

MC aktiv

THE MAGAZINE OF
MC-BAUCHEMIE 2-2024

MAIN FEATURE
**CEMENT-FREE INTO
THE FUTURE | 8**
MC research focusing
on sustainable construction

BIG PICTURE
'FOUR QUARTIER' | 4
Mega project changing Frankfurt's skyline

SUSTAINABILITY
CLIMATE-POSITIVE CONCRETE | 12
The more concrete, the less CO₂

BEST PRACTICE
A 42 BRIDGES IN DUISBURG | 17
Rehabilitation in record time





Ladies and Gentlemen,

The innovative ideas of today can become the standards of tomorrow – as we ourselves have proven time and again with our product developments over the past 60 years. And now, with our cement-free building materials, we are once again heading for a breakthrough.

We have been researching cement-free building materials for many years in order to meet the changing requirements of the construction industry. Cement may still be indispensable, but given its high carbon footprint, the demand for innovative alternatives such as our cement-free concretes and mortars is increasing, offering as they do CO₂ savings of up to 75%. Indeed, our expertise is in demand in many areas: from climate-positive concrete courtesy of the company Bton to large residential buildings as exemplified by the Norderstedt project, and from innovative applications such as 3D-printed buildings to advancements in the production of paving stones, roof tiles and bricks. We show that cement-free alternatives are not just possible, but also both feasible and vital for the future, thus taking sustainable construction to a new level going forward. Read more about this, both in our main feature and in the Sustainability section.

Once again in this issue of MC aktiv we offer an engaging mix of news, innovations, inspiration and project reports. So we hope you enjoy the read!

Kindest regards,

N. Müller
Nicolaus M. Müller

CONTENTS

03 | IN BRIEF

MC-Bauchemie establishes new company in Canada

MC workforce exceeds the 3,000 mark

04 | BIG PICTURE

Mega project: The 'FOUR Quartier'
Major urban development featuring pioneering architecture changing Frankfurt's skyline

06 | INNOVATION

Efficient and precise AAC concrete production with the MC-AirTec process

Emcephob Effect – Clear protection for fair-faced concrete

Colour variety for renders and plasters with MC-Pigment M

07 | INSPIRATION

Fantasy worlds created with sculpting mortar

For more than 40 years, Berlin-based Uwe Thürnau has been creating artificial animal worlds in zoological gardens using MC's sculpting mortars. His art can now be seen in a book.

08 | MAIN FEATURE

Cement-free into the future – MC research focusing on sustainable construction

For years, the issue of sustainability has played a key role in the construction industry – and cement manufacturing in particular is increasingly becoming the focus of endeavours in this regard due to the problem of the CO₂ emissions for which it is responsible. The development of cement-free building materials should help to significantly improve the entire industry's carbon footprint going forward. MC is at the forefront of research in this area and is already developing tomorrow's standards for today with new technologies and sustainable solutions.

11 | INTERVIEW

In the spotlight: Dr. Stephan Uebachs
The managing director of the engineering firm Brameshuber + Uebachs Ingenieure GmbH offers insights into his work.

12 | SUSTAINABILITY

Climate-positive concrete from Bton
Specialist prefabricator Bton Fertigteilwerk GmbH has developed a new process enabling precast concrete that binds more CO₂ than is generated during its production.

13 | BEST PRACTICE

Major project: Eastern North-South Expressway in Vietnam 13
MC's tunnelling expertise accelerates construction progress.

Mollinary stone bridge in Croatia sustainably rehabilitated 14
150-year-old bridge visually enhanced and structurally strengthened.

Challenging repair of an underpass in Switzerland 15
An underpass was fully refurbished and coated while remaining in service.

Rapid concreting of a bridge in Poland 16
Special concrete mix design and logistics enable full concrete pour in one day.

A 42 bridges in Duisburg rehabilitated in record time 17
Despite the pandemic and supply bottlenecks, four bridges on Germany's A 42 motorway were renovated in record time.

18 | IN-COMPANY

Portrait: Kai Markiefka 18
Product Manager for sustainable construction chemicals

Introducing: Aline von Gradowski 18
From trainee to Global Supply Chain Manager

Personnel news 19

MC welcomes 15 new apprentices 19

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Credits and legal

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MC-BAUCHEMIE ESTABLISHES NEW COMPANY IN CANADA



Effective 30 April 2024, MC founded a new company in Canada based in Newmarket, near Toronto, serving to further expand its North American activities. And Alexandre Mondrous has been appointed Managing Director of MC-Bauchemie Canada Inc.

This enabled him to build up a customer base with a small team and make the 'MC' brand known, particularly in the areas of structural, component and soil injection. Markus Treinen, MC's Technical Director North America, assisted Mondrous with a particular focus on technical support and market development.

MC extends North American footprint

Alexandre Mondrous (55), who had already worked as Managing Director for MC in Eastern Europe for more than 20 years, moved to Canada in 2018 for family reasons and began to develop

"The establishment of the company in Canada is the next important step to build a sustainable and profitable business in North America and to grow further on the North American continent,"

explains Alexandre Mondrous, Managing Director of MC-Bauchemie Canada Inc., adding: "Our goal is to become the technology leader for grouting and one of the top 3 market leaders in Canada in the coming years in order to create a solid foundation for further activities and the introduction of additional product lines on the North American market." The Newmarket site will act as a regional hub in this endeavour.



Further information can be found on our website:
<https://bit.ly/3AmSI4d>



MC WORKFORCE EXCEEDS THE 3,000 MARK



The MC Group reached an important milestone in April and passed the 3,000 employee mark worldwide. The photo with MC managers was taken on 13 June 2024 at the MC Cafeteria in Bottrop, an MC-internal international strategy conference.

Mega project: The 'FOUR Quartier' 'FOUR' PROJECT CHANGING FRANKFURT'S SKYLINE

From 2025, the heart of the banking district of the metropolis of Frankfurt am Main will be beating in the new 'FOUR' quarter. This major urban development project is changing the skyline of the city with its pioneering architecture. Since 2019, four skyscrapers up to 233 m high with 600 apartments, plus extensive office space and several hotels, have been under construction in an exciting project that will add life to the district with new restaurants, retail outlets and green islands. And main contractor GP-Con GmbH of Frankfurt sourced an extensive range of products from MC for this mega undertaking. Among other things, the rather unusual use of the special resin MC-DUR TopSpeed ensured optimum construction progress with minimum downtime, even under adverse weather conditions. Also applied in the project were speciality products such as grouting concretes and grouting mortars from the Emckrete range, the Nafufill mortars and the polymer-modified coarse and fine fillers from the Emcefix Spachtel G and F product families.

A broad selection of MC products was widely used on the FOUR site to perform specific construction tasks, thus contributing to the project's on-schedule completion. Occupation of the four towers will begin at the end of 2024, with full completion scheduled for 2025 after the final finishing touches have been applied, enriching the Frankfurt cityscape as a new landmark.



You can find the detailed project report on our website:
<https://bit.ly/4dRXIC2>



EFFICIENT AND PRECISE ACC CONCRETE PRODUCTION WITH THE MC-AIRTEC PROCESS



The foam produced with the MC-AirTec generator features highly stable micro-air voids which are introduced prior to injection into the premixed concrete.

The MC-AirTec process from MC-Bauchemie enables the precise and efficient production of air-entrained concrete (aka autoclaved aerated concrete or AAC) with an even distribution of air voids.

There are a number of factors that influence the production of AAC concrete of exposure classes XF2 to XF4, making it difficult to precisely control the air injection process and achieve the required

air void content. In contrast to conventional methods, in the MC-AirTec process the air-entraining agent Centrament AirTec is first fed through the MC-AirTec generator, with foaming taking place within the appliance. This fine foam contains very stable micro-pockets, which are then introduced into the premixed concrete, enabling fast and even distribution. In this way, the required quantity of air voids is precisely adjusted and a high-quality aerated system is created in the concrete, one that offers outstanding characteristics (density 300 and air void spacing factor).



Your contact



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EMCEPHOB EFFECT – CLEAR PROTECTION FOR FAIR-FACED CONCRETE



MC now offers the new Emcephob Effect system to optimally protect exposed concrete from external influences such as water, dirt and deposits. In combination with MC's concrete cosmetics and concrete re-touching solutions, these products help ensure the long-lasting durability of fair-faced concrete.

The Emcephob Effect system comprises two variants: Emcephob Effect G for a glossy effect and Emcephob Effect M for a matt effect on exposed concrete. Both

can be easily applied crosswise with a roller after the surface has been primed with Emcephob Effect Primer. Transparent, hydrophobic and film-forming, both variants reduce the water absorption of the concrete, while at the same time being open to water vapour diffusion; they further inhibit carbonation and are UV- and weather-resistant – for an optimally protected and durable fair-faced concrete finish.

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COLOUR VARIETY FOR RENDERS WITH MC-PIGMENT M

Renders and plasters play a decisive role in the aesthetic design of interiors and exteriors. The new MC-Pigment M from MC-Bauchemie opens up unlimited colour design possibilities for façades and rendered/plastered surfaces.

wide range of applications – from heritage conservation in churches, palaces, castles and ancestral homes to urban design and private households. Application is extremely simple: The pigment is supplied in precisely dosed sachets, stirred into the mixing water and then simply mixed with the render or plaster.

Your contact



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FANTASY WORLDS WITH SCULPTING MORTAR – SHOWCASING THE ART OF UWE THÜRNAU

For more than 40 years, Berlin-based Uwe Thürnau has been creating artificial animal worlds in zoological gardens using sculpting mortars from the MC-RockMortar product family. Now a new book 'Animal Backdrops for Zoos, Museums and Exhibitions' showcases the work of the artist in impressive manner.

Uwe Thürnau's fantasy environments are known worldwide. With his detailed sculptures, he creates unique worlds for lions, monkeys, penguins and more. In 2018, for example, he designed the rock sceneries in the 'Polarium' (showcasing polar bears, penguins etc.) at Rostock Zoo, and in 2021 those that can now be seen in the big cat house at Berlin Zoo. His new book 'Tierkulisen für Zoos, Museen und Ausstellungen' (Engl.: Animal Backdrops for Zoos, Museums and Exhibitions, DOM Publisher, edited by Natascha Meuser) offers numerous wonderful images and descriptions of his impressive work. Extensively illustrated are the various aspects of designing realistic and aesthetically pleasing animal enclosures that both fulfil the occupants' needs and fascinate visitors. "A book like this had long been my dream," says the Berlin artist, who had previously never found the time to write it. "So when publishers DOM approached me with Natascha Meuser's idea for the work, I was delighted." Thürnau has collected extensive photographic material for the book and reports on his work in engaging detail. The book comprises 232 pages with 430 illustrations and is now available (in German only) in bookshops and online.

Artistic environments with MC-RockMortar

For his fantasy worlds, Thürnau uses sculpting mortar of the MC-RockMortar product family from MC-Bauchemie. It can be used to authentically recreate rocks, walls, trees, exotic buildings, temples and artistic sculptures. There are no limits to the level of creativity possible with this medium. "Back then, we were looking for someone who could supply us with a mortar that was easy to work with and could be modelled well," says Thürnau, explaining the beginnings of the collaboration with MC, which has now lasted for over 30 years.

Easy application – authentic look

The MC-RockMortar line comprises three microsilica-modified sculpting mortars that can be easily applied by hand or by wet-spraying and are well suited to delicate and intrinsic detailing. They also impress with their resistance to high temperatures, freeze/thaw cycling and de-icing salts coupled with an authentic-looking ageing process, which gives Thürnau's artificial animal worlds a timeless and realistic appearance.

BOOK PRIZE DRAW – BE IN IT TO WIN IT!

Send us an e-mail with the subject 'Animal Backdrops' to info@mc-bauchemie.de for a chance of winning 1 of 5 books!

Closing date: 15 October 2024. Good luck!





CEMENT-FREE INTO THE FUTURE

MC research focusing on sustainable construction

For years, the issue of sustainability has played a key role in the construction industry – and cement manufacturing in particular is increasingly becoming the focus of attention due to the CO₂ emissions that it causes. The development of cement-free building materials should help to significantly improve the entire industry's carbon footprint going forward. MC is at the forefront of research in this area and is already developing tomorrow's standards for today with new technologies and sustainable solutions.

Nothing works in construction without concrete: Around 14 billion m³ of concrete are used worldwide every year. This requires cement. During its production, CO₂ is released as a result of the conversion of natural carbonate into clinker, with additional energy then required to calcinate (burn) and grind the clinker to form cement. In 2023, an estimated 4.1 billion metric tons of cement were produced worldwide. Cement production released almost three billion metric tons of CO₂ – and therefore currently accounts for around eight percent of total man-made carbon dioxide emissions. Significantly, up to 95 per cent of concrete's global warming potential is dominated by the CO₂ emissions associated with cement production. In order to achieve the European Union's Paris climate targets and thus climate neutrality by 2050, the construction sector must drastically reduce its emissions over the next two decades. In this context, building owners are also increasingly focussing on sustainable construction and striving for the best possible DGNB or similar sustainability certification for their buildings. Large companies and local authorities in particular are stepping up their efforts to save CO₂. As a result, interest in cement-free concretes is growing continuously – throughout Europe.

The path to net zero: Cement-free concrete

Research into alkali-activated binder systems as cement substitutes has been going on for more than 100 years. Since the 1970s, research into geopolymers as binding agents has been intensified. However, a real breakthrough has only recently been achieved by the Australian company Wagners with EFC® (Earth Friendly Concrete®), a geopolymer binder based on secondary raw materials such as blast furnace slag and fly ash. EFC® contains no cement and therefore causes significantly lower CO₂ emissions. Instead, blast furnace slag from pig iron production or other clinker substitutes are used. Special activators and concrete admixtures are added, which come from MC and are customised to the individual application. However, Earth Friendly Concrete® is by no means just a 'concrete substitute' – but rather a new building material with a number of specific advantages. The absence of cement in the concrete mix means a reduced amount of calcium hydroxide and therefore less reactivity with other materials. This results in a more resistant concrete, especially to chemical attack

(exposure class XA3). As a result, there is generally no need for additional coating or lining of components. In addition, cement-free concrete has a CO₂ footprint that is up to 75 % lower than conventional concrete.

MC-Bauchemie performing pioneering work

MC has already been heavily involved in furthering the product maturity of Wagners' EFC® with its Research & Development department working on the concrete formulation and developing special activators and superplasticisers to achieve the application properties required for efficient EFC® installation. The resulting geopolymer concrete mix is also, in the final analysis, the result of ten years of development work at MC. In a first major project in 2014, EFC® concrete was used in the expansion of Brisbane Westwellcamp Airport – for 51,000 m² of heavy-duty pavements in the provision of turning pads and taxiway areas, as well as for the foundations and wall slabs of the terminal building. And in this project alone, around 8,800 metric tons of CO₂ emissions were saved through the use of EFC®.

EFC® with German Institute of Building Technology (DIBt) approval

Under reference Z-3.15.2157, the German Institute for Building Technology (DIBt) issued a general building approval (AbZ) for the first time for EFC® as an alternative for precast concrete elements. This laid the foundation for the first German production of a cement-free binder compound by Holcim Deutschland GmbH. MC also played an important role here, as the compound made from secondary raw materials such as slag or ash produced as mineral by-products in other branches of industry, can only fully replace cement thanks to the activator developed by Wagners and MC. Moreover a high-performance superplasticiser series that is ideal for use in geopolymer concrete – namely MC-PowerFlow 4100 – was developed in the MC laboratories in Bottrop. This flow-enhancing product has been specially approved for binder combinations of ground granulated blast furnace slag and fly ash and ensures strong liquefaction with economical dosing. The specific functional mechanism enables the production of high-performance cement-free concretes with excellent application properties and without segregation and bleeding.

Major project with MC-PowerFlow 4100

Earth Friendly Concrete® was used on a large scale between 2023 and 2024 in Norderstedt for the 4HÖFE new-build project. This involved around 300 apartments being built on four construction sites in the city centre. In order to examine the potential for reducing CO₂ emissions in social housing in more detail, blu – Gesellschaft für nachhaltige Immobilienprojekte mbH, a subsidiary of Hamburg-based AUG. PRIEN Bauunternehmung (GmbH & Co. KG), had 71 climate-friendly social housing units built on one of the four construction sites using a timber frame construction method combined with geopolymer concrete – a construction method that gave the project showcase status throughout Germany (as reported in MC aktiv 3/23). Here, too, the high-performance superplasticiser MC-PowerFlow 4100 was the first choice for the cement-free concrete so as to optimise the application properties both for the precast elements from prefabricator fdu GmbH & Co. KG, and for the ready-mixed concrete, which was produced in co-operation between Betonlift GmbH & Co. KG and Betonlabor Süderelbe GmbH & Co. KG, with a view to ensuring accurate formulation of the concrete. The result not only impressed the client: Compared to reference concretes based on cement as a binding agent, the EFC® resulted in CO₂ savings of up to 75 %. This is also confirmed in terms of global warming potential (GWP), as determined by a life cycle assessment (LCA) conducted by certification agency KiWA.

Sewerage system constructed using next.beton

Zementrohr- u. Betonwerke Karl Rösler & Sohn GmbH is also capitalising on the development of cement-free concretes. Together with Berding Beton GmbH and Finger Baustoffe GmbH, this Mundelsheim-based company is launching its next.beton piping onto the market as 'Germany's most climate-friendly sewerage system'. The next.beton products are made from a cement-free geopolymer concrete instead of conventional concrete. Here too, MC-Bauchemie was able to successfully shape the associated product development and optimisation. The cement-free concrete technology not only offers considerable CO₂ savings potential of up to 75%, it also conserves primary raw materials – without any impairment to the technical and structural qualities of the product. On the contrary, in fact: The pipes made

The 4HÖFE new-build project by blu – Gesellschaft für nachhaltige Immobilienprojekte mbH, a subsidiary of AUG. PRIEN Bauunternehmung GmbH & Co. KG, involved the construction of some 300 apartments in Norderstedt between 2023 and 2024. One of the focal points of the project was the use of Earth Friendly Concrete® (EFC®), an environmentally compatible geopolymer concrete that requires no cement and can save up to 75 % CO₂. This was used on one of the four construction sites on which 71 climate-friendly social housing units were built using a timber frame construction method – giving the project showcase standing throughout Germany. In order to achieve the necessary properties for the cement-free concrete, the expertise of MC-Bauchemie and the high-performance superplasticiser MC-PowerFlow 4100 were required.



MC has been driving the development of cement-free alternative products in numerous areas in the construction sector for many years with an experienced team of experts. These include, from left to right: Dr. Jörg Stank (Director Corporate Development & BU Tunnelling), Julian Fleige (Application Engineer), Dr. Max-Fabian Volhard (Chemist), Dr. Karsten Koppe (Laboratory Manager for Mineral Building Materials), graduate mineralogist Eugen Kleen, Dr. Florian Beyer-Wittkamp (Laboratory Manager, Polymer Synthesis – inter alia for admixtures for cement-free concretes), John van Diemen (Director of Research & Development), Anton Martin (Chemical Engineer), Kai Markiefka (Product Line Manager) and Dirk Uhlmann (Materials Specialist, Tunnelling business unit).

from next.beton are characterised by high resistance in accordance with exposure class XA3 and can thus be used without the additional protective measures that would otherwise be required.

3D printing: Houses from the printer with EFC® technology

We are currently experiencing a step into the future of construction with 3D printing involving concrete as the core material. Instead of being built brick by brick, houses are created using a 3D printer. They not only look good with their sometimes futuristic touch, they are also extremely cheap and quick to build. The potential for this construction technology is currently regarded as being streets ahead of any other process. And advancements in Germany are occurring at breakneck speed: In Beckum, Westphalia, the first Tiny House from the printer has been created with cement-free concrete – with MC-PowerPrint GeCO₂, a cement-free binder-based mortar for 3D concrete printing. Planning engineers MENSE-KORTE from Münsterland and Röser GmbH from Laupheim, which specialises in 3D-printed prefabricated parts, drove this pioneering construction project together with MC. The task assigned to MC's experts was to develop a product in the shortest possible time that offered both the required properties, such as those relating to strength, and the processing behaviour

necessary for 3D concrete printing – while also significantly reducing the carbon footprint of the overall process. The result after just one year: MC-PowerPrint GeCO₂, a mortar for 3D printing. As MC-PowerPrint GeCO₂ can also be used with an additive system of granulated blast furnace slag and fly ash as an alternative to cement, up to 70% of CO₂ emissions can be saved compared to cementitious mortar products. MC-PowerPrint GeCO₂ offers ideal thixotropy for this technology, i.e. the mortar is liquefied under the influence of energy, for example when pumped by the printer, and is therefore easy to pump and mould, but becomes stable once the mechanical influence is absent. This results in a fine, uniform printed shape that undergoes no deformation from the effects of its own weight, even after several layers of printing.

Research and development at MC

The issues of sustainability and carbon footprint in the construction industry will become increasingly important as the pressure on society to achieve the Paris climate targets grows. There is thus an acute need to develop pioneering solutions – both to better utilise existing resources and to further reduce energy consumption in the production of essential building materials. MC is therefore driving forward the development of cement-free alternative products in the construction sector and is working with a highly

specialised team of experts on the research and development of environmentally friendly alternatives (see photo left). MC also has a long-standing collaboration with Dr. Stephan Uebachs of the Aachen-based building materials consultancy Brahmeshuber + Uebachs beratende Ingenieure für Baustofftechnologie. The engineering firm has accompanied the institutional measurement and approval procedures implemented since the start of EFC® development (see interview on p. 11).

CO₂ reduction not just in concrete

The experts at MC are working on combining new technologies and sustainable solutions in order to reduce or even eliminate cement consumption in as many areas as possible. MC's portfolio ranges from special cement-free applications such as annular space grouting mortar in tunnelling, surface protection systems, solutions for waterproofing buildings and the world's first cement-free moisture control render, to 'everyday' building products such as cement-free mortars or clinker-reduced systems for floor construction. The latter are already being successfully marketed by Botament, a sister company of MC, under the brand name BotaGreen. Moreover, all BotaGreen products carry the EC1PLUS mark, the highest possible EMICODE® seal of approval within the product classification for low-emission installation materials and building products.

Eyes cast to the future

Already on the horizon are further projects likely to form an integral part of everyday construction site life in the near future. These include innovative paving stones and roof tiles, for which MC has developed a functional, semi-dry, cement-free formula for production of the core concrete. Such alkali-activated building materials also offer real added value for these stoneware products: They achieve higher strength values than concrete, are more resilient and, unlike conventional paving products and roof tiles, are not prone to limescale (aka chalk) efflorescence.

The innovations and solutions presented here show that the range of cement-free alternatives available for building materials is becoming ever more diverse. It is also becoming increasingly clear that important contributions can be made in the construction sector to significantly improve the carbon footprint of the entire industry and thus assist in securing the future of mankind. Whether Earth Friendly Concrete®, geopolymers, 3D printing or the replacement of cement in other building materials, MC's ongoing research and development effort is helping to meet the increasing demands of the construction industry with innovative and sustainable solutions. With cement-free products and technical support from experienced experts and consultants, MC plays a leading role in the field of sustainable building materials – and is already developing tomorrow's standards today.

Your contact



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Sustainability aspects becoming ever more key

IN THE SPOTLIGHT: DR-ING. STEPHAN UEBACHS

“The carbon footprint is taking on an increasingly important role in construction material development.”

Dr.-Ing. Stephan Uebachs

Dr. Stephan Uebachs has been involved with building materials since he was a child in his parents' manufacturing business. A Doctor of Civil Engineering, he has been working in the construction industry for 40 years. In 2008, he founded the materials science consultancy Brahmeshuber + Uebachs Ingenieure GmbH in Aachen, which he runs as its managing partner. The building materials technologist and publicly appointed and sworn expert of the Aachen Chamber of Trade and Industry for concrete, masonry, tiles and natural stone gives us an insight into his work.

How long have you been working in the construction industry and how has it changed during this time?

My parents had a manufacturing business, so I have been involved with building materials since I was a child. I have now been working in the construction industry for 40 years. When I started my doctorate in 1998, I specialised in building materials technology. Over the years, very extensive changes have taken place in this field. At the beginning of my work in building materials development, the focus was on increasing quality and efficiency while optimising costs. Sustainability aspects were only taken into account in terms of building material durability. The carbon footprint of a building material or construction method was not given any kind of consideration. This has completely changed today. The amount of CO₂ generated during the production of building materials is becoming increasingly important in the development of those materials and will become ever more key in the future.

What sort of projects do you mainly handle?

In our engineering firm, we deal with two major fields of endeavour. First, there's damage analysis

and repair. Here I work as a publicly appointed and sworn expert for concrete, masonry, tiles and natural stone. The second area is the development and approval of building materials, mostly as part of publicly funded research projects, and in particular in relation to approval procedures initiated by the building materials and construction industry.

What approval procedures are we talking about?

Those related to non-regulated construction products that deviate significantly from the Technical Building Regulations or for which there are no such regulations or generally recognised rules. These therefore do not have any proof of suitability for use in areas regulated by the building authorities.

There are essentially two ways of obtaining such proof of suitability. The first option – in Germany – is to apply for a general technical approval (AbZ) from the German Institute for Building Technology (DIBt). The second option is to apply for approval for a specific project (ZiE) from the respective higher building supervisory authority of the federal states; this then only relates to, and is exclusively valid for, that specific building project.

What are the criteria for obtaining a ZiE project-related approval?

Our engineering firm very frequently provides expert opinions for ZiEs covering unregulated construction products as also in the case of the cement-free concrete used for the 4HÖFE project (Editor's note: see page 8).

In these circumstances, it must be proven that the product concerned fulfils not just the technical requirements, but also those relating to health and safety at work and environmental protection. This proof is usually provided by means of verification concepts that include, for example, tests performed on the building material.

What are the biggest challenges when applying for a ZiE project-related approval?

As recognised experts, we are required to develop the verification concepts and propose them to the responsible building supervisory authorities in such a way that the corresponding verifications can be provided and safe practical use is guaranteed. This is often complex, particularly in the case of new products, as there is no experience to fall back on for these products.



Dr. Stephan Uebachs

“In our engineering firm, we deal with two major fields of endeavour. Firstly, damage analysis and repair, and secondly, the development and approval of building materials.”



Climate-positive concrete from Bton

THE MORE CONCRETE, THE LESS CO₂

Prefabricator Bton Fertigteilwerk GmbH, founded in 2021, has succeeded in developing the building material of the future. At the end of April 2024, Bton opened Germany's first state-of-the-art plant for ecologically optimised and climate-positive concrete in Soltau, in Germany's Lower Saxony.

In Soltau, Bton uses a new patented hybrid mixing technology to produce precast concrete components such as façade, wall and ceiling elements for residential construction in compliance with relevant DIN standards. This technology is being used for the first time in a precast plant, enabling not just a reduction in CO₂, but also, through the application of special formulations, the absorption

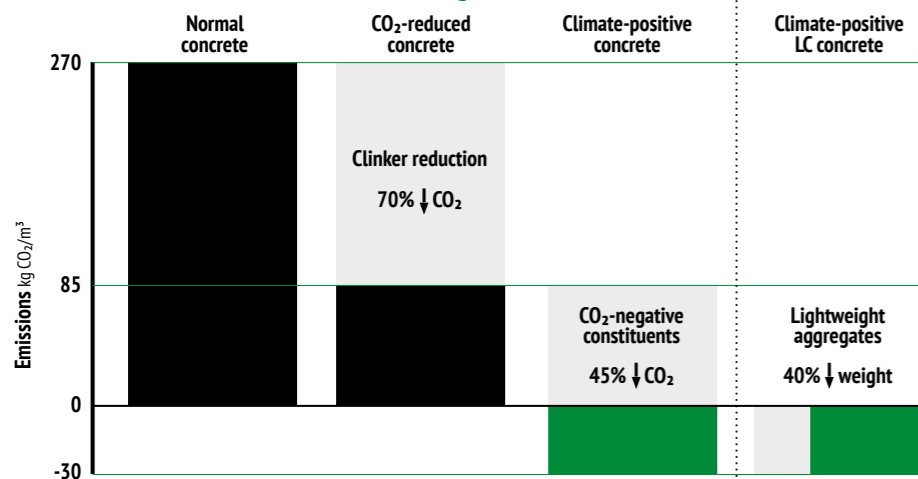
of more CO₂ into the concrete than the total emitted – resulting in the complete decarbonisation of the concrete.

All grades of concrete manufactured at net zero
The concrete formulations and technologies developed by Thomas Sievers, one of the partners of Bton, combine innovative and patented techniques for preparing the raw materials, mixing the concrete and curing, with modern digital algorithms in order to improve the properties of the concrete and make the production processes more efficient. All types of concrete, whether normal, LC (structural lightweight), UHPC (ultra-high performance) or geopolymer concrete (cement-free), can be produced in an automated, ecologically optimised and CO₂-reduced manner and then processed into high-quality prefabricated parts. MC-Bauchemie supplies the concrete admixtures required for the special

formulations, as well as release agents, concrete cosmetic products and special mortar for the pre-cast concrete parts. The large-format components produced in this way are designed for duplicate production and will significantly accelerate housing construction.


Substantially reduced CO₂ footprint using Bton
The hybrid mixing technology enables the production of particularly environmentally friendly concrete, which in a first step reduces CO₂ emissions by up to 75% compared to conventional processes. In a second step, plant-based, regenerative material, so-called 'biochar', is used, which binds CO₂ and thus reduces the carbon footprint to net zero or even below. This means that these climate-positive concretes bind more CO₂ than is consumed in their production, especially that of cement. And the use of structural fibres as a partial or complete replacement for steel reinforcement results in even more CO₂ being saved in the concrete production process. In short: The more such concretes are produced, the less CO₂ is in circulation. Bton has thus developed an innovation for the future of sustainable, decarbonised construction that is also of interest beyond Germany's borders, not least because, for example, even 'unusable' desert sand can also be incorporated in these concretes.


Decarbonisation methods and CO₂ savings



Source: Bton

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 Further information can be found at:
www.bton-group.com/Home_lumk/



Mega project: Eastern North-South Expressway in Vietnam

MC'S TUNNELLING EXPERTISE ACCELERATES CONSTRUCTION PROGRESS



View of the large construction site with mobile concrete mixing plant

Construction of the Eastern North-South Expressway in Vietnam is progressing apace. In the second phase of the ambitious infrastructure project, which will connect the cities of Hanoi and Can Tho over a total length of 1,941 km, MC's tunnelling expertise was required for three tunnels.

The second construction phase of the Eastern North-South Expressway comprises twelve sub-projects. The largest of these has an investment volume totalling the equivalent of 750 million euros and stretches over 88 km through the coastal provinces of Quang Ngai and Binh Dinh in central Vietnam. This section is considered particularly challenging. Along the route, 45 bridges have to be built, as well as two shorter tunnels with a length of 610 and 698 m respectively and a third tunnel, which at 3.2 km is the longest tunnel on the entire North-South Expressway.

Major tunnel construction challenges

The Vietnamese Ministry of Transport and the private investor Phuoc Viet Development Investment Company Limited commissioned the Deo Ca Group, based in Hồ Chí Minh City, which had already worked successfully with MC-BIFI Bauchemie JSC on previous projects, as the general contractor. After thorough initial tests, the Vietnamese MC subsidiary was officially selected as a supplier of concrete admixtures and other construction chemical products.

The region is characterised by harsh weather conditions. Natural disasters such as storms, floods, landslides, heat waves, droughts, etc. occur particularly frequently throughout the year. In addition, contrary to the original forecasts, the workers encountered unstable geological formations in the longest of the three tunnels, which made the construction phases considerably more difficult and threatened to jeopardise adherence to the schedule.

MC solutions ensure construction progress

The tunnelling experts at MC recommended MC-PowerFlow 2257R for shotcrete as a quick and efficient solution for stabilising the rock layers inside the tunnel. The concrete admixture is characterised by its high early strength and workability of up to three hours, even at high temperatures. In order to increase the adhesion of the shotcrete to the surfaces of the tunnel walls, MC-Shortcrete



View of the tunnel entrances

SH100 was used as a strength-enhancing, liquid shotcrete additive, which ensured low rebound and high strength of the concrete.

The high-performance superplasticiser MC-PowerFlow 2252 was used for the concretes of the bored piles, bridge piers, bridge abutments, wing walls, cross girders and bridge decks, as well as for the anchor concrete, and also ensured long-lasting liquefaction and a good consistency of up to four hours, together with high early strength despite the adverse weather conditions.

Good application behaviour despite harsh weather

As construction progressed, the high strength and good flowability of the non-shrink grout – brand name MC-Grout – helped to speed up further work. During the construction of the carriageways, MC-PowerFlow 5285 ensured a flowable and easy-to-work concrete of grade C50/60 N/mm². In the concrete for the tunnel ceiling, the high-performance superplasticiser of the latest PCE generation, MC-PowerFlow 2258, ensured long-lasting liquefaction and stable consistency. The very high water retention capacity improved the surface quality and water impermeability of the concrete, while high early strength values also helped to meet the tight schedule.

In addition to good advice, high product quality and the ability to deliver large quantities of material to the construction site quickly, MC-BIFI was able to contribute MC's tunnelling expertise to this major project. MC products are thus making an important contribution to one of Vietnam's largest infrastructure projects, which is scheduled for completion in 2025.



Careful restoration of Croatian cultural heritage asset

MOLLINARY STONE BRIDGE IN CROATIA SUSTAINABLY REHABILITATED

In Croatia, the Mollinary stone bridge over the Dobra river, built in the middle of the 19th century, had to be repaired. The aim was not only to secure the load-bearing capacity of the structure in the long term, but also to preserve the visual appearance of the protected cultural asset. Several of MC's specialised products were able to demonstrate their capabilities during the complex repair work.

Halfway between Zagreb and Rijeka in central Croatia lies the town of Ogulin on the river Dobra. A stone bridge from 1874 crosses the river here, named after the Austro-Hungarian officer and writer Anton Mollinary. The bridge with its five round arches is 72 m long and around 7.5 m wide. It is part of the Rudolfina Road, which connects Ogulin with the town of Novi Vinodolski, and counts among Croatia's heritage-protected structures.

Old stone bridge in need of immediate rehabilitation

The Mollinary Bridge had not been repaired for a number of decades. The adverse weather conditions in the mountainous region had led to a massive deterioration of the structure over the years. The bridge had large cavities and cracks, and the reinforced concrete deck slab

was so badly damaged that immediate repairs were necessary. The district council responsible involved MC Croatia in the project from the initial planning stage through to execution. MC not only supplied the necessary products, but also provided expert support to the contractor, VACON d.o.o. from Karlovac, in all phases of the project.

In April 2023, work began on sealing the parts of the bridge in contact with water using the injection resin MC-Injekt 1264 Compact. This easily injectable, low-viscosity duromer resin exhibits a high penetration effect when force-filling cracks, joints and cavities, is optimally compatible with moisture, and cures quickly and safely even under dynamic stress.

Maintaining stability and authentic appearance

The bridge abutments and stone piers were then carefully repaired and restored. In order



Close-up of the repaired bridge piers

to maintain stability, all cavities and cracks in the masonry were filled with the mineral suspension Oxal VP I T Flow. This highly flowable grouting and injection slurry from MC is physically matched to natural stone masonry.

To preserve the authentic appearance of the bridge, each joint between the stone blocks of the façade was carefully cleaned and prepared for repointing with the highly sulphate-resistant, microsilica-modified MC-RockMortar L mortar. It is resistant to temperature, freeze/thaw cycling and de-icing salt, has excellent substrate adhesion and is available in various colours. It was applied with great precision to achieve a uniform joint pattern that harmonises visually with the patina of the natural stone and at the same time provides lasting protection for the structure. Before asphaltting, the bridge deck was finally sealed with Nafuflex High Performance, a polymer-modified bitumen thick coating.

Despite the particular challenge posed by the wintery conditions in the often very cold mountainous region, where snow and fog prevail and the weather is unpredictable, the repair of the Mollinary Bridge was successfully completed in just under three months.

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Challenging repair of an underpass in Switzerland

PROVEN MC SYSTEM ENSURES FAST AND SAFE CONSTRUCTION PROGRESS

In the town of Killwangen in the Swiss canton of Aargau, a pedestrian and vehicle underpass running under the railway station had to be repaired during ongoing operations. A tried and tested system from MC for internal tunnel repair and coating helped to ensure impressive construction progress in terms of both speed and safety.



View of the finish-coated tunnel

An underpass beneath the railway station in the municipality of Killwangen, around 20 km north-west of Zurich, was in need of thorough rehabilitation. The company commissioned for the work by Swiss Federal Railways (SBB) was Rothpletz Lienhard + Cie AG, headquartered in Aarau, Switzerland.

Systematic tunnel refurbishment

The repair of the pedestrian and vehicle subway included the dismantling of the walls with complete reprofiling, as well as a full repair of the tunnel ceiling. Products from MC were chosen as part of the project tender, impressing with a self-con-



The substrate preparation work in full swing

tained, tried and tested system structure involving the high-performance fine mortar Nafufill R3 FM and the ready-to-use single-component coating MC-Color T 21. The rehabilitation work began in April 2022. After 3.5 cm of the old wall coating had been removed, Nafufill KMH was used as a bond and anti-corrosion coating. The surfaces were then reprofiled with the fibre-reinforced PCC/SPCC concrete replacement Nafufill KM 250. Enormously resilient, this serves to enhance the structural strength of the substrate, as well as offering high fire resistance.

Nafufill R3 FM and MC-Color T21 – a powerful combination

The surfaces were then coated with the two-component, polymer-modified high-performance fine mortar Nafufill R3 FM – a product that can be used as a blowhole, shrinkage cavity, scratch and surface filler that also offers high resistance to carbonation plus elevated water retention capacity. And it is equally resistant to high temperatures, freeze/thaw cycling and de-icing salt. The fine mortar requires no curing treatment and therefore contributes to rapid construction progress. Nafufill R3 FM therefore proved to be the perfect problem-solver in Killwangen. In the next step, the surfaces were coated with

MC-Color T 21, an innovative MC tunnel coating that is likewise highly resistant and durable. The single-component acrylate dispersion can be applied directly either by roller or airless spraying. In contrast to two-component products, the mixing, repotting and remixing usually required is no longer necessary, thus significantly reducing the amount of work involved. MC-Color T 21 could also be applied directly to the repaired surface in two coats without a bond coat and was dry to the touch after just one hour – once again resulting in savings in both labour and time.

In the final step, the ceiling of the underpass was coated with Emcephob HC, a single-component water-based hydrophobic cream, to reduce water absorption and at the same time increase resistance to freeze/thaw cycling and de-icing salt. This enabled MC to offer a safe, certified and time-saving system solution that minimised the duration of the construction project in Killwangen and allowed it to be completed as early as September 2022.

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Concreting the bridge deck in Ostrowiec Świętokrzyskie

Rapid concreting of a bridge in Poland

CONCRETE MIX DESIGN AND LOGISTICS ENABLE CONCRETE POUR IN ONE DAY

On 25 January 2024, the deck of a bridge over the Kamienna River in Ostrowiec Świętokrzyskie around 180 km south of Warsaw, was concreted in a single day. The work on the bridge, which measures 100 m in length and 19 m in width, was carried out using a special concrete mix developed with the help of concrete admixtures from MC.

The bridge project in Ostrowiec Świętokrzyskie is part of the extensive expansion of highway 754 in the Świętokrzyskie voivodeship. The Kielce-based company Contek Projekt implemented the project, designing the bridge to withstand a load of up to 50 t.

Development of the concrete mix design

The development of the special concrete mix design began in the fourth quarter of 2022. According to the contractor's requirements, a C50/60 concrete had to be created that would be pumpable and fulfil the exposure classes XC4 (carbonation), XD3 (chloride exposure), XF4 (freeze/thaw exposure) and XA1 (chemical attack), as well as have a frost resistance grade of F200 and a water penetration depth of ≤60 mm. The mixture totalling around 1,600 m³ in volume was intended for installation in the bridge pylons and other bridge components. After extensive laboratory tests both in the laboratory of the commissioned concrete manufacturer PBI Beton and at MC in Poland, a mix design was submitted for approval in May 2023. A successful concreting trial confirmed the suitability of the formulation.

Critical blend of concrete admixtures

MC's concrete admixtures played a key role in the success of the project and met all of the client's requirements. The superplasticiser MC-PowerFlow

evo 580 ensured optimum rheology, pumpability and workability, as well as rapid strength development of the concrete. It also demonstrated very good compatibility with the air-entraining admixture Centrament Air 220. This created stable micro-air voids, which were evenly distributed in the concrete volume during mixing, thus further improving the quality and durability of the concrete. In addition, the universal plasticiser Centrament N 11 was introduced, a flow enhancer that



Concreting and smoothing

is often used in combination with MC-PowerFlow superplasticisers and is ideal for the production of design concrete mixes with long consistency retention.

Logistical challenges mastered

Shortly before the planned execution of the work, the project participants were confronted with logistical challenges due to announced road closures. To ensure the continuity of the concreting, the date was postponed to 25 January 2024. PBI Beton was responsible for the production and PBI Logistics for the transport and delivery of the concrete. The average transport time of the concrete mixes was 50 minutes and was carried out with 20 concrete trucks, resulting in a total transport execution time of 16 hours.

Top monitoring and quality control

During concreting, three laboratory units from the construction company Mota Engil Central Europe, MC and PBI monitored the process and ensured the quality of the end product. The project impressively demonstrates how precise planning, specialised concrete mixes and cooperation between different partners can produce outstanding construction results even under difficult conditions. And MC also made a critical contribution to the success of the project with its innovative solutions.

Rehabilitation in record time, despite pandemic

A 42 BRIDGES IN DUISBURG SUCCESSFULLY REPAIRED



The concrete surface is pre-treated with MBC-VT 116 from MC-Bauchemie prior to scratch coat application.

Four bridges on the A 42 motorway at the Duisburg-Nord junction had to be repaired. General supply bottlenecks during the coronavirus pandemic and a short construction period made the rehabilitation work a real challenge. Products from MC provided the solution.

Alongside the A 40 and A 2, the A 42 is one of the most important motorway links in Germany's Ruhr region. With a total length of 45 km, it runs from Kamp-Lintfort, via Duisburg, Oberhausen, Essen and Gelsenkirchen to Dortmund – and connects numerous major cities with each other. Given that the A 42 runs past important industrial and commercial areas, it is very important for freight transport. Commuters also benefit from the motorway's good connections and can travel quickly between the cities of the Ruhr region.

Challenges from high traffic volumes and the pandemic

Due to the steady flow of freight and commuter traffic in recent years, the motorway's subsoil had gradually developed signs of deterioration. Repair work was necessary, for example, on the bridges in Duisburg-Neumühl, at the Duisburg-Nord junction to the A 59 motorway. In total, an area of 20,000 m²

had to be waterproofed. This was a real challenge, as only a short construction period was allocated in order not to disrupt traffic on this important section of the motorway for too long. The coronavirus pandemic also hampered the start of the construction project, as there were significant shortages of construction materials.

Waterproofing and concrete repairs with MC products

The refurbishment work was carried out by KEMNA BAU Andreae GmbH & Co. KG – ZN Sonderbau West on behalf of Autobahn GmbH. Due to a successful, long-standing collaboration and the extensive product range available, the contractor decided to use reactive resins and concrete repair products from MC-Bauchemie. Firstly, the substrate was prepared in accordance with the bridge-related standard specifications of Germany's ZTV-ING (Ad-

ditional Technical Contract Conditions and Guidelines for Civil Engineering Structures). The concrete surface was then pre-treated with the reactive resin MBC-VT 116 certified in accordance with TL-BEL-EP, with the scratch coat applied fresh-in-fresh. In the next step, the treated surface was broadcast with quartz sand. Once this layer was fully cured, a polymer bitumen welded sheet was applied to receive the asphalt as the carriageway wearing course and surface finish. Following the demolition of the edge caps, the undersides of the cantilevers of all four structures also had to be extensively repaired. Nafufill KMH was primarily used as a bond coat and corrosion inhibitor, with Nafufill KM 250 being applied as PCC II mortar. Smaller areas were treated with Nafufill KM 180 and Nafufill KMH.

Having commenced in 2021, the construction project at the Duisburg-Nord junction was successfully completed after a comparatively short time by the end of 2023 – much to the delight of the numerous commuters on the route.



View of the construction site at the Duisburg-Nord motorway junction

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PO **RT** **R** **A** **I** **T**
Kai Markiefka
PRODUCT MANAGER FOR SUSTAINABLE CONSTRUCTION CHEMICALS



Kai Markiefka (33) is a Product Manager & Product Line Manager at MC who is involved in the development of the latest PCE technologies, driving forward 3D concrete printing and promoting the widespread use of sustainable, cement-free concrete – both nationally and internationally.

Kai Markiefka already knew exactly where he wanted to go when he was at school. Born and raised in Dinslaken to the north of Germany's Ruhr region, he completed his vocational baccalaureate at the vocational college in Mülheim and trained as a chemical lab technician. He then completed his Bachelor's degree in Applied Chemistry at the Westphalian University of Applied Sciences in Recklinghausen in 2014. In 2015, he began working as a student trainee at MC during his Master's degree in Applied Polymer Chemistry at Aachen University of Applied Sciences. After his Master's thesis and 15 months as a working student, he fi-

nally signed a contract as a development chemist at MC in 2017.

Kai's carrier path at MC

For around two and a half years, he worked in the concrete laboratory on polymer synthesis and the development of polycarboxylate ethers (PCEs). He then followed the call of a large corporation located at Freiburg im Breisgau, but eventually returned to Dinslaken and MC. In 2021, he was offered the opportunity to join MC as Product Line Manager. Today he works closely with colleagues from Research and Development on innovative product technologies such as cement-free concretes and mortars, as well as 3D concrete printing.

He supports the foreign subsidiaries in the use of PCE raw materials and is active in a wide range of areas – from customer acquisition to process management. "MC knows how to create jobs that are

perfectly tailored to the strengths of its people," says Kai. The Norderstedt 2023 project, in which a residential building complex was constructed using climate-friendly geopolymers, is particularly close to his heart (we reported on this in MC aktiv 3/23).

Family man, adventurer and sports fan

In addition to his professional activities, Kai is a real family man. He has been married since September 2022 and the couple are expecting a child soon. He is also the happy owner of two cats and a dog.

He and his wife love travelling and have already been to Chile, Argentina, Bali, South Africa, Hong Kong, Singapore and Sydney. Kai also looks forward to skiing with his friends every year. In addition, he is a passionate football fan of FC Schalke 04, enjoys jogging and has resolved this year to cycle his 17 km commute along the Emscher river to MC.

INTRODUCING: ALINE VON GRADOWSKI

From apprentice to Global Supply Chain Manager

Aline von Gradowski (30) began her training as an industrial administrator at MC in 2013. Once qualified, she started as a clerk in logistics planning, where she was able to develop her skills through small projects and special assignments. In 2019, the young native of the Ruhr town of Gladbeck began a part-time business administration degree programme at the FOM University of Applied Sciences in Essen, which she successfully completed in 2021. Six months before graduating, she became a project manager in logistics and managed several projects, including the introduction of a driverless transport system, which she still oversees today. In 2023, she took over the management of the registry and switchboard, and in 2024 she was promoted to Global Supply Chain Manager. In her free time, she pursues her passion for dancing. Her favourite format is video clip dancing, as it combines several dance styles at the same time. Above all, Aline appreciates the family atmosphere at MC and is looking forward to the challenges ahead.



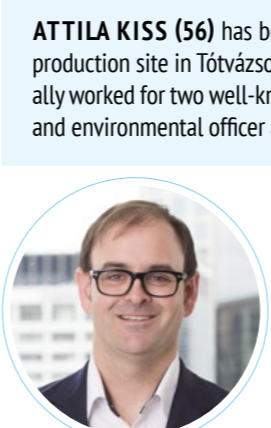
Wishing you continued success and enjoyment!

PERSONNEL NEWS

New employees



TOMASZ FALKOWSKI (44) was appointed to the newly created position of Regional Chief Operations Officer (COO) for Central and Eastern Europe, Central Asia, the Middle East and India at MC on 20 May 2024. In this role, he is responsible for the further development of the MC-Bauchemie Group's national companies in the above-mentioned regions and reports directly to Dr. Ekkehard zur Mühlen, Managing Director of MC-Bauchemie. For further information, go to: <https://bit.ly/3YK0CyY>



ATTILA KISS (56) has been the new Managing Director of MC in Hungary since March 2024 and also manages the production site in Tótvázsony-Kövesgyőr. After completing his degree in mechanical engineering and his MBA, he initially worked for two well-known large corporations in areas including procurement, production management, as a safety and environmental officer and as a plant manager.



JASON BOLT (42) was appointed Managing Director of MC-Bauchemie Australia in February 2024. Originally a cement chemist, he later obtained further degrees in industrial chemistry, civil engineering and business administration and can look back on a multifaceted career. Before joining MC, he worked in various positions in a well-known industrial group, most recently as a member of the executive board.



FARAHNAZ FARAJOLLAHI (47) joined MC-Bauchemie on 1 May 2024 as Business Development Manager to drive forward MC's commercial activities in the Pacific region. After completing her Bachelor's degree in materials engineering at the University of Science and Technology in Tehran, the Iranian worked in the construction chemicals industry for 17 years. She most recently headed up the building materials department of a well-known construction chemicals company in Iran.

KEI SATO (30) has been working as Business Development Manager in the Tunnelling business unit at MC-Bauchemie since 1 May 2024. After completing his Bachelor's degree in chemical engineering at Curtin University in Australia in 2017, he initially worked in the tunnelling sector for a large industrial group in Japan and Australia. At MC, he will use this experience to drive forward MC's tunnelling business.

MC-BAUCHEMIE WELCOMES 15 NEW APPRENTICES

On 1 August 2024, 15 new apprentices started their training at MC. As usual, the first working day began with a welcome at MC's training centre in Bottrop, where the traditional group photo was also taken. The new apprentices at MC-Bauchemie, standing in the back row from left to right: Favour O. Eghosa (warehouse logistics specialist), Matthias Wilczok (industrial clerk), Tobias Frese (industrial clerk), Ivan Bykov (building materials tester), Lucas Przybyla (chemical technician), Theodor Lukas Lievers (chemical technician), Luca Joel Pflug (paint laboratory technician), Nicholas Nwaokorie (chemical technician), Jonas Nüsgen (industrial clerk). Front row from left to right: Jan Surma (industrial clerk), Paula Puls (industrial clerk), Arda Damar (chemical production specialist), Kübra Kantar (chemical laboratory technician), Maya Jana Janetzki (industrial clerk). Not in the picture is Lena Sophia Pohlmann (forwarding clerk), as she started her training on 15 August 2024. **We extend our warmest welcome to them and look forward to sharing their successes at MC!**



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