SUSTAINABILITY AT SCHWENK

Information on the business, ecological and social environment of our building materials

June 2020

SCHWENK Building Materials Group

SCHWENK


SCHWENK

Foreword

Dear readers,

Focusing on sustainability both in our mindset and in our actions is more than a current fashion. It is also the basis for future-oriented business and long-term success in our society. At SCHWENK we acknowledge our economic, ecological and social responsibilities. As a family company in its fifth generation, we have always made our decisions with a view to our responsibility to future generations.

Sustainability is a major part of our corporate strategy. The purpose of this report is to document our actions in terms of sustainability, initially for our business in Germany and then in the near future for the entire group.

We are continuously working on the development of climate-compatible processes, products and solutions with an eye to quality and innovation. This process not only covers our value chain as a manufacturer of building materials, but it also integrates additional activities such as environmentally-compatible transport, agriculture and forestry as well as reforestation into our sustainability concept.

We take our responsibility for people, nature and the environment seriously, concentrating on vital topics such as employee health, sustainable supply and conservation of raw materials as well as protection of the climate. For sustainability we endeavour to set standards in technology and to do more than simply comply with legal regulations and requirements. We have proven in the past that we can meet this claim by our pioneer work with the introduction of new technologies such as SCR, DeCONOx and ExMercury equipment. We are also leaders in the use of alternative fuels and save approximately 550,000 tonnes of lignite a year, thereby preventing around 1.2 million tonnes of CO_2 emissions.

The global reduction of CO2 emissions is one of the central challenges of our age and requires political, business and technical solutions. We are determined to be part of the solution and will continue our contributions towards this end. Our goal is to be CO_2-neutral by 2050. The construction of a CO_2-neutral cement plant is a significant milestone on the path to a technical solution. We plan to achieve this target by 2030.

Picture: Thomas Spannagl | SCHWENK

CO_2-neutrality can only be achieved with technical solutions in combination with sufficient amounts of renewable energy, a level business playing field in Europe and the appropriate infrastructure for the transport, storage and/or usage of CO_2. Independently of the above, we are also working intensively to reduce our CO_2 emissions throughout our complete value chain.

We are very proud of what we have achieved so far. What is more, we are dedicating substantial financial resources combined with high motivation and innovation to prepare the path for future generations in the company and in our society.

You can read in the following pages about our current and future approach to these challenges.

Do you have any feedback? We are looking forward to hearing about your ideas.

Yours sincerely,

Thomas Spannagl
CEO

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About this sustainability information

Sustainability is a permanent component of our corporate strategy. It is a broad field and is reflected in a very wide range of areas and tasks at SCHWENK. For this reason, at the start of 2020 we decided to bundle these areas and to combine all of our sustainability activities. References to persons in the following text always refer to all genders.

This is the first edition of the "Sustainability at SCHWENK" information and it covers our activities in the area of sustainability for 2019. It is intended primarily for our employees, our customers and interested professionals.

The following pages describe both well-known and completely new applications and solutions. We consider that it is important to describe sustainability holistically and to show both the background and interactions.

Our focus for 2019 is on the SCHWENK Building Materials Group in Germany and covers the four divisions of cement, sand & gravel, concrete and pumps. We also select specific topics in different divisions for more detailed discussion. This offers a more in-depth view of the different areas of our supply chain.

In our focus pages, our colleagues answer questions that many of our readers might have in an interview format.

This sustainability information has been compiled and designed primarily by the six members of our project team with the support of the various divisions. This information will not be updated or re-issued regularly but only as dictated by circumstances.

The project team

• Laura Müller	Corporate Communications
• Thomas Spannagl	CEO
• Dr. Hendrik Möller	Member of the Executive Board
• Dr. Markus Schauer	Technical Manager Raw Materials Supply/ Environmental Protection
• Erik Schleicher	Shareholder
• Michael Schmitt	Technical Manager Integrated Management System (IMS)

THE SCHWENK GROUP

GENERAL

SCHWENK was founded in Ulm in 1847 making it one of the oldest family owned companies in the German building materials industry. Our core business is divided into four divisions: cement, sand & gravel, concrete and pumps.

Cement

Sand & Gravel

Concrete

Pumps

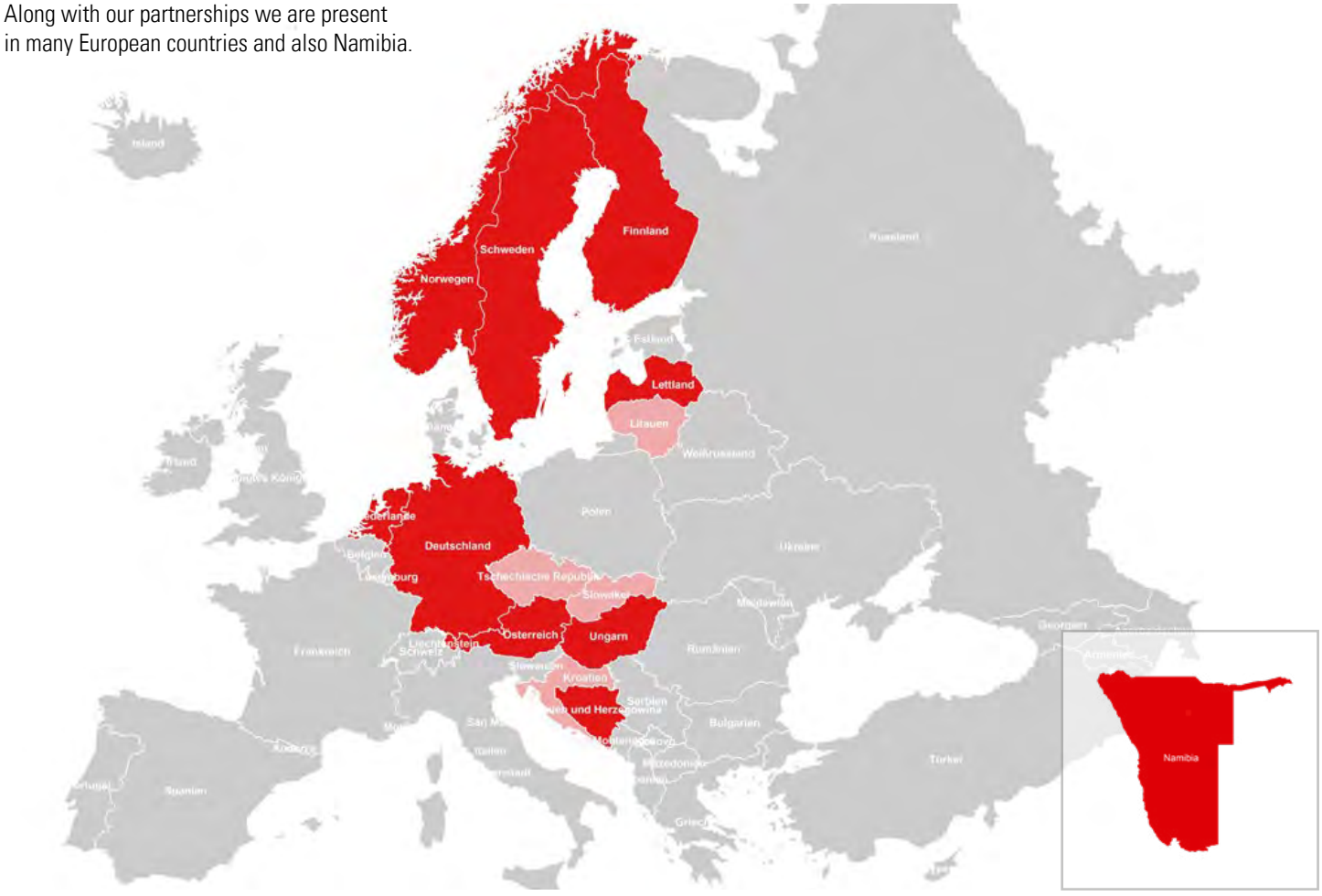
The constituents of our building materials are limestone, crushed rock, sand and gravel. We procure our raw materials mostly from our own deposits and extraction sites. Together they form the basic ingredients for manufacturing concrete. When combined with our concrete pumping services and our high-quality consulting services, we can supply a complete range of services for our customers.

SCHWENK is present in the market in Germany and internationally with a large number of partnerships and subsidiaries. They form a wide-ranging portfolio – from suppliers of building materials to research companies to the farming and agriculture business.

Picture: Ulm Head Office | SCHWENK

SCHWENK GLOBAL

Along with our partnerships we are present in many European countries and also Namibia.



Participations at and over 50% Participations over 25%

Picture: Working together | Adobe stock photograph: WavebreakmediaMicro

OUR PRINCIPLES

Our goal is to work with our partners to add value and achieve long-term success.

Our slogan "Baustoff leben" expresses that we do not simply concentrate on one single product or one single application, but look at building material as a holistic concept. Our principles of "Live quality", "Live responsibility" and "Live future" form a strong foundation for our daily work.

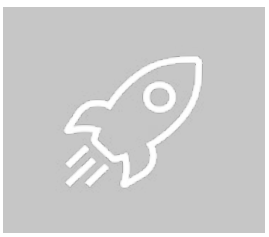
Live quality for us means that we are internally and externally a competent partner for the development of solutions that reliably meet the requirements of our customers. Quality also means that our technology and equipment are always state of the art. We are continually monitoring and optimising our processes.

Live responsibility means that we combine our planning and actions over generations. This is also reflected in our long-term partnerships with our customers. In addition to our responsibility to our employees and their health, we are focused on conscientious and responsible behaviour with respect to the environment, climate and resources.

Live future in our company means that we recognise and participate in social changes and anticipate customer requirements. To this end, we focus on the research and development of new products and processes with partners and universities and also on the innovation and professional curiosity that marks our everyday work.

Live quality

Live responsibility



Live future

MATERIALITY ANALYSIS AND SUSTAINABILITY TARGETS

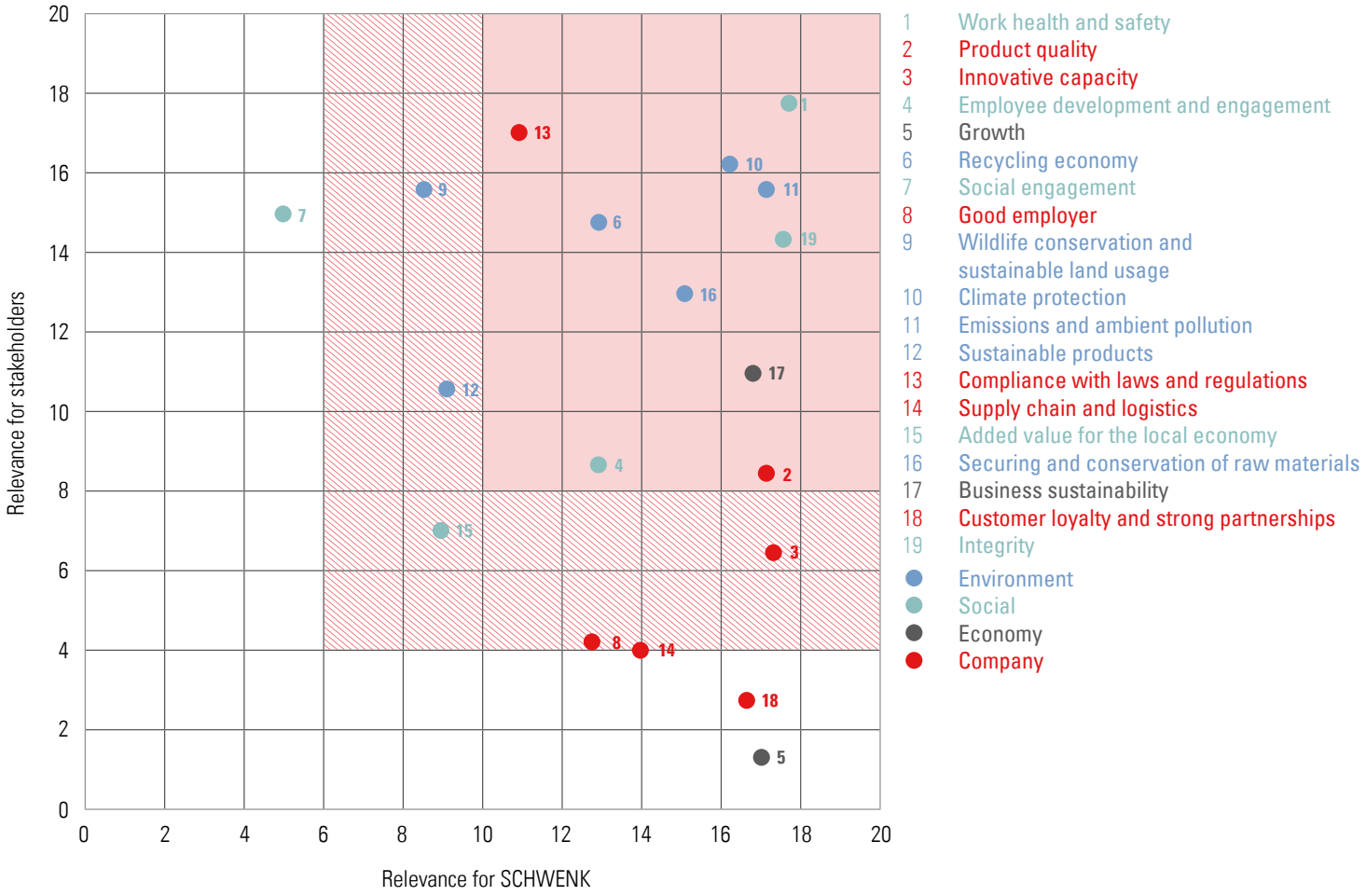
We have assembled our major emphases in the field of sustainability in a materiality matrix. In order to identify the relevant stakeholder topics, the stakeholder group was initially restricted to employees, customers and specialists. All topics relevant to SCHWENK are derived from the corporate strategy and the targets. An internal analysis was conducted to evaluate and display the identified topics by their relevance for SCHWENK and for the stakeholder group.

The major topics were classified according to their average relevance (white zone), high relevance (cross-hatched zone) and very high relevance (red zone). They are also colour-coded by topics: environment (blue), company (red), social (light blue) and economy (grey).

With our principles and our claim we also support the UN Sustainable Development Goals (SDGs). In accordance with the materiality analysis, we are concentrating our engagement on six of the 17 SDGs, which are highlighted in the graphic below.

Picture: UN Sustainable Development Goals, SDGs | www.bmz.de

Materiality matrix



GROUP STATISTICS FOR GERMANY

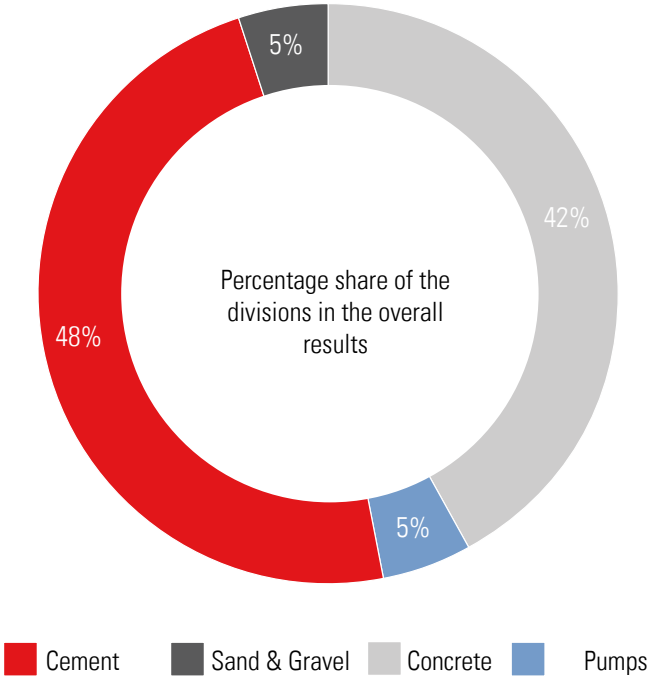
Our business, ecological and social statistics are based on the SCHWENK Building Materials Group in Germany.

OVERVIEW OF OUR DIVISIONS

We are continually investing in our plants and systems. Over the past three years we have invested an average of

approximately **62.9 million euros** a year.

Sales	2017	2018	2019
Cement	3.2 million t	3.3 million t	3.5 million t
Sand & Gravel	3.3 million t	3.6 million t	3.1 million t
Concrete	3.4 million m³	3.3 million m³	3.7 million m³
Pumps	3.5 million m³	3.4 million m³	3.1 million m³



CEMENT

4+1 plants

In addition to the four cement plants in Allmendingen, Mergelstetten, Karlstadt and Bernburg, SCHWENK Zement KG is a shareholder in Zementwerk Lübeck.

SAND & GRAVEL

7+6 plants

Our seven sand and gravel plants are distributed over three 100%-owned SCHWENK companies. We are also shareholders in additional companies with a total of six plants.

CONCRETE

102+41 plants

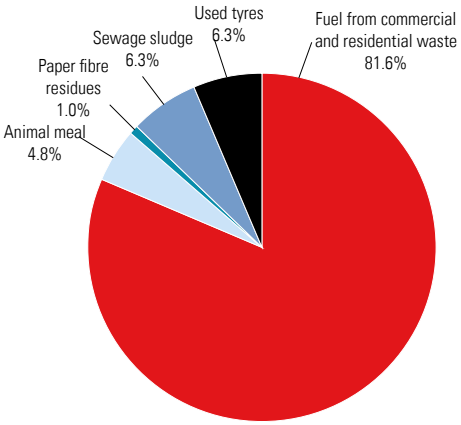
With our 102 ready-mix plants distributed over 14 companies and our 22 shareholdings in another 41 plants we can offer an optimised network of suppliers throughout Germany.

PUMPS

185 vehicles

Five companies are bundled into SCHWENK Betonpumpendienst GmbH & Co. KG [concrete pumping services]. With our eight shareholdings we provide mobile and stationary concrete pumping services throughout Germany.

Alternative fuel mix in clinker production based on the fuel energy consumption (SCHWENK Zement Deutschland 2019)



Development of alternative fuel consumption based on the fuel energy consumption

NUMBER OF EMPLOYEES

The SCHWENK Building Materials Group has about 2170 employees. They are distributed over the cement, sand & gravel, concrete and pumps divisions.

2170 employees

TRAINEE RATIO

We've been training our young talents in-house since as long ago as 1902. We are ensuring that we have the experts of tomorrow with a trainee ratio of 6.1% throughout all divisions.

6.1%

>92%

SCHWENK has been a leader in the field of alternative fuels for many years. An average of >92% of our fuel requirements is covered by alternative fuels.

CLIMATE PROTECTION VALUES

	2017	2018	2019
Specific net CO_2 emissions (per tonne cement equivalent)	428	428	435
Specific net CO_2 emissions (per tonne clinker)	529	524	528
Clinker/cement factor	78.8%	79.2%	79.7%
Proportion of alternative fuels	92%	93.4%	92.3%
Proportion of biomass	30.0%	30.2%	31.6%

See also: Climate protection p. 22

EMPLOYEE DISTRIBUTION

About 59% of employees are hourly paid, with 41% being salaried employees. With 16% female employees SCHWENK is above the industry average (according to bbs Zahlenspiegel statistics 2019).

PERIOD OF EMPLOYMENT

We are particularly proud of how long our employees remain with us at SCHWENK. The average period of employment is 14 years with the SCHWENK family.

14 years

COMPLIANCE MANAGEMENT SYSTEM

MANAGEMENT SYSTEMS

The integrated management system as the hub

Our integrated management system (IMS) regulates all processes, instruments and sequences in the company. The system is based on OHSAS 18001 (work health and safety), DIN EN ISO 9001 (quality), DIN EN 197-2 (product), DIN EN ISO 14001 (environment), DIN EN ISO 50001 (energy) and the monitoring regulations for monitoring and reporting CO_2 emissions. The certifications of the systems set a standard at SCHWENK. The standard is checked, assured and continuously improved by internal and external audits.

AUDIT AND CONSULTATION

The basis for compliance with specifications and continuous improvement

Our internal auditing departments see themselves as service providers for the SCHWENK Building Materials Group. Their objective is to support the management of the various entities to meet their specifications and targets, to increase efficiency, economy and returns and to secure the company assets. They therefore work with the organisation to achieve the targets. They apply a systematic and targeted approach to evaluate and optimise the efficiency of the auditing mechanisms and management and monitoring processes.

MANAGEMENT OF RISKS AND OPPORTUNITIES

The internal early warning system

Our risk management is based on a careful balance of business opportunities and risks. It is an important instrument for the early detection of factors that could lead to discrepancies. Our risk management is therefore a basic requirement for deriving and implementing preventive actions.

TRAINING AND E-LEARNING

Internalising and living the defined actions and regulations

Regular training combined with e-learning ensures that our employees are continuously being familiarised with all currently valid compliance rules. We support active continuing education activities and are consistently expanding our offerings in IT-based continuing education and training.

COMPLIANCE – HAND-IN-HAND WITH OUR PRINCIPLES

Picture: Compliance with helmet requirements in work safety | SCHWENK

You can use the contact form on our website to send questions or suggestions to us at any time.

Compliance with legal and internal company regulations

To us, general compliance with all legal and regulatory requirements and also internal company regulations is key. We expect the same from our partners. The good reputation of our company is based on moral and ethical behaviour and fair competition.

Management requires both employees and also suppliers to refrain from any participation in any form of corrupt practice, such as extortion, fraud or bribery. Our compliance directives include detailed instructions for action.

IN FOCUS: AGROSILVA

FIRMLY ROOTED

How the new agriculture and forestry company combines many years of tradition at SCHWENK.

An interview with Wolfgang Monz, authorised representative of Agrosilva GmbH & Co. KG.

A look at SCHWENK companies shows one name in particular – Agrosilva GmbH & Co. KG. What is behind Agrosilva and how long has this company existed?
Agro stands for field, pasture, property, farmland – that is, the agricultural part. Silva translates as forest, tree, timber and thus covers the forestry part. Agrosilva is a 100% subsidiary of SCHWENK and is still very new. The idea of establishing a separate company came up in 2019. The company was registered on 3 March 2020.

A building materials company with an agricultural and forestry company. How does that fit together?
SCHWENK has had a forestry operation for around 20 years. Establishing a company was simply an extension of that. In addition, all generations of our owners are and have always been very attuned to nature. Their principles also define the company. This means that nature, agriculture and forestry have always been a permanent component of SCHWENK.

A building materials company such as SCHWENK produces a large amount of CO_2. Does Agrosilva contribute to the compensation for this?

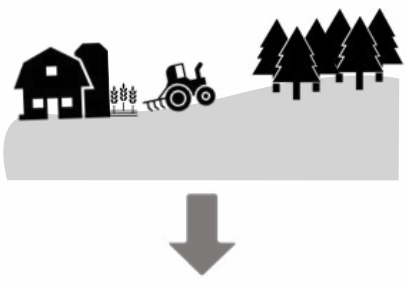
The company was not established to compensate for the CO_2 emissions at SCHWENK. However, our agriculture and forestry business does make a small but important contribution – particularly in the context of the climate discussions within our building materials group.

Agriculture and forestry is the only sector in the group that binds net CO_2 and thus removes it permanently from the atmosphere.
One of the factors involved in this are the plants and reforestation. The other factor is the soil, which permanently binds the carbon dioxide in the humus. Our sustainable forestry and the annual growth in our forests absorbs in the range of 10-15 tonnes of CO_2 per hectare and year.

The growth in humus, which is even higher on farmland than on the forest floor, permanently removes 2-3 tonnes of CO_2 per hectare and year from the atmosphere. This means that our total absorption rate per year is around 24,000 to 25,000 tonnes of CO_2.
That is about as much as the entire SCHWENK fleet emits in all divisions and including quarry vehicles, our mixer trucks, other trucks, pumps and business vehicles. In view of the above, it can be said that the SCHWENK fleet is CO_2-neutral.

Why do you consider Agrosilva so special?
Well, in the first place I find it very exciting to see that this company can be part of a large building materials group such as SCHWENK.

Agricultural business - plant production
binds 1,500 tonnes of CO_2 per year



Sustainable forest management
binds 18,000 tonnes of CO_2 per year

Soil and humus
binds 4,900 tonnes of CO_2 per year

Total
24,000 - 25,000 tonnes CO_2 binding per year

As I noted at the beginning, it is not a separate component but it is closely connected to the principles of the entire group. We are given full support for the structure and its continuing development.
Our agricultural and forestry activities are in part linked to activities already conducted by previous generations of our owners.

Our shareholder Eduard Schleicher has only recently told me that his great grandfather, Kommerzienrat Dr.-Ing. e. h. Carl Schwenk, owned a working farm in Blaustein. This means that Agrosilva is following an old tradition.

If you look five years into the future – what are the important topics at Agrosilva?
An important foundation stone will be to set the strategic and business direction of the company. We also want to grow steadily and sustainably. This is important, because we would like to expand our portfolio into the future. We have a long wish list. In addition to agricultural and forestry products such as grain or timber, we are looking at organic farming or meat production.

That sounds very exciting. Thank you for the interview, Mr Monz, and all the best for the future.
Very pleased to talk to you and thank you for the best wishes.

Interview: May 2020

Picture: Wolfgang Monz | SCHWENK

Our forests **compensate for approx. 24,000 tonnes of CO_2** annually, which is approximately as much as the amount emitted by the complete SCHWENK fleet of vehicles.

Mathematically seen **this makes our fleet CO_2-neutral.**

PRODUCTION

SECURING AND CONSERVING RAW MATERIALS

The manufacture of cement and concrete requires raw materials such as limestone, aggregates, gravel and sand. The spatial distribution and quality of the raw materials is an essential component in our strategy for the supply and conservation of raw materials.

We find our raw materials with geological exploration using digital methods of mapping and analysis. Methods such as 3D mapping using drones and photogrammetry, exploratory drilling with geochemical analysis and the calculation and visualisation of models of deposits are only some of the technologies that we use. The resulting knowledge of the spatial distribution of the deposits enables us to contact landholders and licensing authorities at an early stage and to secure the deposits for the long term.

Competing claims for usage, even in areas with high-quality raw materials, are increasingly restricting and endangering the availability of raw materials. Sand and gravel deposits in particular, which are used as raw materials for the manufacture of concrete, are likely to become increasingly scarce in the short and medium term with a restriction of the number of deposits available for raw materials extraction.

Our usage of natural resources is more and more based on the use of technology that enables us to use the available raw materials in our quarries to the fullest possible extent. This includes the use of online analysers for quality control and mixing beds for homogenisation of the raw material for our cement plants. We also use rock crushers in our gravel plants to make full use of oversized rocks.

ALTERNATIVE RAW MATERIALS

At SCHWENK we have been able to replace more than 13% of natural raw materials with alternative materials. They are combined with the natural raw materials to ensure that they meet our high standards of quality. This conserves natural raw materials and closes material cycles. Examples of alternative raw materials include used casting sand, sludge from processing potable water supplies and also calcined limestone from soda production.

See also: Climate protection | raw materials p. 23

ADDITIONAL COMPONENTS

Additional components for the production of cements with reduced clinker content include not only natural raw materials such as limestone or pozzolan but also alternative components such as fly ash from power plants or granulated slag from steel production.

> 130 years

This is the number of years for which raw materials in our quarries will be available. This long-term perspective and action means security and ability to plan – also for the regions around our sites.

Picture: Collage of plants from all divisions at SCHWENK | SCHWENK

SECURING RAW MATERIALS

The manufacture of one tonne of cement requires up to 1.5 tonnes of raw materials. Germany has only a small number of geological deposits with the chemical and mineralogical quality and long-term availability that makes them suitable for cement production. For this reason securing these local deposits for the long term has top priority at SCHWENK.

Our five principles:

- Proactive geological exploration
- Securing ownership at an early stage by purchase or excavation contracts
- Planning reliability in regional raw material planning programs
- Transparent approval processes with consultation of the local population at an early stage
- Prompt restoration of excavated areas

CONSERVING RAW MATERIALS

Deposits of natural cement raw materials are local and thus are finite and cannot be increased. This is why we do all we can to conserve these resources as long as possible. We want to ensure that they can be used by future generations.

Our actions for conservation of natural raw materials:

- Development of products and production methods with reduced requirements for raw materials
- Use of alternative raw materials
- Use of excavating and processing technologies to minimise the proportion that overlay and burden materials
- Raw materials extraction as completely as possible

IN HARMONY WITH NATURE

FROM EXCAVATION TO RESTORATION

LAND USE AND BIOLOGICAL DIVERSITY

The removal of raw materials in our quarries and mines is a short-term land use. However, it always means significant change to nature and the landscape. Local people may also suffer disadvantage due to the work. When we submit an application to open a quarry, consultation with the local population - at the earliest possible stage - is very important to us.

We consider suggestions and objections from local people at information meetings and work with them to develop environmentally compatible quarrying processes. The required approvals and licences are then obtained in close consultation with the relevant approval authorities. The process is based on the applicable legal regulations for protection of the environment.

Picture: Allmendingen quarry | SCHWENK

CONCEPTS FOR LIMITING INTERFERENCE WITH NATURE AND THE ENVIRONMENT

Quarry projects involve intervention into nature and the landscape that could last for several decades. For this reason we implement concepts for mitigation and that include measures for the promotion of protection of nature and biodiversity during the operational phase.
We make an effort to keep the area required for our work as small as possible. We therefore make an effort to use the natural raw materials as completely as possible and we try to use alternative raw materials.

SUBSEQUENT REHABILITATION - RECULTIVATION AND NATURE RESTORATION

The subsequent uses of our quarries are defined in the form of a landscape restoration plan at the initial planning stage for a new quarry. The plan includes the schedule and objectives of recultivation and nature restoration.

Landscape restoration plans are prepared for all of our quarries. Our many decades of experience in working with this type of planning has shown that the technical and natural conditions tend to develop dynamically and are continuously changing during the operational phase of a quarry project. Therefore, we have developed dynamic concepts at specific sites to define the targets for subsequent use and we have been able to implement them successfully.

Plans for rehabilitation over a manageable period of a few years are defined in the course of regular inspections with licensing authorities and nature conservation organisations. We also include options for modifying plans based on the dynamics of natural developments. We are sure that such concepts will become increasingly significant – particularly when the speed of climate change is considered.

3800 times

That is the ratio of area used for settlement and traffic compared to the area used for quarries in Germany. The area used for mining raw materials from quarries and gravel pits in Germany is currently only 0.0036% (source: BGR).

Subsequent use: Solar panel system in the Darast gravel pit

Subsequent use at the Riedheim gravel pit

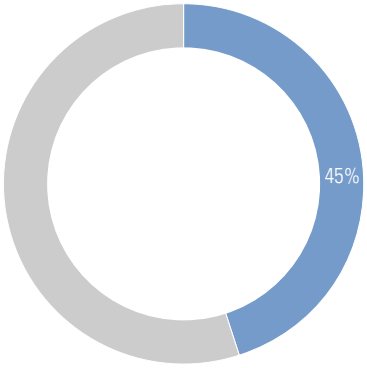
Result of a dynamic subsequent use plan with the example of the Mergelstetten quarry

Restoration of the Aufhausen quarry

NATURAL HABITATS
FOR ENDANGERED ANIMALS AND PLANTS

CONSERVATION OF NATURE AND WILDLIFE IN OUR EXTRACTION SITES

Operating quarries and sand and gravel pits provide space for endangered animals and plants even during their operating phase. We regularly record biodiversity data for use in preparation of biodiversity management plans in order to determine the biodiversity values of our extraction sites and to develop measures for the promotion of species protection. We also initiate and promote a range of projects for species protection.



We currently have an average of 379 species of plants recorded in our quarries. This makes up around 45% of all plant species that could be found in the relevant reference region (ordinance map TK25), although the area of all our quarries makes up less than 1% of the total area of this region. Our quarries therefore represent a hot spot for biodiversity.

REINTRODUCTION OF THE PARTRIDGE

Implementation of a research project with cage breeding and provision of the preferred habitat (open land).

FALLOW DEER PROJECT

We are introducing new methods for the maintenance and development of open-land biotopes in our quarries, such as planting low-nutrient grassland. In this case we are supporting fallow deer in an area of more than 100 ha.

ECONLOGICAL ACCOUNTING PROJECTS

We are supporting biodiversity and the establishment of biotope networks with various projects such as the maintenance and development of mixed orchards and the development of wildflower strips, meadows and hedges in neglected fields.

MONITORING THE YELLOW-BELLIED TOAD

Our quarries are preferred habitats for the yellow-bellied toad. We continuously record developing migratory biotopes to enable biotope development and quarrying operations to exist together.

Dr Markus Schauer, Technical Manager Raw Materials Supply/Environmental Protection | SCHWENK

"TEMPORARY NATURE"

Over the total lifetime of our extraction sites specific areas tend to develop where no quarrying operations takes place for several years. Endangered species and habitats that can no longer find living space in the surrounding cultural landscape, get a chance to settle here.

We promote such sites with the concept of "Temporary Nature". This involves moving areas within quarries excluded from operational use for several years and identifying them as stepping-stone or migratory biotopes. This gives nature time for restoration and the development of biodiversity. These biotopes and environments migrate in the most literal sense of the word through the quarry over time. This has enabled us to establish environments for the yellow-bellied toad, the sand martin, rare plants such as the sarsaparilla and other species.

Picture: Martin nests in the restored quarry at Allmendingen | SCHWENK

CLIMATE PROTECTION

Our targets

- 200
kg CO_2/t clinker
(absolute over the 1990-2030 period)

- 38%
kg CO_2/t cement equivalent
(relative over the 1990-2030 period)

-19.0%
average clinker factor
(relative over the 1990-2025 period)

As producers of building materials such as cements, special building materials and concrete we are part of the resource and energy-intensive primary industry. Our manufacturing processes, particularly the cement clinker production, is connedted with CO_2 emissions. The cement industry throughout Germany annually emits approximately 20 million tonnes of CO_2. Efforts have long been in train to reduce CO_2 emissions for the sake of climate protection. The Kyoto protocol defines three mechanisms for reaching global climate protection targets. The best-known mechanism is emissions trading, which is regulated by an EU Directive for companies in Europe. The number of emissions permits is allocated to specific types of industry and is reduced from period to period. Companies that have already made great efforts for climate protection can sell excess permits.

If the allocated number of permits is not sufficient to meet the obligations, emissions permits must be purchased. We calculate the annual CO_2 emissions and prepare emission reports for our cement plants based on the EU monitoring directive and monitoring plans. We surrender the corresponding number of emissions permits via our emissions trading accounts in accordance with the verified emissions reports. Our target is to reduce CO_2 emissions by 200 kg CO_2/t of clinker from 1990 to 2030. By reducing the proportion of clinker in the cements over the same period we aim to reduce specific CO_2 emissions per tonne of cement equivalent by 38%. The reduction by 2019 was already 21%.

	2017	2018	2019
Specific net CO_2 emissions (per tonne cement equivalent)	428	428	435
Specific net CO_2 emissions (per tonne clinker)	529	524	528
Clinker/cement ratio	78.8%	79.2%	79.7%
Proportion of alternative fuels	92%	93.4%	92.3%
Proportion of biomass	30.0%	30.2%	31.6%

Our most important levers for climate protection and energy efficiency are:

Raw material

Fuel

Processes and innovations

RAW MATERIAL

What is SCHWENK doing to conserve natural raw materials and to close the material cycle in a reasonable manner?

The manufacture of cement and concrete requires high volumes of natural raw materials. They are obtained by excavation of the required primary material in quarries or sand and gravel pits. They form the most important basis for the production of cement and concrete. Because natural deposits are finite and also for ecological reasons, alternative raw materials and ash from alternative fuels are becoming increasingly important. At SCHWENK we have been able to replace more than 13% of natural raw materials with alternative materials. They are combined with the natural raw materials in such a way that we can maintain the high quality of our products. The addition of alternative raw materials saves not only natural raw materials and closes material cycles but it also reduces CO_2 emissions.

MORE THAN 13%

of natural raw materials for cement manufacture have already been replaced at SCHWENK by alternative substitute materials.

Picture: Limestone in the Bernburg quarry | SCHWENK

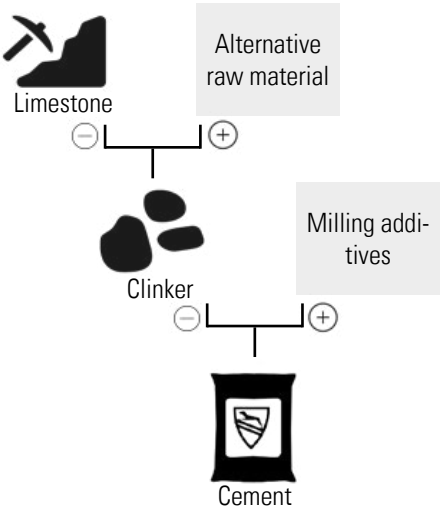
Picture: Bernburg quarry | SCHWENK

How does the use of alternative raw materials reduce CO_2 emissions?

Approximately two thirds of CO_2 emissions in the cement manufacturing process are due to the raw materials. The emissions are already integrated into the limestone. The first stage of cement manufacture is to calcine the limestone to form clinker and then grind the clinker to cement. The following two options are available to save on CO_2 emissions: see graphic.

1. Less limestone in the clinker

2. Less clinker in the cement



Use of alternative raw materials in clinker production

With the rotary kiln, cement production includes a high temperature process. A wide range of very different raw materials is completely decomposed, melted and converted to new mineral phases at extremely high temperatures (approx. 2,000 °C gas temperature and approx. 1,450 °C material temperature). Limestone ($CaCO_3$) is the most important raw material for clinker production. The integrated CO_2 is released during the calcination process. This is referred to as "decarbonisation": $CaCO_3$ becomes CaO and CO_2. Alternative raw materials, which are already "decarbonised" and thus have less or absolutely no CO_2 integrated in the starting material do not release CO_2 in the clinker burning process.

Clinker producers should prefer this process for reasons of environmental protection. So long as the chemical composition of the starting materials and the end materials – with reference to the chemistry of the fuel ashes – meets the requirements of the "recipe" for the chemical composition of the final Portland cement clinker, the choice of the type and origin of the raw materials placed in the rotary kiln is very flexible. Whether the silicate or silicium components required for the production of clinker come from natural sand from a sand pit or whether used sfoundry sand is used is virtually irrelevant for the chemical composition of the clinker. The natural and alternative raw materials are equivalent in their capacity for use in the extremely high processing temperatures in the rotary kiln, so long as the chemical composition is comparable. Unfortunately, the availability of calciumoxide-containing alternative raw materials that also contain no or little CO_2 is very limited.

For this reason, SCHWENK selects sites that have access to sources of appropriate alternative raw materials such as used casting sand, broken concrete from roof tile production, filter dust from steel manufacture or residual materials that contain aluminium. Materials of this type have

already been in use for clinker production for many years. The technical and legal approval prerequisites for the use of alternative raw materials must of course be in place.

Our Bernburg site has a special factor in this context. We share a quarry with SOLVAY AG, a manufacturer of soda. The manufacture of soda requires CO_2, which is produced from limestone in the SOLVAY process. The remaining CaO, referred to as lime lenses, is used in the Bernburg cement plant with limestone to produce clinker. The exploitation of the synergy of two completely different industrial processes has enabled the Bernburg plant to reduce its CO_2 footprint in clinker production to the lowest specific level of all SCHWENK cement plants.

Use of secondary cementitious materials

A high-temperature process is not required for grinding cement clinker with a wide range of granulates. In addition to clinker, limestone meal, gypsum, fly ash, granulated slag, natural pozzolan or volcanic ash are the most important materials for grinding cement. Almost nothing is changed other than the fineness. This takes materials that can no longer be used in their own material cycles and adds them to the material cycle in the production of building materials.

This additional use saves valuable resources. The substitute materials used for cement manufacturing must therefore be subject to rigidly defined quality standards before they can be used. Therefore, the options for the use of alternative raw materials in cement grinding are significantly more restricted compared to clinker production. The regional availability of the additives is the deciding factor in the manufacture of cement with the lowest possible proportion of clinker. SCHWENK is also experimenting with different processes in this area. We are conducting research projects to test the suitability of very fine material from concrete recycling (RCF= recycled concrete fines or crushed concrete) as an alternative milling additive.

Other projects have already demonstrated that innovative recycling processes for used concrete (referred to as electrohydraulic pulsing) make it possible to separate the additives (gravel and sand) in used concrete completely from the cement matrix (bonded hardened cement). The sand and gravel recycled in this way can be used for manufacturing concrete. The remaining cement stone can be used in the rotary kiln calcination process and also in cement grinding.

IN THE LEAD

The use of alternative fuels at SCHWENK is the rule, not the exception. We have been leaders in the cement industry in this field since many years.

We have replaced more than 92% of our coal consumption with alternative fuels in all of our cement plants. This has saved millions of tonnes of CO_2 over the years. It has also helped us to remain competitive.

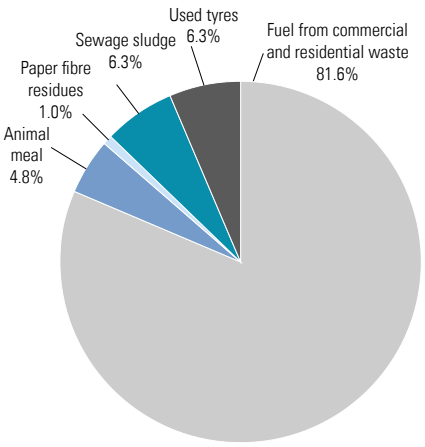
Our plan is to reduce CO_2 emissions in clinker production by another 50 kg/CO_2 per tonne of clinker by 2025 (reference year 2018). The key to this ambition is a further increase in the biogenic fuel proportion – in practice with the use of specially processed biomass and alternative fuels with low content of fossil CO_2.

FUEL

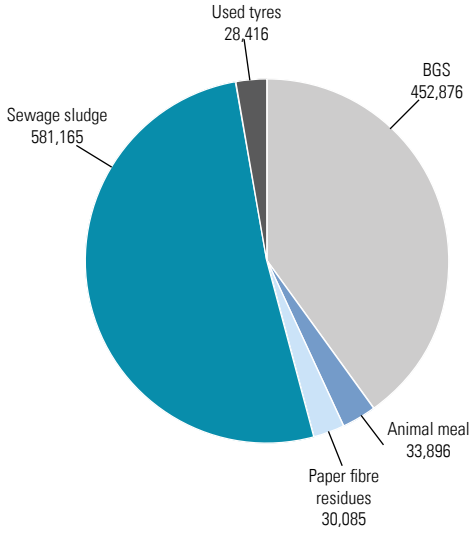
CO_2 emissions are generated in the rotary kiln during the clinker calcination process by the use of energy from the fuel to generate the processing heat. This forms approximately one third of CO_2 emissions in the cement manufacturing process. The use of alternative fuels replaces fossil energy sources such as oil, natural gas or coal. With high biogenic proportions they contribute to the reduction of CO_2 emissions and thus to protection of the climate.

Alternative fuels include dried sewage sludge or fuels derived from commercial and residential waste (BGS). Organic pollutants are burnt completely at temperatures over 2000 degrees Celsius. The mineral components from the ash are completely integrated into the cement clinker and help to save natural raw materials. This means that the fuels used in cement manufacture are fully used not only for their energy content but also for their material content.

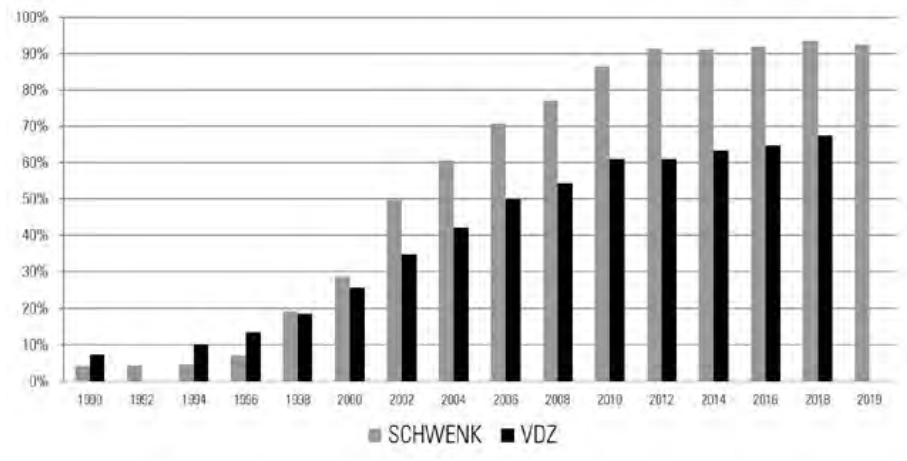
Alternative fuel mix in clinker production based on the fuel energy consumption
(SCHWENK Zement Deutschland 2019)



Alternative fuel mix in clinker production based on volumes used (in tonnes)
(SCHWENK Zement Deutschland 2019)



Development of alternative fuel consumption based on the fuel energy consumption



What is the difference between an "alternative fuel" and "waste/refuse"?

Alternative fuels are precisely composed mixtures of specially sorted and prepared waste streams (for an optimal combustion process and thus a consistently high-quality product). They enable utilisation of energy and materials. The biogenic proportion also improves the environmental footprint.

The latter aspect has become more important in emissions trading, particularly in recent years, a commonly little-known factor. The deciding factor is whether the fuel components consist of biogenic (renewable) materials (paper, cardboard, wood etc.) or residues derived from crude oil (such as plastics). TThe higher the biogenic part of the alternative fuel (wood, paper, cardboard, natural rubber, animal fat etc.) used in the rotary kiln, the better the improvement of the environmental footprint in terms of CO_2. In addition to the absolute quantity of fuels that we use in the rotary kiln, the biogenic proportion of the fuel has become very important for the economical operation of our plants and to keep them as climate-neutral as possible.

Used tyres
Biogenic component: 27%

BGS
Biogenic component: 26-35%

Sewage sludge
Biogenic component: 75-85%

Paper fibre residues
Biogenic component: 70-90%

Animal meal
Biogenic component: 100%

Waste wood
Biogenic component: 100%

Why does SCHWENK burn sewage sludge?

Sewage sludge from municipal sewage treatment plants was formerly spread primarily on farm fields as fertiliser. However, due to the ever-increasing proportion of questionable content in the sludge, such as drug residues or microplastics, the legislation now prefers thermal processing as the best solution. Sewage sludge contains 75-85% biogenic carbon content from paper, soap and digestive products. When dried, sewage sludge has a heating or fuel value equivalent to the brown coal dust that we formerly used as fuel. The composition of sewage sludge fits very well into to the "recipe" for clinker production. SCHWENK recognised the economical and ecological benefits of burning sewage sludge in the rotary kiln at an early stage. We have invested in storage capacity, transport, drying and process technology and we are now one of the largest industrial processors of sewage sludges in all of Germany.

What are the limits to alternative fuel use?

Organic pollutants are burnt completely at temperatures over 2000 degrees Celsius. However, not everything that could theoretically be used as fuel in our kilns would be considered practical.

As a result, SCHWENK group management has undertaken not to use fuels containing commonly restricted waste as defined in the CSI Guidelines for Co-Processing Fuels and Raw Materials in Cement Manufacturing.

17.3 million

tonnes of CO_2
from 7.9 million tonnes of coal
This is how much CO_2 and fossil fuels we have already saved since 1990 by the use of our substitute fuels

580,000

tonnes of sewage sludge
is what we burn annually and thereby avoid fossil CO_2 emissions of approx.

78,500

tonnes.
We are also helping to ensure that organic pollutants do not enter the food chain by being spread on fields.

450,000

tonnes of BGS
are burned annually. This corresponds to the annual volume of plastic waste generated by all households in Baden-Württemberg.

In accordance with CSI Guidelines commonly restricted waste includes:

- Electrical and electronic waste (e-waste)
- Whole batteries
- Radioactive waste from the nuclear industry
- Explosives and ammunition
- Corrosive waste, including mineral acids

PROCESSES AND INNOVATIONS

The cement manufacturing process is one of the most energy-efficient industrial processes overall. The average efficiency is around 80%.
Compared with the most modern coal-fired power plants with an efficiency of <50% that is extremely efficient. We traditionally use as much as possible of the heat emitted by the combustion process in our plants.

FOR RAW MATERIALS

We use the waste heat of our kiln to dry moist raw materials such as clay, marl or limestone.

FOR FUELS

We also use the waste heat of the kiln in large BGS or sewage sludge dryers to prepare our fuels for use. The dryer the more efficient and consistent they are.

FOR THE NEIGHBOURS

We also do a good deed for the neighbours and the whole community at our plant in Karlstadt near Würzburg with the unused waste heat: we use it to heat the local open air swimming pool.

The radiated heat emitted directly into the surroundings from the kiln shell is certainly impressive, but unfortunately it cannot be economically used. Like virtually everywhere in our industry, rotary kilns are not enclosed at SCHWENK.

INNOVATIONS FOR PROTECTION OR OUR CLIMATE

Picture: Bernburg quarry | SCHWENK

THE TARGET TO 2050

The long-term target for Germany is to be as carbon-neutral as possible by 2050. SCHWENK accepts this challenge and is taking an active part in various research projects – including projects for the development of innovative binding agents and manufacturing processes.

Celitement

Celitements are high quality hydraulic binding agents which are manufactured using a patented, energy-efficient process. They are characterised by a reduced use of limestone and low process temperatures in manufacturing. We are researching and optimising these innovative hydraulic binding agents with the aim of creating marketable products. The research is using the latest analytical equipment and takes advantage of our many years of experience in the field of building materials.

See also: In focus: Celitement p. 48

Cement Innovation for Climate

"CI4C" – Cement Innovation for Climate is a joint venture of the four European cement manufacturers Buzzi Unicem – Dyckerhoff, HeidelbergCement AG, SCHWENK Zement KG und Vicat. The objective of this group is the implementation of a research project under the title "catch4climate" to investigate the practical application of oxyfuel technology in the cement manufacturing process.

See also: In focus: CI4C p. 50

Picture: DeCONOx plant Allmendingen | SCHWENK

EMISSIONS AND AMBIENT POLLUTION

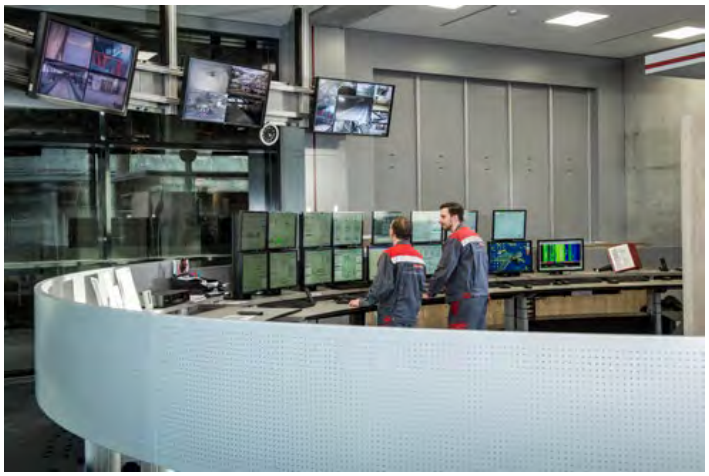
AIR POLLUTION CONTROL

While the excavation and processing of raw materials and also the production of building materials primarily produces noise and dust, a number of different air pollutants must be dealt with in the kilns of our cement plants. We comply with the legislation for protection of the environment and are subject to close monitoring by the authorities.

We are consistently investing above-average amounts in the best available environmental technology at all our sites. This ensures that out plants' emissions are regularly below the applicable limits and benchmarks. It also means that we are achieving our targets of reducing emissions of air pollutants to below the legally required amount. Our actions are making significant contributions to the protection of health and the climate.

EMISSION REDUCTION TECHNOLOGY

The use of modern fabric filters for removal of dust and the entrapment of equipment which causes dust is standard practice in our plants. We use road watering systems in our quarries to minimise the diffusion of dust. We are also leaders in the development and application of innovative emission reduction technology. This means that we exceed the currently applicable regulations for the use of the best available technology (BAT).
We use SCR plants to minimise NOx and NH3 emissions at our Karlstadt and Mergelstetten cement plants and we also have a DeCONOx system in our Allmendingen cement plant.



Picture: Control room at Mergelstetten | SCHWENK

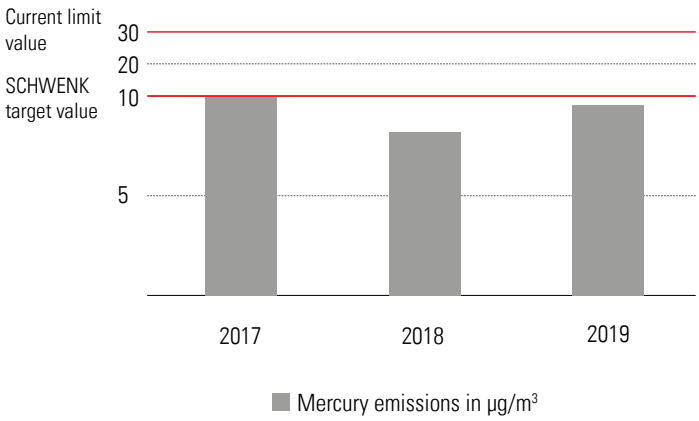
We not only comply with the valid limit values for all pollutants, we also remain well below them.

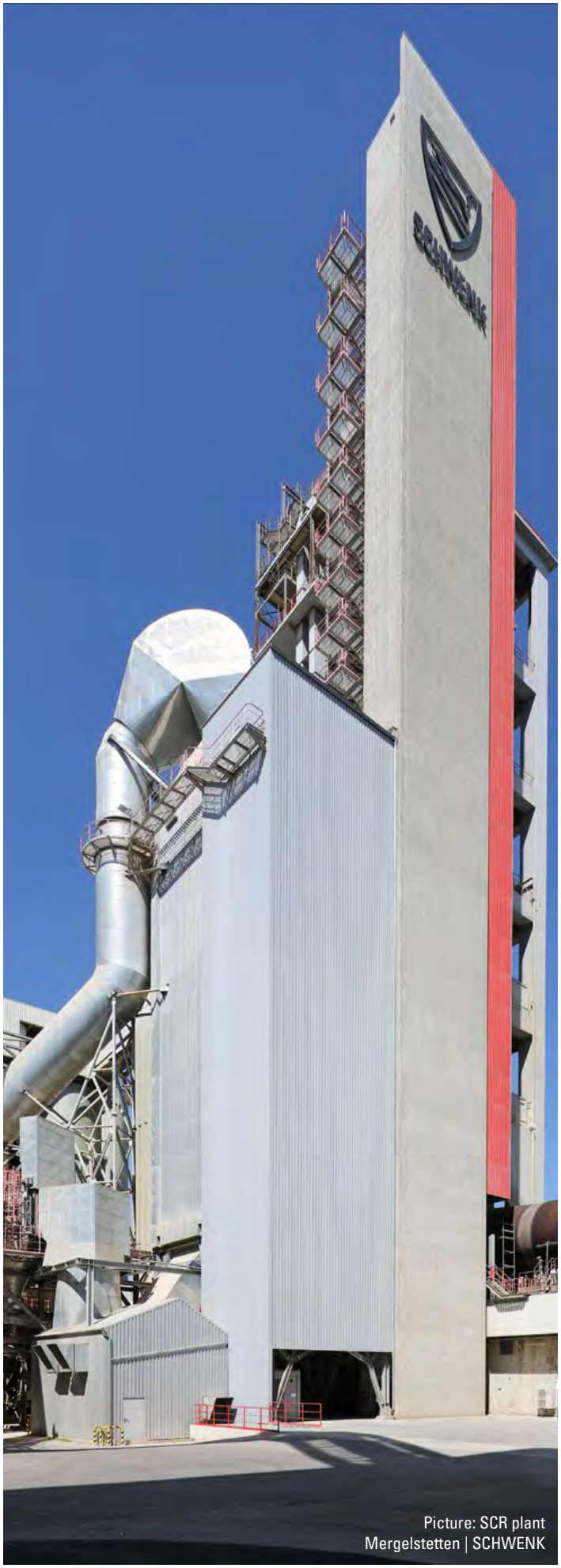
Ammonia (NH_3) emissions	**2017**	**2018**	**2019**
Limit value in mg/m³	50	35	30
SCHWENK emissions in mg/m³	31	23	11

NOx emissions	**2017**	**2018**	**2019**
Limit value in mg/m³	234	234	200
SCHWENK emissions in mg/m³	204	196	190

Dust emissions	**2017**	**2018**	**2019**
Limit value in mg/m³	10	10	10
SCHWENK emissions in mg/m³	2.32	3.45	2.74

Mercury emissions
Average of SCHWENK Zement KG





Picture: SCR plant Mergelstetten | SCHWENK

Picture: SCHWENK trucks on the Münsterplatz in Ulm | SCHWENK

SUPPLY CHAIN AND LOGISTICS

SUSTAINABLE LOGISTICS

SCHWENK focuses on the reliable, on-time and cost-efficient delivery to our customers. Even with wide fluctuations in customer demand we remain a reliable partner with deliveries almost always at the precise time promised. In addition to our strong customer orientation, sustainable logistics has always been one of our principles. This becomes particularly clear in the long-term and diverse relationships that we maintain with our logistics partners.

Our building materials are naturally very heavy. For the sake of sustainability we try to use barges and rail transport as much as possible for transporting raw materials and to deliver building materials. We prefer to work closely with local, generally small to medium-sized transport companies for transport by road. The emphasis on local means that in most cases drivers are able to come home at night to their families. Our way of working also strengthen regional economies.

CLOSELY NETWORKED AND CONNECTED

All of our cement plants are connected to the rail network. In Karlstadt we also have a harbour for loading and unloading barges. There is a terminal in Magdeburg for transferring cement from Bernburg to barges.

However, our network is more than simply transport connections. An important component are our logistics partners. They generally identify closely with SCHWENK and our values.

Transport by rail

Our subsidiary BELog gives us in-house expertise in rail transport. We are planning to use rail transport more in the future for materials such as sand, gravel, clinker and cement. Our terminal in Rostock harbour allows us to supply our terminals in Norway and Sweden. We are continuously establishing additional supply lines, including to customers with direct rail connections or connections via transhipment rail terminals.

BELog train in front of the Bernburg cement plant | SCHWENK

Transport by barge

Our cement plant in Karlstadt has a direct connection to the Main river. We receive important raw materials and ship cement and cement clinker by barge from this harbour. We have maintained a continuing relationship with a number of locally based, in some cases family-owned shipping companies for many years. They assist us with the supply of our customers with access to canals, even in difficult cases.

Harbour at the Karlstadt cement plant | SCHWENK

Transport by road

Our partly outsourced fleet of silo trailers, tippers, mixer trucks and concrete pumps uses almost exclusively engines that conform to the latest EURO 6 standard. We are already using alternative fuels such as CNG (compressed natural gas) und LNG (liquefied natural gas) in regions with the appropriate network of fuelling stations. We are also considering vehicles using hydrogen and electric drive for short distances and very small loads. Regardless of what type of engines will be used in the future, we are planning a significant expansion of the decarbonisation of our truck fleet.

We use a modern and fully integrated fleet management system that digitally assigns tasks to drivers in order to optimise our routes and processes. This has significantly improved the speed and flexibility of our logistics. Our order and dispatch receiving system is noted for its closeness to customers. By close cooperation we can avoid unnecessary travel and respond quickly to changes. Modern loading systems also assist us in reducing the transport of “air”. They ensure that the freight capacity is fully exploited without exceeding the permissible total weight. This enables us to avoid many unnecessary loads, particularly on the road.

Cement silo semitrailer at the Mergelstetten plant | SCHWENK

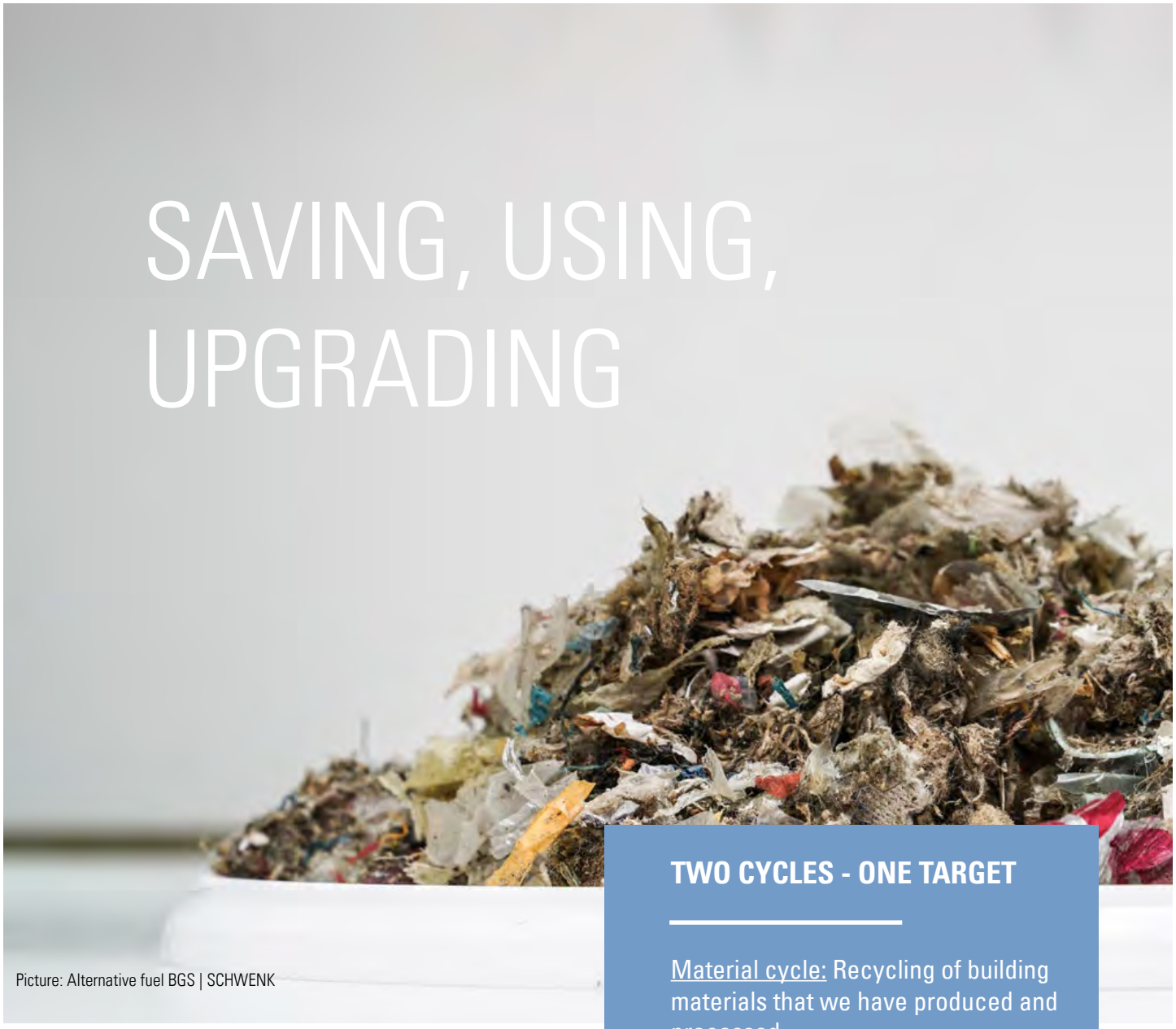
Concrete mixer truck in front of the SCHWENK headquarters | SCHWENK

SELECTION AND ASSESSMENT OF LOGISTICS PARTNERS

We base the selection of our small to medium-sized logistics partners on their sustainability. We focus on items such as compliance with environmental standards, safety regulations and identification with our company.
We assess our selections once a year and our partners are subjected to a transparent, fair and traceable evaluation. Achievement of the best environmental standard is an important target.
In order to ensure that our partners can maintain a sustainable business, we decided in 2018 to reimburse the costs for the road toll extension and adjustment to the polluter pays principle (i.e. to the last kilometre) directly to our transport contractors. Only contractors who comply with the EURO 6 standard can take advantage of these cost benefits, establishing another strong incentive for compliance with the latest environmental standards.

Picture: Bernd Köpf, Spedition Franz Herkommer GmbH & Co. KG | SCHWENK

SAVING, USING, UPGRADING



Picture: Alternative fuel BGS | SCHWENK

TWO CYCLES - ONE TARGET

Material cycle: Recycling of building materials that we have produced and processed.

Residual material flows: Recycling residual material flows from other industries that we integrate into our manufacturing process.

RECYCLING ECONOMY

USE OF RAW MATERIALS AND FUELS

When defining the term "recycling economy", SCHWENK distinguishes between the material cycle of recycling the building materials that we have manufactured and processed and the recycling of residual material flows from other industries that we integrate into our manufacturing process. By using alternative raw materials and fuels we can integrate materials that cannot be recycled in their original material cycles into the cycle of the manufacture of building materials.

Examples of fuels
We recycle short fibres from paper recycling that can no longer be used in the paper and cardboard production cycle. They supply valuable energy. The conversion of these materials to cement clinker moves them into the manufacture of building materials cycle and the subsequent recycling process. The same applies for alternative fuels such as biological sludges, animal and bone meal, old tyres, old plastic and paper and textile residues.

Examples of raw materials
Alternative raw materials include dust from metal manufacturing and processing industries, granulated slag from steel production, fly ash or synthetic gypsum (REA gypsum) from coal-fired power stations and used casting sand. Similarly to alternative fuels, these residual materials can no longer be used in their original material cycles. Their use in the manufacture of cement and clinker transforms them into a product that gives them a "new life" in a new material cycle.

Picture: Sand & gravel plant Riedheim | SCHWENK

RECYCLING ECONOMY IN BUILDING MATERIALS

There is a significant shortage of natural raw materials in the face of the increasing demand for raw materials. A recycling economy dedicated to efficient use of resources is becoming more important for securing supplies of raw materials. The building industry in particular is forced to think and act in material cycles with the requirements for greater energy and resource efficiency. The residues of building materials left after an initial stage of use should be recycled as completely as possible. The lifecycle of a building should be considered at the stages of planning, design, erection and usage. The composition of the building materials must therefore be considered for recycling during the manufacturing process. We at SCHWENK make sure that we not only comply with material limit values at the usage stage but we also guarantee recycling as completely as possible at the end of the lifecycle. Even now the greater part of old concrete manufactured with cement is recycled for road and footpath building or for manufacturing recycled additives.

Recycling and reuse of mineral building wastes or building residues as completely as possible, including in the cement manufacturing process, is in our view becoming ever more important. When recycling old concrete, very fine particles that cannot be used directly fall out of the concrete matrix. We are working to develop options for use of this material in clinker production and also in cement grinding (RCF=recycled concrete fines or crushed stone fines). In our ready-mix plants we are working on the technical options for adding or even completely replacing natural additives with recycled additives on request. Concrete and reinforced concrete are ideally suited for recycling into building materials at the end of their useful life. We are continuously experimenting with the material and technical possibilities and applying them to practical use.

See also: Climate protection p. 22

WATER MANAGEMENT

Water is a limited and therefore essential resource, particularly in this time of climate change. Water is essential for us for combining with cement, sand and gravel to manufacture concrete. Water is also used in many other ways during the production process.

In cement manufacture

All SCHWENK cement plants have access to large quarries from which we obtain our raw materials: limestone, marl, clay and sand. We place great emphasis on protection of the underground water. We regularly measure and analyse the development of the water table during the excavation process. In some cases our cement plants are located in water conservation areas. In these plants all stored raw materials, auxiliary materials and operating materials must be stored so as to eliminate the possibility of water pollution, even in the event of an accident. In quarries in which water storage is required to prevent flooding, pumping is required to remove water from areas. We use this water to supply our cement works wherever possible. We are increasingly using the option of decentralised seepage areas to return water from precipitation to the water table immediately after rainfall.

We not only use water in the production process but we also simultaneously release large volumes of water. This occurs while drying raw materials and fuels and also during calcination in the rotary kiln. In addition to the release of CO_2, every combustion process releases a comparable volume of water (H_2O). When you drive past a cement plant in cool weather you can see the condensed water vapour rising from the chimney. Depending on the location 20-25 tonnes of water can be released from our chimneys every hour.

During excavation of sand & gravel

Water management is just as important when excavating sand and gravel as in the operation of quarries for cement plants. We operate sandpits in the dry layers above the water table and also gravel pits below the water table. Special excavators dig the gravel directly out of the water. We take great care in the process to ensure that the machines and technology cannot pollute the water. After the excavation natural lakes are left – and also lakes that can be used for swimming. The water available on site is used for washing gravel and it is returned to the water table after use.

With the manufacture of concrete

Concrete consists primarily of sand and gravel, cement and water. A cubic metre of ready-mix concrete requires approximately 180 litres of water for manufacture. More water is required for cleaning mixers or silo trucks after delivery of ready-mix concrete. This results in mud from washing and residual water that should be returned to the concrete manufacturing cycle as much as possible. All of our ready-mix plants are fitted with water recycling systems.

In 2018 we achieved an average specific water consumption of

254.40
l/t of cement

over all of our cement plants in Germany. This value will be permanently below 250 l/t by 2030.

Water vapour at the Allmendingen plant | SCHWENK

Dredger at the Borgsdorf plant | SCHWENK

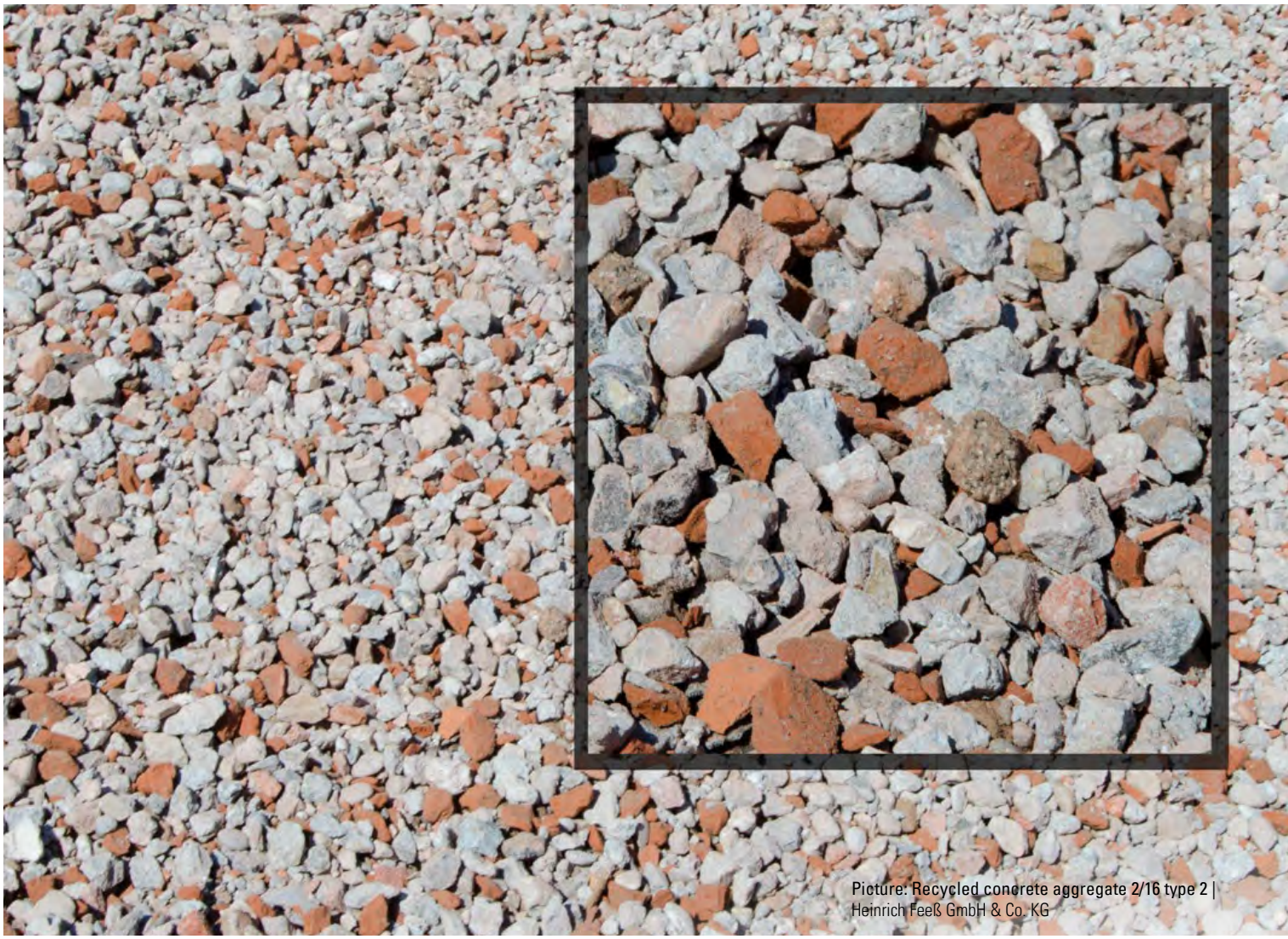
Cleaning the mixer in the ready-mix plant | SCHWENK

RECYCLED BUILDING MATERIALS

In addition to the excellent technical properties of concrete and mortar, they are building materials that in principle can be almost completely recycled. In principle, all constituents of concrete can be considered a component of a recycling economy and can be used completely in the manufacture of concrete and cement, depending on the available options and the technical effort required.

We have participated in various projects for demonstrating the available options for the use of recycled aggregate in the manufacture of concrete. If customers request it we therefore supply ready-mix concrete with recycled additives – interesting examples of successfully implemented construction projects can be seen. The properties of recyclable additive are in some cases different from those of natural raw materials. This must be considered and taken into account accordingly to prevent new problems arising from a seemingly reasonable solution to the original problem.

Processed recycled aggregates at Fees | Heinrich Feeß GmbH & Co. KG



Picture: Recycled concrete aggregate 2/16 type 2 | Heinrich Feeß GmbH & Co. KG

RECYCLED CONCRETE IN USE

Regulations allow the use of recycled concrete for a defined area of the concrete structure for internal and external building parts up to strength class C30/37. The special characteristics of the recycled aggregate must be taken into account in the manufacture of the concrete in the ready-mix plant. Processing at the construction site with installation and post-installation treatment is no different from standard concrete.

This means that recycled concrete can also be used to construct permanent and visually striking structures.

FROM RED TO GREY

Even though the recycled aggregate is very different in colour from standard aggregates, the completed structure shows no indication of which aggregate was used.

Picture: Concrete exterior facade | SCHWENK

PRODUCTS AND SOLUTIONS

CUSTOMER ORIENTATION

ENVIRONMENTAL RELEVANCE OF OUR PRODUCTS

We are surrounded every day by a wide range of products and structures that were erected with concrete and cement. We often take little notice of this building material. It has become an integral part of our environment. Its continuing success is becoming part of a global challenge: climate change. The more building material is manufactured the greater the volume of CO_2 emissions. The CO_2 naturally contained in the limestone is released in the manufacture of cement. It forms around two thirds of the CO_2 emissions of the entire manufacturing process. The high demand results cumulatively in a significant "CO_2 footprint" and thus is highly relevant to the environment. From a global point of view it is the sheer mass of cement and concrete used every year that represents a significant factor for the climate. And the demand is increasing! The reasons for the growth are the increase in population, urbanisation and the desire for modern infrastructure with roads, bridges and residential buildings.

We are meeting the challenge at SCHWENK!

Increased efficiency and longevity of our building materials

In order to improve the CO_2 balance and increase the efficiency of resource usage, we need to do "more with less". We have already improved the performance of our building materials and are doing our best to continue our development to face the challenges of the future. Cement and concrete are ideally suited for the construction of lasting and very robust structures. The challenge is to close the associated material cycles as much as possible.

Together as an industry

Our building materials serve an extremely specific market. The market demands properties of our products that we have optimised and adjusted with our customers for many decades. The CO_2 balance and optimum efficiency in the use of resources means that we now also need to consider that environmental factors are as important as economical factors. The required changes, in some cases huge changes, will demand close cooperation from all involved. This will be the only way to reduce the climate relevance of our building materials in the long term.

At SCHWENK we are convinced that environmental factors are becoming increasingly important to the extent that we are expecting a future paradigm change in the entire cement and concrete industry. This is why we are continuously researching, developing and investing in keeping our manufacturing processes, products and services as sustainable as possible. Our target is to demonstrate to Europe the technical options required so we can continue to build sustainably with concrete and cement. Our ambition challenges us to keep re-inventing ourselves while at the same time not losing our competitive capacity and our economic efficiency.

Picture: Reference Meister Martin Luther Ulm | SCHWENK

CSC certification

Since March 2020 SCHWENK has been one of the first manufacturers in Germany to be awarded a gold certificate under the CSC system standard 2.0 (CSC= Concrete Sustainability Council) for all of our cement plant sites. This certification system, established worldwide, is a high-quality certification covering sustainable procurement of raw materials and the production of building materials.

It assesses and evaluates the environmental, social and economical facets for companies in the field of cement, concrete and aggregates. The certification process has confirmed that our building materials meet the highest standards for national and international systems for the assessment of the sustainability of buildings and structures (DNGD, LEED, BREEAM). In Germany 20% of all buildings are already certified in accordance with such systems and the number is continuously increasing. The reason is that certified buildings have higher value and are more attractive for investors. In addition to the cement division, the first companies of our concrete division have successfully completed their certification.

Picture: SCHWENK CSC certificate | SCHWENK

PRODUCTS AND CONSULTING

We support our customers for the optimal use of our products by our cement application technology departement (Anwendungstechnik Zement; ATZ), also referred to simply as "construction consulting". In addition to cement, concrete or aggregates, we also offer services and digital consulting in the fields of quality control, logistics and consultation. The SCHWENK technology centre (Technologiezentrum; TZ) inspects and advises plant laboratories for SCHWENK companies and also for external customers. The pending changes in the area of the reduction of the CO_2 intensity of our processes must remain in harmony with the advanced technical requirements of our customers for our products and services. This requires competent consulting and coordination. We provide this with the ATZ, the concrete technology centre and our plant laboratories.

The increasing desire for sustainable construction can only be fulfilled by concurrent operation via many interfaces. From planners to architects to manufacturers of building material, from companies commissioning buildings to government regulators – all entities involved are required to complete a building project successfully both technically and sustainably. The increasing complexity is the major challenge here. Good communications and coordination, above all at an early stage, are essential to avoid an increasing number of faults, damage or an overwhelming of planners, owners and building contractors. The properties of new building materials must harmonise with the practical work on the construction site. New properties of construction materials derived from the application of new technology must be securely controlled. We are trying to engage ourselves through all interfaces. Our target is a solution combining the best aspects of environmental, economic and technological factors.

ACHIEVING THE TARGET TOGETHER

Individual entities in construction often work together like a well-rehearsed orchestra. A new piece of music or a new challenge must be communicated properly and rehearsed in order to achieve success for all.

Picture: Werner Rothenbacher
Application technology | SCHWENK

Picture: BPD Vogtland pump and SCHWENK Beton Vogtland ready-mix truck | SCHWENK

ADDED VALUE OF OUR BUILDING MATERIALS

Successful projects are characterised by the fact that on completion all parties involved are satisfied and the personal benefits, added value and also the common goals have been reached. An increasingly important common goal is sustainable building. Our aim therefore is to supply building materials that meet the growing demands for climate protection, environmental protection, sustainability and resource efficiency. At the same time we must achieve added technical value – whether it is by very consistent product qualities, simple and robust handling on the construction site or physical properties that go beyond the fulfilment of minimum standards.

We as a family company are convinced that the investment and effort that we place in increased climate and environmental protection will bring significant added value to the company with its employees and their families, our customers and, viewed in the long term, also society as a whole. Concrete and cement as building materials have outstanding potential for the future with their wide range of uses and excellent properties.

Under good technical management concrete building components and concrete structures can be used for a very long time, even under the most extreme conditions. This is a very positive factor when assessing the complete lifecycle of builing structures. Concrete is not a disposable product! Well and innovatively planned and built and maintained with high quality, concrete is a building material for all who value long-term added value above short-term success.

ADDING VALUE

BUILT FOR GENERATIONS

Building with concrete means thinking long-term. The earliest uses of this material have proven this. Buildings such as the Pantheon in Rome or the aqueducts have already lasted for millennia.

Picture: Reference CC Heidenheim | SCHWENK

RESEARCH AND DEVELOPMENT

OPTIMISATION ACROSS ALL BUSINESS DIVISIONS

As a building materials group with a total of four divisions – Cement, Sand & Gravel, Concrete and Pumps – SCHWENK has a wide range of experience and expertise in the complete construction supply chain.
We cover virtually all requirements for our building materials by our own work in practice – from knowledge of geology and the environmentally compatible operation of our quarries, sand and gravel pits for the additives in the concrete to the manufacture and quality control of cement, the main binding agent, through to optimisation and monitoring of high-performance concrete mixes in the concrete technology centre. SCHWENK is the market leader in many parts of Germany when it comes to the most demanding applications such as pumping concrete over long distances under very high pressure.

The development of new cements with even less clinker content and new properties has immediate effects on the subsequent options for application in concrete. For example, the increased use of recycled aggregates changes the requirements for classical aggregate materials such as sand and gravel or the construction chemistry used in concrete. Even the processing procedures for manufacturing recycled building materials may change some important durability properties.

As a building materials group our strength lies in understanding the complex interactions with all divisions working together. We collaborate with universities, research centres, our industry associations and of course our customers to maintain a holistic view over sustainable building.

ONE DIVISION FOR ALL AND ALL DIVISIONS FOR ONE:

Because the overall solution is not in individual solutions along the supply chain. Therefore, at SCHWENK all divisions work closely together to improve the sustainability of building.

Picture: Test bodies in the Allmendingen cement laboratory | SCHWENK

"Developments in the building materials field are a marathon - not a sprint!"

Our starting points

Product

Application

Process

DEVELOPMENT OF CEMENT AND CONCRETE WITH IMPROVED CO_2 BALANCE

One of our strengths is the proximity to our customers and markets. Ensuring the consistency of our building materials, high reliability and supply security and consistent compliance with the assured properties is and remains the highest goal of our building material efforts. Climate change brings another factor into the focus of our research and development. The challenge associated with this requires us not only to improve our existing products and processes but also to deal with in some cases completely new technology, which can be referred to as "breakthrough technology". This will require a high degree of effort in development and financing.

We will have to develop multiple selected and potentially promising technical approaches in parallel to comply with legal requirements and to meet the general interest in climate-neutral building materials. And of course we cannot neglect the day to day cooperation with our customers and continuous product development.

We are currently working on projects such as Celitement, additive manufacturing (3D-printing) and the oxyfuel process.

Product technology: Celitement – a completely new type of hydraulic binding agent

With the use of Celitement, SCHWENK now has a completely new binding system with excellent technical and environmental properties. It is covered by patents throughout the world. We have been developing the product and its production process for industrial use over the past ten years based on the original research at the Karlsruhe Institute of Technology (KIT) in the form of a cooperation contract with the KIT. At the beginning of 2020 SCHWENK acquired full ownership of Celitement GmbH along with the pilot plant. The plans for the first industrial reference plant are almost complete. SCHWENK will decide whether to invest in the first industrial-scale plant depending on the final assessment of a wide range of tests with the sample material from the pilot plant. Celitement is one of the very few developments in the field of innovative binding agents that has managed the transition from research to industrial practice. Projects of this type need the long-term approach of a family company like SCHWENK for successful implementation.

Application technology: Additive manufacturing (3D printing) with short carbon fibres

Using a special extrusion process we are working with a partner in the building industry to develop a process for manufacturing innovative finished parts without using reinforcing steel by additive manufacturing. We see the industrial prefabrication of concrete components as a possible way of introducing innovative building practices that also save resources to the industry. We are interested in applying productivity increases that have long been implemented in other industries to the manufacture of concrete. This will require the development of not only machinery and processing technology but also the right binder. A particular challenge in the field of additive concrete building is the achievement of product characteristics that are normally achieved by the use of reinforcing steel. In contrast to many other "3D concrete printing" concepts, our initial focus was on the development of building materials with oriented short fibres derived from specially treated carbon fibres. When correctly combined and applied these materials can achieve not only the well-known high compressive strength of cement mortar but also extremely high flexural strength. We are following and promoting the development of innovative 3D printing processes in concrete construction so we can align our products to the new requirements of the technologies at an early stage. Technology such as this requires close cooperation and collaboration with materials scientists, mechanical engineers and toolmakers, specialists in computers and IT along with planners and structural engineers.

Processing technology in cement manufacture: The oxyfuel process

The manufacture of building materials such as cement at a consistent quality demands great familiarity and experience with the industrial processing technology for cement manufacture. The process of developing a cement plant as free from CO_2 as possible is very ambitious. The target is to trap the CO_2, which cannot be eliminated in the process, using carbon capture technology. Once liquefied it can be stored underground (CCS = Carbon Capture & Storage) or combined with hydrogen in a wide range of processes to form additional products such synthetic fuels (CCU = Carbon Capture & Use).

Two basic approaches for separating CO_2 in cement plants are available:

1. The CO_2 can be separated from the typical exhaust gas flow from the chimney. The disadvantage of what is referred to as post-combustion technology is the very high volume of exhaust gas. Air consists of 78% nitrogen (N2). The carbon capture process requires nitrogen and CO_2 to be separated. This requires a high investment in plant technology and high power and heat requirements during operation.

2. An alternative is oxyfuel technology. This process uses pure oxygen for combustion in clinker manufacture. This significantly reduces the volume of gas that must be cleaned. SCHWENK, along with three partners in the cement industry, has decided to set up an initial pilot plant using this technology at Mergelstetten. The company set up for this purpose, Cement Innovation For Climate (CI4C), will manage the project over the following years.

PIONEER PLANT AT MERGELSTETTEN

Our Mergelstetten cement plant will be the site of the first pilot oxyfuel plant

Picture: Allmendingen concrete laboratory | SCHWENK

CEMENT COMPLETELY REIMAGINED

Small steps – long lever

An interview with Dr Hendrik Möller, Managing Director of Celitement GmbH.

Dr Möller, what is the exact origin of Celitement GmbH and the unusual name?
Celitement GmbH was founded in 2009 in the context of a cooperation between research – represented by the KIT – and industry, in this case SCHWENK Zement KG. The name Celitement, which refers to the company and the product, is not always that easy to pronounce. The double usage also causes some confusion.

Our original name logo started with a C with a triangle below it. That is the symbol used by geochemists for CO_2. The "lite" in blue and vertical: like Cola light stands for light or virtually free – referring to CO_2. The "ment" at the end indicates the product group, i.e. cement. To write it like this is not particularly practical. In the end we simply inserted the "lite" into the middle of the word "cement". The result is Ce-lite-ment. Our products – the Celitements – are high quality hydraulic binding agents which are manufactured using a patented, energy-efficient process. Compared to Portland cement clinker, they are characterised by a specifically lower use of limestone and lower process temperatures in manufacturing. Celitements are thus a new type of hydraulic binding agent. They have been developed with the objective of creating marketable products and contributing to reducing the CO_2 intensity in cement manufacturing.

What exactly is the difference between a classical Portland cement and Celitement?
The manufacture of a tonne of Portland cement clinker releases an average of 840 kg of carbon dioxide. Around 67% of this results from the deacidification of the main raw material, limestone, i.e. $CaCO_3$. Less limestone is required for the manufacture of Celitement. As a result less CO_2 is released. In addition to cement clinkers, modern cement also contains additives such as gypsum, limestone meal, granulated slag, fly ash or natural pozzolans. These additives can also be combined with Celitement and enable the CO_2 intensity to be reduced even more.

How much better is the CO_2 balance of Celitement compared to Portland cement?
That is difficult to answer. Start with the basis of the comparison: what sort of cement are you thinking of? The European cement standard includes 27 types of cement, soon to be 30. Even if there are still no solid numbers from measurements at an industrial Celitement plant, in our opinion pure Celitement is now at least 30 percent better that an average European ground clinker. Greater savings to about 50 percent are possible depending on the recipe of the starting raw materials and how we can optimise the process in the future. However, ultimately the volume of CO_2 per tonne that a single binding agent emits is not really relevant. What is relevant is the total CO_2 burden of the structures or building products manufactured with it. This is where the efficiency and technological performance becomes crucial, where the "green" cements or special binding agents such as Celitement can still have some advantages.

The principle of Celitement seems quite simple, so why was this idea not developed earlier?
The Celitement project is an excellent example of how a marketable product can be developed from fundamental research. The researchers at the Karlsruhe Institute of Technology were originally working with the reaction mechanism of the most important mineral phase of Portland cement clinker, tricalcium silicate (Ca_3OSiO_4 or abbreviated to C_3S). They then noticed that during the process of hydration to the end product C-S-H, i.e. calcium silicate hydrate (the "glue" in mortar and concrete), passed briefly through a previously unknown intermediate phase. The next proposal was to manufacture a pure form of that respective intermediate phase and use it as a "semi-finished" binding agent. Finding and precisely analysing this reactive and otherwise only briefly existing intermediate phase of cement hydration requires specialised expertise and analytical techniques. Even the largest cement manufacturers do not have these facilities in their laboratories. In general, the cement industry only has plant laboratories oriented to production and applications. We have never had the interdisciplinary working groups and the analytical scale required in fundamental research with their very expensive and specialised machines and systems.

Why has SCHWENK become involved in this project and even taken over the company completely in 2020?
SCHWENK is convinced of the principle of Celitement as a binding agent. The former company structure could not provide the substantial financial support for a required expansion of the pilot plant nor for the subsequent business operation. SCHWENK offered to acquire all the shares in Celitement GmbH from the former partners in order to continue the successful work of the past few years and to be able to

complete the project. The acquisition of Celitement GmbH retroactively to 1 January 2020 enabled the project to be continued. The acquisition also protects a planned, but not yet released, major investment by SCHWENK in the first industrial reference plant.

You said you would like to expand the pilot plant. How many tonnes does the plant currently produce and how much do you plant to produce in future?
Since the first mill was commissioned in the pilot plant at the end of 2013, we have been manufacturing approximately 10 tonnes a year of a wide range of Celitements or their intermediate products. But this was over a very long period and with very many different processing parameters and variations in recipes. After the expansion, we are planning to produce 2-3 tonnes a week "in one batch" in what we refer to as routine operation, in which we will attempt to manufacture the same material at a constant consistency over an extended period.

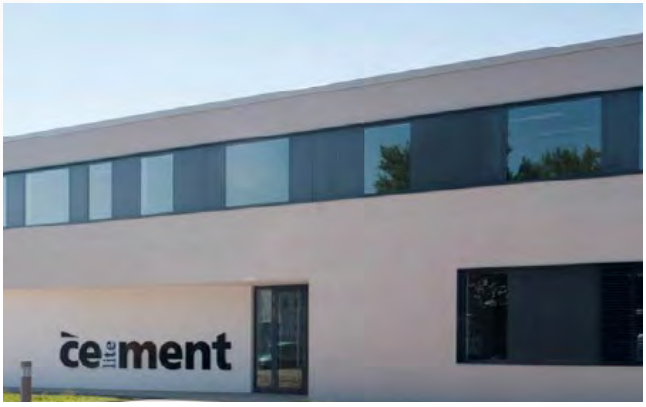
When do you think Celitements will be available for purchase in the market?
Our planned industrial reference plant is designed for a maximum annual capacity of 50,000 tonnes. We plan to establish standard operation and issue further licences from 2026. This may seem a long time. However, it is very ambitious when you consider the preliminary work, practical experiments and studies that will be required.

Dr Möller, thank you for the interview. We look forward to seeing the first tonnes manufactured in the reference plant.
It has been a pleasure.

Interview: April 2020

Picture: Dr Hendrik Möller | SCHWENK

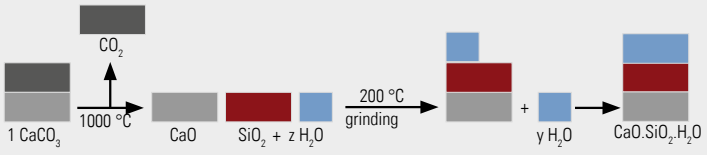
Picture: Pilot plant | Celitement



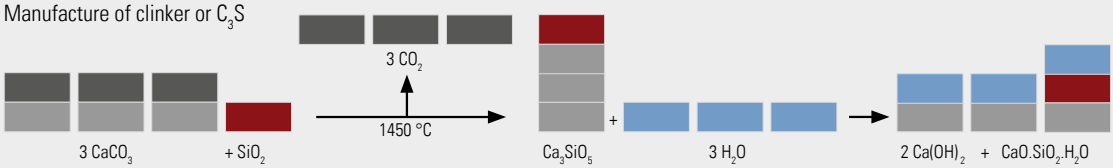
Picture: Celitement office | Celitement

Legend

Manufacture of Celitement



Manufacture of clinker or C_3S



FOUR COMPANIES WORKING TOGETHER

A joint venture for our climate

An interview with Jürgen Thormann, Member of Management.

CI4C
CEMENT INNOVATION FOR CLIMATE

Climate change is everyone's business. What is SCHWENK's position on this topic?
SCHWENK has been a leader in our industry in the field of environmental protection for many years. However, climate change poses challenges to the operation of cement plants that go far beyond protection of the environment. We have proved that we are in control of the processes with reference to environmental protection. There is nothing to prevent us from facing climate change with the same attitude. Group management and business management have made a clear decision that we will be involved in the development of technology for combating climate change. The first task is research to develop technologies that can be applied to removing the climate-damaging CO_2 from the exhaust gas of the cement kilns and make other use of it.

A company under the name CI4C was established in December last year. What does this name mean?
Four cement manufacturers founded a research company under the name CI4C. They are Buzzi Unicem – Dyckerhoff, HeidelbergCement AG, SCHWENK Zement KG and Vicat. The name of the company was selected in English because it is a consortium of European companies. The name is intended to show outsiders the objective of this company: Cement Innovation for Climate. The partnership will not be a business operation but is intended to promote innovation in the face of climate change.

What actual developments will this involve?
CI4C will build a cement kiln at industrial scale to be operated using the oxyfuel process. The kiln will be designed for a daily production of 450 tonnes of clinker. It will also be used as a test bed for the technical development of the new process under real-world conditions.

Where will the new kiln be built?
The consortium has decided to build the kiln at our Mergelstetten site.

When will construction start?
The emissions approval process is currently under way. The construction approval is part of this process. At the same time we are working on the design of the plant with the plant contractor. The technical planning for the plant and machinery will follow immediately afterwards. Then construction work is intended to start as soon as the dimensions and the first loads for the foundations have been calculated. The approval process is being conducted with public participation. We wish to involve the public in order to improve trust and acceptance in the general public. Finally, the first construction permit can be issued in an early approval process. Currently it appears that construction can be started early in 2021.

Will the oxyfuel kiln be integrated into the Mergelstetten cement plant?
This is not possible due to the approval regulations, because CI4C is a separate company. The site for the new plant must therefore be separated from the current cement plant in Mergelstetten. However, CI4C must work closely with the cement plant, because the greater part of the operating resources such as coal, alternative fuels and raw meal will be supplied by the cement plant. The laboratory in Mergelstetten will also be needed to provide important services such as quality control. The provision of material supplies and services is to be regulated by cooperation agreements between CI4C and the cement plant.

Can you give is a brief explanation of the oxyfuel process?
The oxyfuel process uses pure oxygen for combustion in contrast to the use of air in the conventional process. Air contains up to 78 percent nitrogen, which is not involved in the process. This means that the entire nitrogen content of the air comes out in the exhaust gas of conventional kilns. CO_2 must be in as high a concentration as possible in the exhaust gas in order to separate it easily. The nitrogen from the air dilutes the CO_2 – this makes it more difficult to separate. Nitrogen does not enter the kiln when pure oxygen is used in the oxyfuel kiln. As a result, calcination and deacidification of the limestone generates almost pure CO_2 as the exhaust gas. The only other major component of the exhaust gas is water vapour, which can easily be removed by condensation. This makes it possible to clean the exhaust gas flow from the kiln, which means primarily removing dust and other minor impurities. The CO_2 can then be separated and liquefied with suitable technology.

catch 4 climate

What happens with the CO_2 after it has been liquefied?
There are two options for further use. The first option is to recycle the CO_2 to fuel, referred to as reFuels. However, this requires huge quantities of electricity from renewable sources. Otherwise, the use of electricity from conventional electrical generation would simply release CO_2 somewhere else. The second option would be to compress the CO_2 underground or under the sea. There are currently new possibilities in this area in Norway. The cavities under the seabed resulting from the removal of oil and gas could be refilled with CO_2.

Is the name of the project explained by the process?
Yes, exactly. The name of the project is "Catch for Climate", abbreviated as C4C, and is intended to express the actual purpose of the project. Our target is to make a contribution to the protection of our climate by separating the CO_2 arising from the cement manufacturing process and making it useful.

Thank you, Mr Thormann. We hope you are able to start construction of the kiln on schedule.
Thank you.

Interview: April 2020

Picture: Jürgen Thormann | SCHWENK

Picture: Mergelstetten plant | SCHWENK

A STRONG NETWORK

FOR RESEARCH AND DEVELOPMENT

COOPERATION WITH PARTNERS AND UNIVERSITIES

We have maintained and expanded a network with a wide range of partners for many years. We use the network to find out about and continue the development of the latest methods and processes – particularly in the field of CO_2-reduction. Because the German construction industry is dominated by small and medium enterprises, the average expenditure on research and development is not comparable with other industries such as the automotive industry. This makes it even more important for us to work closely with reliable partners.

In 1879
we started working with the Test Institute for Building Materials directed by Dr Wilhelm Michaëlis.

In 1894
we started working with the Royal Technical University in Stuttgart (today the Otto Graf Institute).

COOPERATION PARTNERS IN THE R&D NETWORK

R&D	MIP Polymerforschung Mainz	MPA Berlin Brandenburg	Uni and MPA Stuttgart
EMPA Zurich	University of Augsburg	University of Weimar	University of Ulm
KIT Karlsruhe	TU Clausthal	TU Munich	Fraunhofer Inst. for Silicate Technology
Bergakademie Freiberg	MFPA Leipzig	TU Aachen	HBC Hochschule Biberach
BASF Construction Chemicals	FH Nuremberg	University of Erlangen	

SIX DECENTRALISED SCHWENK LABORATORIES

Our laboratories at the cement plants are competent contacts for our network.

Picture: Tim Schröder Allmendingen Laboratory | SCHWENK

PEOPLE AND ENVIRONMENT

Picture: SCHWENK employees | SCHWENK

EMPLOYEES AND EMPLOYMENT

PEOPLE AT THE CENTRE

Highly qualified and motivated employees guarantee the success of our company. We have established a working environment that includes attractive working conditions and targeted development activities that help our employees achieve success. This forms the foundation for sustainable company development. Work safety and employee health have top priority for us as a manufacturing company.

We are proud to be a traditional family company. It is important for us to ensure a modern and safe working environment for our employees. SCHWENK as a company takes full responsibility for the protection of employees, their health and a sustainable business environment. A good employee policy for us means that we establish general conditions for our employees within which they can develop their potential and achieve top results. Appropriate remuneration and attractive benefits are as important as targeted individualised development opportunities and an atmosphere characterised by fairness and esteem.

Our management mission statement describes fundamental and binding principles with respect to employee management. It offers our managers valuable support for their daily management tasks, such as with reference to responsible actions, the development of employees and transparent communication at an equal level. Our central, person-related processes are described in detail in a personnel core process of the integrated management system and are accessible throughout the group. We require all managers and employees of our group to act legally and ethically at all times. SCHWENK acknowledges the core working standards of the International Labour Organisation (ILO) and the Universal Declaration of Human Rights of the United Nations.

We expect consistent compliance with these basic standards and recommendations from our employees and business partners.

EMPLOYMENT AND EMPLOYEE PARTICIPATION

Employee participation has become firmly established and has proven effective at our cement plants in Germany. Members of the employee committees at the various sites form the general works council. Group management, human resources and employee representatives maintain continual constructive communication. Dialogue with the union is also open and fair in the applicable contexts. As a family company we have always been enthusiastically socially engaged more out of conviction than as a social requirements.

Number of employees

The SCHWENK Building Materials Group has about 2170 employees. They are distributed through our four divisions: cement, sand and gravel, concrete and pumps.

2170 employees

Period of employment

We are particularly proud of how long our employees remain with us. The average period of employment is 14 years, making them a permanent part of the SCHWENK family.

14 years

Employee distribution

About 59% of employees are hourly paid. 41% are salaried employees. With 16% female employees SCHWENK is above the average compared to other companies in the construction industry.

Picture: Fabian Fluck, payroll accounting | SCHWENK

SECURE AND FLEXIBLE

PAYMENT POLICY AND WORKING TIME REGULATION

Our pay policy is based on the general market standards for companies in this industry. Virtually all of our companies are subject to collective agreements and we reward the efforts of our employees with competitive wages and salaries.

The company pension scheme at SCHWENK matches general market standards. We comply strictly to the legal requirements for regulating working hours. Our compliance guidelines, under which employees are able to report violations, support our compliance with all applicable regulations.

FLEXIBLE WORKING HOURS

In order to enable flexible working hours we offer employees models such as trust-based working hours, flextime, work hour accounts, part-time and leaves of absence. We offer some of our older employees individualised part-time contracts (current quota: 2.1 percent). The number of employees working part-time is five percent.

PERSONNEL DEVELOPMENT

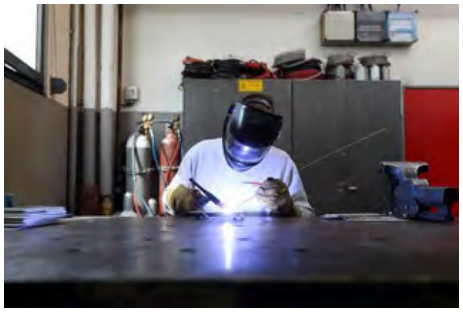
Targeted and accurate personnel development measures make a major contribution to the success of our company. They promote specific competencies and the capacity for action of our employees. Personnel development is therefore a central task of our managers and at SCHWENK it is based on the following three foundation stones.

Tasks and responsibilities
The assignment of tasks and responsibilities develops employees technically and personally in their daily working environment. Annual interviews available to every employee form the basis for identifying future high performers and talent and for preparing individual development plans to assist in their progress and growth. The systematic succession planning for all management and key positions is linked to personal development. It is a central and personal-based risk management process and is implemented in close consultation between management and the human resources department. Our target is to link the succession planning process even more closely with the processes for assessment of performance and potential to develop and improve a general scheme for talent management.

Coaching
Coaching forms another foundation stone. Our managers use continuous feedback, exchange and meetings to support the development of all employees.

Training
Our employees have access to internal and external training, continuing and further education courses as required. The internal promotion of younger employees in the form of potential development programs (PDP) is a fixed component of our personnel development measures. The one-and-a-half-year program offers participants a wide range of assistance with orientation and supports them with their future career planning.

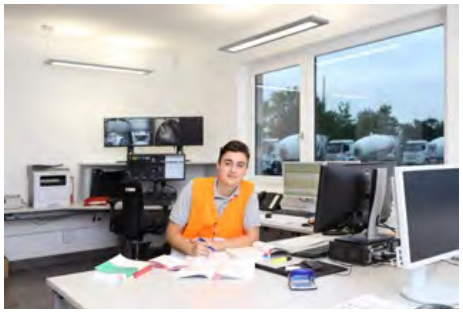
Picture: Lisa Groll, Personnel Development, and



Maximilian Fetzer, industrial mechanic | SCHWENK

Anja Huber, chemistry laboratory technician | SCHWENK

Federico Delmonte, process mechanic
Building materials | SCHWENK



Inan Karabasak, process mechanic
Ready-mix concrete | SCHWENK

TRAINING AND CONTINUING EDUCATION

In addition to the above activities, apprentice training and dual studies for securing and retaining qualified successors has always had a very prominent position at SCHWENK. In 2019 we offered a total of 15 different commercial and technical industrial apprenticeships and also a dual study programme (mechanical engineering). The SCHWENK Building Materials Group had an apprenticeship ratio of 6.1 percent with a total of 122 trainees in 2019. We are particularly proud of the fact that in the same year 20 young people and thus 100 percent of the trainees could be offered positions at SCHWENK due to passing their examinations and their good performance.

In addition to the actual apprenticeship, we also offer school and university students the opportunity to gain practical experience on the job in the form of internships, dissertations and factory student activities and to become acquainted with SCHWENK as a potential employer. We find it very important to offer employees development opportunities precisely tailored in line with their requirements. We take care to provide the relevant mixture of on-the-job and off-the-job actions – for example in the form of project learning, work at other sites and training. We also support employees with obtaining additional qualifications associated with the duties of the position such as more comprehensive continuing education courses over an extended period. In the 2019 financial year we extended our training and continuing education measure to place a central emphasis on the topic of work health and safety.

Courses in the field of work safety make up 71 percent of all training activities. Specialist courses at 27 percent are another important focus of our employee development. The remaining 2 percent cover management development for employees with management responsibilities. The most important factor in all of our employee development measures is that we encourage employees to reflect on what they have learnt and how to transfer it to their daily work. Specially designed tools and processes systematically promote the transfer of knowledge and improve retention of what they have learnt. The responsibility for all of the above is shared by the learners and their managers, whose primary duty is to oversee the personal development of their subordinates.

6.1%
trainee quota

15
different commercial and technical occupations

100%
employment of trainees

DIGITAL LEARNING

We are developing a new strategy for digital learning in which our employees will be able to take greater advantage of the benefits of digital learning, such as in the form of e-learning. We are currently finding that online courses in the field of work safety are working very well. We intend to expand our range of digital learning formats and content to further areas and topics in the future. Modernisation of the IT infrastructure and the introduction of cloud-based collaboration tools will also promote new virtual forms of working together.

MANAGEMENT DEVELOPMENT

We offer our managers leadership courses tailored for specific groups. We also encourage reflection on their own management role along with exchange of experience by individualised coaching and group discussions of specific cases. It all assists our managers to develop ideas and solutions for their everyday management problems. In 2019 50 percent of our managers below top management level took part in at least one programme or management training course.

WORKING TOGETHER TOWARDS ONE GOAL

For the development of our employees and our company

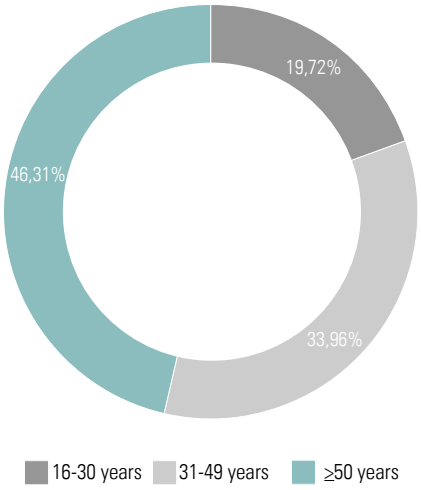
Picture: Tobias Schullar, TZ Central Laboratory North | SCHWENK

DIVERSITY

MAKES ALL THE DIFFERENCE

44.8 years
is the average age of our employees

Our people fall into the following age groups:



DIVERSITY MANAGEMENT

Generation management

We have established a proactive and systematically updated personnel management programme to ensure that we can properly manage departures due to retirement and recruitment of new people coming from apprenticeships and training and also from external recruiting and that we can proactively prevent risks resulting from changes in personnel. We particularly look forward to seeing how our employees support and promote one another regardless of their age groups. For example, this happens on the one hand by the sharing of extensive technical and process experience and on the other hand by efficiently using modern technology and software and communications solutions.

Diversity as a success factor

We are firmly convinced that people are best motivated to work if they feel that they and their performance at work are assessed without any form of prejudice. The diversity of our people contributes to the success of our company. The different backgrounds and differences in thinking and point of view also promote additional potential creativity and innovation. This makes a valuable contribution to the design of processes and the development of solutions for our customers. What appears important to us is that we also form a common understanding of the company and a unified system of values to reconcile the difference between diversity and unity. We are proud have people from 25 different countries employed in our company.

25

different nationalities can be found in our group throughout Germany.

Compatibility of job and family

We as a family company have always placed great importance on family values.
Depending on their domestic situation the needs of our employees can vary greatly: from building a house to family planning to the care of relatives. We support our employees by being aware of the individual situation, assessing applicable actions and developing individual solutions. Examples of how we assist can be flexible working hours and home-office regulations.

Picture: Collage of SCHWENK employees | SCHWENK

WORK HEALTH AND SAFETY

Safe and healthy working conditions are an important foundation for the success of our company. This applies to our employees and to all persons who enter our facilities or could be endangered by our activities and products. Every accident means human suffering for the victims and their families. Therefore, the prevention of work-related injuries, health problems and diseases is top priority for us. In cases of doubt work health and safety always take priority. All employees are required to take active responsibility for work health and safety in their areas of work and to take an active part in improving health and safety at work. We promote the competence and the awareness of risk and responsibility of all employees by personal training courses and e-learning measures.

Concrete pump with secure stand, BPD Vogtland | SCHWENK

The MISSION ZERO campaign is targeted to the complete prevention of accidents and also near misses. The slogan for all processes is as follows: “we will work safely or not at all”. All supervisors are responsible at all times for making sure that everyone knows that we take this very seriously.

Accident rate (LTIFR) *	2017	2018	2019
SCHWENK Zement	6.0	2.2	3.7

*Number of accidents of all our employees with at least one day off work per 1,000,000 working hours.

Picture: Sebastian Sponfeldner, Plant Group Manager SCHWENK Sand & Gravel North | SCHWENK

Picture: Dominik Wagner, ready-mix concrete driver
SCHWENK Beton Alb-Donau | SCHWENK

SAFE AND HEALTHY

More than 90 percent of work health and safety management systems in our German plants are certified with the "Sicher mit System" [Systematically safe] certification of the Social Accident Insurance Institution.

We have established management systems for safety and health at work. This provides a structured procedure for the planning and implementation of measures for the prevention of work-related accidents, occupational diseases and other health hazards related to work and for effective first aid. The provision of safe and healthy workplaces, the detection of risks and opportunities and the continuous improvement of our work and health performance are in the forefront.

The health and safety of third parties is also important to us. The rules for the protection of visitors to our facilities are described in binding guidelines. Our pump and ready-mix trucks have turning sensors and camera systems, particularly for the protection of pedestrians and cyclists on the road. We provide checklists to construction managers and our pump operators for setting up concrete pumps. They cover all aspects relevant to safety for our machines and building sites. Trained safety coaches support our pump operators on site with site inspections and inspections of the vehicle equipment and the driver's protective equipment to ensure health and safety.

OUR MISSION ZERO

Working together to redesign work health and safety

An interview with Michael Kuhn, Maintenance Manager Southern plants group.

How long has Mission Zero been here and what does it mean?
SCHWENK Zement KG, South plant group has had a special mission since early 2015: Mission Zero. The target is for all employees to come home to their families safe and healthy after work.

What is important for employees with reference to Mission Zero?
We have always considered work health and safety as part of our culture, because it is not a time limited project. We all want to live a safety culture together. Our target with Mission Zero is to inform, communicate and promote active cooperation. It is important to us that employees identify with their work, with the actions and with the approaches to solutions. Because this is the only way that they can communicate the culture to their colleagues.

How do you involve employees in Mission Zero?
When we started Mission Zero, our main interest was what concerned and interested the foremen and the engineers. We organised a range of events such as seminars, open workshops and internal and external meetings with management to compile all the different points of view and requirements. In combination with a comprehensive survey we were able to establish a structured overview of the topics and to set priorities. We then addressed the employees at work with Mission Zero cycles. This resulted in a huge collection of ideas, suggestions and approaches to solutions and also feedback in the form of statements. They were all evaluated in consultation with the department managers and the feasibility was checked. We also established work groups that are actively and continuously involved with the topics.

How do you get "Zero accidents - work health and safety" into the heads of all employees?
The best way is by changing the culture – I don't think that you can direct or order this. There is a long way to go to meet the target, which has of course been dogged with delays and setbacks for us. However, we will not be deterred! We are continuously assessing Mission Zero and asking ourselves what we can do to improve. We are also considering strategic items coming from employees. We discuss, clarify and develop solutions for them. An important approach every day is the continuous assessment of the risks and hazards of all activities. This is the basis for detection and initiation of protective measures. It may be only a brief consideration, but better still a discussion with documentation in a meeting with colleagues. Regular information and discussion in all areas, in all meetings and at all events are important components in the continuing development of Mission Zero and embedding the "No accidents - healthy working" target in all heads.
In brief: constructive leadership, comprehensive communications and respectful interaction – this is how the mission will be in all heads.

What can employees contribute?
Quite simply, they can all do their part by taking care at work all the time, avoiding dangerous situations, noting and reporting near misses and unsafe behaviour. Above all they must be prepared to learn. If they all take responsibility for themselves and their actions and look out for their colleagues we are already close to winning. We should all act as examples and give feedback whenever possible. It can be in the form of reporting or active participation in work groups or team meetings.

Give us an example of results of Mission Zero.
Welding is a good example. Many do not know that actions on this topic were initiated by Mission Zero surveys and our suggestion process. As a result we have installed a welding cabin with an exhaust system in the mechanical workshop in Mergelstetten. In Allmendingen a central exhaust system extracts fumes from the welding cutter, the welding workstations in the mechanical workshop and the welding workstations in the apprentice workshop. Height-adjustable welding tables at both sites help to prevent constrained posture problems for welders while they are working. 3M Speedglas welding helmets have been purchased for on-site welding work. They were selected and tested in consultation with the works council and some of the welders. They are currently the best available on the market.

Another suggestion from employees was about our training. We introduced an e-learning tool around two years ago to improve training. It helps to make training and important information more easily understandable and more accessible. Around 60 percent of topics are already developed in close consultation with head office and the North plant group. The effectiveness is checked and ensured with check questions. There is never any shortage of further input. We regularly receive new topic suggestions and information. The tool is also effective in communicating information about unexpected topics such as corona virus quickly and effectively.

That sounds like a good foundation for close communication with employees.
Certainly. In order to include our youngest employees we have taken advantage of the corona home office phase to turn the tables. We have given the trainees of the South plant group instructions in the draft stage for review and training and given them the task of preparing questions and answers for checking the effectiveness. The feedback in the form of lists of questions was excellent and very detailed. I find this a good example of active cooperation. And they will remember this in future every time that instructions for a trainee are required. And perhaps some of their own questions will be ready to be answered.

Thank for the interview, Mr Kuhn.
It has been a pleasure.

Interview: May 2020

Picture: Michael Kuhn | BAUZ ©Mirko Bartels

Picture: Personal protective equipment | SCHWENK

The shape of our sticker looks like a safety shield. It reminds us every day of our common mission!

MISSIONZERO

HEALTHY LIVING

Picture: Wilfried Fuchs and Tina Dubb | SCHWENK

THE DUTY OF US ALL

The promotion of employee health always needs to strike a balance between working conditions, individual behaviour and personal responsibility.

HEALTH MANAGEMENT

Healthy and top-performing employees are a significant factor in the success of our company. Since 2013 we have bundled our actions in the field of health into a company health management system.

The target of our holistic approach is to implement and promote a comprehensive and preventive health policy. This includes areas such as improving awareness of health issues among employees and management, well-being in the workplace and reducing health risks and stress. We offer a wide range of measures, activities and programmes designed to meet the needs of our employees. We conduct regular surveys of employees to ensure continuous improvement and adjustment of our services.

TIPS

Quick and easy – tips for everyday use on the intranet

We regularly post targeted exercises and information in the field of health on the intranet. Employees can take part in small learning units teaching tips on how to improve their health and integrate them into everyday life. The continuous enrichment of the content provides a wide range of information for all employees.

COURSES

Preventive action for physical and mental health

Some of our sites have various exercise courses for maintaining health and fitness. Employees can participate in an internal SCHWENK course during breaks or after work. The options range from fitness training to back gymnastics through to yoga. We also work with Jobrad, a company bike leasing plan, designed to promote healthier and environmentally friendly movement.

PREVENTION

The basis for early action

Medical prevention is an important part of maintaining health. We support participation in preventive medical examinations with local offers and as part of our bonus programme.

BONUS PROGRAMME

Collect points

The bonus programme is an important part of prevention. Employees can collect points by healthy behaviour, even at home, and convert them to prizes.

COMMUNICATION

From training to workshop

Training and workshops for our managers ensure that they can conduct communications processes, such as employee interviews, successfully. We maintain a communications culture that provides open and regular information on health topics to promote and reinforce awareness of health among employees.

RISK ASSESSMENT

Guide to our offers

The risk assessment of psychological stress is an important field of action for work health and safety and for health in particular. Specific offers in this area are derived from our regular surveys of employees.

IN FOCUS: TRAINING ISLAND

ERGONOMICS AND PREVENTION IN 12 MIN.

The training island model

An interview with Irene Walter, Corporate Health Management at SCHWENK.

What exactly is the training island and the associated concept?
The training island is a very special building block in our health management system. For about two years employees have had the option of exercising or relaxing for 12 minutes during working hours. One of the personal trainers is always there to look after every employee individually and to adjust the exercise to the employee's wishes and requirements.

12 minutes of exercise – and that once a week. Does it work?
Absolutely – it does work!

Can you explain exactly how?
First of all, you register in the virtual appointment list. This offers maximum flexibility, because an employee can reserve any free 12-minute block. It does not matter whether you are wearing work clothes or a business shirt – no need to change for exercise.
It is specially designed for short effective exercises that do not cause sweating. Fitness, freedom of movement, relaxation or general health targets can be defined with the trainer at a six-monthly test. Participants then work with the trainer within the 12-minute unit based on the results of the test.

Relaxation in a personal training unit – how can I visualise that?
Many colleagues, sometimes even me too, find long sitting at the screen can affect the neck. That is why there is the opportunity, of which I also like to take advantage, of having a massage with the aid of a hypervolt massage barbell by the trainer.

Many colleagues, sometimes even me too, find long sitting at the screen can affect the neck. That is why there is the opportunity, of which I also like to take advantage, of having a massage with the aid of a hypervolt massage barbell by the trainer.
Yes……and how. The trainers know exactly what they have to do with the participants in 12 minutes to make it effective. But it is not only the muscle ache that you sometimes take home…

What else do you get out of it?
A number of exercises that can easily be done at home or can be integrated into private training. They are also suitable for the office. There are also a number of tips for everyday use. For example, I have a small reminder card at my workstation that reminds me to move around for about two minutes every 30 minutes.

What sort of tips are there?
The training island not only teaches us physical exercises such correct carrying, lifting or sitting but also about topics such as nutrition. We learn what is important or not important for the body. What remains in the memory is particularly the five portions of fruit or vegetables that we should have to remain in the best of health.

I could imagine it being difficult to have a visit to the training island in this time of corona?
That is absolutely correct. With the increasing number of people working at home we quickly developed an online concept to enable employees to continue to exercise without contact at home. The training unit is run on the computer screen, similarly to well-known online training platforms such as Gymondo and others, but simply better! The trainer is in personal contact with the employee by video. Of course, doing it by video is not nearly as good as the "live coaching". However, the participation has been very good and the feedback positive, which of course has greatly pleased us.

Has the regular attendance at the training island changed anything for you and your colleagues?
I find that regular attendance has raised awareness of my own health. You are in a way "reminded" to keep moving. The combination of workplace and movement is ideal. Movement and also relaxation is integrated into the working day. I have also noted that the small but effective units have had an effect on muscle groups that I was not aware of before regular exercise and they have come alive. In addition, the six-monthly test assesses individual functions, movement and data of my own body. You get your results and the improvements are shown in black and white so you can set new targets. Many colleagues also report that they have experienced improvements throughout their body. This also reduces physical pain.

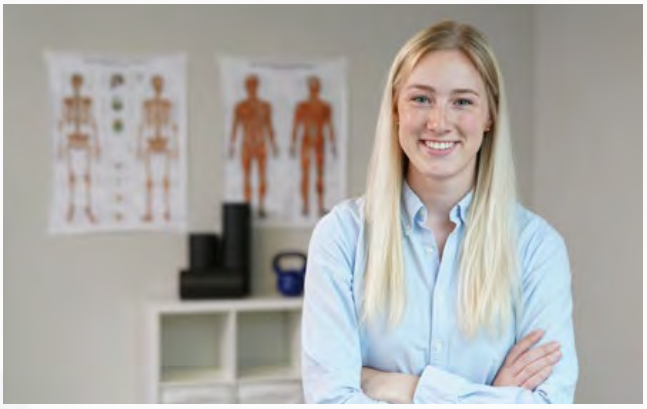
Trainingsinsel
In 12 Minuten fit und entspannt

Can the success be measured in numbers?
The regular retesting measures individual values but the results are only available for the participant and the trainer. The information is not accessible for SCHWENK. However, as a company we are very interested in the participation rate and the regularity of attendance. For example, at the Ulm office we have reached a participation rate of over 60 percent, which has greatly pleased us. We have also gained 14 new people as participants since the beginning of the year. A number that we look forward to increasing in future. Feedback from our colleagues is also greatly welcomed.

How well is the programme accepted and what is the long-term target?
The programme is generally very popular at all our sites. Even with the high average participation rate of 60 percent, our target is to attract even more enthusiastic employees to the training island. The individual exercise units achieve more movement, increase awareness of your own health and help reduce physical pain.

That sounds like a good ambition. I wish you success and thank you for the interview.
Thank you too.

Interview: February 2020



Picture: Irene Walter | SCHWENK

Picture: Irene Walter and Christiop Schulze (Training Island Manager Ulm-Augsburg-Kempten) | SCHWENK

SOCIETY AND ENGAGEMENT

We are represented throughout Germany with our numerous locations and companies. This supports the local economy by increasing employment, paying taxes and bringing our supply chain close to our locations. In addition to our business responsibilities we consider it our duty to participate in public life. We therefore also get involved in what is happening in the region around our locations. We all profit from open discussion, social projects and community involvement.

DONATIONS AND SPONSORSHIPS

We support selected associations and activities around our location with our donations and sponsorships. We are able to support regional environmental, social and cultural projects in our regions. This means that we contribute to the quality of life in the cities and communities where we work. We pass on the social responsibility that we practise in the company to our successors in the company in the earliest years of their employment. For example, some of our trainees organise a donation-supported Christmas market every year, with the income going to community projects. We have also maintained close contacts and cooperation with schools, universities and other educational establishments for many years. We take the topic of traffic safety very seriously. Our "Safety with SCHWENK" programme teaches the youngest children everything they need to know about blind spots, the dangers of road traffic and how to behave correctly on the road.

BEING LOCAL

AND PART OF THE COMMUNITY

HUMANITARIAN AND SOCIAL PROJECTS

We make our decisions based on our responsibility to society. It is up to us to help those who most need help. We support them with a wide range of different projects.

ENVIRONMENTAL AND CLIMATE PROJECTS

Our production process means that we are intervening in nature and the landscape – this is unfortunately unavoidable. We are fully aware of this and therefore we support special environmental and climate projects.

SPORTING AND CULTURAL ASSOCIATIONS

We can all experience social cohesion, community and family values in sporting and cultural associations. We want to contribute to making sure that our society has continuing access to a wide range of recreation options and opportunities to play various sports.

RESEARCH AND EDUCATION PROJECTS

Success for us is based on continuing development. We therefore also support scientific projects in the field of building materials and a wide range of education projects.

Picture: Concrete mixer in front of the Ulm cathedral |

REGIONS, BUILDING AND CULTURE

One example of all that holds us together is our strong involvement in the cathedral support association of Ulm, the city where we started.

ASSOCIATIONS AND SOCIETIES

The principle of working together is also applicable to the associations and societies with which we are involved. In addition to memberships in industrial associations such as the Verein Deutscher Zementwerke e.V. (VDZ), the Cembureau and the Global Cement and Concrete Association (GCCA), which are actively involved in promoting sustainability in the construction industry, SCHWENK is also a member of a number of local associations involved in the environment, education and culture.

STAKEHOLDER COMMUNICATIONS

As a company we are subject to the demands and expectations of different stakeholders. Open communications and making opportunities for open exchange of views is essential for us for the detection of requirements and trends. We address questions, suggestions and concerns of various interest groups and develop solutions. When we apply for approvals required for obtaining raw materials we involve the local population at the earliest possible stage with information events. We work together to develop concepts for extracting rock in an environmentally responsible manner. Customers have the opportunity to discuss current concerns and work actively with us to face challenges and actions at our customer events such as concrete seminars. We maintain a continuous dialogue with our employees via our organisational structure, our company meetings and the intranet. We are currently working on improving internal communications with the introduction of new technical solutions and increasing digitalisation. We want to make information available faster and more easily and reinforce cooperation.

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