3D CONCRETE PRINTING

JANUAR 2019, DR. CARSTEN RIEGER
SIKA SERVICES AG / CORPORATE CONSTRUCTION / TM CONCRETE

BUILDING TRUST

“THE BUILDINGS WE CREATE INSPIRE US AND REFLECT WHO WE ARE AS A SOCIETY.”

FOR MORE THAN HUNDRED YEARS THERE HAS BEEN ALMOST NO CHANGE IN THE WAY WE BUILD WITH CONCRETE…

1. Form placing
2. Reinforcement
3. Form closing
4. Concrete pouring
5. Demolding

WHY DO WE MAKE IT THIS WAY?

Square windows!
The cheapest way to construct

…but always forms cracks in the corners.

Size of bricks!
The size a mason can handle to build a wall

…but long production time.

Flat ceilings!
By far the most economical way to produce

…but material (concrete and steel) is used extremely inefficiently.

Conservative!
Using traditional practices

…but with material waste and structural inefficiencies.

DRIVING FORCE FOR NEW ARCHITECTURAL FORMS

BASED ON HISTORICAL INSPIRATION IN CONSTRUCTION

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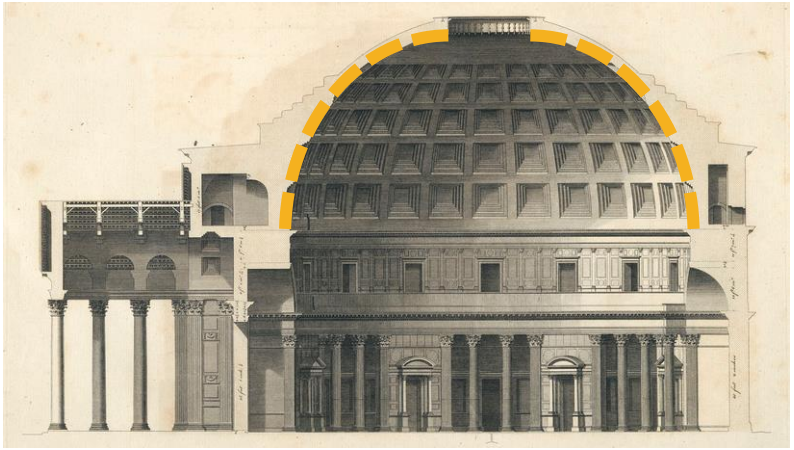

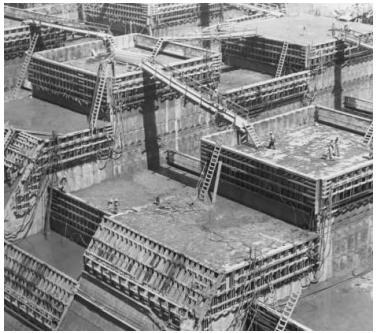

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DRIVING FORCE FOR NEW ARCHITECTURAL FORMS

DIGITAL INNOVATIONS IN CONSTRUCTION

THE IDEA

CONCRETE 3D PRINTING

THE NEW SHAPE OF CONCRETE

NEST | Empa eawag aquatic research

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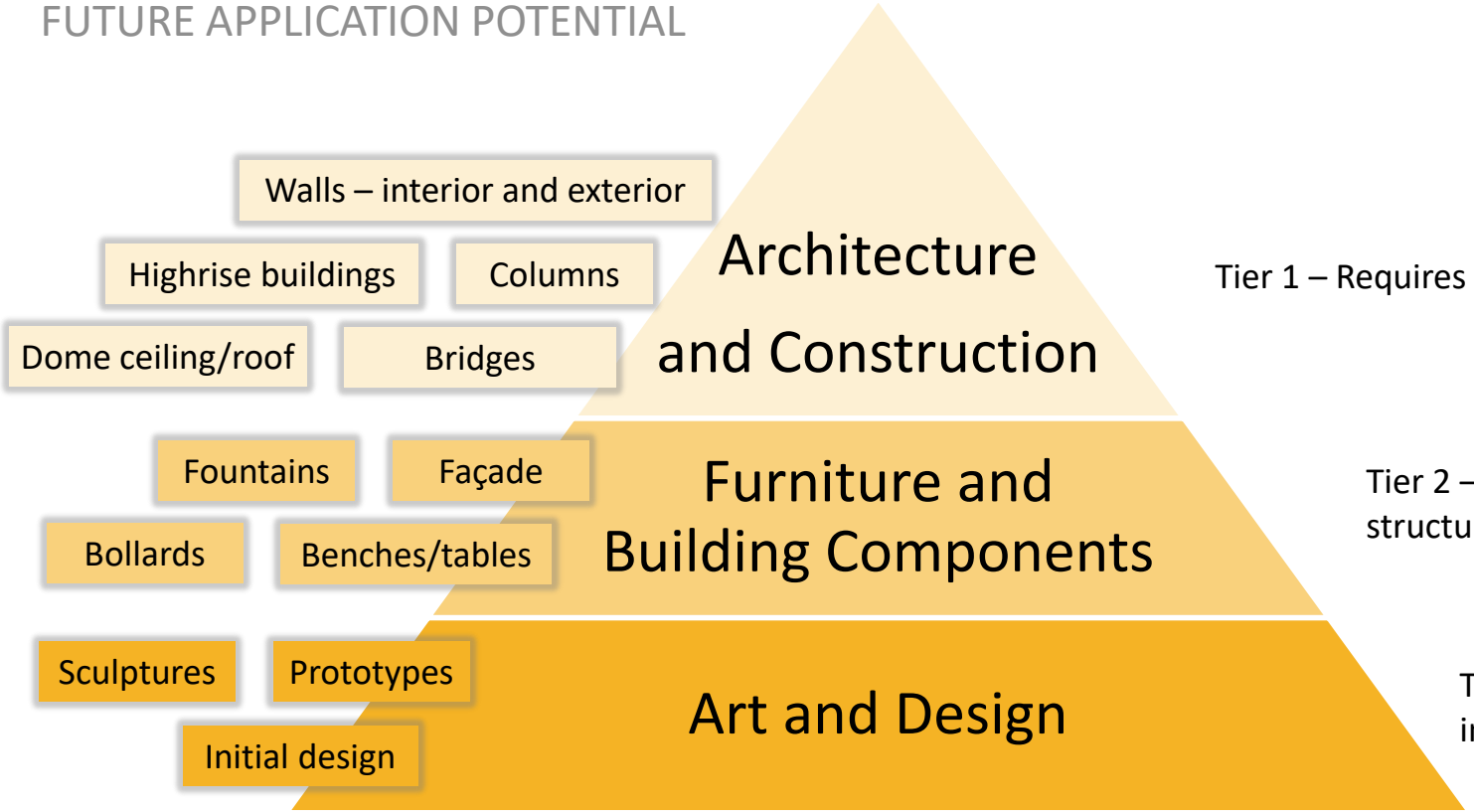
CONCRETE 3D PRINTING

FUTURE APPLICATION POTENTIAL



Tier 1 – Requires high structural integrity

Tier 2 – Requires low structural integrity

Tier 3 – Minimal structural integrity required

Based on *Current challenges and future perspectives of 3d concrete printing*, 2016
https://www.researchgate.net/publication/303738799_Current_Challenges_and_Future_Perspectives_of_3D_Concrete_Printing

3-D PRINTING:
Huge potential for the future

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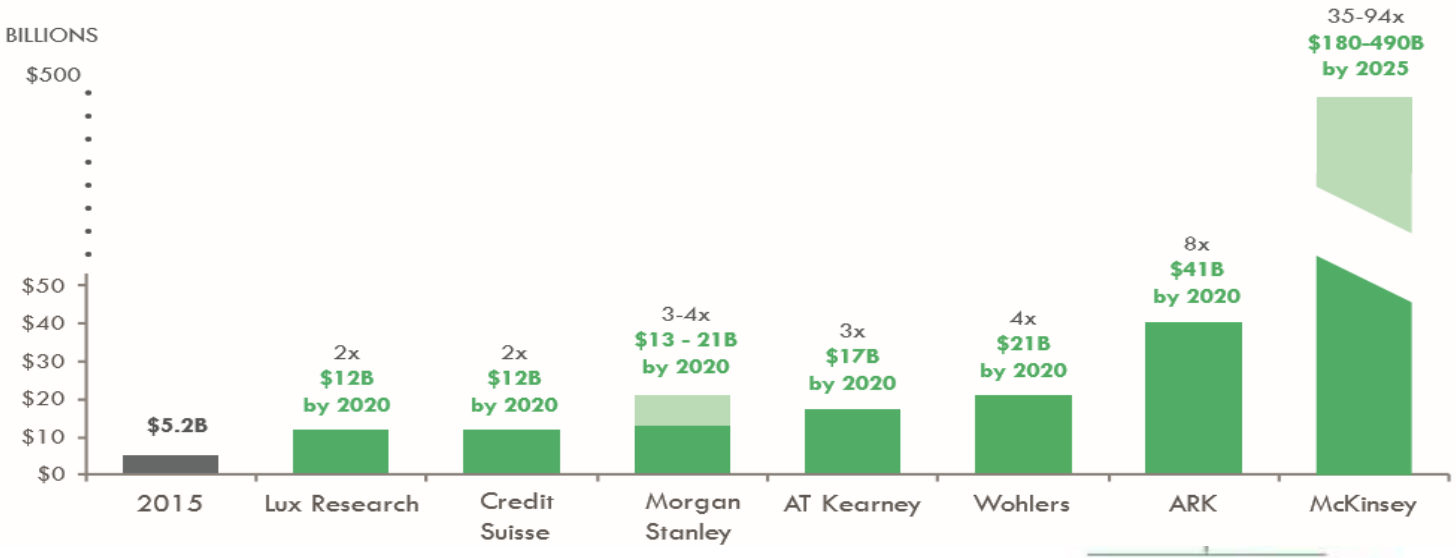
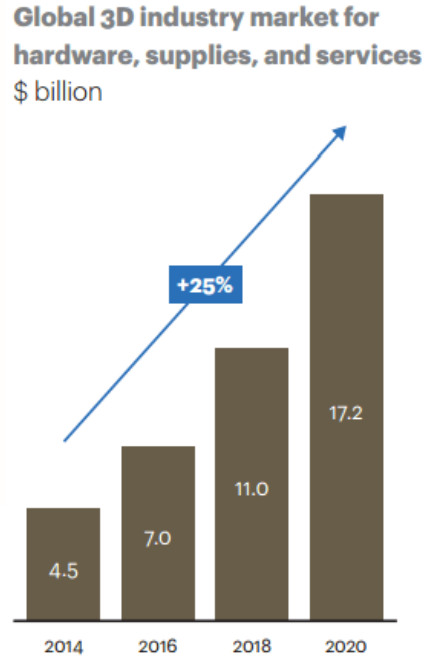
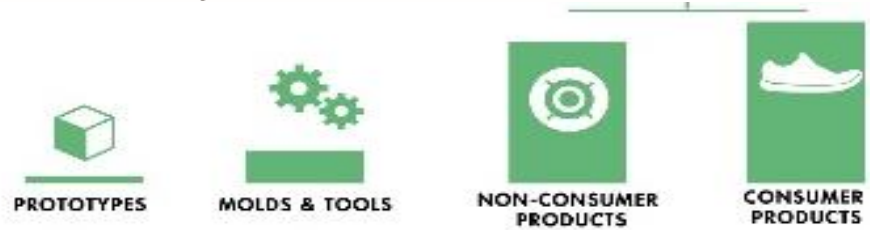
3D INDUSTRY MARKET

GROWTH AND LOCAL

Increasing market!







MARKET SIZE	$12.5B	$30B	$230B	$260B
1ST APPLICATIONS	1980'S	1990'S	EARLY 2000'S	
CURRENT PENETRATION	23%	2%	0.1%	

A.T. Kearney analysis

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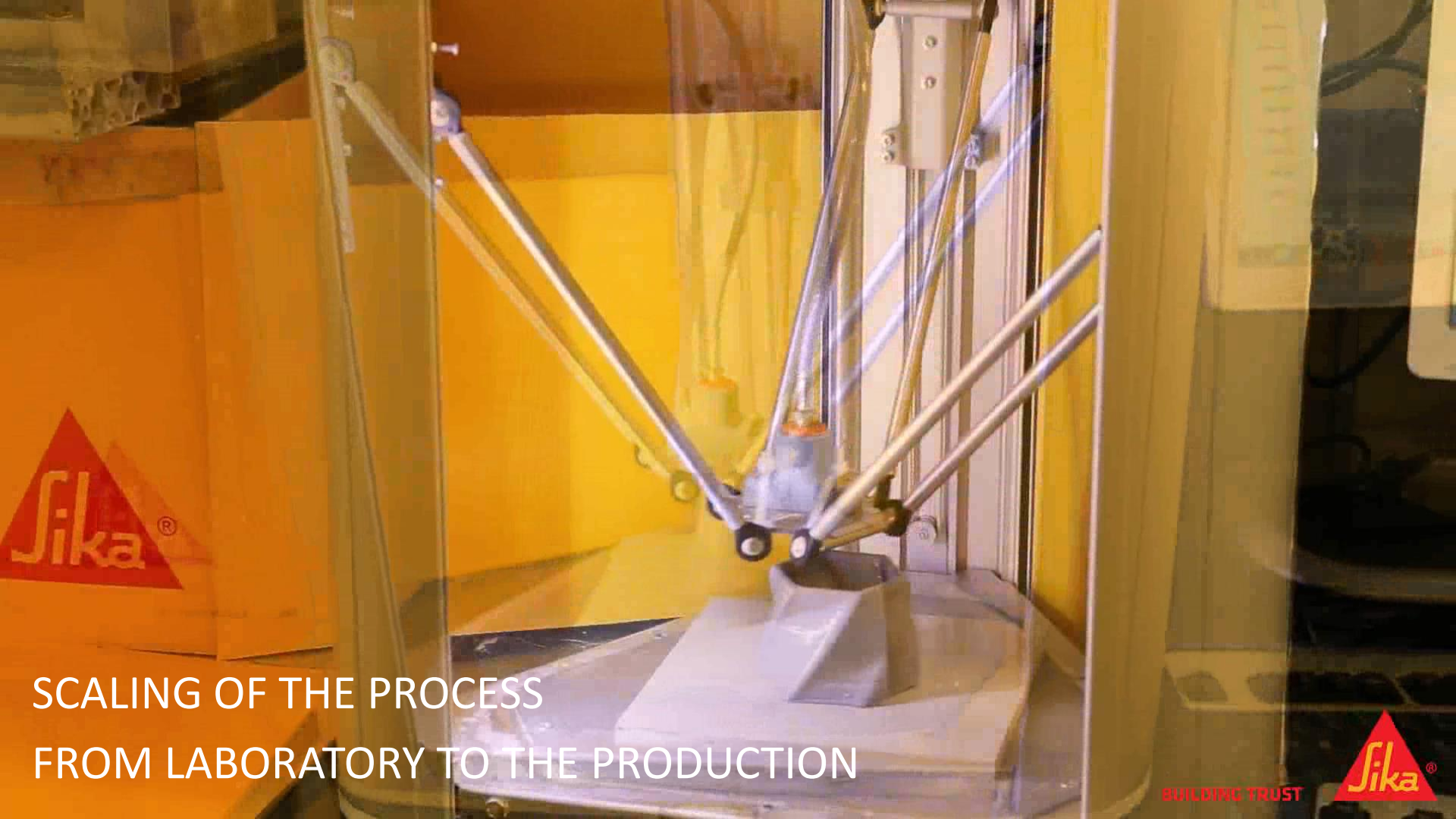
3D PRINTING - THE FUTURE OF CONCRETE

SIKA – RAISING THE BAR

Other companies and startups

Sika



SCALING OF THE PROCESS
FROM LABORATORY TO THE PRODUCTION

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FROM SMALL TO LARGE

SCALING OBJECTS

- Design in hand
- Laboratory tests
- Scale to reality

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BREAKING THE WALL

LAYERS BONDING

- No breaks at the layers transitions: Perfect binding

CONCRETE 3D PRINTING

INDUSTRIALIZATION (READY!)

PRINTER SIZE
UP TO 5M
TO BUILD
LARGE
PRECAST PARTS

3D TECHNOLOGY CENTER FOR PROTOTYPING

7 PATENTS
ON PRINTING PROCESSES
INNOVATIVE MATERIALS
ADMIXTURES FOR 3D

INNOVATION AWARDS AT THE EUROPEAN WORLD OF CONCRETE

FLOW CONTROL UP TO **2 TON/H** FOR COMPLEX SHAPES FLOW WITH
3 SEC MIXING
FOR AN ULTRA HIGH PERFORMANCE CONCRETE

HORIZONTAL AND VERTICAL SPEED UP TO **1M/S** AND **20CM/MIN**

ABSOLUTE ACCURACY OF **<1MM**

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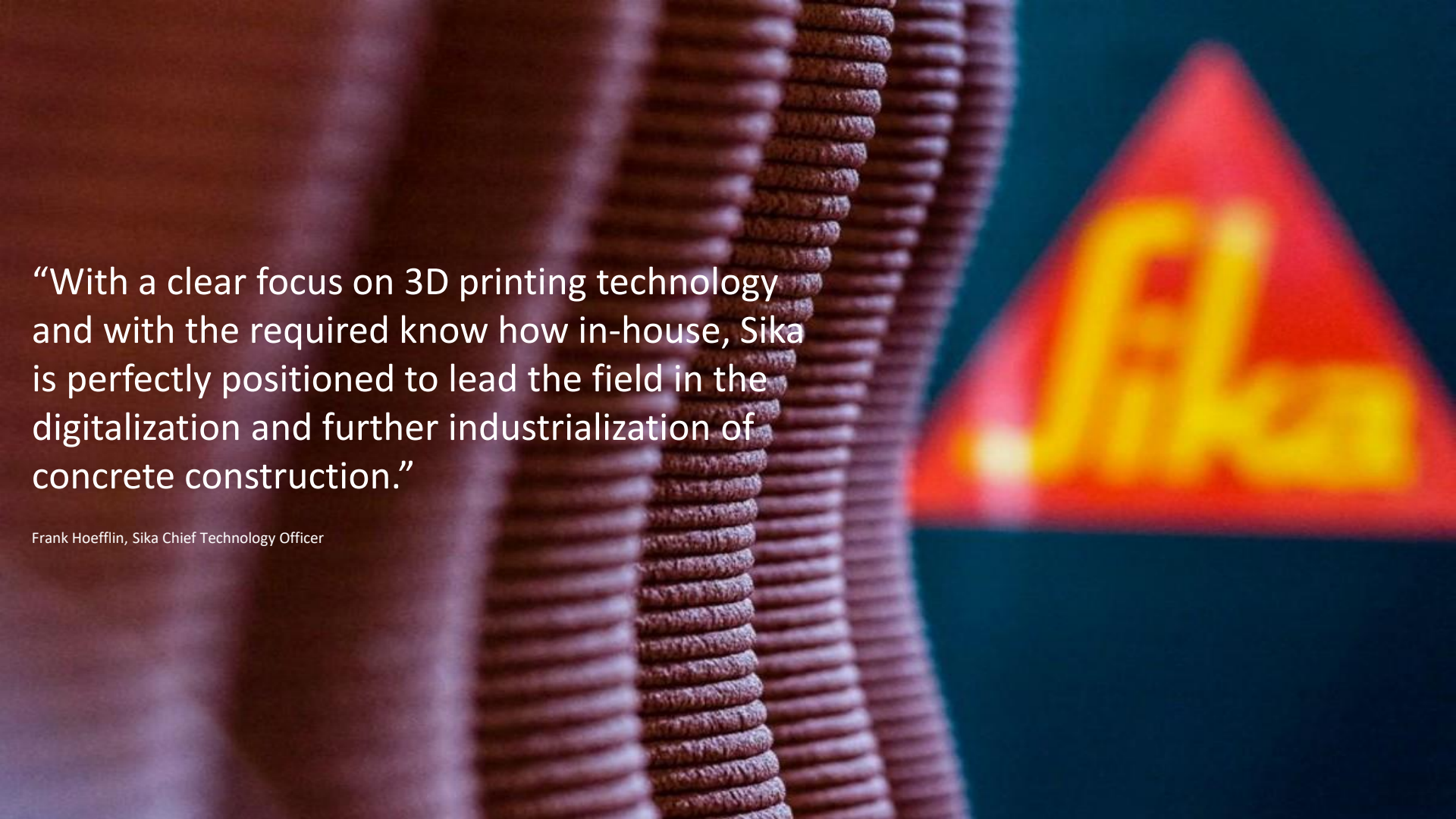


“With a clear focus on 3D printing technology and with the required know how in-house, Sika is perfectly positioned to lead the field in the digitalization and further industrialization of concrete construction.”

Frank Hoefflin, Sika Chief Technology Officer

WHY SIKA?

WE ARE
THE TECHNOLOGY LEADER.

Sika is the technology leader – in concrete, customer service and innovations based on our strong R&D facilities.

WE ARE
INDUSTRIALIZATION READY.

Sika is fully equipped as a construction chemicals company in over 100 countries, to support your large scale business needs.

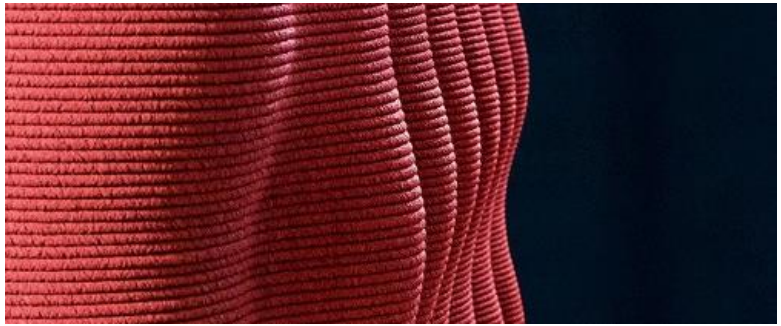
WE ARE
OFFERING WHAT NO ONE ELSE CAN OFFER.

Sika is the only company supplying all of the required building blocks for cementitious printing, and capable of such printing speed.

CONCRETE 3D PRINTING

VALUES FOR CUSTOMERS

FREEDOM OF DESIGN



- New design possibilities for standard construction elements
- Customized, complex designs and new structures possible
- Enable combination of materials and features for ultimate “form follows function” efficiency

TIME SAVING

- Fastest, most precise technology available in the market
- Fast, automated process: less labor, no formwork, immediate setting 3D ink

SIKA AS LEADER OF INDUSTRIALIZATION OF 3-D CONCRETE PRINTING

OUR KNOW-HOW AND UNIQUE POSITION

- Automation with Sika’s pulsment process control
- Extrusion performed by the Sika MiniShot system
- 3D mortars
- Setting on demand with Sika accelerators
- Concrete technology and mix design powered by Sika® ViscoCrete®
- Formulation expertise from Sika's specialist teams
- Sika fiber technology for stability
- Partnerships with leading universities and industry partners in place

THE IDEA – TO PARTNER WITH YOU

CONCRETE 3D PRINTING

- Sika offers prototyping and initial printing test via 3D technology center
- Sika offers startup support for first-time customers
- Sika ensures freedom of practice
- Customer can provide digital 3D design files of large scale projects for evaluation of partnership opportunities – we can help you bring your most creative designs to life!

- Sika provides 3D ink and license for Sika 3D printing system
- Sika provides the print head, which comes optionally together with 3D printer. Print head is produced under a Sika license by an external company. Supply of the print head strictly controlled by Sika
- Sika can provide support for engineering of 3D Printer Equipment.

Architects

Contractors

PARTNERS

CONCRETE 3D PRINTING

Owners / Architects / Engineers

Contractors

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CONCRETE 3D PRINTING

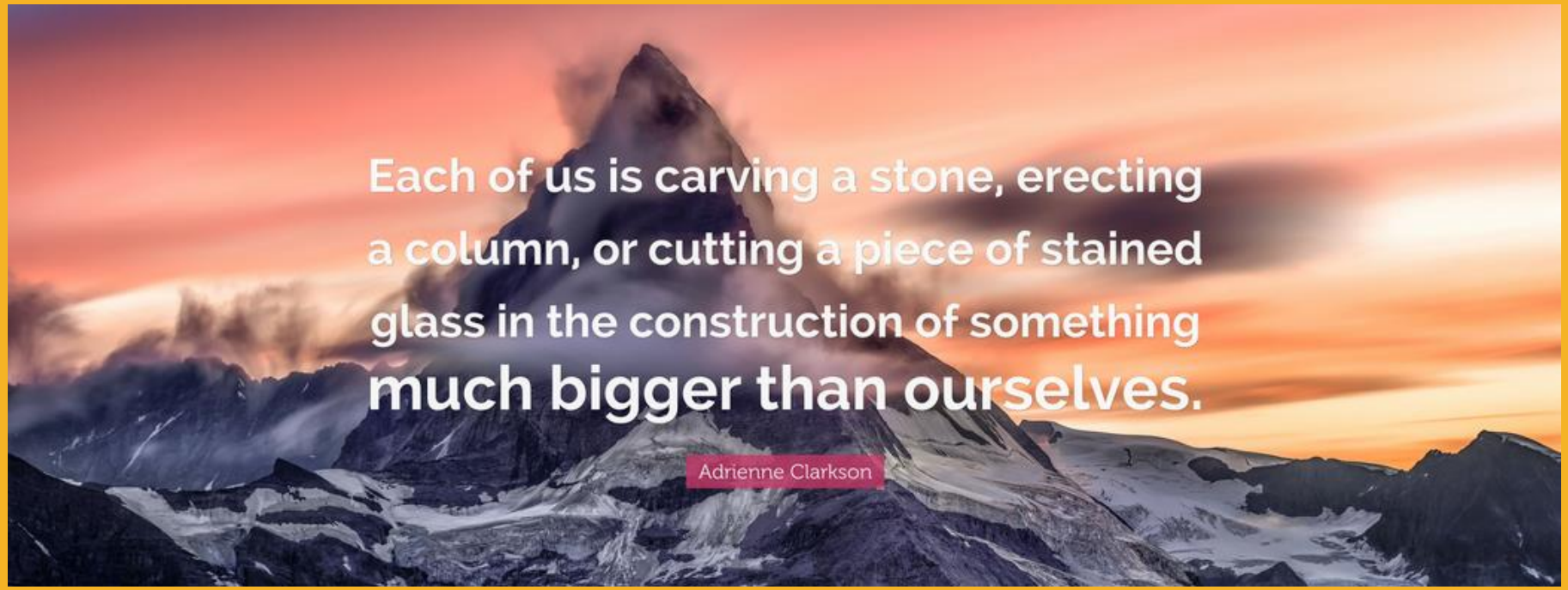
WITH SIKA

IT IS A COMPLETE PACKAGE, NOT JUST A PRODUCT.

The aim of this collaboration is to be a **partner**, not just a supplier.
Sika, as a global organization, can offer more than just mortar.

We want to contribute to your success,
which is also our success.

TECHNOLOGY LEADER	INDUSTRIALIZATION READY	SETTING THE BENCHMARK
✓	✓	✓



THANK YOU FOR YOUR ATTENTION

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