle times. There is also no need to use a drawing plate because the board's upper side is flat and without joints. This also generates time savings per cycle. It makes the Wasa Uniplast Ultra one of the most efficient production boards on the market.

Wasa Uniplast Ultra production boards have won over numerous customers around the world alongside Ecomix, the Bulgarian concrete product manufacturer. The boards' surfaces are extremely impact-resistant due to the addition of glass fibres and achieve high Shore hardness, which translates into very hard-wearing surfaces. The Wasa Uniplast Ultra is therefore an excellent choice for a reliable, long-term solution in the area of production boards.

Ecomix was also able to reduce cycle times in addition to significantly better compaction results. This not only has a positive economic impact in the medium and long term, but also an ecological one – something of great importance for the company's future strategic direction.

Both companies are very pleased with their trust-based working relationship and are confident about the steadily growing market in Bulgaria.

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Hess Group, 57299 Burbach-Wahlbach, Germany

New concrete block and paver plant and value adding line for Alomaier Trading and Contracting Company

مصنع جديد لقوالب الكتل الخرسانية والأرصفة وخط بميزات إضافية لشركة الأومير للتجارة والمقاولات

Alomaier Trading and Contracting Company (OTC) was founded in 1978. With more than 46 years of experience, today, OTC is one of the leading building and infrastructure contractors in the Gulf region. The company is also active in the manufacturing industries within the construction sector, such as ready mix, as well as asphalt and crusher plants in several locations, all at strategically placed favourable locations in Saudi Arabia. Recently, the OTC reached a great milestone, expanding its business using HESS Group and SR Schindler's state-of-the-art concrete block and paver plant RH 2000-4 MVA, in addition to a fully automated Shot Blasting, Curling and Coating line.

تأسست شركة الأومير للتجارة والمقاولات (OTC) عام 1978. وبفضل خبرتها التي تزيد عن 46 عامًا، أصبحت إحدى شركات المقاولات الرائدة في مجال البناء والبنية التحتية في منطقة الخليج. تعمل الشركة أيضًا في الصناعات التحويلية ضمن قطاع البناء، مثل الخرسانة الجاهزة، فضلًا عن مصانع الأسفلت والكسّارات في عدة مواقع، وتوجد جميعها في مواقع استراتيجية مواتية في المملكة العربية السعودية. ومؤخرًا، حققت الشركة إنجازًا كبيرًا، حيث وسّعت أعمالها من خلال الاستعانة بمصنع الكتل الخرسانية والأرصفة المتطور RH 2000-4 MVA من مجموعة HESS وSR-Schindler، فضلًا عن خط السفع بالخردق، والثني والطلاء الآلي بالكامل.

Hess Group and SR Schindler have significantly expanded their market presence in Saudi Arabia in recent years. This growth is attributed to the rising awareness of the advanced technologies provided by these companies and their focus on local aftersales support through Topwerk Middle East.

OTC was established as a partnership company in Al Zulfi City, Riyadh province, Kingdom of Saudi Arabia. It started as a contracting company owning only few equipment, a crusher and an asphalt mixer. OTC operates with a fleet of over 3,000 pieces of equipment and machinery, supported

Outside view of the OTC plant

by a team of more than 4,000 multinational employees. This robust capacity enables the company to execute projects efficiently, meeting budget constraints, strict timelines, and the highest quality standards. Based on that, OTC was classified by the Saudi Ministry of Municipal and Rural Affairs as a first-class contractor to build roads, railways, reservoir dams, and bridges.

Turnkey concrete block and paver line from the Hess Group and SR Schindler

OTC's main goal is to support their existing and future projects with a concrete production line, along with the concrete value-adding line, to ensure and maintain the quality and timeline of their projects.

For OTC, it is important to have a competent and reliable partner by its side, who can support it in its development work with all the necessary knowledge and technical solutions. Hess Group and SR Schindler offer system solutions from a single source and know the needs of the customers. Consequently, the Hess Group and SR Schindler have supplied the core components for the project, from the concrete block and paver plant, the entire handling system as well as the value-adding line. The result is a high-performance concrete block and paver production that impresses with both the output quantity and the high quality of the end products.

SX series concrete mixers

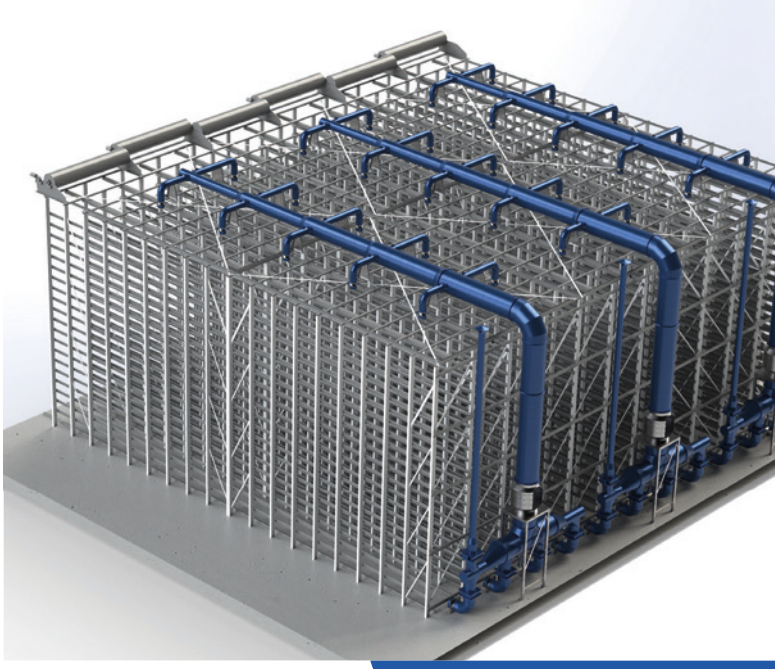
For the respective concrete mix design, OTC can rely on aggregates from eight silos on the new line. The aggregates are dosed directly from the silos arranged in a row into the underneath running traveling weigh batcher which ejects the aggregates to one of the two skip hoist buckets, which feed the base and face mixer.
Two planetary mixers were selected for the concrete production: the large SX3750 for the base concrete and the smaller SX750 for the face concrete. The Topwerk mixers are particularly suitable for the manufacture of semi-dry concrete, as needed e.g. for the production of paving stones, kerb stones, hollow blocks and slabs. The planetary mixers are characterized by their high level of mixing intensity and have been reliably used by many customers worldwide for many years. The quality of the mixed concrete has a decisive influence on the quality of the products, and the Topwerk mixers ensure homogeneous mixes in the shortest possible mixing time.

The cement is dosed through a speed-controlled screw and slowly added to enable a good blend. Adding the cement directly to the mixing material also reduces the cement dust deposits in the upper area of the mixer trough. There is less soiling during the mixing process and consequently the cleaning time and costs are reduced.

RH 2000-4 MVA – developed for the high-performance market sector

The heart of the new production line consists of the concrete block and paver machine, the RH 2000-4 MVA. It has

CONCRETE CURING & RACKING SOLUTIONS



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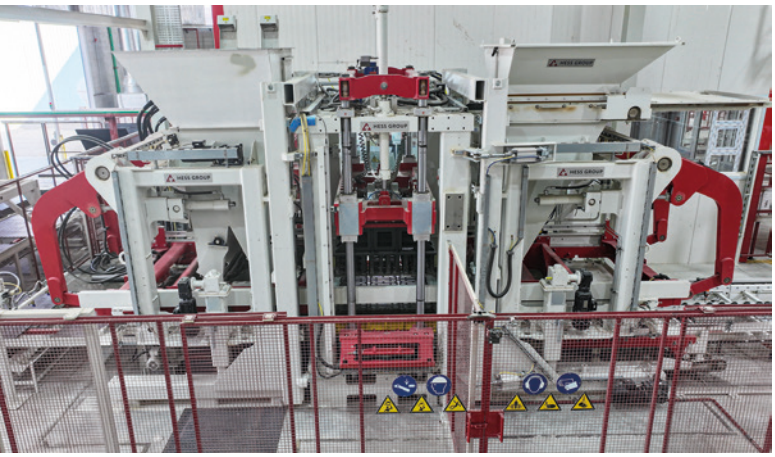

Hess concrete block and paver plant RH 2000-4 MVA

Control Panel

been developed as a particularly powerful machine for the high-performance market sector. Despite short cycle times, the machine is characterized by a soft, overlapping movement process. This is achieved through special control technology and hydraulics. The intelligent interaction of these components thereby guarantees the reliable and highly productive manufacturing of concrete precast elements. Production on the new line at OTC is done on 1,400 x 1,300 x 14 mm steel production boards.

The M Technology is the latest technology in industrial hydraulics. With Rextroth Motion Logic Control (MLC+H), all movements and positioning mechanisms of the machine components are controlled by a dedicated hydraulic system and CNC Control unit which communicates with the PLC of the machine, maintaining equal oil pressure on both sides of the tamper head and filler box cylinders, providing sequence benefits in unrivalled results, power, precision and performance. The smooth and easy operation of the M-Version RH 2000-4 production machine ensures great economic efficiency for the producer in his marketplace.

The machine is also characterized by a solid steel base and upper frame, which ensures that the vibrating force is directed properly into the product. Thanks to the high precision of the control system, even at full speed a high-accurate motion is achieved, which is of critical importance for filling, compaction and the product quality. In addition, setting the parameters on the display panel is particularly simple and user-friendly.

Like all concrete block and paver machines produced by the Hess Group, the new plant at OTC is also equipped with an operating console. The height and angle of the touch screen can be adjusted to accommodate all the operator's needs. This touch panel enables all the concrete block and paver machine's functions to be fully monitored. The operating concept thus allows even lesser experienced personnel to quickly become familiar with the control system. Furthermore, the semi-automatic mold change can be directly monitored

Finger cart system and curing chamber

at the machine using a mobile panel, which makes the mold change safer and even faster.

Fully automatic handling system and curing chamber

Freshly made concrete products are transported on the steel production pallets via V-belt conveyors to the elevator. In subsequent upgrades, a dumping station and a double washing plant are expected to be added on the wet side.

The elevator with 22 levels and a max load capacity of 14 t collects the production boards, and depending on the product height, deposits one at every level or every second level. The finger car then takes the production boards out of the elevator and transports them into the curing rack which has 16 chambers. Altogether, the curing rack with 16 positions per chamber has a capacity of 4,950 active production boards and 5,632 boards total.

The cured products are then taken back out of the rack by the finger car and transferred to the lowerator.

Servo 700-2 cuber

Using the lowerator, the production boards with the cured products are separated onto the latch conveyor on the dry side and conveyed to the Hess Servo 700-2 cuber. The movements of the cuber for lifting, turning and traveling are fully electrically servo driven and the cuber clamp is equipped with a hydraulic system. The fast cycle times of the cuber when stacking the products keep up with those of the concrete block machine and the dry line.

The bundles of blocks are stacked onto the 28meter long slat conveyor, which allows enough time for the forklifts to bring the cubes to the storage area, without affecting the production efficiency.

Servo 700-2 cuber

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Fully Automatic Finishing line supplied by SR Schindler

The empty steel production boards on the latch conveyor are conveyed further along the line and are cleaned as they pass through the steel board scraper and brush.

The special production board buffering system for maximum plant efficiency is a remarkable added value to the plant. If the dry side releases more steel production boards than are needed on the wet side, a magnetic stacking device arranged in front of the board silo takes the production boards off the cross conveyor.

Fully Automatic Finishing line supplied by SR Schindler

SR-1250 shotblasting unit

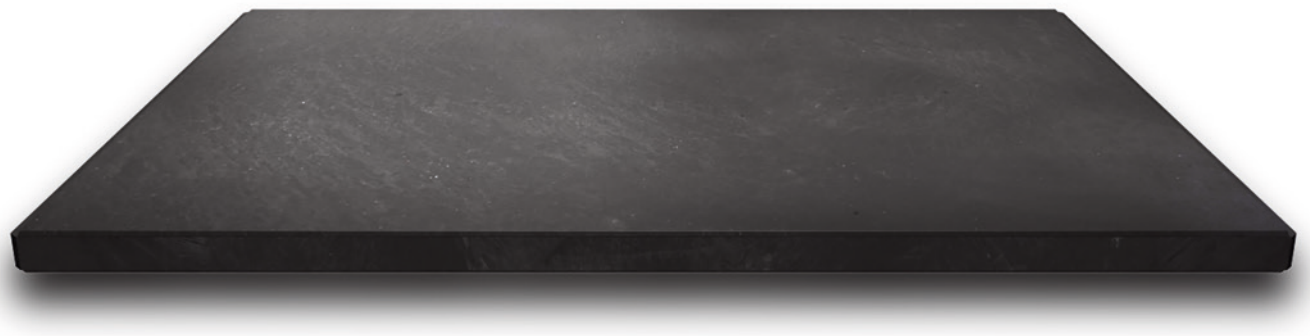
SR Schindler supplied a type SR-1250 shot blasting unit for finishing the surface of concrete products. The SR-1250 shot blasting unit processes layers with dimensions between 800 x 800 mm and 1,200 x 1,200 mm. The maximum product thickness for this operation is 180 mm. A shot blasting unit removes the binding material from the product surface, exposing the aggregates in paving stones and concrete slabs. The products are machined on the face side. Shotblasting machines are operated with steel or stainless-steel shots with a standard size of 0.6–1.2 mm. During operation, turbines propel stainless steel shots onto the products to achieve the desired shot blasting effect. The blasting intensity and belt speed are frequency-controlled adjustable depending on the product being treated and the desired surface appearance.

CA 1200 curling unit

A layer pusher with a transfer table transports the freshly shot-blasted products in an endless row into the CA 1200 curling unit, also supplied by SR Schindler. Curling is particularly well suited for textured products but also gives roughened and/or shot-blasted products a slight shine and exclusive surfaces.

Shotblasting unit (in commissioning)

NON PLUS **ULTRA**



More than 6 million of our WASA UNIPLAST® ULTRA boards are deployed in concrete plants all over the world. Many of them have been in use for decades – and are showing no signs of fatigue.

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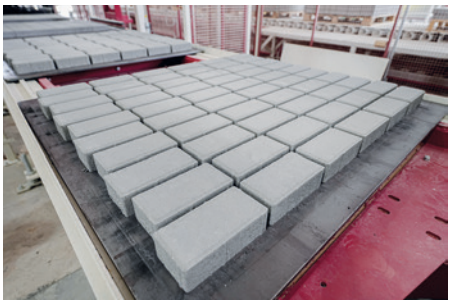
Curling unit

Coating line

A layer pusher with a sliding table transports the freshly curled products layer by layer into the coating line, supplied by SR Schindler.

The coating system consists of, in total, three infrared heating stations and two spray units. The surfaces for the primer are preheated under the first infrared heating station. The primer is sprayed on under the first spraying unit. The concrete products are then transported to the intermediate heating station

Coating line (in commissioning)



Freshly produced concrete blocks and quality control

to dry and prepare for sealer. They are then dried under the last heating station and finally packed onto transport pallets and transported to the storage yard.

A Seamless Blend of Technology and Expertise

OTC's commitment to delivering the highest quality products is reflected in its investment in advanced technology from the Hess Group and SR Schindler. The state-of-the-art concrete block and paver machine, combined with the fully automated value-adding line, allows OTC to produce durable, aesthetically refined products that meet diverse customer needs. This seamless integration ensures efficient, reliable production while maintaining the flexibility to adapt to specific client requirements.

By pairing cutting-edge machinery with a highly skilled workforce, developed through strategic training programs, OTC sets a benchmark for excellence in the industry – consistently exceeding expectations and building trust as a reliable partner in construction.

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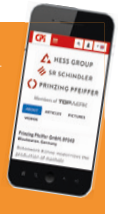

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Quality and more in the spotlight

الجودة وأقصى درجات الاهتمام

When bauma opens its doors in Munich this April, visitors to the Masa booth in Hall B1.347 can expect a great mix of new and proven products. While the basic technology for producing blocks and pavers hasn't been revolutionised since the last bauma, a closer look at Masa's booth reveals significant advancements, particularly in quality assurance of concrete products.

عندما يفتح معرض "باوما" أبوابه في مدينة ميونخ في شهر أبريل من هذا العام، يمكن لزوار جناح الماسة في القاعة B1.347 أن يتوقعوا مزيجًا رائعًا من المنتجات الجديدة والمجربة. وبالرغم من أنه لم تحدث أي طفرة في التكنولوجيا الأساسية لإنتاج الكتل والأرصفة منذ معرض "باوما" الأخير، فإن إمعان النظر في المنتجات المتوفرة في جناح الماسة يدلي الستار عن تطوّرات كبيرة، وخاصة في مجال ضمان جودة المنتجات الخرسانية.

Masa will showcase its new product for non-contact inspection and measurement of concrete products in Munich. This inline system detects various product defects, measures product height across the entire production board, and inspects the boards themselves. The streamlined quality control module is fully integrated into the Masa plant control system, allowing operators to use the familiar interface.

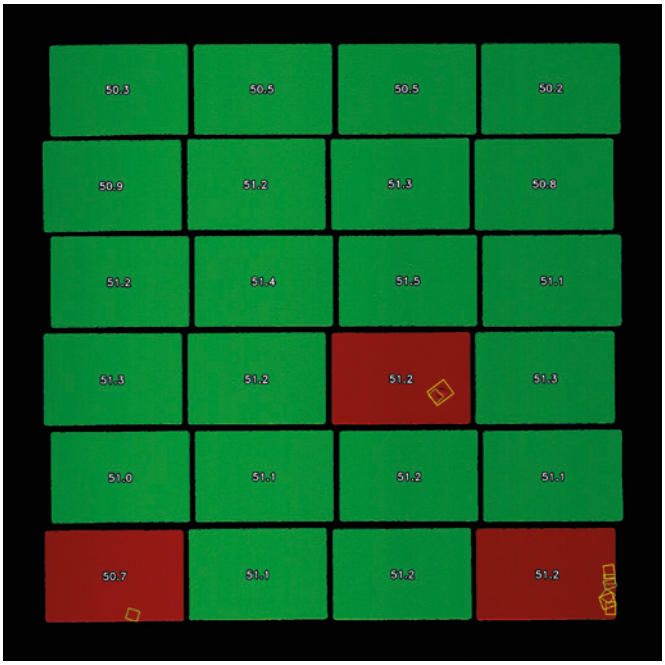
Tradeshow premiere of a learning system

The Masa system for optical quality control is set for its Munich debut. Over the past few months, Masa has optimised the prototype in live operations, fine-tuning settings, visualisations, and design at a pilot customer. The prototype has successfully passed test runs in a real production environment, with the integrated AI-supported evaluation software learning daily. Ahead of bauma, you can already catch a glimpse of the system.

Measure inline

On the wet side, the system performs non-contact measurements on freshly produced concrete products directly behind the block/paver machine. The wet side conveyor continues to transport the production board with the products without delaying production or stopping for measurements. For producers, this means quality control without any loss of time.

Results screen 'Defects': Each defect type is given a different colour coding.



Results screen 'Defects': Products to be sorted out on the dry side are marked.

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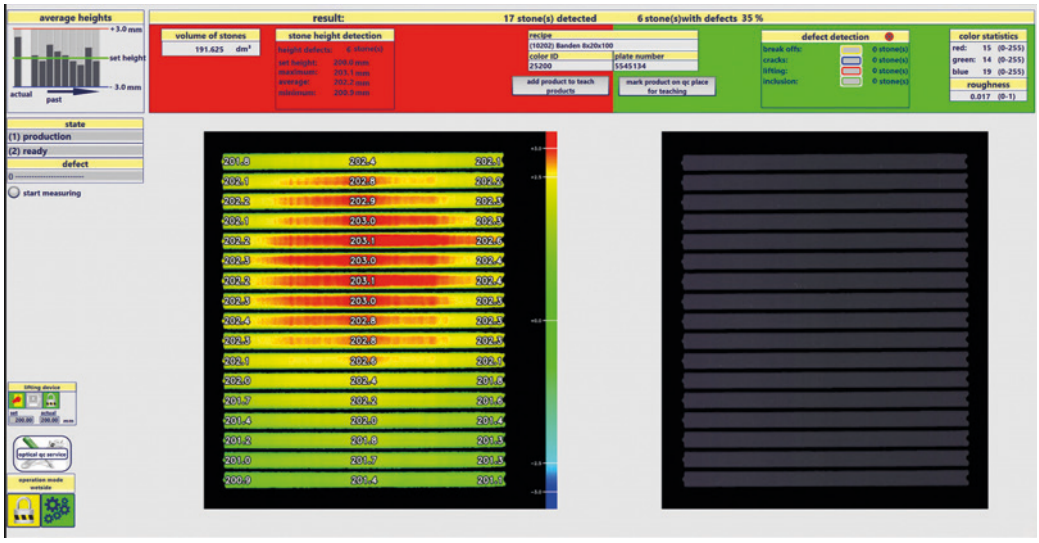

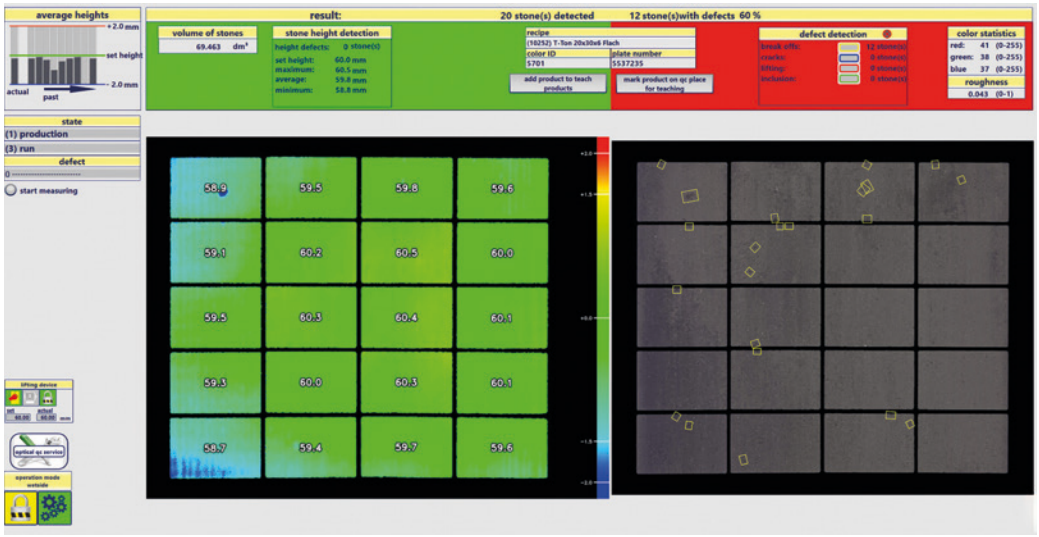

Visualisation in the Masa plant control system: block height measurement and defect detection

Detect product defects at an early stage

The system detects a wide range of product defects, distinguishing between surface defects and impurities. It visualises and classifies deviations from the standard in the Masa plant control system and marks the detected products. The system identifies:

- Surface defects from a size of approx. 1 mm²
- Surface plugs with a height difference of about 0.5 mm
- Fine cracks from a width of approx. 0.5 mm
- Cement dots

Thanks to early fault detection, the system actively helps the machine operator optimise production. As the operator receives immediate feedback about product irregularities right after the demoulding process, they can quickly adjust machine settings, recipes, or raw materials, reducing rejects. Depending on the type and quantity of defects, it may be advisable to remove the entire production board with fresh products before curing, using the optional Masa tilting device. This ensures that the curing area is filled with flawless products, preventing subsequent complaints. If only a few products are faulty, they can be sorted out on the dry side.

Determine product height

The system scans the concrete products as they pass under the device without making contact and measures the product heights across the entire production board. The visualisation interface displays the block height in colour, based on the specified tolerances.

Inspect production board

The condition of the production boards, which serve as the transport medium for concrete products, directly affects the quality of freshly manufactured concrete items. Any damage, unevenness, or deflection in the production boards negatively impacts the products, leading to increased costs due to rejects. This is where the quality control system plays a crucial role. It inspects empty production boards for potential quality defects and identifies these within defined tolerance limits in the Masa plant control system.

The technology in the device

To integrate the device, which contains all the measurement technology, into the production plant as space-efficiently as

possible, Masa developed the slimmest possible design. This allows the quality control system to be installed in new plants and retrofitted in many existing ones.

During bauma 2025, Masa cordially invites interested visitors to their booth to get a firsthand look at the quality control system and its capabilities for precise and continuous product inspection. Developers and sales staff will be available to answer questions about the technology "in and on the device," such as surface scanners, optical cameras, or encoders. They will also discuss installation options, practical applications, and the benefits of quality control.

bauma 2025 – The Masa booth offers even more

In addition to the new system for optical quality control, many other current Masa milestones will be spotlighted for visitors in Munich in Hall B1.347, presented in both analogue and digital forms.
The online world of the Masa Service Cloud has been expanded and will be showcased at the booth, along with a special feature for digital transformation in AAC plants. The Production Reporting System, developed by Masa experts for AAC production, will also make its tradeshow debut (see also AAC worldwide 04/2024). This tool connects the information worlds of plant operators and management, making products traceable down to their production data on the day of production.

A prominent exhibit from the "Concrete block production" area will offer insights into Masa machine technology and a broad perspective. An installation from the AAC production section will provide a deeper view. Masa will also create ample space for sand-lime brick specialists. bauma 2025 – The Masa team looks forward to seeing you! ■

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At Masa, we think of nothing but concrete – and how to shape it for the building materials industry. The machines we design and build are used for the production of concrete blocks, pavers or landscaping products, aerated concrete blocks and (reinforced) panels as well as sand-lime bricks. In other words, we are real concrete heads with a passion for reliable, high-performance machines.

Marc is one of our concrete heads who ensures with his precise work in mixer construction the high quality of our Masa Multi Color System. It has low-maintenance stainless steel silos, load cells for each silo as well as pivoting belts and a frequency-controlled collecting belt for high-precision concrete positioning right into the mold. When it comes to HQ recipe-controlled repeatability, just ask the concrete heads.

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ma-0000733

apilion machines + service GmbH, 77694 Kehl am Rhein, Germany

Round, elliptical or arch-shaped – universal cage welding machine for all cases

آلة اللحام القفصية الشاملة الدائرية، أو البيضاوية أو قوسية الشكل لجميع الحالات

Whenever you hear the term "concrete pipes", you first think of round reinforced concrete pipes. However, these can also have completely different geometries, such as elliptical or arch-shaped. The use of such pipe shapes is continuously increasing, especially in the USA where demand is rising.

إن أول ما يتبادر إلى ذهنك عندما تسمع مصطلح "أنابيب خرسانية" هو الأنابيب الخرسانية المسلحة الدائرية. مع ذلك، يمكن أن يكون لهذه الأنابيب أشكال هندسية مختلفة تمامًا، مثل الشكل البيضاوي أو المقوّس. ويتزايد استخدام مثل هذه الأشكال من الأنابيب باستمرار، وخاصة في الولايات المتحدة حيث يتزايد الطلب عليها.

As a result, the company ECP (Engineered Concrete Products) from South Dakota approached apilion last year and enquired about a machine that could efficiently produce all these shapes.

As one of the global technology leaders, apilion can draw on the decades of expertise of Züblin Maschinen- und Anlagenbau GmbH (Züblin MAB), which has produced several hundred machines since it was founded in 1957. The portfolio includes machines for the production of reinforcement cages for reinforced concrete pipes, manholes, box culverts, masts, piles, bored piles, pressure pipes, jacking pipes and other precast concrete parts.

Based on this experience, the resourceful engineers were able to further develop the tried-and-tested SMS machine type within a very short space of time so that all three cage geometries (round, elliptical and arch-shaped) can be produced efficiently on one machine.

The SMS machine type can efficiently produce three cage geometries (round, elliptical and arch-shaped).

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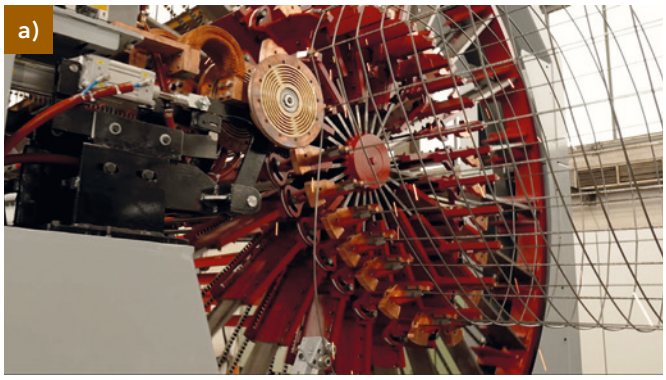
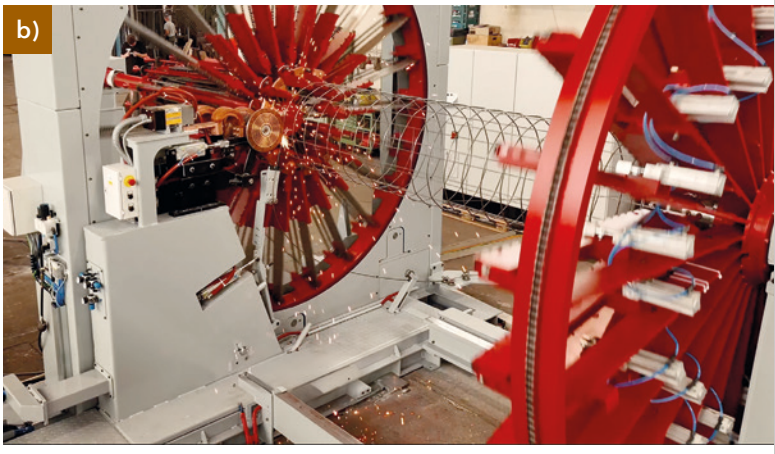


Production of elliptical cages



Production of round cages

The longitudinal wires are fed manually with pre-cut wires or optionally with automatic longitudinal wire feed; the winding wire always comes from coil. Longitudinal and winding wires are connected by resistance welding. The cage geometries and sizes can often be changed at the touch of a button or in a few simple steps.

The possible cage sizes vary between 340 and 4,400 mm with 12 to 48 longitudinal wires (5-10 mm), depending on the design. For this customer in the USA, an SMS 220 was installed with 24 longitudinal wires for a diameter range of 340 to 2,700 mm. All important cage parameters can be saved in detail.

As with all apilion machines, all important components such as motors, drives and control systems for the SMS series are sourced exclusively from reputable suppliers with worldwide service departments. No hydraulic components are used and parameters are changed electronically. Only one operator is needed.

In order to increase production efficiency and output, the SMS series machines are also available with additional automation options such as the aforementioned automatic longitudinal wire feeding system, an automatic cage removal device and a performance package for higher output rates.

All these points, together with the robustness and durability of the apilion machines, persuaded the customer to opt for the SMS from apilion, and the machine was able to start producing elliptical cages already in autumn 2024. ■

FURTHER INFORMATION

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Next-level wetcast automation platform

منصة التشغيل الآلي للصب الرطب المتطوّرة

Afinitas, a leading global infrastructure equipment and services company headquartered in St. Louis, MO., USA, has launched a platform of wetcast automation systems aimed at helping precast concrete producers enhance productivity, reduce labor issues and increase throughput to get products to market faster. The platform, named Prima 360, leverages a wide range of technologies developed in-house by Afinitas. The systems are backed by the strength of Afinitas' global technical team and service support.

أطلقت Afinitas، وهي شركة عالمية رائدة في مجال معدات وخدمات البنية التحتية يقع مقرها في سانت لويس بولاية ميسوري بالولايات المتحدة الأمريكية، منصة لأنظمة التشغيل الآلي للصب الرطب تهدف إلى مساعدة منتجي الخرسانة الجاهزة على تعزيز الإنتاجية، والحد من مشكلات العمالة وزيادة الإنتاجية لتوصيل المنتجات إلى السوق بصورة أسرع. تستفيد المنصة، التي يُطلق عليها "بريما 360"، من مجموعة واسعة من التقنيات التي طورتها شركة Afinitas داخليًا. وتحظى هذه الأنظمة بدعم قوة الفريق الفني العالمي لشركة Afinitas وخدمات الدعم.

Combating the Labor Shortage with Automation

The numbers can be jarring:

- Global construction spending could exceed $20 trillion annually by 2040, nearly doubling the current figure.
- Yet, some estimates suggest a projected global shortage of 75 million workers by the year 2030.
- Approximately 80% of construction firms report difficulty finding skilled labor.
- In the U.S. alone, the U.S. Bureau of Labor Statistics reports that the construction sector will need to add 700,000 new jobs by 2031 to keep up with demand.

As the construction industry is set for remarkable growth in the coming decades, the impending retirement of our aging workforce – nearly 40% of construction workers globally are over age 45 – highlights a critical skills gap. This gap often leads to project delays and increased costs.

"Every day I witness precast manufacturers battling the effects of labor shortages," remarked Derek Von Cannon, Afinitas Vice President of Sales. "One of their top concerns is how an unreliable labor market will impact their ability to manufacture quality products to meet customer demand."

According to Von Cannon, this concern along with others faced by producers, including maintaining profitability, increasing market share and fending off competing products, led to the formation of Afinitas' Prima 360 wetcast automation platform.

"A typical wetcast plant setup makes it nearly impossible to drive productivity," said Von Cannon, who has spent nearly 20 years in the industry. "There are just too many variables and no linear process flow that can be measured, analyzed and optimized." Von Cannon points out that one of the top principles of lean manufacturing is creating a flow and that's exactly what Prima 360 automation does for nearly every aspect of wetcast production.

The automated process flow of the Prima 360 system offerings allows precast producers to save on labor – sometimes up to 50% – increase throughput, simplify production planning, and provide the operations team with all the metrics they need to optimize their production processes at every level. It goes without saying that a 50% labor reduction over traditional wetcast operations can drive a rapid ROI and give producers a decisive advantage over the competition!

In Von Cannon's eyes, the power of Prima 360 helps alleviate the major pain points producers are experiencing, especially when it comes to finding labor. He emphasized it is not about replacing jobs: The issue is attracting and retaining talent.

"Today's workforce is more comfortable in front of a screen operating a controller, and Prima automation allows them to engage with production in an exciting new way," said Von Cannon. "Plus, rather than eliminating jobs, it empowers companies to use team members in new ways that increase their skills." This, says Von Cannon, will bolster the workforce and help precast concrete remain relevant, noting that the competition, like plastic producers, have very automated processes.

"Not only will producers be better off from a labor market standpoint, but they will also get more products to market better and faster," said Von Cannon.

The Afinitas Prima 360 platform, which launched in August 2024, leverages a wide range of technologies developed in-

The Afinitas Prima System with assembly-line efficiency.

house by Afinitas. The overarching goal is to provide wetcast automation that works for all types of factory layouts, product requirements, including polymer products, and budgets.

The Components of Prima 360

The Prima 360 platform is comprised of 4 systems: Prima (Afinitas' signature wetcast system for high-volume production), Prima Fit, Prima Base and Prima Scape.

Prima, first developed nearly two decades ago by Afinitas' HawkeyePedershaab brand, is a cutting-edge wetcast automation system designed to drive productivity by simplifying wetcast production. Prima uses a state-of-the-art production loop to produce nearly any type of infrastructural product. The Prima system ensures there are no wasted motions or time spent waiting. Each task is broken down into manageable bites at specialized workstations, resulting in maximum efficiency.

"With Prima, you're not bringing the tools and material to each mold. You're bringing the mold to the worker. It drastically reduces the labor input per piece, because of that assembly line efficiency," said Jason Banwart, Director of Technical Sales at Afinitas. "Each worker is doing a certain task at a certain station all day long, and that system is hitting cycle time all day long, so it really drives efficiency and drives down the labor content in every piece."

Specialized workstations on the Prima at Tindall Infrastructure in Spartanburg, SC.

In 2021, Tindall Infrastructure built its Spartanburg, South Carolina plant around the Prima system and was impressed by the way it allowed its team members to become experts at what they do rather than having a roaming crew move from form to form. They liked the fact that the materials required for the job were always at hand and there was no time wasted looking around for tools - a benefit to plant operations and the employee.

In addition, Prima didn't limit them to one type of product. Any form that fits on a tray can fit the system. The system is unique in that it can in many instances use existing form equipment. "We can mix old forms and new forms into one system, and with our new Afinitas forms we can design in a lot of great time-saving features to make it very quick and efficient to open the forms and get the products out," said Banwart.

Another benefit of Prima is its robust data collection capabilities. The cycle time for every task is logged whenever the button is pressed at each station. That data goes into a CSV file and is used to generate reports and dashboards to measure productivity.

In addition to labor savings, Von Cannon also pointed out that with Prima you'll have a cleaner and more comfortable factory. This, he says, results in a better work environment for your team which will help attract and retain employees. "Happier employees are typically more productive - but in addition to that they'll be safer too," he emphasized.

Prima Fit for Purpose

For producers who are not quite ready to invest in a full-scale Prima System, the team at Afinitas has introduced Prima Fit. This system, as the name suggests, is wetcast automation that scales to fit producer requirements. It's a powerful, yet economical option that utilizes vertical product stacking to maximize floor space. In addition, Prima Fit can be easily configured to produce specialty precast structures that would require extra space and set-up time on other systems.

Prima Fit is an economical way to automate.

Intuitive configurator allows limitless channel flow designs.

The Prima Fit technology was created by Afinitas' BFS brand and has been used for decades to produce a variety of architectural products. Over the years the technology has evolved to create an extremely efficient and effective system to streamline wetcast production. Prima Fit is ideally suited to produce products like median barriers, retaining walls, manhole products, road and railway products and many other specialty products.

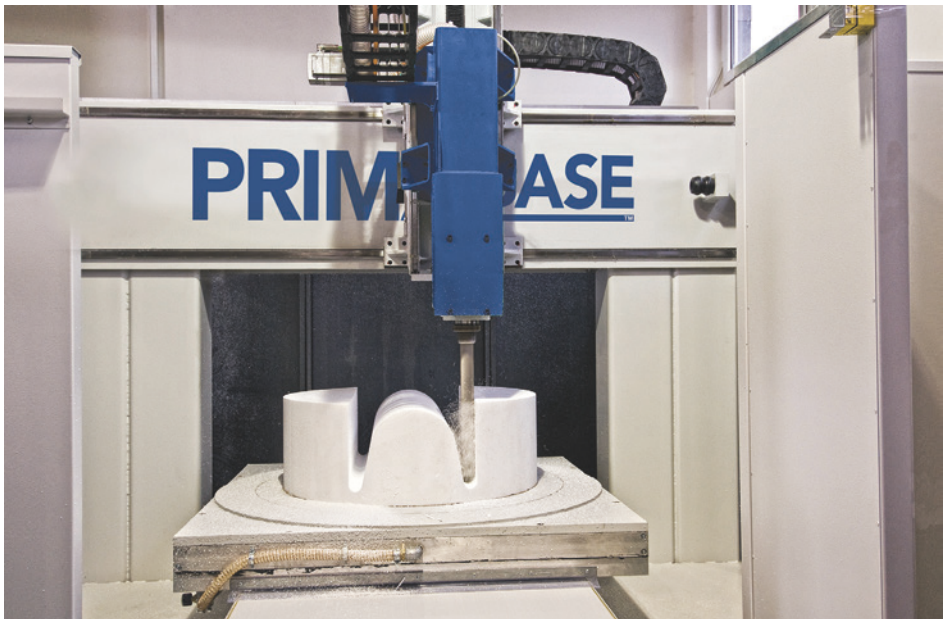
Prima Base Fixes Manhole Base Configuration Challenges

Prima 360 leverages a wide range of innovative technologies, both inside and outside of the production loop of its flagship Prima system. One example is the Prima Base system, a cutting-edge foam milling machine that enables producers to create customized monolithic manhole bases. With this machine, producers can create specially designed negative molds out of polystyrene blocks that ensure precise, defect free products in record time.

For producers, manufacturing to the proper specifications for a wide range of utility projects can be a serious challenge. As the bottommost portion of an inspection chamber, manhole bases are designed to make it easy to inspect and maintain sanitary and stormwater management pipelines.

Unfortunately, manhole bases are typically required in areas where multiple pipelines converge. They're often connecting pipes of different sizes, materials, gradients, and invert levels, and that means finding a one-size-fits-all solution is next to impossible.

Even if a base could accommodate the various connection types, channels must be formed between each pipe to minimize the risk of buildup and ensure pipelines remain un-



Prima Base precision CNC milling capabilities.

Prima Base's one-piece design simplifies the labor-intensive assembly process of monolithic manhole bases.

Prima Scape System for concrete slabs and veneers.

obstructed. Traditionally, these channels have been created manually through on-site benching – but this process is incredibly time consuming, labor intensive, and imprecise.

That's where Prima Base comes in. Prima Base's intuitive design software and milling process creates channel-forming molds out of a single piece of industry-standard EPS (expanded polystyrene) foam. Connection pieces, or side cores, are simply fixed to the main core top using self-locking principles.

This process for creating the entire flow-channel portion of the EPS core top in one continuous piece is special. Other systems require hot-wire cutting machines, careful gluing process, screws, tape, or proprietary-shaped foam pieces to create the channel negatives. With Prima Base, each channel configuration is milled to precise specifications based on engineer-approved drawings, ensuring a consistently Perfect fit and long-lasting performance.

Prima Base enables producers to manufacture fully customizable high-precision precast concrete bases designed to help their customers simplify installation, accelerate project timelines, and meet the unique needs of any project.

Prima Scape Offers Beauty and Precision in Wetcast Production

Rounding out the 360 offering is Afinitas' Prima Scape (formerly BFS Slabflex) system. Prima Scape draws upon decades of vibration technology to help producers create visually appealing and mechanically precise slabs, pavers, veneers and more. With one automated system, Prima Scape makes reproductions of natural stones, slate, granite, wood or terracotta in exact laying units for flooring, pool and fountain slabs, patios, deck slabs and other residential and commercial applications.

According to Afinitas Sales Manager Volker Nusser, customers were looking for a good technical solution that has the advantage of automating the production of products with many different surfaces and various dimensions. "With our Prima Scape technology, we have the ideal solution for commercial and landscaping products as well as guide system pavers for the blind – a growing demand in many parts of the world."

Prima Scape offers a high degree of flexibility and can produce sizes ranging from 20 x 20 cm up to 100 x100 cm with a maximum height of 25 cm. The heart of the system is its volumetric concrete feeder with automatic volume adjustment which allows for the very accurate filling of the molds. The slabs are compacted at the vibrating station according to precisely controlled, product-related vibration curves.

"Prima Scape is very modular and can grow with customer needs," said Nusser. Modules can include an automated demolding system, surface coating systems, a slab turner, mold cleaning station, packing station, and robotic stacking unit. There is also an option for a separate wet and drycast line.

"Our Prima Scape system is easy to clean," said Nusser. "But there is hardly any spillage during the feeding process since the molds are filled with such great precision." A special feature of the cleaning cycle is that the molds can be sprayed with release agent so that they can be easily demolded. To meet all needs, there is a variable adjustment on the spraying jets."

With Prima Scape, product color options are limitless whether it be two-tone, marbling or other effects.

According to Nusser, the system can be easily operated by three employees and is equipped with a state-of-the-art controller with convenient remote maintenance unit. He de-



A wide variety of effects can be achieved with Prima Scape technology.

scribes Prima Scape as the Perfect combination of beautiful visual effect, user-friendly equipment and strength. In fact, the polyurethane molds Afinitas makes for the system help ensure tear-resistance, dimensional accuracy and product durability.

Curing and Technical Know-How Too

Two more advantages Afinitas offers are its curing systems and its deep bench of global technical expertise. The Afinitas CurePak system is a direct-fired steam generator that can be used to cure any type of precast product. The CurePak is designed to ensure proper hydration of the cement resulting in the strongest concrete possible. It also uses up to 50% less fuel and water, offering cost savings as well.

Von Cannon also touts the advantage of working with a team of experts. "There are a lot of considerations that go into the planning of an automated system and determining the right system for your needs. You have to consider budget, plant footprint, product mix and a whole host of other factors," said Von Cannon. "Afinitas has a global team of engineers that love to dive into discussions about Prima products and how they can make your production more efficient."

Afinitas CurePak Curing System.

Automation is the Future

With offerings like Prima 360, Afinitas is betting that automation will propel its organization and the industry forward to solve workforce challenges and meet customer demand. Equally important is providing responsive service to support the market toward this end.

"Not only will the labor situation improve, but producers will be able to operate at a lower cost basis and maintain higher and more consistent quality," said Von Cannon. ■

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The principle of shrink formwork: Magnetic formwork solutions for damage-free demoulding

مبدأ قوالب الصب المنكمشة: حلول قوالب الصب المغناطيسية لإزالة القوالب دون إحداث أي ضرر

Since the mid-1990s, formwork solutions with integrated magnets have become established throughout the industry and since then numerous formwork systems have been developed for a wide variety of tasks. Many of these are now standard equipment in precast plants around the world. Ratec continues to be one of the market leaders when it comes to particularly complex formwork requirements with demanding framework conditions, such as in automated production. One of these complex requirements for a formwork solution can be that the formwork must shrink for the demoulding process in order to be released from the concrete safely and without damage.

منذ منتصف تسعينيات القرن العشرين، أصبحت حلول قوالب الصب ذات المغناطيسات المتكاملة حلولًا راسخة في جميع قطاعات الصناعة ومنذ ذلك الحين خضعت العديد من أنظمة قوالب الصب للتطوير لتلبية مجموعة واسعة من المهام. أصبحت العديد من هذه الأنظمة الآن معدات قياسية في مصانع الخرسانة الجاهزة في جميع أنحاء العالم. وتظل شركة Ratec إحدى الشركات الرائدة في السوق عندما يتعلق الأمر بمتطلبات قوالب الصب المعقدة بشكل خاص مع الظروف الإطارية الصارمة، كما هو الحال في قطاع الإنتاج الآلي. ومن بين هذه المتطلبات المعقدة لحل قوالب الصب ضرورة انكماش القوالب ليتسنى إجراء عملية إزالة القوالب ولكي يتم إخراجها من الخرسانة بأمان ودون إحداث أي ضرر.

The shrinkage principle is more familiar from the production of room modules, where the formwork core usually has to shrink in order to be able to lift the concrete body. However, there are also applications in the production of flat precast concrete elements.

As a rule, the following practical cases require a shrinkable solution:

- Concreting on both sides, with or without additional profiling on the formwork profile
- Shuttering of recesses without bevelled edges
- Shuttering of complicated profiles

As a leading manufacturer of magnetic formwork solutions, Ratec has already developed tried and tested solutions for these applications, which are presented below.

Shrink formwork suitable for robot concreting on both sides

Use of shrinkable window formwork in the vertical production of room modules

Robot-compatible shrink formwork for garden and landscape elements

High-quality, aesthetically pleasing elements for the design and embellishment of gardens and outdoor facilities place particularly high demands on surface quality and low fault tolerances on the production side.

Ratec was entrusted by a manufacturer with the task of developing a robot-compatible formwork that can be concreted on both sides and can be stripped on all sides without breakage, even when using chamfer strips. This is achieved by means of a shuttering profile with movable side panels that automatically fold down and shrink when lifted. The shuttering profile can therefore be lifted out without damaging the element, despite the chamfer strips on both sides of the base.

Shrinkable formwork for window and door recesses

Windows and doors are traditionally topics that can always pose challenges on the formwork side and are therefore often solved by the customer themselves on an individual basis.

One of the latest developments, particularly for vertical production in battery or room module moulds, is a shrinkable frame that can be used for door and window cut-outs. The solution was used for the first time together with the 3D mould kit for the production of room modules for a modular house project in Singapore. Other customers, including in Germany, are now using the shrinkable window formwork. The main area of application is the efficient shuttering of recesses in large quantities, especially for standard window sizes.

The steel frame is manufactured in the dimensions requested by the customer and consists of two halves and two separate corners. To demould, first remove the conical corners. The two halves of the window can then be mechanically shrunk together and removed. This enables damage-free demoulding. The process of shuttering and deshuttering is significantly accelerated. The solution is suitable for both vertical (battery mould or room module mould) and horizontal production.

The solution has now been supplemented with side parts that allow the size of the frames to be adapted to other lengths, which increases flexibility for the customer.

Damage-free demoulding thanks to the shrink principle, even with manual formwork handling

There is another very simple but effective solution for manual shuttering, which can also be categorised as shrink formwork in the broadest sense - the window corner. This is a corner bracket for fixing and damage-free demoulding of recesses that are clad with wood. The wood is mitre-sawn for this. The side sections of the recess formwork are inserted into the corner and fixed in place with a star grip quick release screw con-

Corner bracket for planking with wood for shuttering recesses

nection. After concreting, the screw connection is first loosened and then the formwork legs are pulled out upwards. The wood-planked corner remains in the element and can be removed at the end. It can be combined with all wood-planked formwork solutions, such as PSV, MST and Easy Form. The advantage: Both the window corner and the planked side sections can be reused several times before new planking is required. The element and formwork remain undamaged.

The continuous further development of magnetic formwork technology and the intelligent adaptation to both manual and highly automated production processes make Ratec a leading supplier in this field. One of the main strengths lies in the development of customised solutions for sometimes difficult problems, which in the best case scenario will later become a standard solution.

The company has also built up an extensive portfolio of room module formwork, which is now used for a whole range of products, including transformer stations, cable cellars, room modules for residential construction, sanitary blocks and lift shafts.

These and other solutions for efficient precast concrete element production can be experienced from 7 to 13 April 2025 at the Ratec booth in hall B1, stand number 348 at bauma Munich. ■

FURTHER INFORMATION

RATEC
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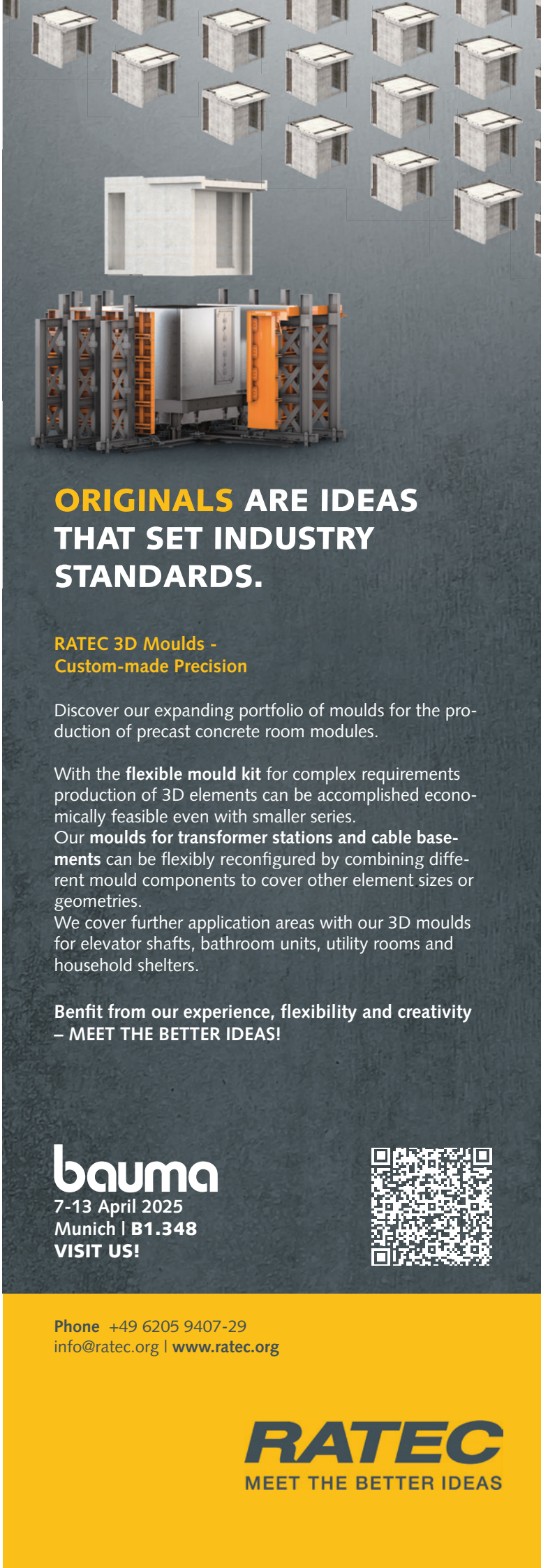


Eurobend GmbH, 90547 Nuremberg-Stein, Germany

Combining precision and flexibility: mesh welding lines with integrated universal bending modules and special mesh bending stations

الجمع بين الدقة والمرونة: خطوط لحام شبكية مزودة بوحدات ثني عالمية متكاملة ومحطات ثني شبكية خاصة

Eurobend GmbH offers a comprehensive line of automatic machines for all precast concrete applications: from entry-level welding machines producing simple reinforcement elements to complex equipment for the production of special mesh, engineering mesh, mesh with openings, mesh with bent line and cross wires and bent mesh into baskets.

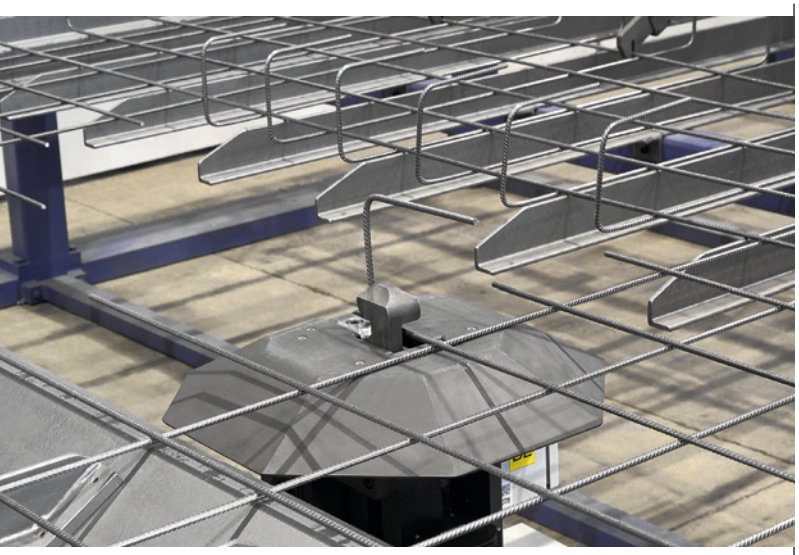
تقدم شركة Eurobend GmbH خطًا شاملًا من الآلات الأوتوماتيكية لجميع استخدامات الخرسانة الجاهزة: بداية من آلات اللحام الأساسية التي تنتج عناصر تقوية بسيطة إلى المعدات المُعقدة لإنتاج الشبكات الخاصة، والشبكات الهندسية، والشبكات المزودة بفتحات، والشبكات ذات الخط المنحني والأسلاك المتقاطعة والشبكات المثنية في السلال.

The Eurobend AMM series of mesh welding machines work from coil and offer highest flexibility at a very high level of automation without any changeover times. A number of innovations and unique design features make them the leading models on the market:

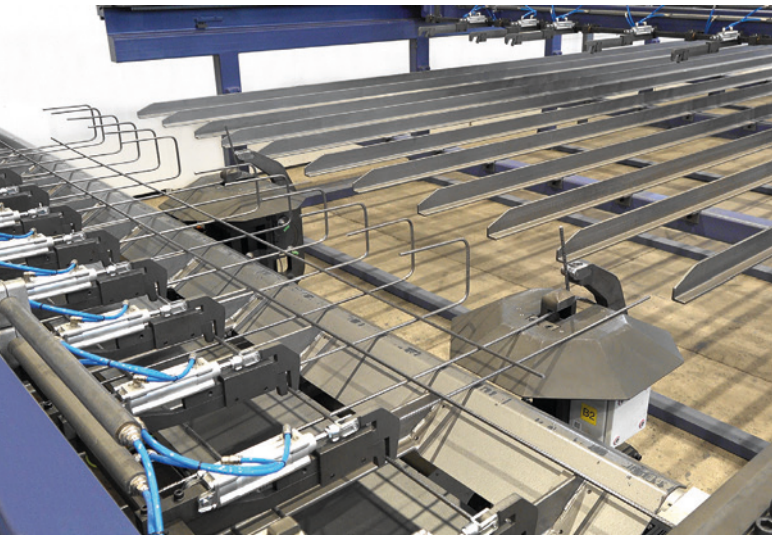
- Machines available processing diameters up to 12mm, 16mm and 20mm, cold drawn or hot rolled material, from coil.
- Depending on productivity requirements, the PL XY AMM models are available with one or two multi-point weld heads that weld up to six or twelve spot welds per cycle. For the highest productivity requirements, the PLC AMM models are available with up to 81 fixed weld heads. The PLC AMM models are by far the most productive in this category.
- Any type of mesh can be produced automatically, immediately and without changeover and idle times.

View of a PL XY AMM machine with two moving, multi-point welding heads

View of a PL XY machine with two integrated, in-line universal bending modules



Universal bending module



Synchronous working universal bending modules

Detail of bends

Paul
Maschinenfabrik GmbH & Co. KG

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✉ stressing@paul.eu

PLC AMM line with integrated universal bending modules, mesh buffer racks and distribution system on circulating pallets

Cage production with integrated, in-line mesh bender

- The line and cross wires are fed into the welding portal immediately by two separate Flexiline rotor straightening and cutting machines with maintenance-free 5G rotors each with eight hyperbolic rollers and with extremely fast diameter change system. The diameter change takes place in less than 3 seconds without mechanical moving parts. Depending on the model, up to six diameters can be processed.
- Direct feeding of the cross wires into the welding portal. The complicated, maintenance intensive and susceptible common cross wire feeding systems, where the cross wires have to be produced first and then the longitudinal wires, as it is the case in the lines with one straightening machine, are no longer necessary.
- Thanks to the innovative concept, the AMM machines are the most compact on the market and have a minimal floor space demand.

The machines are offered with unique precision bending systems:

- Integrated, in-line universal bending modules for bending up individually selected line and cross wires, even within openings. The sophisticated design, the drive with servo motors each and the advanced modern software make them the most technically superior in the industry. They are characterized by highest precision and speed. Two bends are performed in 2.5 seconds with consistently precise bending geometry.
- Integrated, in-line mesh bending stations for bending mesh into baskets.
- No idle times during production. During the bending process of one mesh the next one is already in production.
- Connection to master computer for the "Just-In-Time" production, synchronized with circulating pallet systems.
- The AMM welding machines require only one operator.

Additionally available optional systems include:

- Robotic transport systems for automatic transfer of produced mesh to circulating pallets.
- Mesh buffer and storage systems ■

FURTHER INFORMATION

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Peikko Group Corporation, 15101 Lahti, Finland

Strong connections in precast construction – the next generation of anchor bolts

الوصلات القوية في البناء بالخرسانة الجاهزة – الجيل القادم من مسامير التثبيت

With the increasing demand for strong connections in precast construction, Peikko presents the high-strength Hulco anchor bolt for bolted connections. The anchor bolts are used to securely anchor concrete or steel structures or machines in the foundation – usually foundations, ceilings, columns or walls. Due to their short anchoring length, they are ideal for use in thin components such as panels and beams.

مع تزايد الطلب على الوصلات القوية في عمليات البناء بالخرسانة الجاهزة، تقدم شركة Peikko مسامير التثبيت عالية القوة Hulco للوصلات المثبّتة بالمسامير. تُستخدَم مسامير التثبيت لتثبيت الهياكل الخرسانية أو الفولاذية أو الآلات بأمان في الأساسات - عادةً الأساسات أو الأسقف أو الأعمدة أو الجدران. ونظرًا لقصر طول جزء التثبيت بها، فهي مثالية للاستخدام في المكونات الرقيقة مثل الألواح والعوارض.

Peikko Hulco 30

As a CE-marked solution, Hulco anchor bolts have a tested, high load-bearing capacity for heavy-duty connections even in the most demanding anchoring applications. They are particularly suitable for industrial buildings such as warehouses, halls, dams and power stations. As a replacement for PPM L anchor bolts, Hulco anchor bolts are characterised by an optimised use of materials, which reduces transport and packaging costs as well as the overall environmental impact. ■

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Moldtech S.L., 41500 Alcalá de Guadaira (Sevilla), Spain

New hydraulic mould for precast bridge piers in a high-speed railway project in the UK

قالب هيدروليكي جديد لركائز الجسر الجاهزة في مشروع سكة حديدية عالية السرعة في المملكة المتحدة

Moldtech, a leader in the design and manufacture of equipment for the precast concrete industry, has taken a new step in its consolidation as a benchmark in the precast sector with the manufacture of a hydraulic mould for precast bridge piers. This equipment has been installed in the United Kingdom as part of the ambitious HS2 high-speed rail project, one of the most notable transport infrastructure initiatives in Europe. This new development represents a significant advancement in the way bridges and other complex structures are built on large-scale projects.

لقد اتخذت شركة Moldtech، وهي شركة رائدة في تصميم المعدات اللازمة لصناعة الخرسانة الجاهزة وتصنيعها، خطوة جديدة في تعزيز دورها باعتبارها مرجعًا رائدًا في قطاع الخرسانة الجاهزة من خلال تصنيع قالب هيدروليكي لركائز الجسور الجاهزة. وقد تم تركيب هذه المعدات في المملكة المتحدة كجزء من مشروع السكك الحديدية عالية السرعة HS2 الطموح، وهو أحد أبرز مبادرات البنية التحتية للنقل في أوروبا. يمثل هذا التطور الجديد تقدمًا كبيرًا في طريقة بناء الجسور وغيرها من الهياكل المعقدة في المشروعات الضخمة.

Strategic collaboration with Pacadar, a leading Spanish construction company

Pacadar Group is a leading company in Spain specialized in the design, construction and assembly of precast prestressed reinforced concrete. With an international presence in the United Kingdom, the Middle East, America and Australia, its extensive experience and technological leadership allow them to offer solutions for all types of structures, both in civil works and building. The company is distinguished by its ability to tackle complex projects, which has consolidated the trust of its clients in the precast concrete sector.

The collaboration between Moldtech and Pacadar marks an important advance in the infrastructure construction sector. Our client Pacadar, has a long history in the development of creative solutions for construction, has been a pioneer in the introduction of precast technologies in infrastructure projects both in Spain and in other international markets. This cooperation has made it possible to address a major technical challenge: the prefabrication of bridge piers, an element that is historically concreted in situ.

The advantages of prefabrication in terms of quality, speed and optimization have been key factors in the development of this project. While traditional construction of bridge piers requires long construction times and strict quality control at the construction site, the use of precast allows for greater control of processes in a more controlled environment, such as an industrial plant, ensuring higher quality standards and a significant reduction in production times.

Hydraulic mould for bridge piers

Production of bridge piers

Transportation of the precast element

Advanced technical solutions in the hydraulic mould

The hydraulic mould designed by Moldtech for this project has outstanding characteristics that differentiate it from other equipment available on the market. One of the main improvements is its ability to produce bridge piers of variable height, with considerable dimensions and weight, a crucial feature to adapt to the demanding requirements of the HS2 high-speed rail project. The mould is designed for pouring concrete in a position rotated 90°, which allows a more agile and safer operation compared to other traditional methods. Moldtech has manufactured, supplied and assembled a mould for precast piers at Pacadar Plant at the Isle of Grain, Kent, where precast elements for the Edgcote Viaduct are being produced. This project has been especially challenging due to the complexity of the mould, designed to produce giant piers (over 72 tons) with a curved surface and an architectural "fluted" finish.

Precast piers 72 tons

Precast bridge piers

Besides, the mould has a fixed base and hydraulic opening and closing movement of side moulds, which greatly facilitates the production process and reduces the time required to manufacture each piece. Likewise, the closing stoppers are adjustable depending on the different heights required for the bridge piers, which provides great versatility to the equipment.
The hydraulic system of the mould is one of the strong points of this development, since it not only allows a more fluid and precise operation, but also guarantees great robustness in the production of large concrete pieces. The minimum tolerances in the dimensions of the piers produced ensure exceptional quality, a key factor in the construction of critical infrastructure such as bridges within a high-speed railway line.

Additional tools to improve performance

In addition to the hydraulic mould, Moldtech has supplied the client with a custom-made tool for the production of the bridge pier reinforcements. This tool, designed specifically for this project, is essential to guarantee precision in the manufacturing of steel reinforcements, a key component in the structure of concrete piers. The combination of the hydraulic mould and this custom tool allows the client to optimize the entire production process, reducing errors and improving the overall effectiveness of the project.

Production at full capacity

The mould supplied by Moldtech is now fully operational at the client's UK facility, where bridge piers are being produced at a high rate to meet the demanding HS2 project deadlines. The finished elements are being installed quickly and precisely, which contributes to the advancement of the high-speed railway project, an infrastructure project of great importance not only for the United Kingdom, but also for Europe in general. This solution also minimizes the environmental impact of the works, by reducing the execution time on site and the waste generated during the construction process.

Moldtech in the precast industry

With a presence in infrastructure projects in multiple global markets, Moldtech continues to demonstrate its development of advanced solutions for infrastructure construction. This collaboration with Pacadar on the HS2 project reinforces its position as a reference supplier for projects of high technical complexity.

Moldtech has established its reputation thanks to its ability to adapt its products to the specific needs of each client, offering customized solutions that meet the highest quality standards and optimal results. With each new project, Moldtech continues to raise the standard in the precast concrete industry, contributing to the advancement of modern civil engineering. ■

FURTHER INFORMATION

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EQUIPMENT FOR PRECAST CONCRETE PLANTS

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Construx-Weckenmann, 8531 Hulste, Belgium

Fully adjustable lift shaft and box-culvert mould

عمود رفع قابل للضبط تمامًا وقالب عبّارة صندوقية

Being one of the world's most renown mould manufacturers, Construx Weckenmann developed over time a vast portfolio of moulds that suit precast manufacturers' needs. In close collaboration with the customer Construx Weckenmann tries to find the most appropriate mould which is in accordance with all technical specifications, which fits the customers' budget, and which copes with the dimensions and numbers of precast elements the customer wants to cast. For companies producing box-culverts, lift shafts or stair cores, Construx Weckenmann conceived many years ago a fully adjustable formwork system, the Flexbox. Soon the Flexbox became the n°1 mould for many of the major European precast culvert and shaft manufacturers. And in recent years, Construx Weckenmann supplied several Flexbox moulds to a large number of precast manufacturers all over the world, from the U.S.A. to New Zealand.

لقد طورت شركة Construx Weckenmann، كونها إحدى أشهر شركات تصنيع القوالب في العالم، بمرور الوقت مجموعة كبيرة من القوالب التي تناسب احتياجات مصنِّعي الخرسانة الجاهزة. فمن خلال التعاون الوثيق مع العميل، تحاول شركة Construx Weckenmann التوصل إلى القالب الأكثر ملاءمة الذي يتوافق مع جميع المواصفات الفنية، والذي يناسب ميزانية العميل، ويتواءم مع أبعاد وأعداد العناصر الجاهزة التي يريد العميل صبها. وبالنسبة للشركات التي تنتج عبّارات صندوقية أو أعمدة رفع أو قلوب سلالم، فقد ابتكرت شركة كونستروكس ويكينمان منذ سنوات عديدة نظام قوالب قابل للضبط تمامًا، وهو نظام "فليكس بوكس". وسرعان ما أصبح نظام "فليكس بوكس" القالب رقم 1 للعديد من المصنِّعين الرئيسيين لعبّارات وأعمدة الخرسانة الجاهزة في أوروبا. وفي السنوات الأخيرة، قامت شركة Construx Weckenmann بتوريد العديد من قوالب "فليكس بوكس" لعدد كبير من مصنِّعي الخرسانة الجاهزة في جميع أنحاء العالم، من الولايات المتحدة الأمريكية إلى نيوزيلندا.

The Flexbox is one of the most robust, reliable and multi-functional moulds on the market. Construx Weckenmann designed this new type of adjustable moulds to produce any type of shaft or core without ties through the concrete element. The system is suitable to make single and double lift shafts, stair cores and box culverts. The idea of the mould is to start with an adjustable base frame on which all components can be locked into position. The inside mould has 4 hydraulically retractable corners which, when connected without any infill panels, form the minimum shaft size. This size can be chosen at 1200mm x 1200mm, 1000mm x 1000mm or even at 900mm x 900mm.

When adding infill panels in between the inside corners, any other internal size can be achieved. Increments can be 250mm or 10mm or anything in between. The retractable

Typical setup of a Flexbox mould

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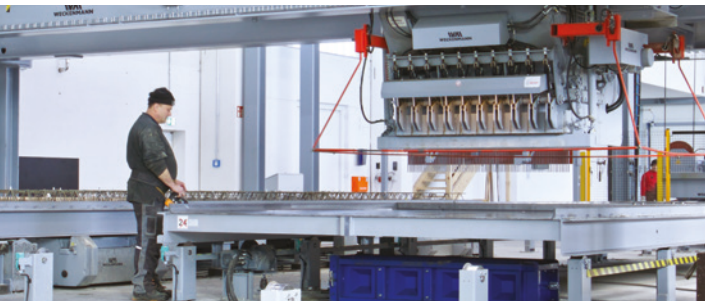
Machinery

Precast Moulds

Circulation Plants

On-Site Formwork



Shaping the Future of Concrete

construx.eu
weckenmann.com

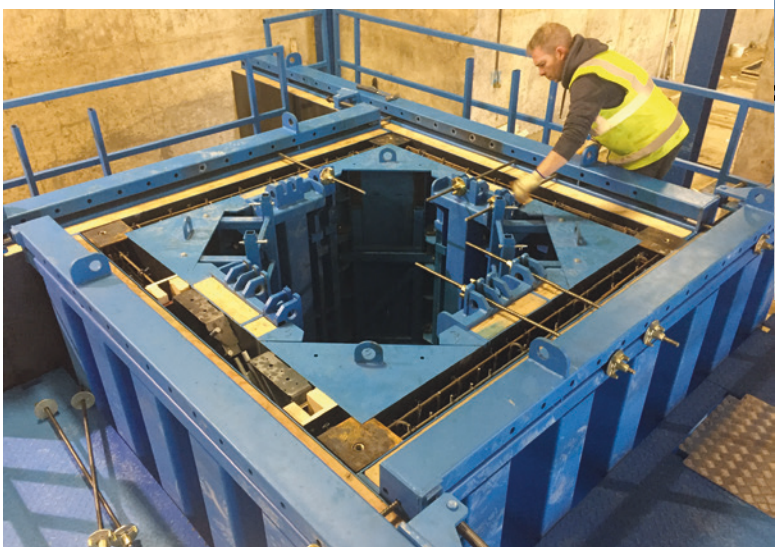
corners can feature a 90° angle (for lift shafts and stair cores) or can have a triangular chamfered corner (for box-culverts), or even a combination of chamfer and 90° angle. In case the mould is going to be used for lift shafts and stair cores as well as for box-culverts, the chamfered corners can have detachable top-up parts. The retractable corners can be operated by means of 4 individual hydraulic hand-pumps or with one single hydraulic group. Typical net heights of the moulds are 3m and 3,5m. By using modular inside and outside panels, the length and the width of the elements made in the moulds can be up to 7,5m x 4m, or even more.

After assembling the inside mould, steel bases are fit onto the base frame and against the inside mould. These bases sit on height adjusters and can have different widths, allowing various wall thicknesses for shafts and culverts. The continuous height adjustment system allows to finish the concrete on top of the mould at all times. The bases can be flat (for lift shafts and stair cores) or have a rebate (for box-culverts). The outside panels connect to each other in a hit and miss configuration. By doing so, any outside size can be achieved, no matter the increments of the inside mould. Outside panels and inside panels are connected to each other with spindles at the base and by means of tie-rods over the top of the mould. So, there is no need for ties through the concrete element, which results in a fair-faced and watertight finish.

Shaping the Future of Concrete

Construx Weckenmann meets the requirements of their customers, in order to obtain the most appropriate solution to manufacture their precast culverts and shafts. Construx Weckenmann is an engineering-driven manufacturing company relying on the commitment, creativity and experience of its employees. Their aim is to establish a partnership, rather than to be a supplier, in providing turnkey solutions for precast and on-site formwork issues. ■

Fixing rebar onto the inner core of the mould



Connecting the outside panels onto the inner core

Stair cores right after demoulding, showing a fair-faced concrete finish

FURTHER INFORMATION

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Bianchi Precast Group, 43045 Fornovo di Taro (PR), Italy

New production of precast architectural concrete panels in France

إنتاج جديد من الألواح الخرسانية المعمارية الجاهزة في فرنسا

Bianchi Casseforme has supplied a new tilting table and four new fixed tables to produce precast concrete panels.

لقد قامت شركة Bianchi Casseforme بتوريد طاولة مائلة جديدة وأربعة طاولات ثابتة جديدة لإنتاج الألواح الخرسانية الجاهزة.

Celtys is deeply rooted in the heart of Brittany, drawing strength from the region's heritage, values, and decades of expertise. As a subsidiary of the Quéguiner Group, Celtys has emerged as a pioneer and reference point in the construction sector, leveraging nearly 70 years of experience in the precast concrete industry. The company has built a solid reputation for designing, manufacturing, and marketing concrete solutions that cater to a wide range of construction projects. Celtys has become one of the national leaders in precast concrete, offering products that excel in functionality, durability, and aesthetics. Thanks to its advanced industrial processes and streamlined commercial operations, the company meets diverse customer needs–from the simplest construction requirements to highly specialized and complex concrete solutions.

Over the years, Celtys has developed more than fifty unique products, some of which are patented and created entirely in-house. Supported by a dedicated laboratory, a specialized Design Office, and the Methods Department, the company continues to push the boundaries of innovation. Its state-of-the-art manufacturing facilities enable Celtys to respond quickly and flexibly to client demands, making the company known for its professionalism and responsiveness. Celtys has steadily expanded its business beyond Brittany, supplying products across France, Eastern Europe, and selected international markets. Its team's dedication to customer service has made the company a reliable partner for clients at home and abroad.

In Brittany, Celtys products are distributed by trusted partners, Quéguiner Matériaux and Leader Mat. Moreover, Celtys has established a strong presence in national tenders, earning its status as a preferred supplier for major projects. These include tramway infrastructure in cities such as Nantes, Lyon, Le Mans, and Brest, as well as architectural and landscaping elements in places like Reims and Rennes.
To meet growing demand, Celtys has expanded its production network across Brittany. Today, the company operates 13 ready-mix concrete plants, 6 concrete product factories, and 1 Rexlan polymer concrete factory. This broad network ensures that Celtys can efficiently supply its high-quality products to a wide range of clients and projects, maintaining its leadership in the construction sector.

Concrete distribution machine Speedy from 2014

Tilting table

Celtys has decided to expand part of its production by choosing Bianchi Casseforme s.r.l as a partner for the supply of a new tilting table and four fixed tables for the production of precast architectural concrete panels. Already in 2014 the company had collaborated with Bianchi Casseforme for the supply of concrete distribution machines Speedy with a hopper capacity of 4 m³.

Bianchi Casseforme S.r.l is one of the leading international companies in the design and construction of plants and machinery for concrete prefabrication. Thanks to the experience and know-how acquired in their decades-long history, they can boast of offering a vast range of fully automated products and services with the quality and reliability of Made in Italy.

Four fixed tables

Supply

Tilting Table for the production of precast concrete panels with a length of 9,5 m and width of 4,6, made with 10mm thick sheet steel and stiffened using structural profiles. The structure is positioned on neoprene anti-vibration supports and is equipped with a fixed lower edge of 25 cm with a flat shape without chamfer and 6 electric vibrators (0-200 Hz 400V) with support plates welded to the mold. The table tilting mechanism involves rotating the table around a fixed point using telescopic hydraulic cylinders, allowing for easy removal of the panels from a vertical position once the concrete has cured. These cylinders are activated by a hydraulic power unit equipped with pumps, electric motor, and control elements.

Four Fixed Tables for the production of precast concrete panels with a length of 6,1 m and width of 3,1 made with 8mm thick sheet steel. The structures are positioned on neoprene anti-vibration supports and equipped with 4 electric vibrators (0-200 Hz 400V) with support plates welded to the molds.

The supply is completed with two electronic frequency converters calibrated for the simultaneous work of 6 vibrators. ■

FURTHER INFORMATION

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