



SOLUTIONS FOR TODAY'S AND FUTURE CHALLENGES OF THE PRECAST CONCRETE INDUSTRY

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BIBM CONGRESS, COPENHAGEN, NOVEMBER 2021

BUILDING TRUST



FUTURE CHALLENGES AND SIKA'S SUSTAINABLE SOLUTIONS CONCEPT

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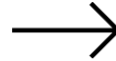


SOCIETY, ENVIRONMENT & ECONOMY

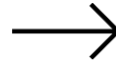
FUTURE CHALLENGES FOR CONCRETE PRODUCERS



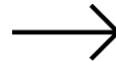
GLOBAL
MEGATRENDS



FUTURE LAWS
& REGULATIONS



CONSTRUCTION
PROBLEMS



FUTURE CHALLENGES

Carbon Neutrality

- Cement production efficiency
- Alternative binder systems
- Clinker reduction in concrete

Resource Efficiency

- Increased recycling rate
- Renewable raw materials
- Enhanced service life

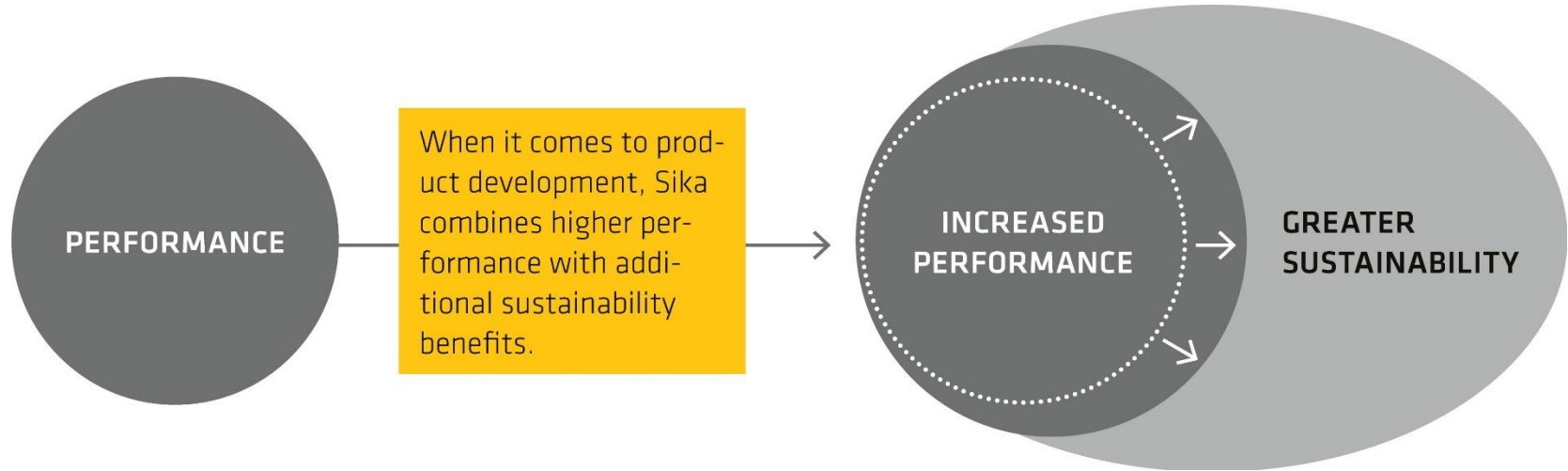
Productivity Increase

- Automation & Digitalization
- Prefabrication
- Modular construction

“SUSTAINABLE SOLUTION”

WHAT IT MEANS FOR US

- ✓ Focus on added value
- ✓ Positioning defined by customer needs



SIKA'S SUSTAINABLE SOLUTIONS FOR CONCRETE

CARBON NEUTRALITY

→ CEMENT PRODUCTION EFFICIENCY

→ ALTERNATIVE BINDER SYSTEMS

→ CLINKER REDUCTION IN CONCRETE



CEMENT ADDITIVES

- SikaGrind® Activator
- SikaGrind® Optimizer

Limestone
Calcined
Clay
Cement

LC³

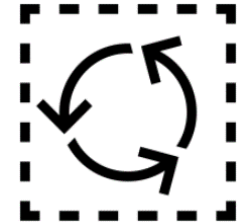
LC³ ADMIXTURE TECHNOLOGY

- Sika® ViscoCrete® LC3
- SikaGrind® LC3



PCE TECHNOLOGY

- Sika ViscoCrete®
- SikaPlast®

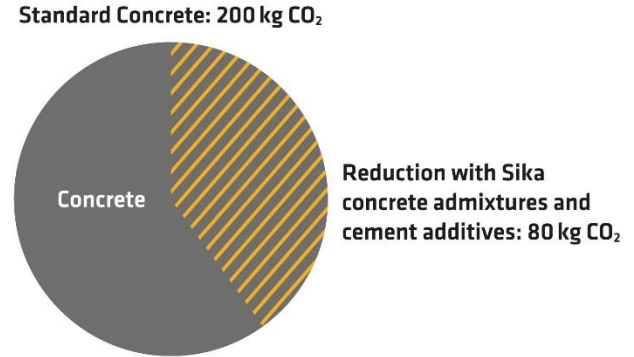
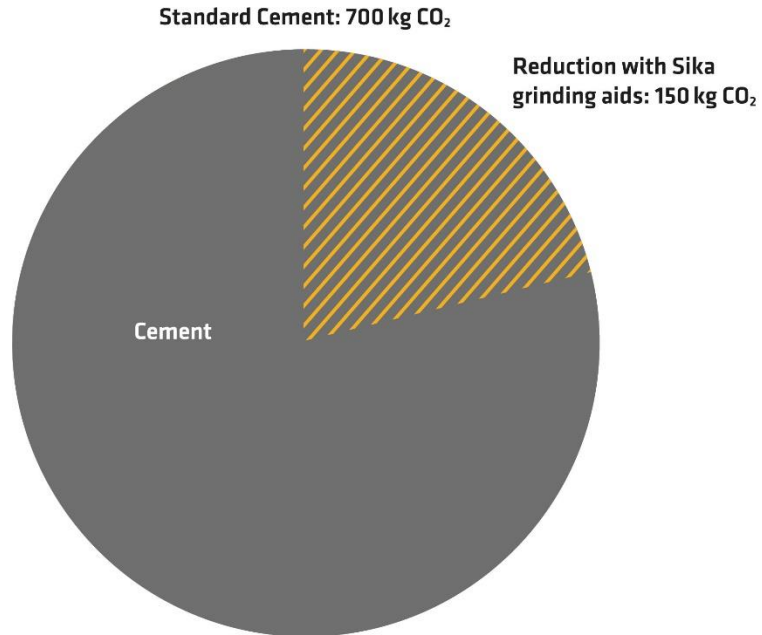


reCO₂ver PROCESS

- New reCO₂ver product line

SIKA'S SUSTAINABLE SOLUTIONS FOR CONCRETE

CARBON NEUTRALITY



SIKA'S SUSTAINABLE SOLUTIONS FOR CONCRETE

RESOURCE EFFICIENCY

→ INCREASED RECYCLING RATE

→ RENEWABLE RAW MATERIALS

→ ENHANCED SERVICE LIFE



SIKA'S CODE CONCEPT

- Sika® ViscoCrete®
- Sika® Stabilizer



DURABILITY ENHANCEMENT

- Sika® ViscoCrete®
- SikaControl®
- SikaFiber®



WATER REDUCTION

- Sika® ViscoCrete®
- SikaPlast®
- Sikament®



BIO BASED RAW MATERIALS

- Sika® ViscoCrete®
- Sika® Separol®

SIKA'S SUSTAINABLE SOLUTIONS FOR CONCRETE

PRODUCTIVITY INCREASE

→ AUTOMATION & DIGITALIZATION

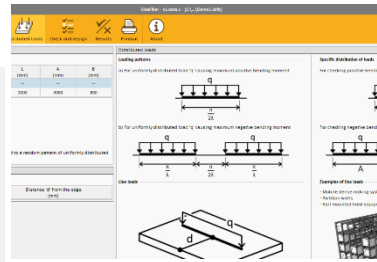
→ PREFABRICATION

→ MODULAR CONSTRUCTION



CONCRETE ADMIXTURES

- Sika® ViscoCrete®
- SikaRapid®
- SikaFiber®



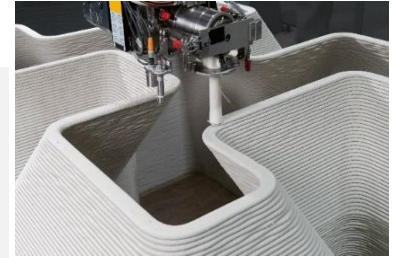
DIGITAL TOOLS

- Sika EPD Calculator
- SikaFiber® Software
- Sika Mix Design App
- Sika Sand App
- Tank Level Management



MODULAR BUILDING

- One-Stop-Shop for Total Precast



3D CONCRETE PRINTING

- Sikacrete® 3D

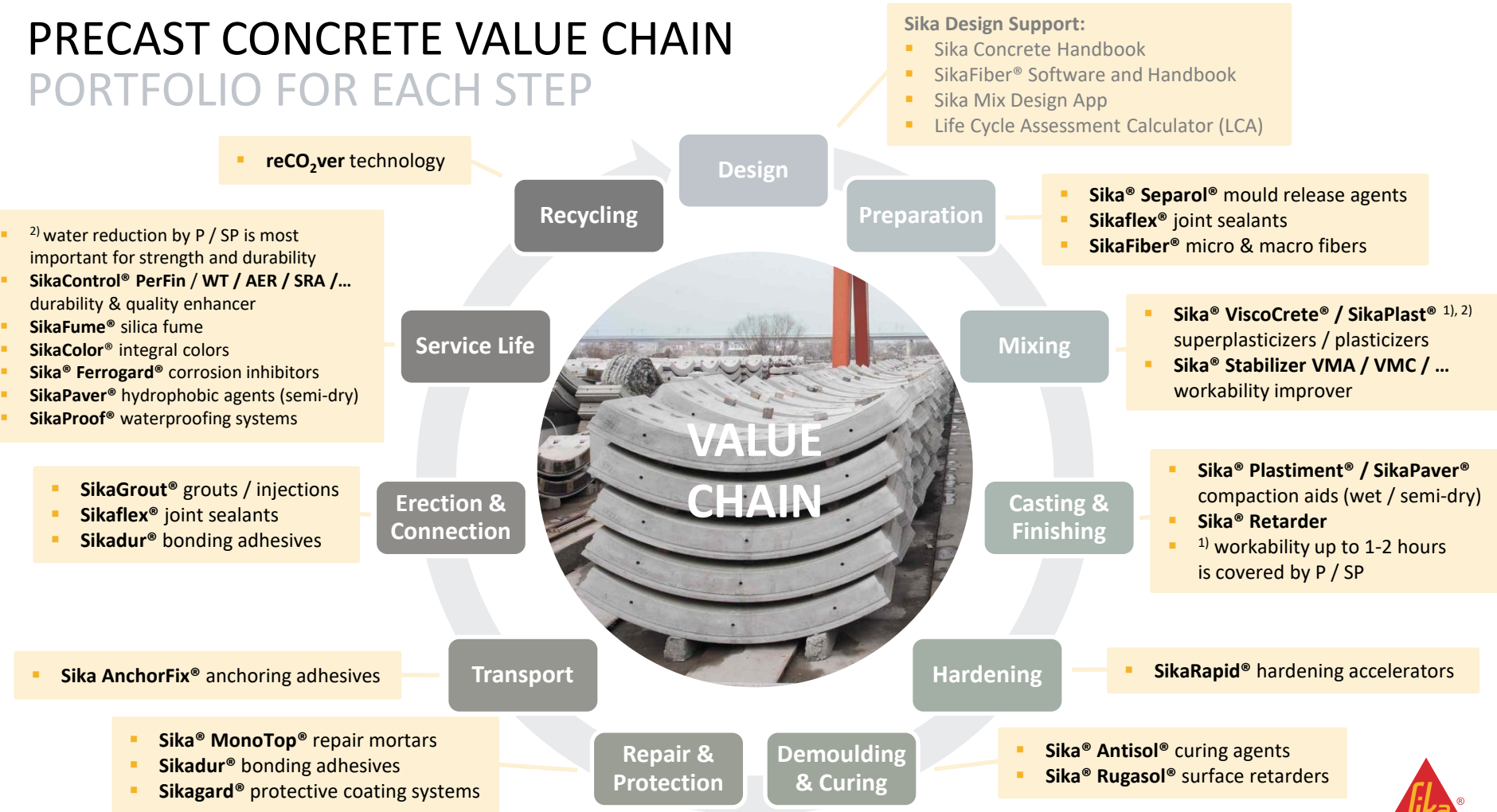
KEY PRODUCT TECHNOLOGIES & INNOVATIONS

BUILDING TRUST



PRECAST CONCRETE VALUE CHAIN

PORTFOLIO FOR EACH STEP



CARBON NEUTRALITY, RESOURCE EFFICIENCY AND PRODUCTIVITY INCREASE

PCE – A KEY TECHNOLOGY FOR FUTURE CONCRETE

Sika® ViscoCrete® SUPERPLASTICIZER/HRWR

BENEFITS

- ✓ PCE technology for tailor-made solutions
- ✓ Cost and performance optimized mix designs
- ✓ Energy and water consumption ↓
- ✓ Enabling easy and self-compacting concrete (SCC)
- ✓ Productivity ↑
- ✓ Operational costs ↓
- ✓ Surface quality, strength, durability ↑
- ✓ Enabling slimmer element dimensions (HPC/UHPC)
- ✓ Environmental impact of concrete ↓







Sika is the first company to produce a superplasticizer from **bio-based** monomers and to launch it on the market. Over 85% of the previously crude oil-based raw materials are replaced by raw materials obtained from agricultural by-products.

CARBON NEUTRALITY: CLINKER REDUCTION IN CONCRETE

EXAMPLE: CEMENT REPLACEMENT BY GGBFS

Aggregates 0/32 mm
 $T_{\text{Ambient}} = 20^{\circ}\text{C}$
 $T_{\text{Concrete}} = 22^{\circ}\text{C}$

		REFERENCE	CEMENT REPLACEMENT
Cement	CEM I 42.5	350 kg/m ³	290 kg/m ³
Additive	GGBFS	-	60 kg/m ³ (k=0.6)
Water		168 l/m ³ (w/c=0.48)	156 l/m ³ (w/c _{eq} =0.48)
Superplasticizer	Sika ViscoCrete	0.4 % b.w.o.c.	0.6 % b.w.o.c.
Consistency (FTS)	5 min	53 cm	57 cm
	60 min	43 cm	45 cm
Density / Air		2'427 kg/m ³ / 1.8 %	2'421 kg/m ³ / 1.9 %
			
Strength	fc_{cu} 1-day	22.4 N/mm ²	20.9 N/mm ²
	fc_{cu} 28-day	55.5 N/mm ²	60.3 N/mm ²
Durability			Improved (Reduced shrinkage!)
Sustainability (LCA)	 Cumulative Energy Demand	1200 MJ	1126 MJ (-6.1 %)
	 Global Warming Potential	287 kg CO ₂ -eq.	247 kg CO ₂ -eq. (-14.0 %)
Costs			60kg less Cement!

CARBON NEUTRALITY: CLINKER REDUCTION IN CONCRETE

EXAMPLE: CEMENT REPLACEMENT BY 30/60/90% GGBFS



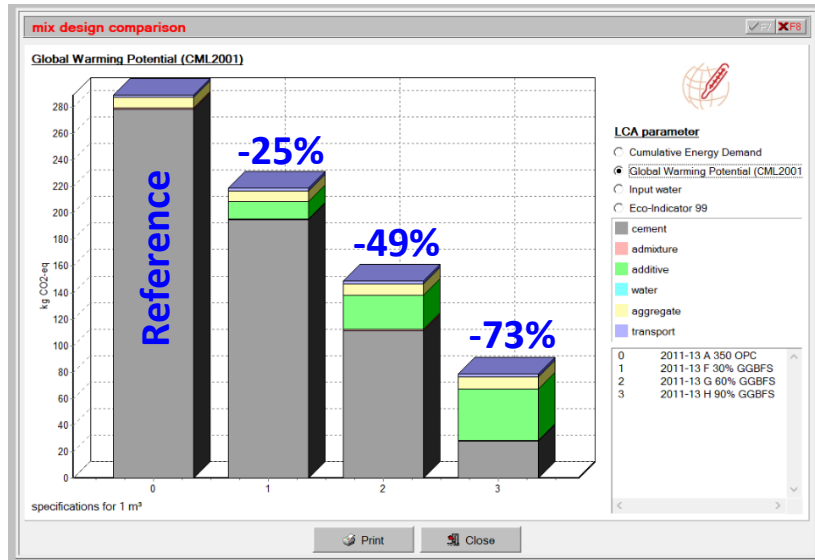
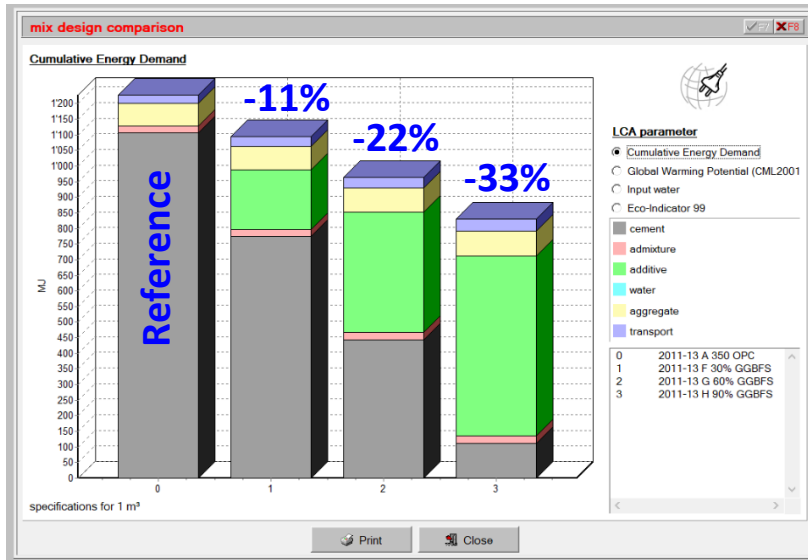
Cumulative Energy Demand [MJ]

Total amount of primary energy from renewable and non-renewable resources



Global Warming Potential [kg CO₂-eq.]

Potential contribution to climate change due to greenhouse gas emissions



CARBON NEUTRALITY: ALTERNATIVE BINDERS

LC³ – THE FUTURE CEMENT



- CO₂ footprint ↓ (vs. OPC)
- Composed of widely abundant materials
- Projected to represent 20... 30% of all cement by 2050!

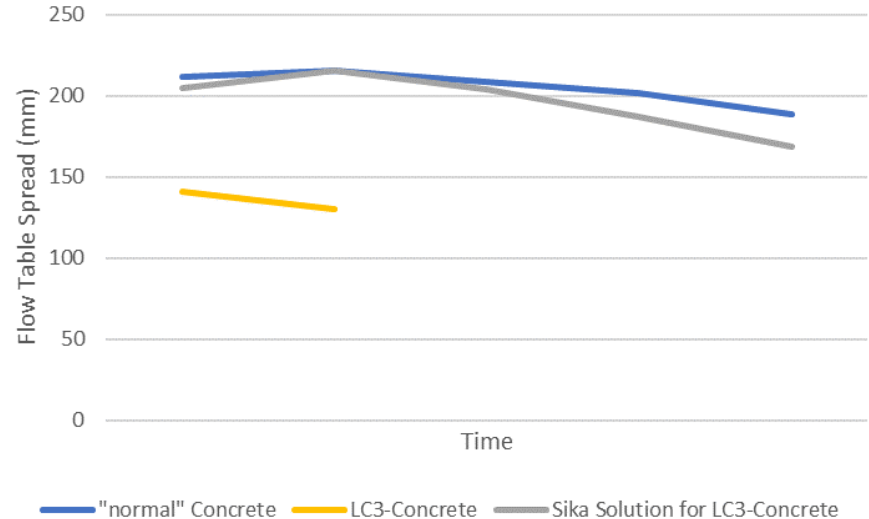
Sika LC³ concrete admixtures enable

- ✓ **Similar consistency, workability, early and final strength as with OPC**

e.g. 50% clinker
+ 30% calcinated clay
+ 15% limestone
+ 5% gypsum



similar strength
performance at 28 days
as CEM I 42.5



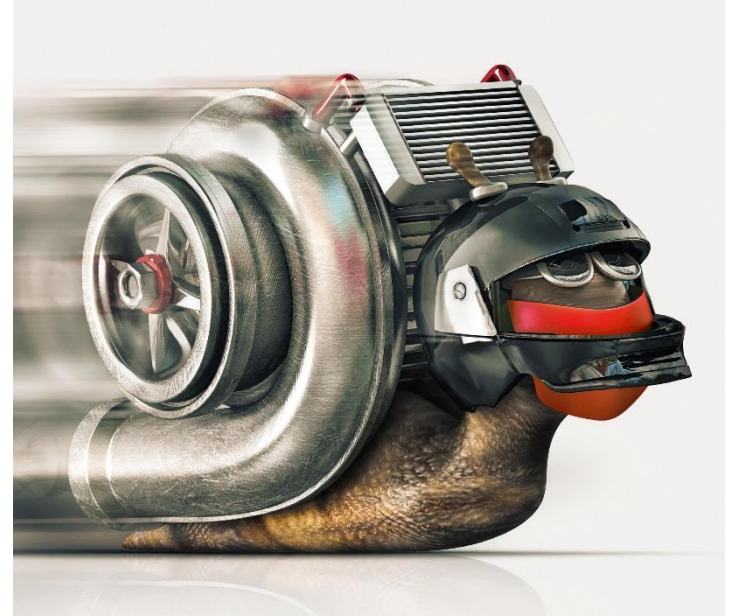
PRODUCTIVITY INCREASE AND RESOURCE EFFICIENCY

SUSTAINABLE HARDENING ACCELERATION

SikaRapid® HARDENING ACCELERATORS

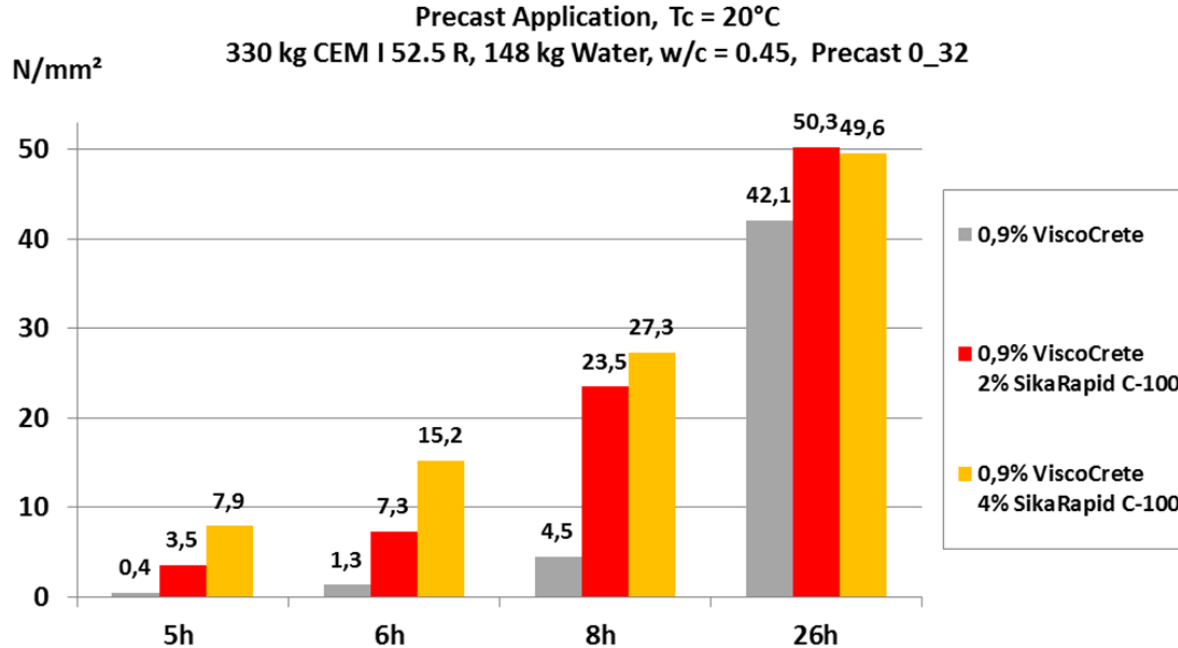
BENEFITS

- ✓ Early strength ↑
- ✓ Heating period ↓
- ✓ Max. concrete temperature ↓
- ✓ Energy consumption ↓
- ✓ Productivity ↑
- ✓ Operational costs ↓
- ✓ OPC (clinker) ↓
- ✓ Durability ↑
- ✓ Carbon footprint ↓



SUSTAINABLE HARDENING ACCELERATION

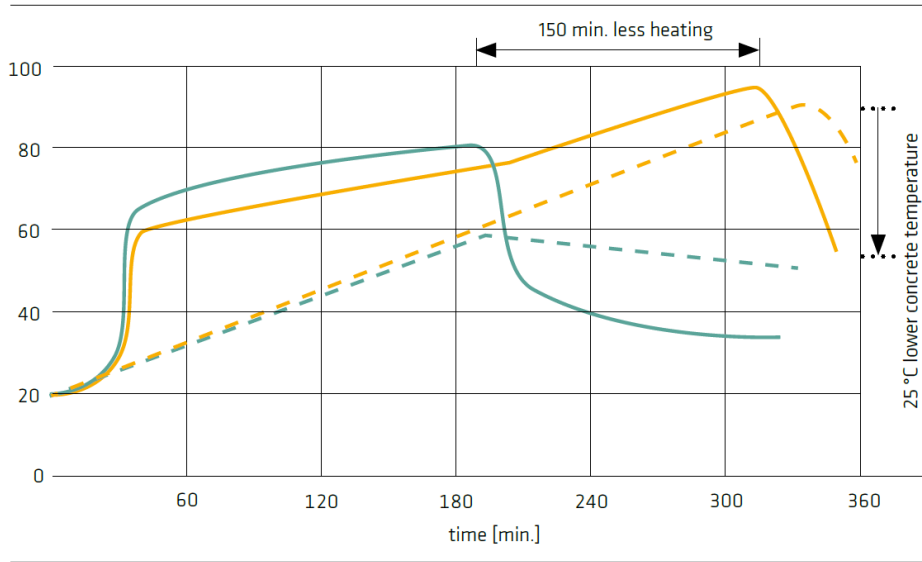
EXAMPLE 1: EARLIER DEMOULDING & SHORTER CYCLE TIMES



SUSTAINABLE HARDENING ACCELERATION

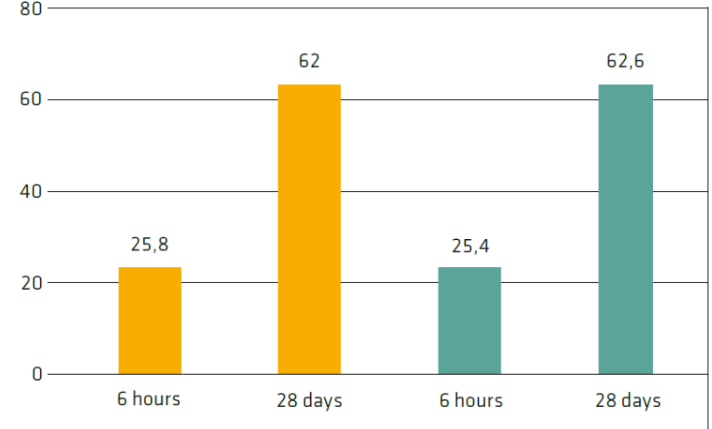
EXAMPLE 2: LESS HEATING FOR SIMILAR EARLY AND FINAL STRENGTH

Concrete temperature development in [°C]



— Heating without SikaRapid® - - - Concrete temperature without SikaRapid®
— Heating with SikaRapid® - - - Concrete temperature with SikaRapid®

Concrete compressive strength [MPa]



■ Specimens produced without SikaRapid® ■ Specimens produced with SikaRapid® (150 min. less heating)

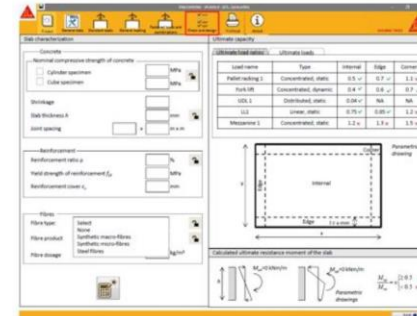
PRODUCTIVITY INCREASE

FIBERS FOR CONCRETE REINFORCEMENT

SikaFiber® POLYPROPYLENE MACRO-FIBERS

BENEFITS

- ✓ Partially or fully replacing bulky steel bar or mesh reinforcement
- ✓ Time and money in the construction process ↓
- ✓ Safety, durability and serviceability of concrete ↑
- ✓ Concrete performance ↑
- ✓ Easy to handle and easy to dose
- ✓ SikaFiber® design software

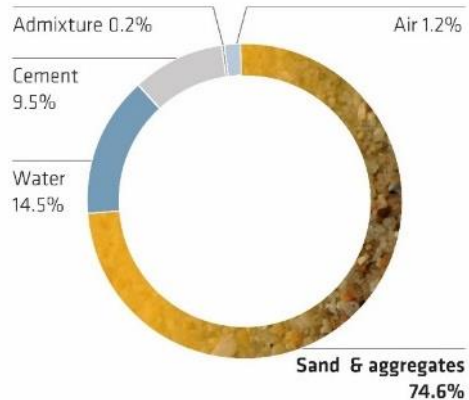


RESOURCE EFFICIENCY

AGGREGATES - CONCRETE'S ROCK SKELETON

BACKGROUND

- 75% of concrete & mortar consist of sand & aggregates
- Aggregates strongly impact concrete quality and applicability



CHALLENGE

- In the future, sand will be a scarce resource
 - Low-quality sand
 - New sand sources/ replacements
 - Recycled aggregates
 - ...



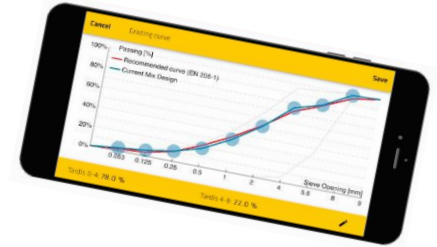
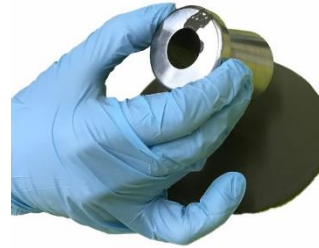
RESOURCE EFFICIENCY

SIKA CODE CONCEPT

A HOLISTIC CONCEPT TO UNLOCK CONCRETE TREASURES



- Technical guide from analysis to customized support & tailored Sika solutions



PROPERTY	PRODUCT RANGE	MAIN SAND TYPES
Water reduction	ViscoCrete®, SikaPlast®	All
Slump life	ViscoCrete®, SikaPlast®, ViscoFlow®	All, recycled
Contamination blocker	Sika® Stabilizer	Natural, crushed
Anti-bleeding	Sika® Stabilizer, opt. mix design	Crushed
Viscosity enhancer	Sika® Stabilizer, opt. mix design	Crushed

CARBON NEUTRALITY AND RESOURCE EFFICIENCY

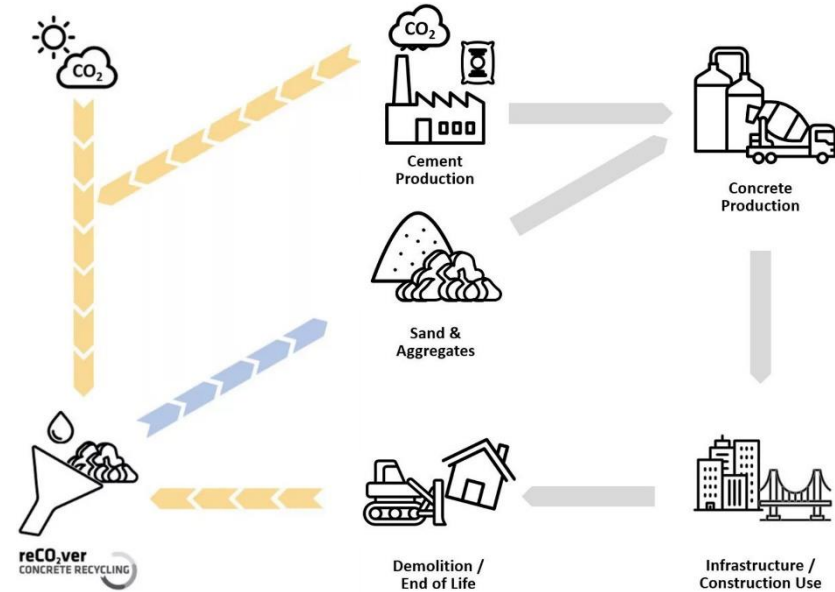
reCO₂ver CONCRETE RECYCLING

A GROUND-BREAKING NEW PROCESS BY SIKA

- Chemo-mechanical treatment of concrete demolition waste
- Superficial carbonation of the cementitious matrix that is softened and removed upon attrition

BENEFITS

- Aggregates free from cementitious material obtained: **Primary material quality, saving natural resources**
- **CO₂ sequestration** (about 50 kg of CO₂ per ton)
- Additional reduction of CO₂ emissions by:
 - Reduction of cement requirement in recycled concrete
 - Partial replacement of clinker with generated fine powder
- **Circular economy of concrete!**



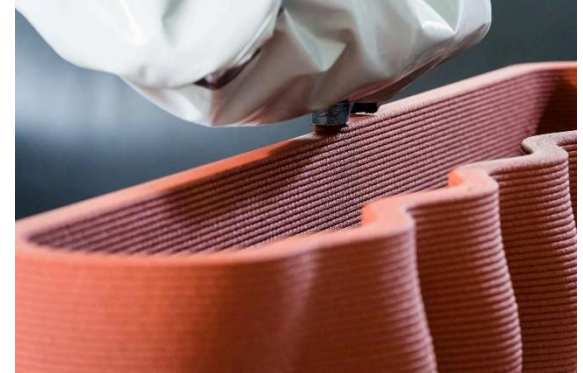
PRODUCTIVITY INCREASE

3-D CONCRETE PRINTING

3DCP – A DRIVER FOR A PARADIGM SHIFT IN CONCRETE INDUSTRIALIZATION

BENEFITS

- Ultimate “form follows function” efficiency
- New customized, complex designs and structures possible
- Lower construction costs
- Digitalize and industrialize construction process to streamline construction and reduce material waste
- machine-perfect fabrication for higher quality elements
- Time saving and increased productivity: automated process with less labor, no formwork and immediate setting 3D ink



PRODUCTIVITY INCREASE

3-D CONCRETE PRINTING

- Sika is the only company capable of supplying all technologies needed for industrial 3DCP from a single source
- **Our Concrete 3D Printing is Industrialization Ready!**

Printer size up to
5 meters
to build large precast parts

3D
Technology Center for prototyping

18 patents
on printing processes, innovative materials and admixtures for 3D printing

Horizontal and vertical speed up to
1 m/s
and 20 cm/min, absolute accuracy of < 1 mm

Flow control up to
2 ton/h
for complex shapes flow with 3 sec mixing for an ultra high performance concrete

Innovative
awards
at the European World of Concrete

KEY TAKE AWAY MESSAGE

KEY TAKE AWAY MESSAGE

- Megatrends like **sustainability** and **digitalization** drive growth in the construction industry.
- Future challenges for concrete producers are
 - **Carbon Neutrality**
 - **Resource Efficiency**
 - **Productivity Increase**
- Sika is the right partner as **ENABLER** for a sustainable construction industry
 - ✓ 110+ years experience
 - ✓ Innovation leader
 - ✓ Addressing the customer challenges
 - ✓ Value adding through performance and sustainability
 - ✓ Full-range for Precast
 - ✓ Globally active, locally integrated





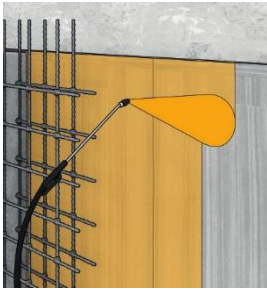
THANK YOU FOR YOUR ATTENTION

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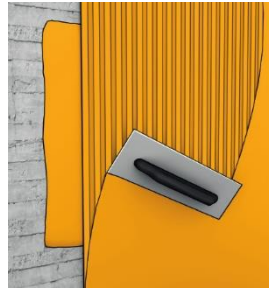
BACKUP: TOTAL PRECAST

MORE THAN ADMIXTURES

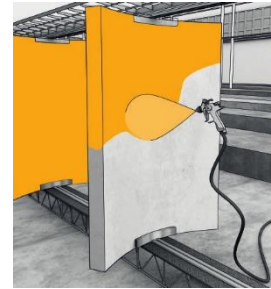
- As **full range supplier**, Sika meets the diverse complexity of the entire construction process.



SURFACE APPEARANCE



REPAIR



PROTECTION



SEALING



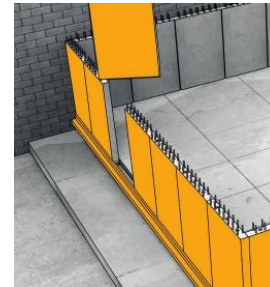
BONDING



ANCHORING



GROUTING



WATERPROOFING