

3D CONSTRUCTION PRINTING

INDUSTRIALIZATION OF THE CONSTRUCTION

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BUILDING TRUST



INTRODUCTION

AN INTERDISCIPLINARY TEAM

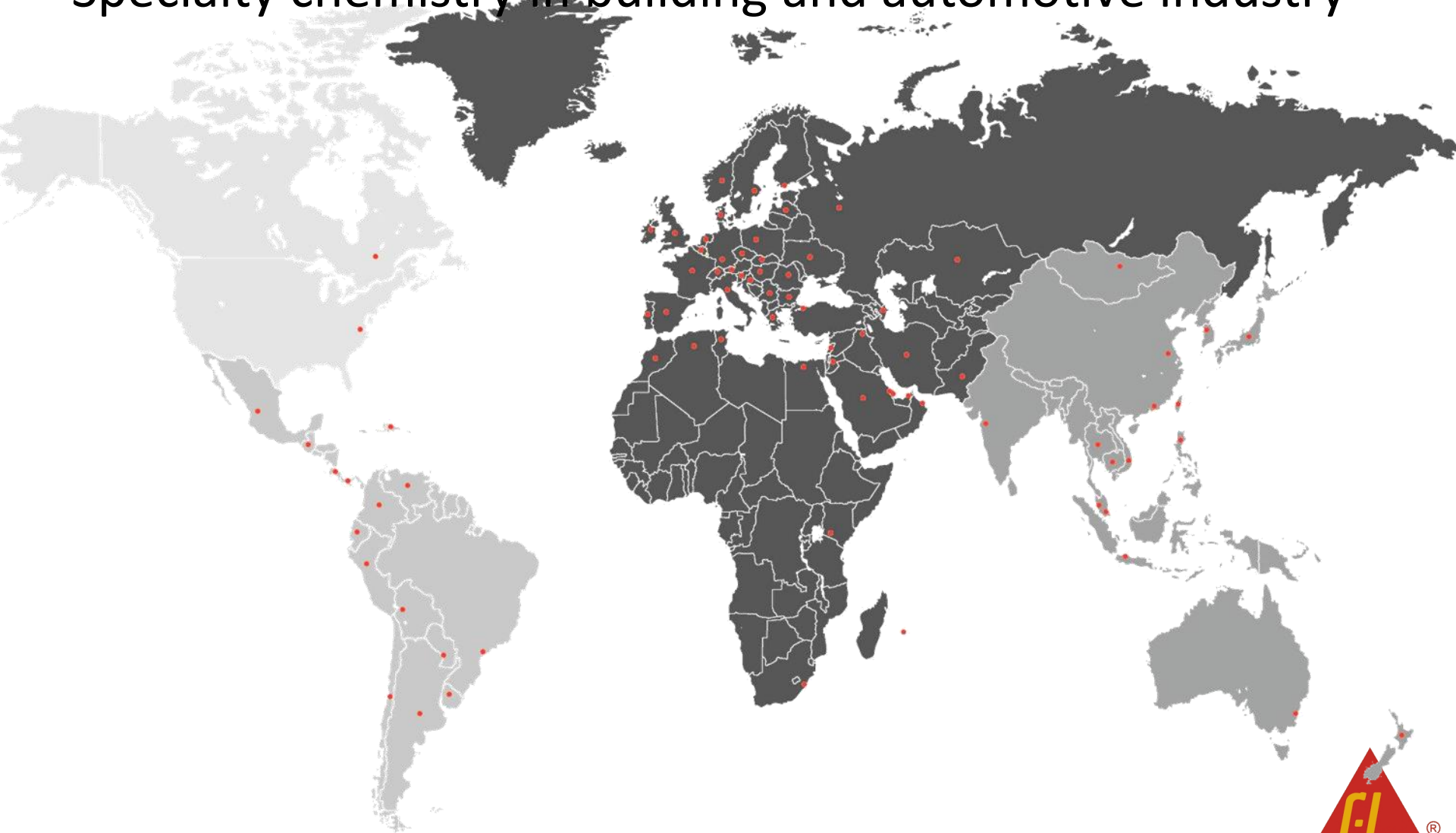


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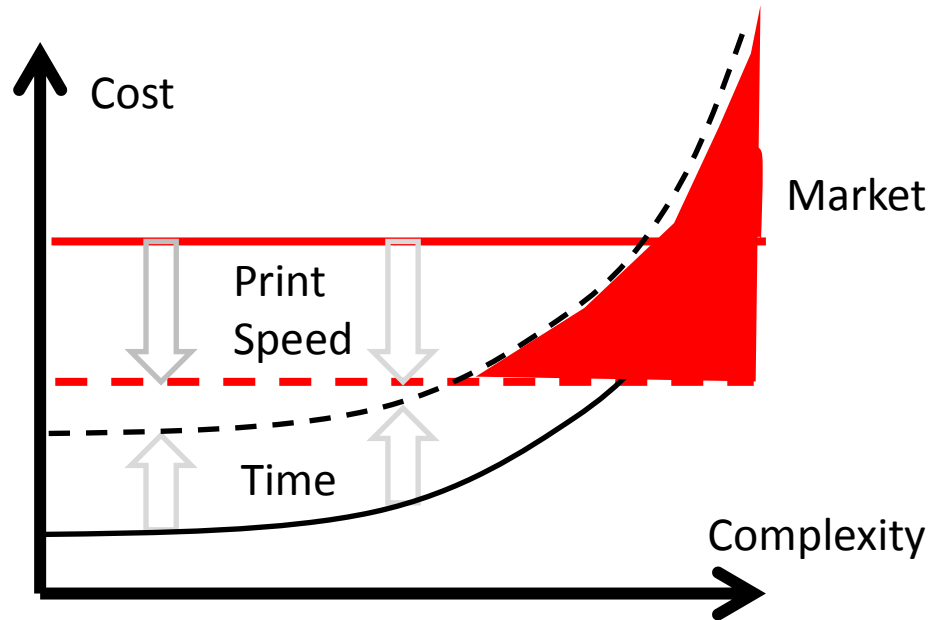
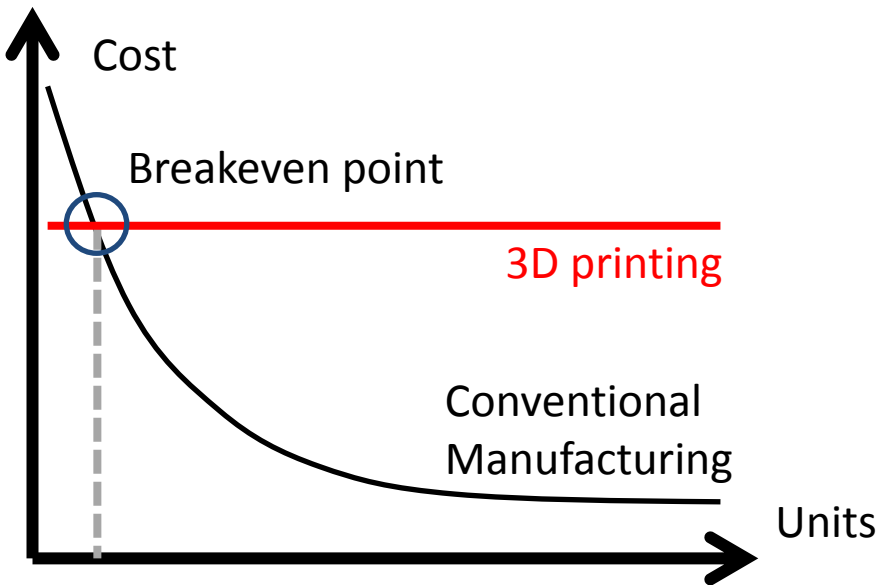
- 97 countries - Over 190 factories - 17,000 employees
- R&D: CHF 160 M€ - 800 employees
- Specialty chemistry in building and automotive industry



LOCAL MANUFACTURING MARKET GROWTH

Increasing market!

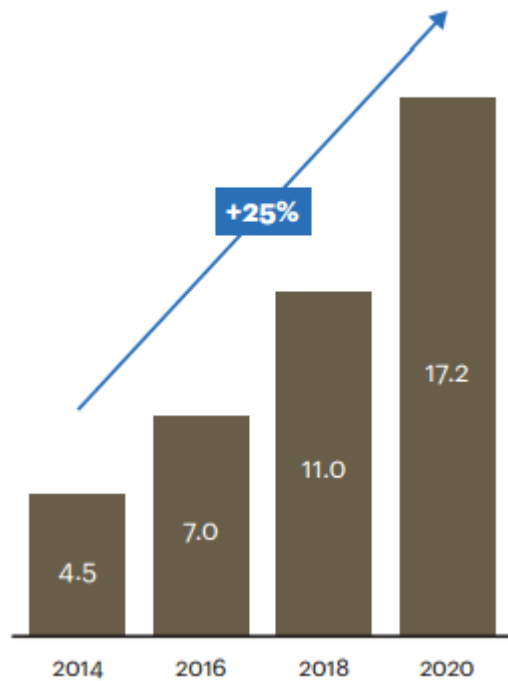
- Limitations of speed and cost: 2 to 10 times faster/cheaper each year!



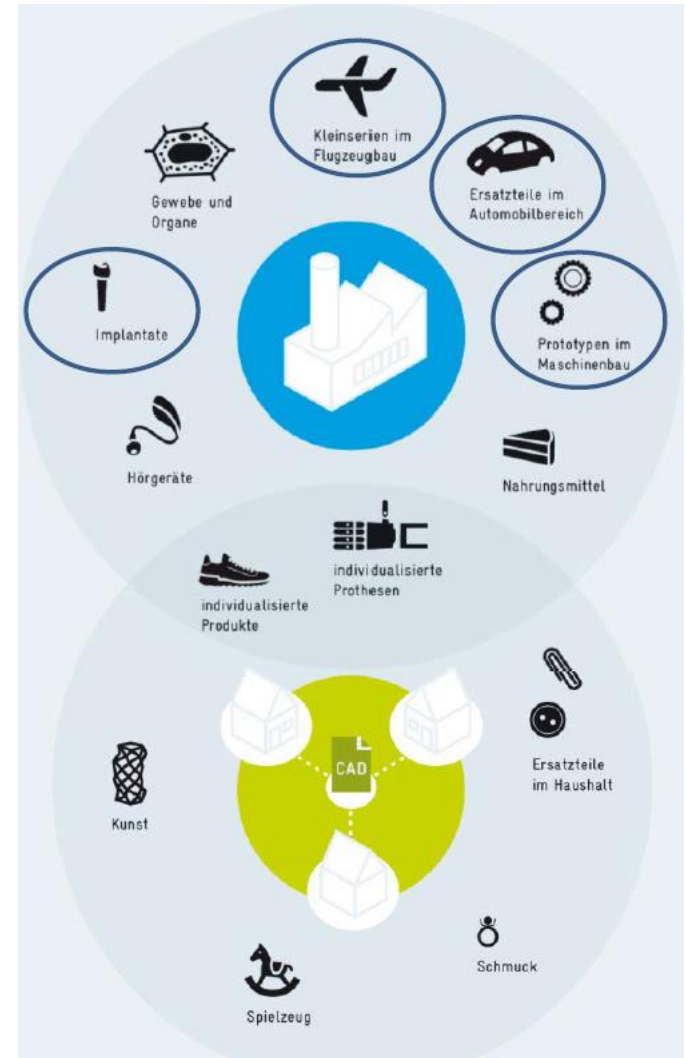
MARKET GROWTH

GLOBAL 3D INDUSTRY

Global 3D industry market for hardware, supplies, and services
\$ billion

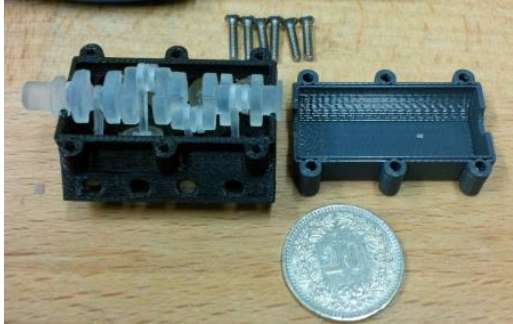
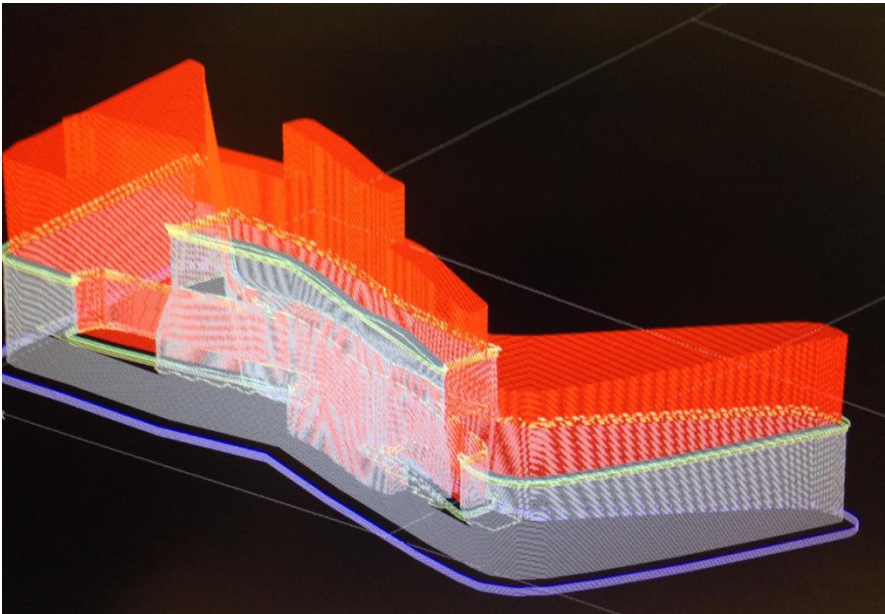


Sources: Wohlers Report, SmarTech Markets, Credit Suisse; A.T. Kearney analysis



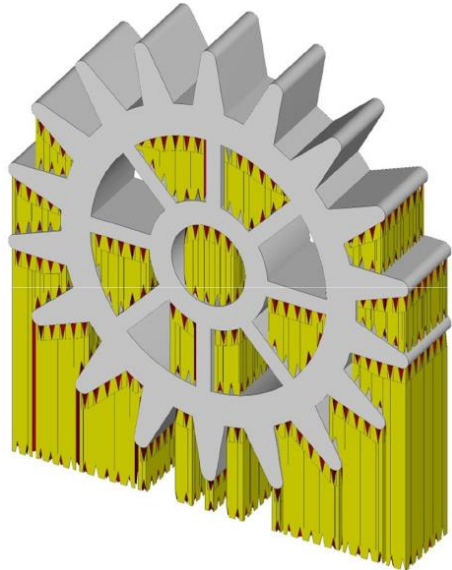
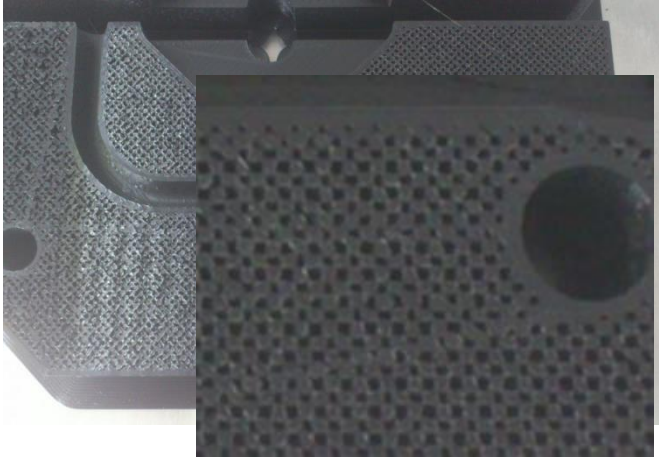
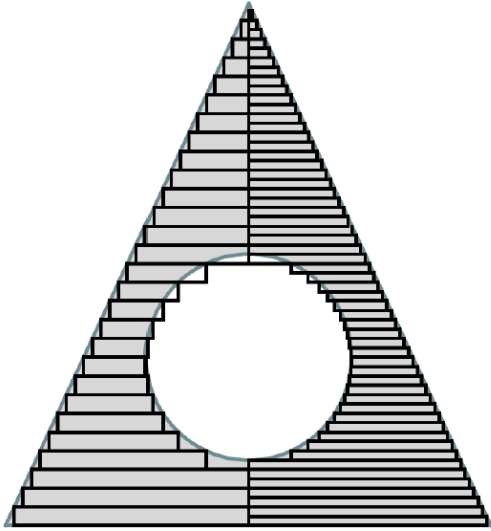
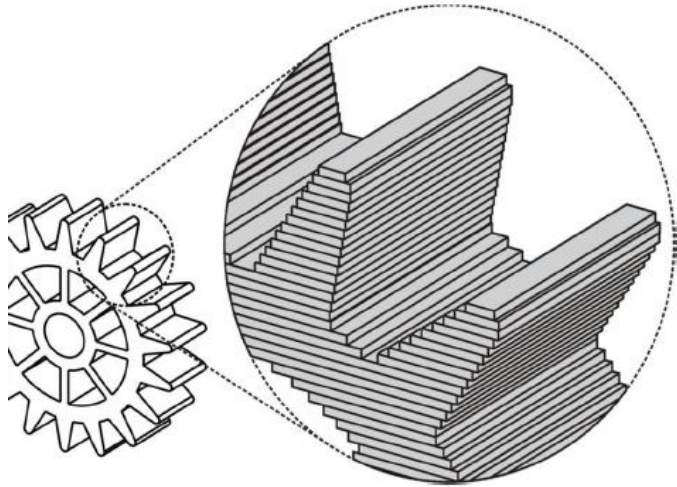
EXAMPLE : 3D PRINTER IN SIKA

PRODUCT DEVELOPMENT-FAST PROTOTYPING



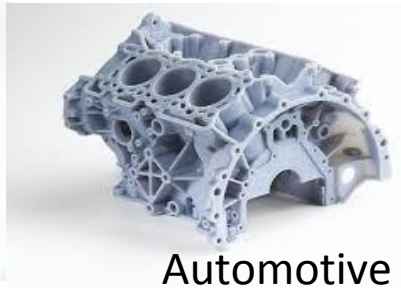
INTRODUCTION 3D

INFILL, SUPPORT & RESOLUTION



PRINTING TECHNIQS STATE OF THE ART

A HUGE VARIETY



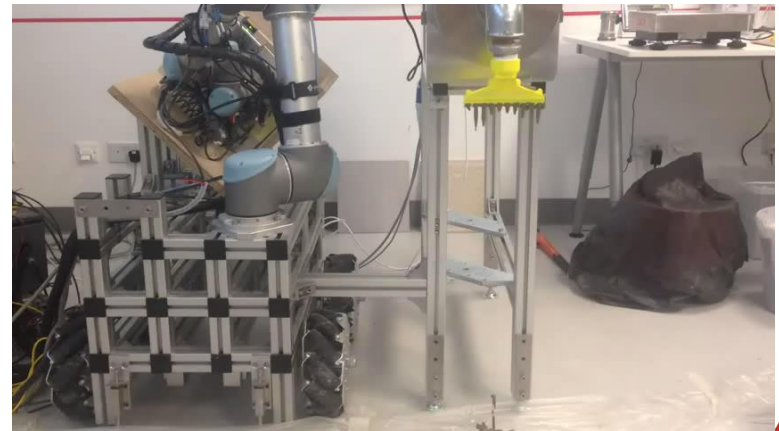
Stereolithographie (SL) Multi-Jet Modelling (MJM) Poly-Jet Modelling (PJM) Fused
Deposite Modelling (FDM) Layer Laminated Manufacturing (LLM) Digital Light Processing
(DLP) Selektives Lasersintering (SLS) Selective Laser Melting (SLM) Electro Beam Melting
(EBM)

MODERN CONSTRUCTION TECHNOLOGY: A REVIEW

AUTOMATIC BRICK POSITIONING

world first

fastbrick robotics successfully construct the world's first 3D printed brick structure utilising its unique patented compensation system.



- Same technology, only replace human

MODERN CONSTRUCTION TECHNOLOGY: A REVIEW

LOST MOLDS

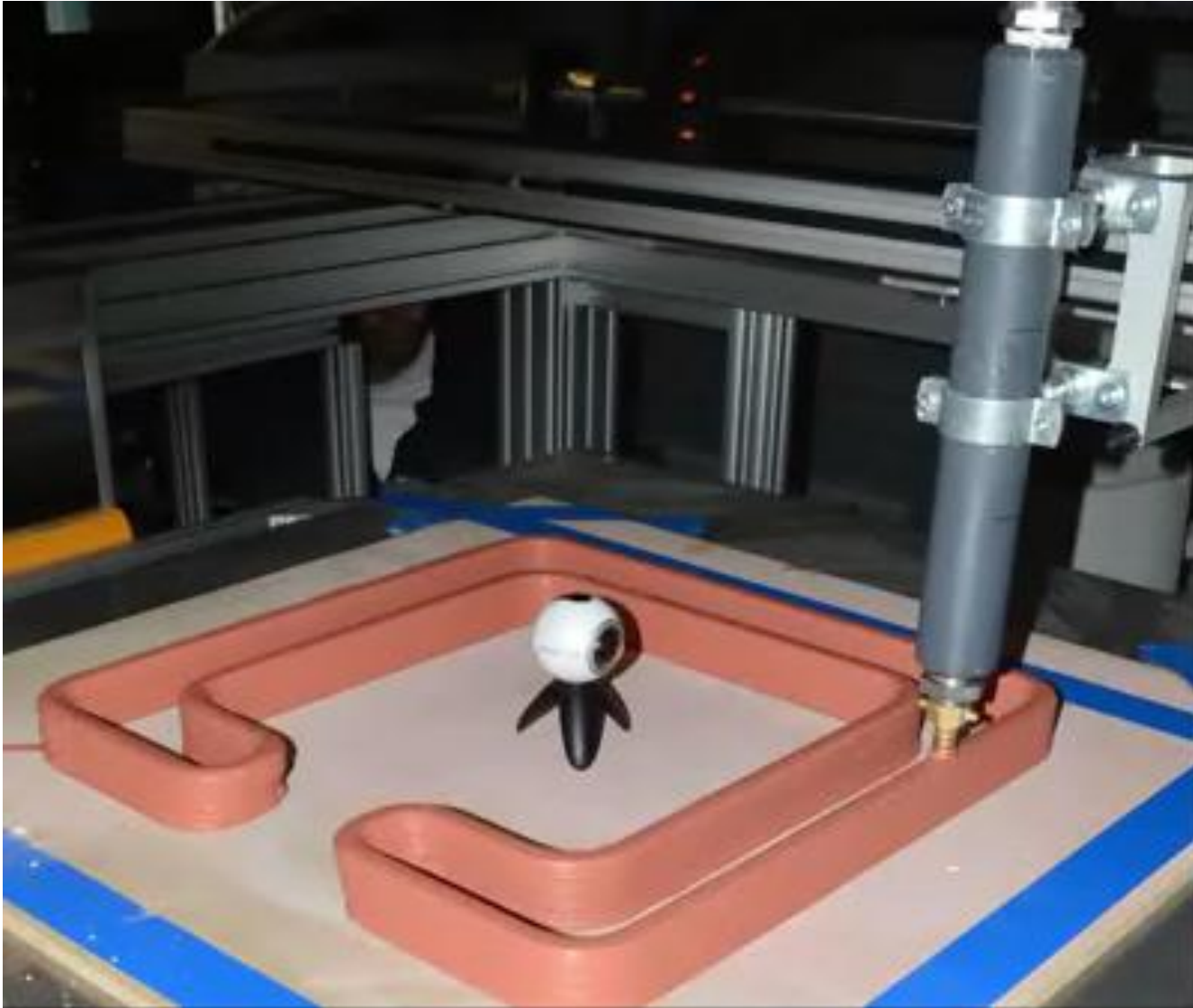


HighCon: Printed Carton mold



SIKA LABORATORY

CONCRETE HOUSE DESIGN



DEVELOPMENT GOALS

Material and Machine

Material Properties

- Pumpability
-> defines max machine size
- “Stiffness” at nozzle
-> supports following layers
- Strength evolution
-> defines vert. build speed
-> defines overall costs
- Process robustness
(Temperature, material variations)

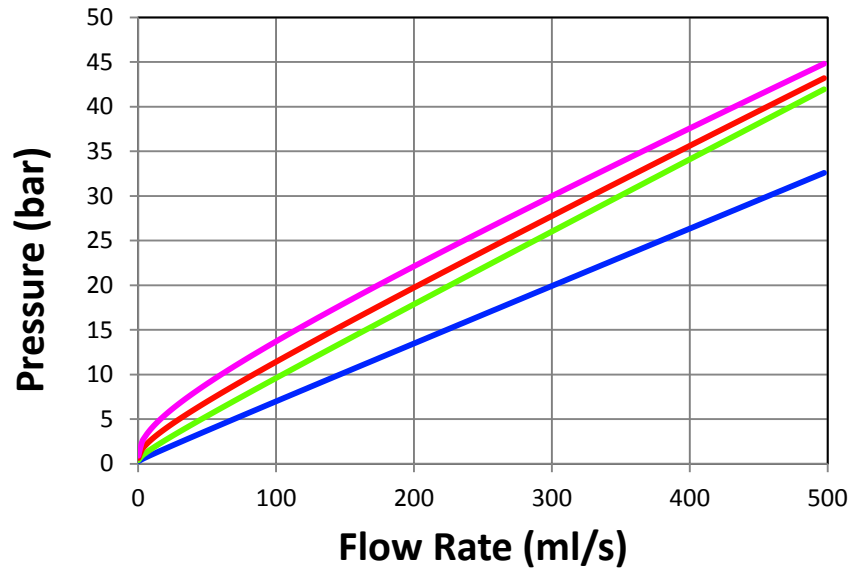
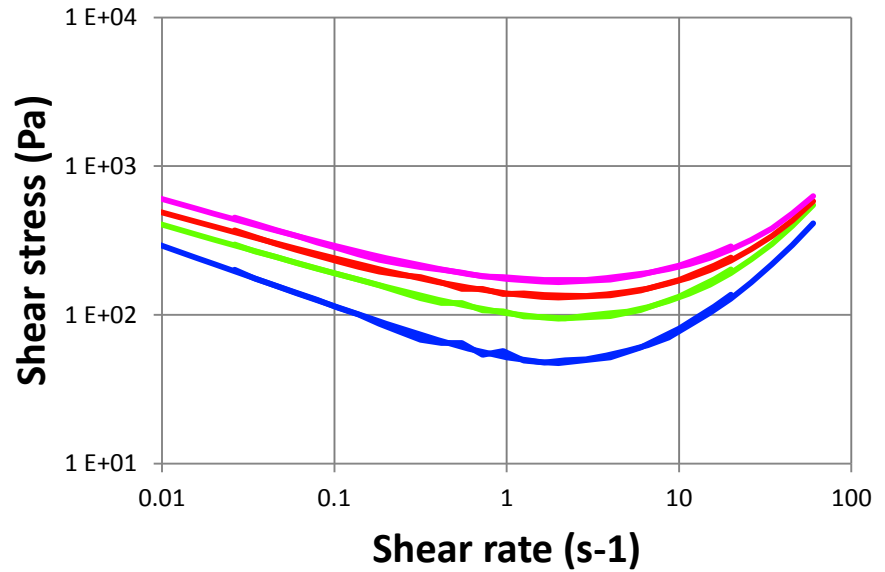
- While maintaining final strength,
shrinkage, long time performance
price

Machine

- Mechanics
- Robotics
- Software
- Path generation

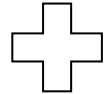
RHEOMIX: SIKA UNIQUE SOLUTION

FROM RHEOLOGY TO PRESSURE NEEDED

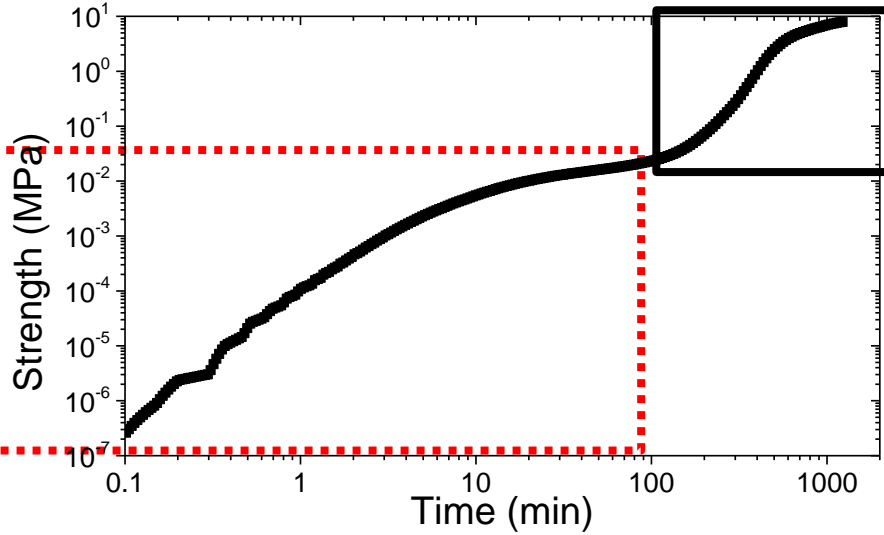


FROM SOFT TO HARD MATTER

LIQUID AND LOCAL POWDERS



Flow properties



Mechanical properties

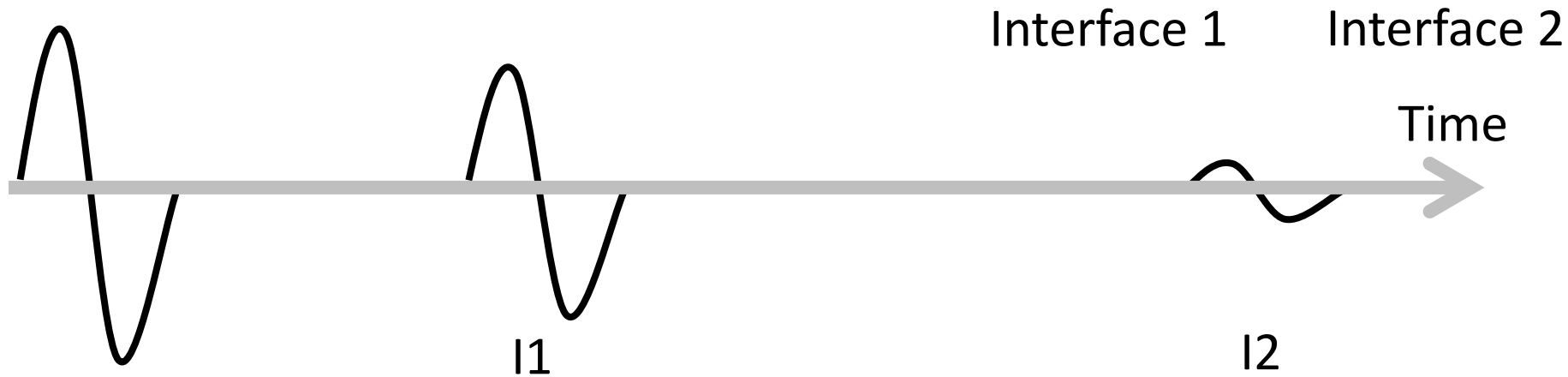
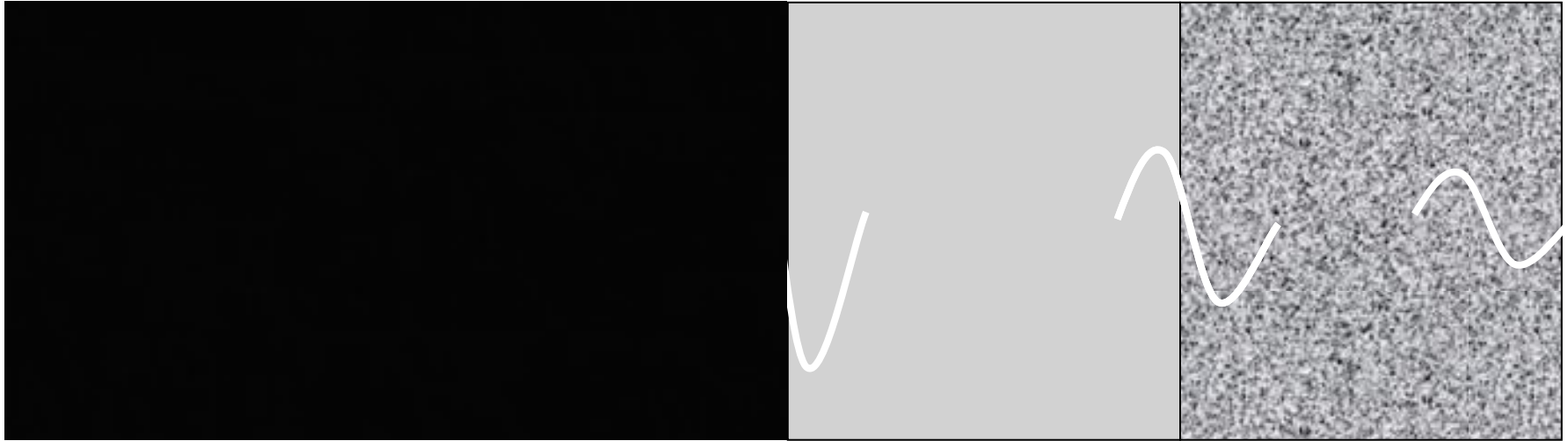
ULTRASOUND SHEAR WAVE PROPAGATION

START THE MUSIC

Wave Generator & Receiver

Wave Guide

Sample



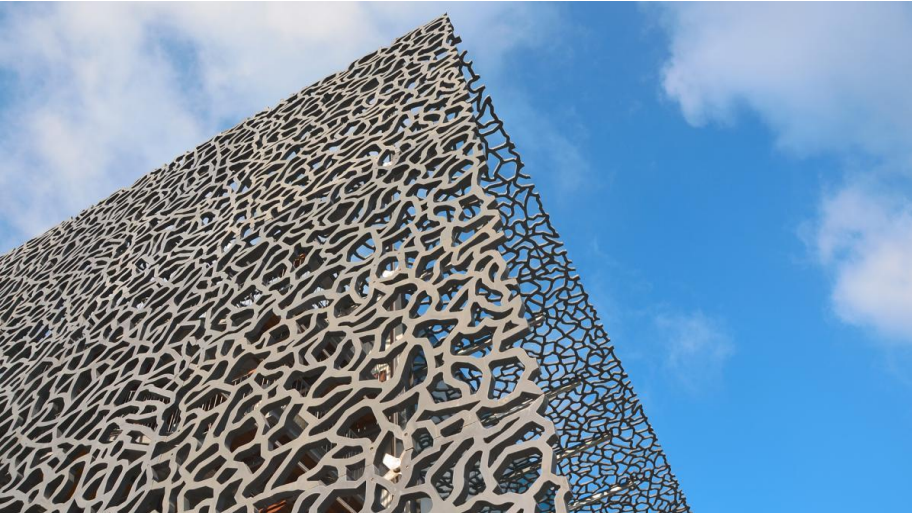
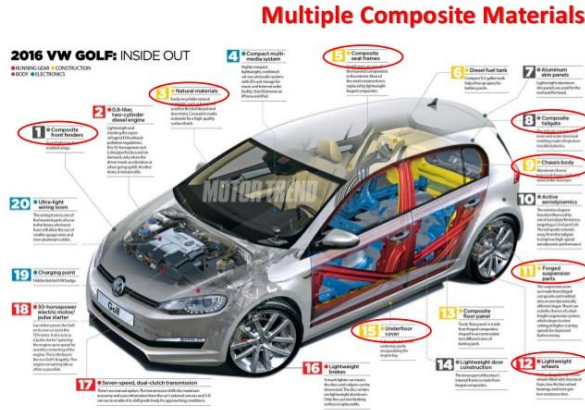
- Analyse of Fly Time & Amplitude

REBAR IN 3D PRINTING PREPOSED OR PRINTED



ULTRA HIGH PERFORMANCE CONCRETE COMPOSITE MATERIALS

- Automotive
- Aeronautic
- Medical
- Sport
- Food-cosmetics
- But also construction



PRINT WALL AND BREAK IT



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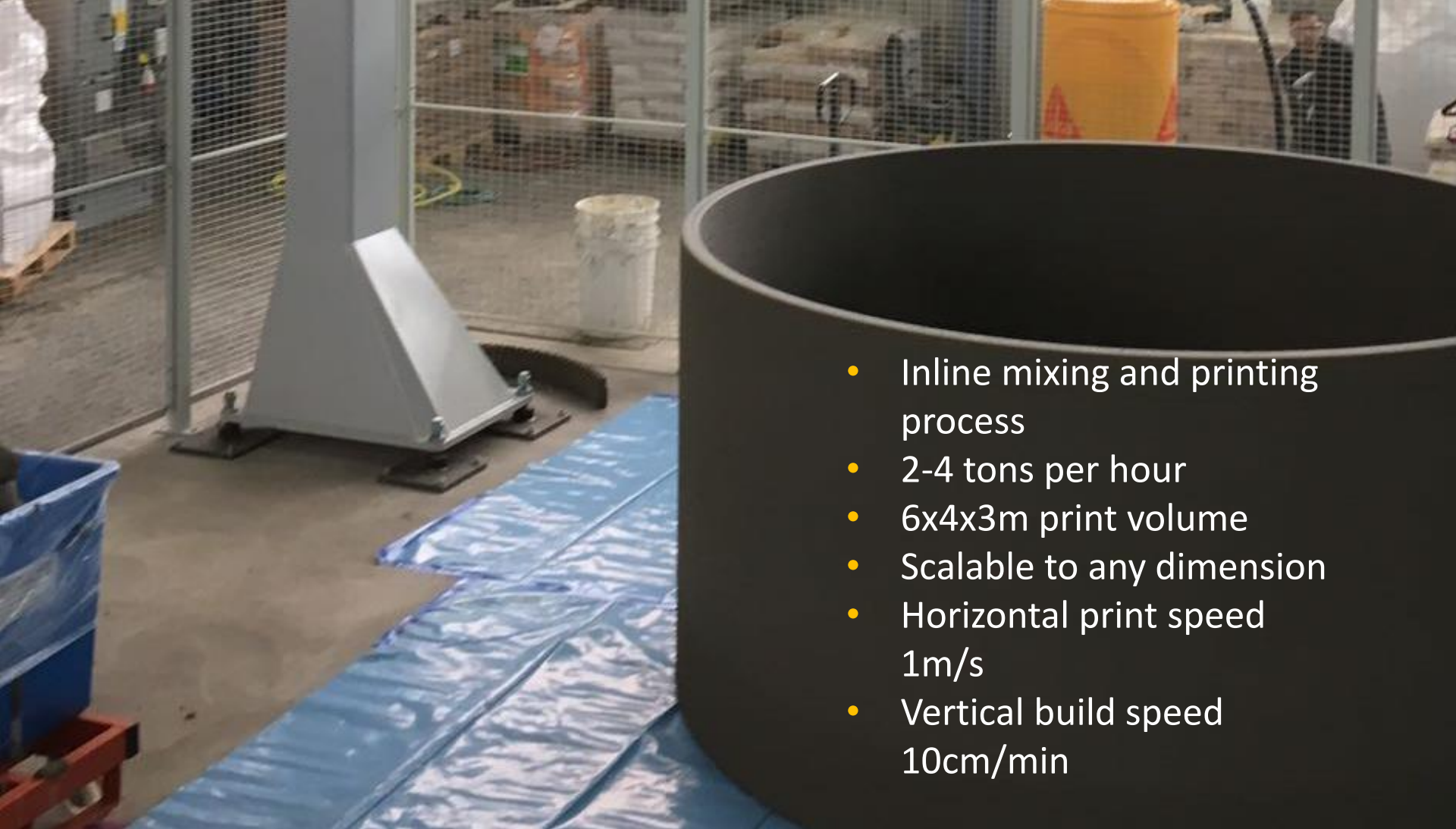


BREAKING THE WALL

LAYERS BOUNDING



- No breaks at the layers transitions
- Perfect binding



- Inline mixing and printing process
- 2-4 tons per hour
- 6x4x3m print volume
- Scalable to any dimension
- Horizontal print speed 1m/s
- Vertical build speed 10cm/min

3D TECH CENTER

TORWARDS THE INDUSTRIALIZATION

BUILDING TRUST



PRINT AT HIGH SPEED AND QUALITY

CONTINUOUS PRINTING



SIKA ACCELERATORS

Setting on demand for all binders with a quick strength growth for continuous printing





SIKA 3D MORTAR

High quality 3D printing mortar
with low viscosity and high strength

3D CONSTRUCTION PRINTING

THANK YOU



3-D PRINTING:
Huge potential for the future

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