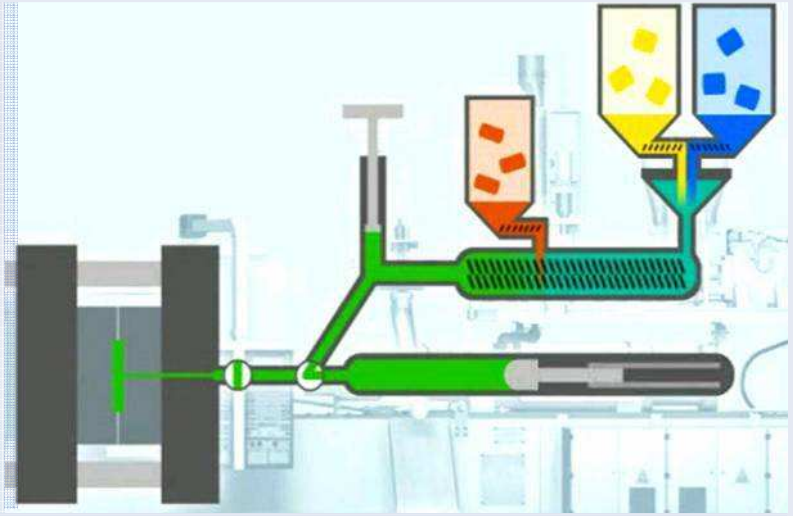
AUTOMOTIVE COMPOSITES CONFERENCE & EXHIBITION
World's Leading Automotive Composites Forum
SOCIETY OF PLASTICS ENGINEERS
AUTOMOTIVE & COMPOSITES DIVISIONS

KRAUSSMAFFEI

# On the direct way to profitability
## Injection Molding Compounder IMC

Krauss-Maffei Kunststofftechnik GmbH, 2007

# Agenda

- General principle of the Injection Moulding Compounder
  - Working principle
  - Differences and advantages
- Automotive applications
  - Front End carrier development
  - State of the art applications
  - Outlook
- Opportunities
  - Use of natural fiber
  - Local reinforcement

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# Get the Benefit together

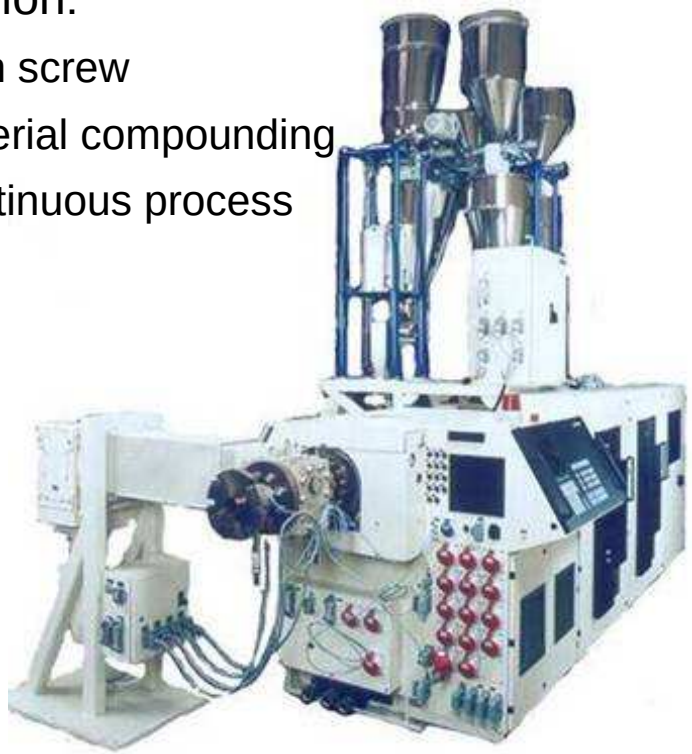
## IMC Injection Moulding Compounder– Principle

Injection Moulding:

- Single screw
- Material processing
- Discontinuous process

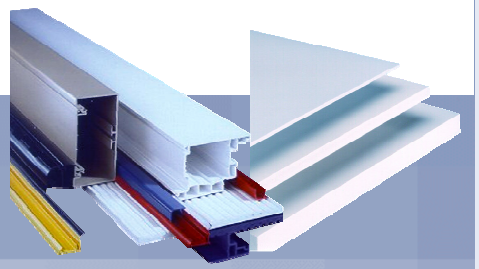
Extrusion:

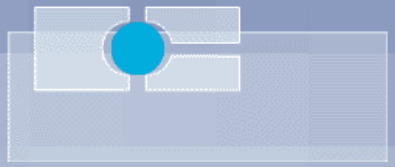
- Twin screw
- Material compounding
- Continuous process



# Your system....is out of one hand

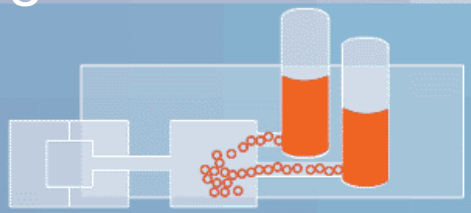
## One supplier - Krauss Maffei – Simple integration



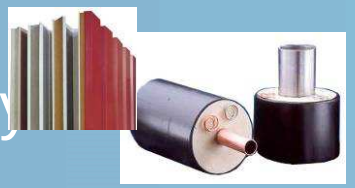


Injection molding

Extrusion

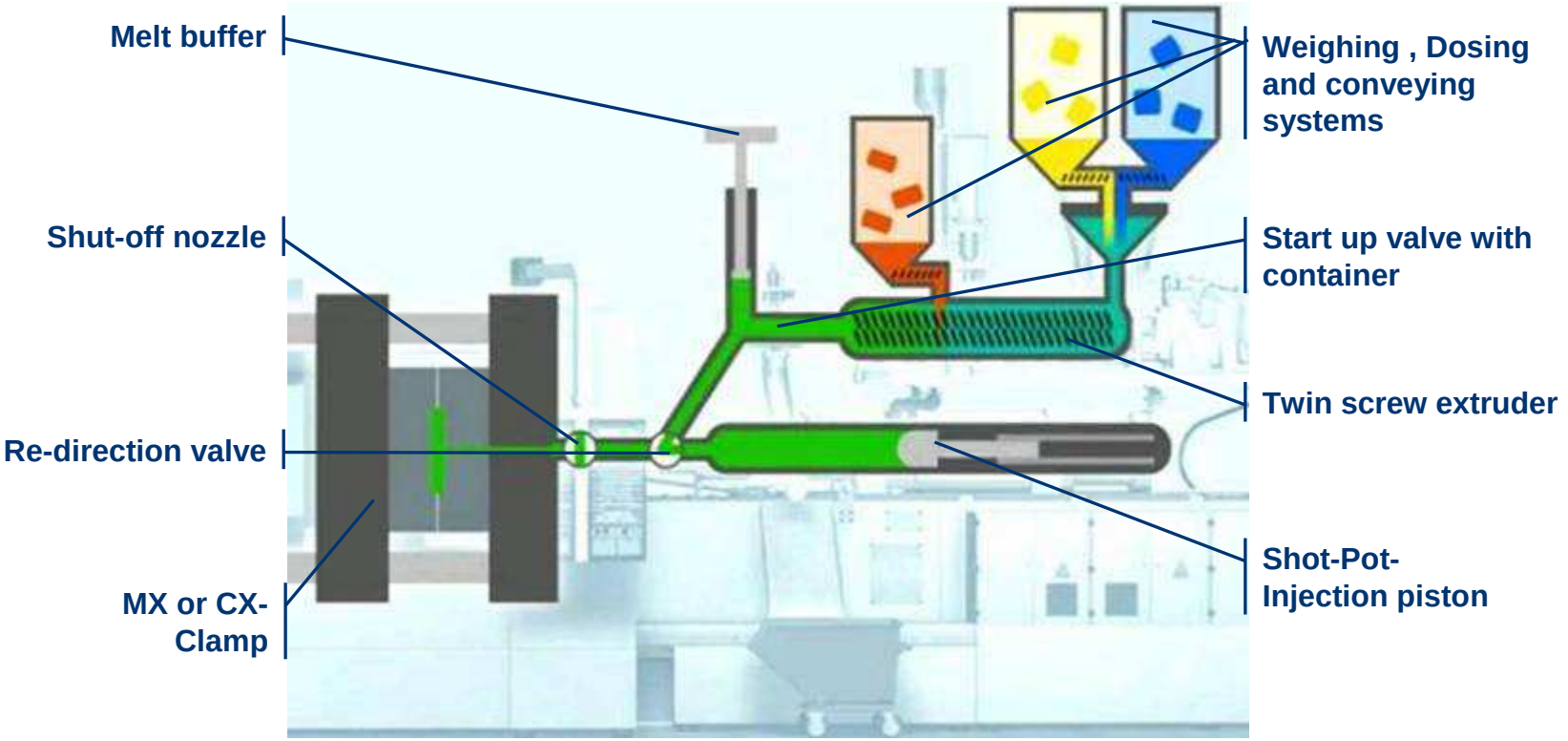


Reaction technology



# Continuous and discontinuous – Two in One

## IMC Injection Moulding Compounder– Principle



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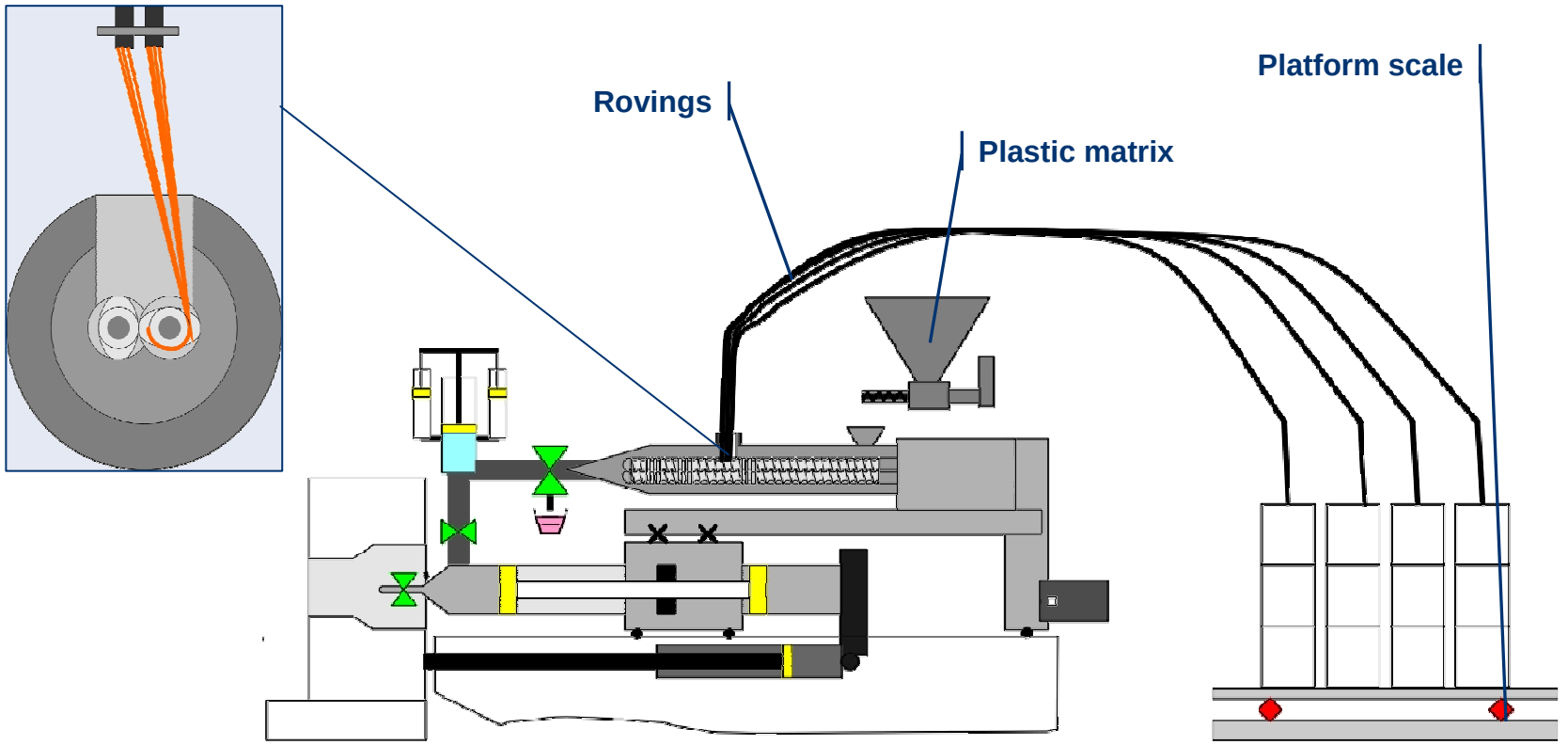
# What makes an IMC suitable for long glass fiber applications?

## Long glass fiber – IMC with platform scale




We know, what we are talking about...
Industrial References
KM2000 - 14000 MX
AKsys
Germany – Köngen
KM 2000 – 14.000 MX IMC
Krauss Maffei Injection Molding Compounder
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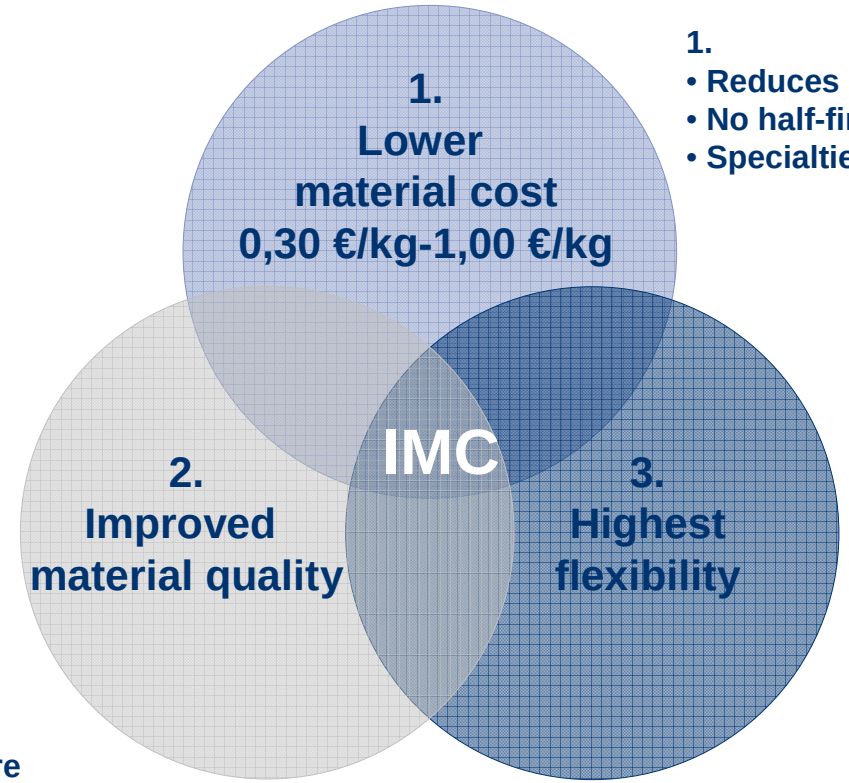
# Unbeatable combination of properties

## IMC Injection Moulding Compounder– Main Benefit



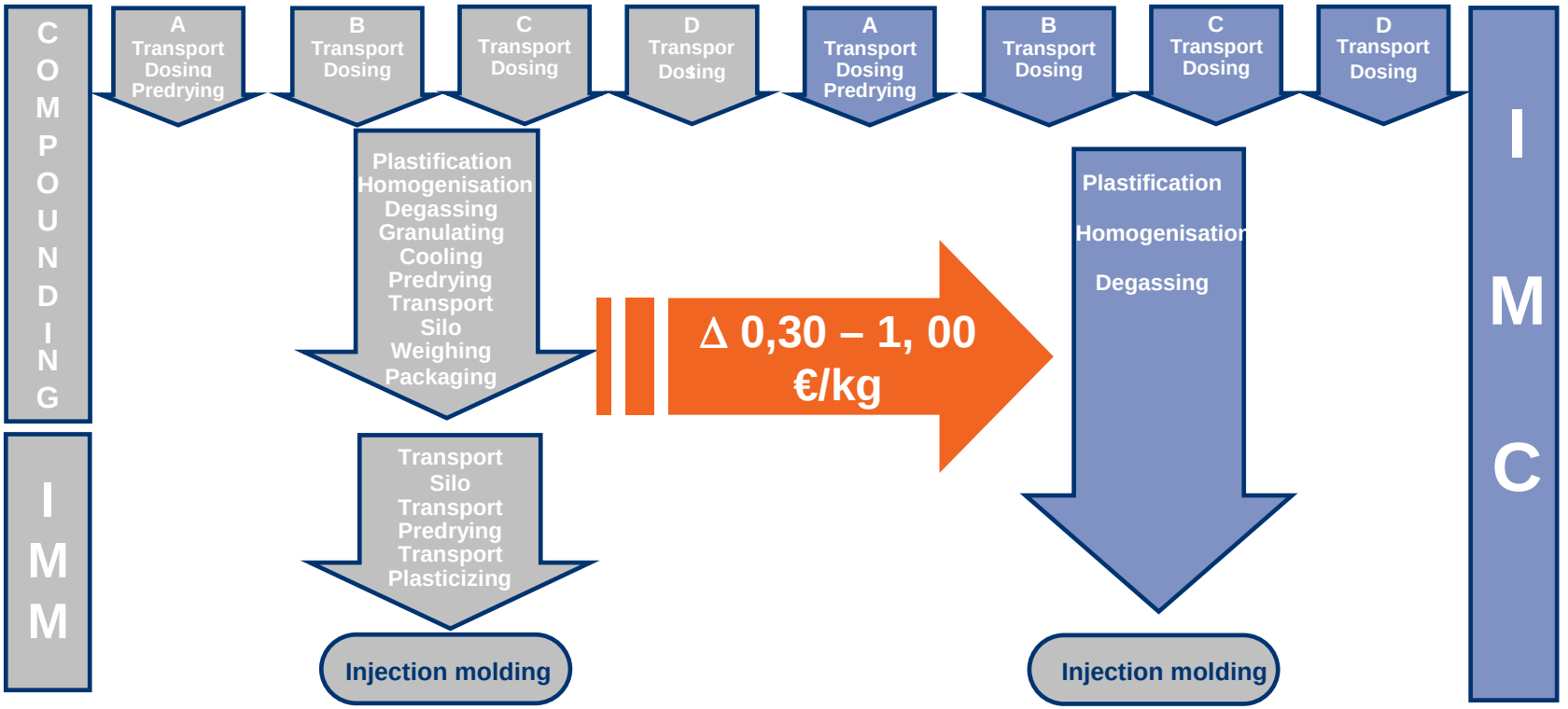

**1.**
- Reduces process steps
- No half-finished products necessary
- Specialties for low tonnages

**2.**
- Longer fibers
- Better homogeneity
- Lower mass temperature

**3.**
- Fiber reinforcement
- Blends
- Fillers

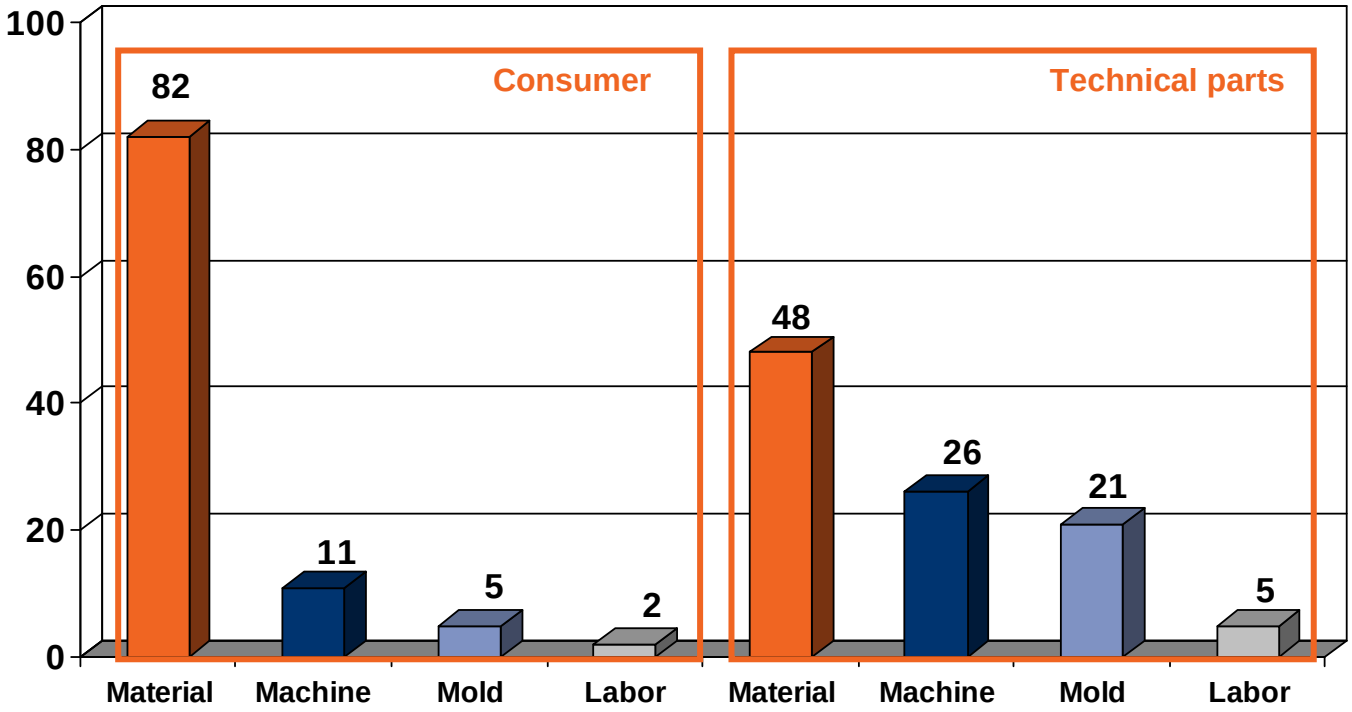
# Less is more... Less cost, more profit

## Material cost savings – Save one stage's added value



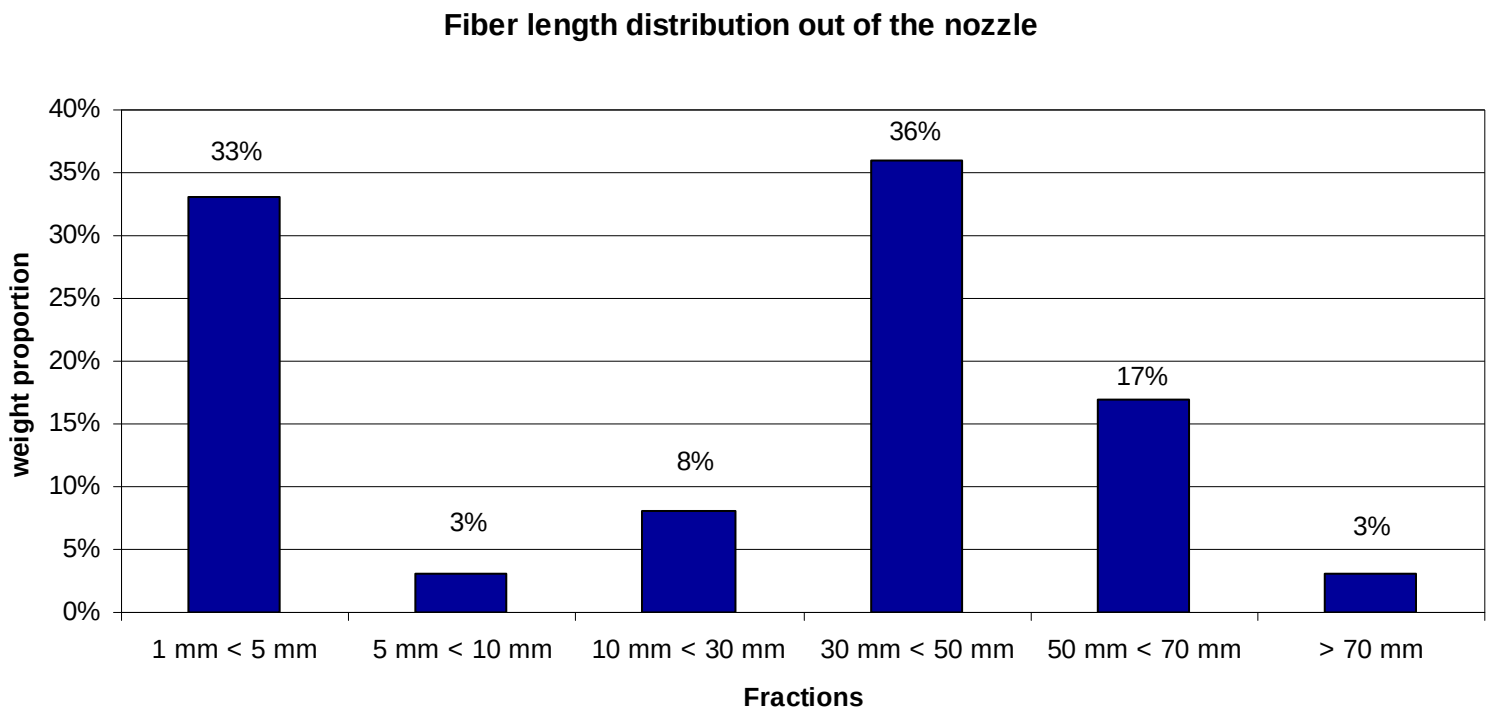
# Cost savings… yes, but with the right starting point

## Material cost savings – Reduction of part cost



# Long fibers out of the nozzle – Take your chance!

## Long glass fiber – Fiber length measurement




Measured by IKT Stuttgart, PP 30 % GF, Burned for 3 h at 550 °C, sieving method, weight distribution, sample out of the nozzle

# One for all – Do you know a more flexible system?

## Highest flexibility – Material choice

Fibers

- Longer fibers and homogenous dispersion

Blends

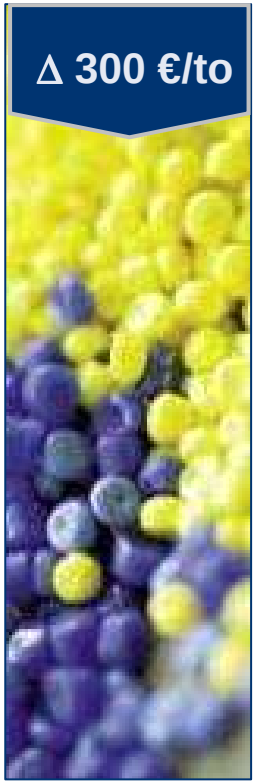
- Specialties - Reactive Blends, fiber reinforcement,...

Fillers

- High fill grades, substitution possibilities

**Benefit:**

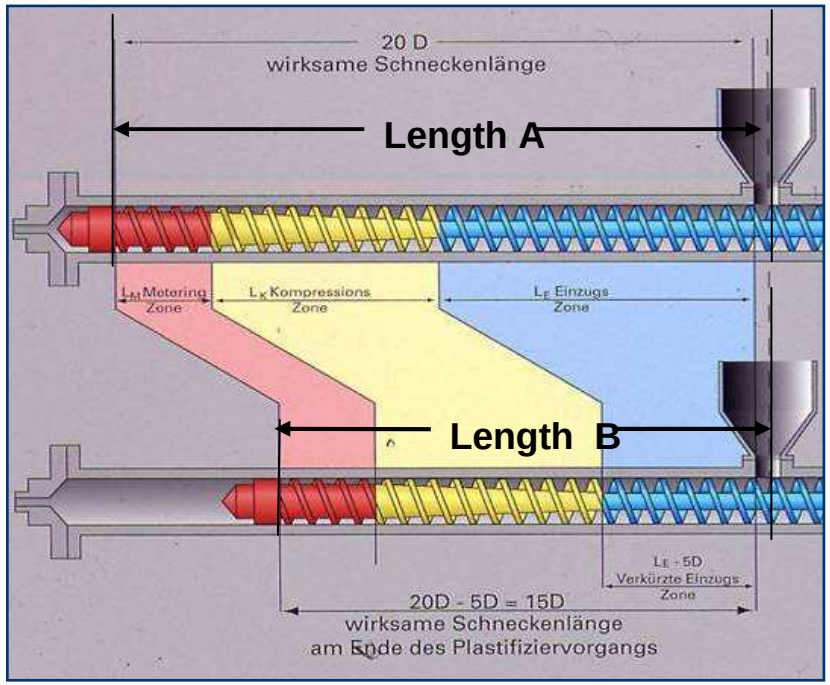
- Material cost savings – At least 0,30€/kg
- Almost every thing is processable

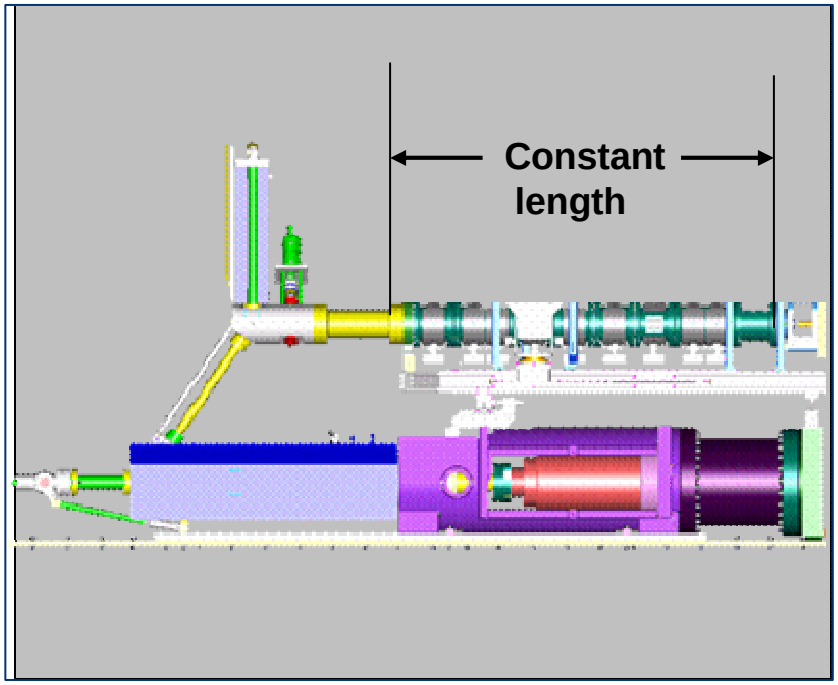




# Constant effective screw length – No change of material quality

## Constant screw length – Constant material quality

| Standard | Inline compounding |
|---|---|



# Wider field of application and less screw wear

## High plasticizing and throughput capacity

Maximum throughput

- With small screw diameters

No injection pressure on screws

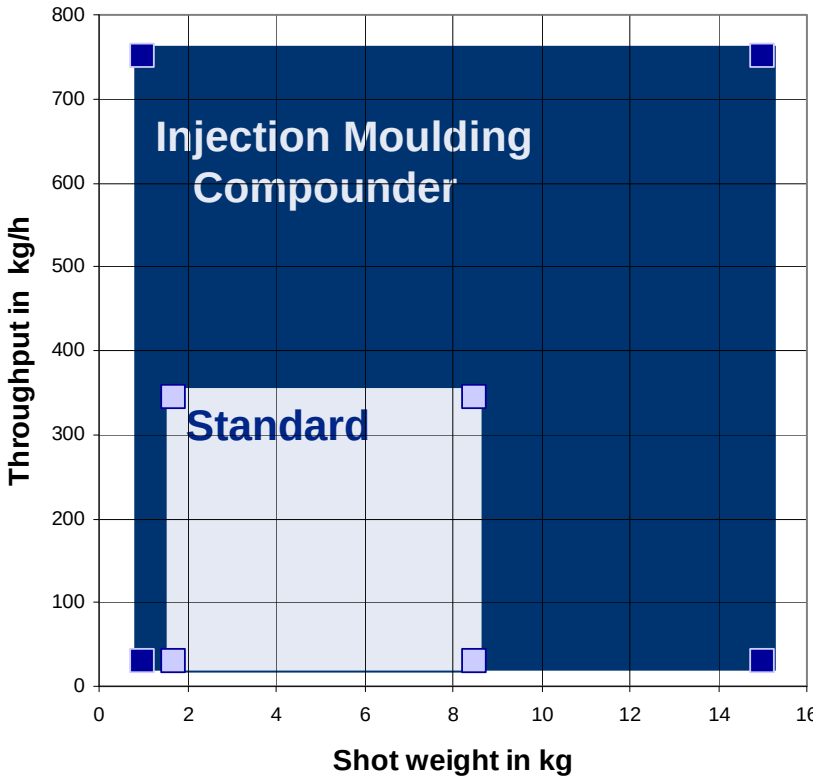
- Less stress

Throughput is independent of screw speed

- Low mass temperature

**Benefit:**

- Real enlarged working range
- Significant less wear in comparison to single screw
- Reduced cooling and cycle time




Example: SP24500, PP GF 30

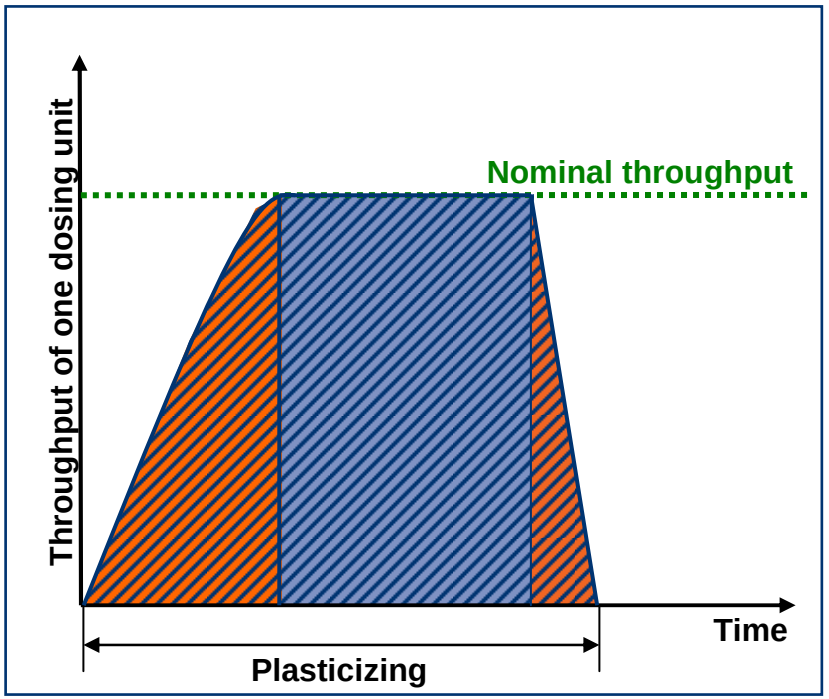
IMC: $D_{Ex=}$ = 81 mm, $D_{Kolben}$= 165 mm, 300 1/min max.

Standard: D= 165 mm, 60 1/min max., plasticizing time = 50 % cycle time

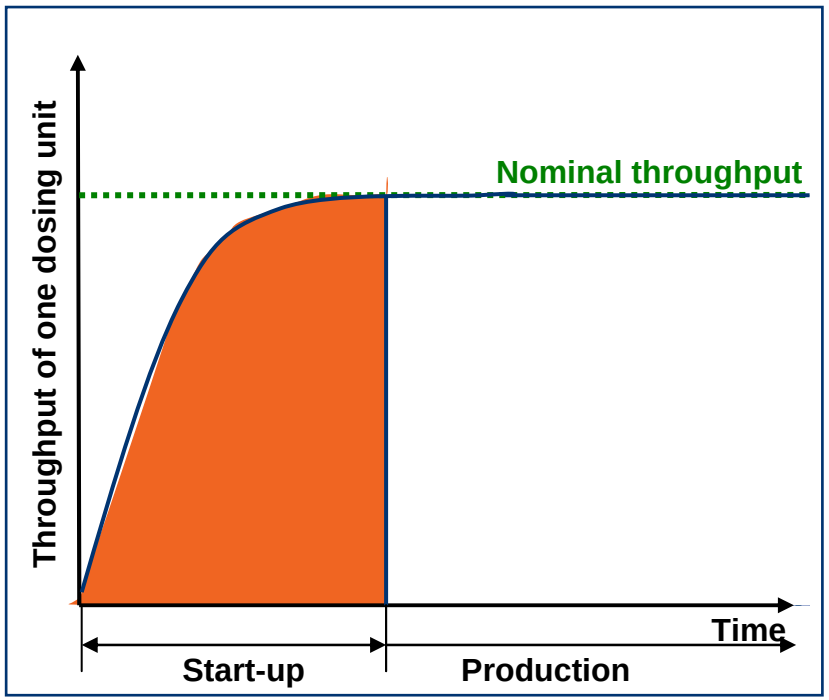
# The longer it runs, more stable gets the process!

## Clear-cut documentation – Continuous dosing

### Discontinuous mode



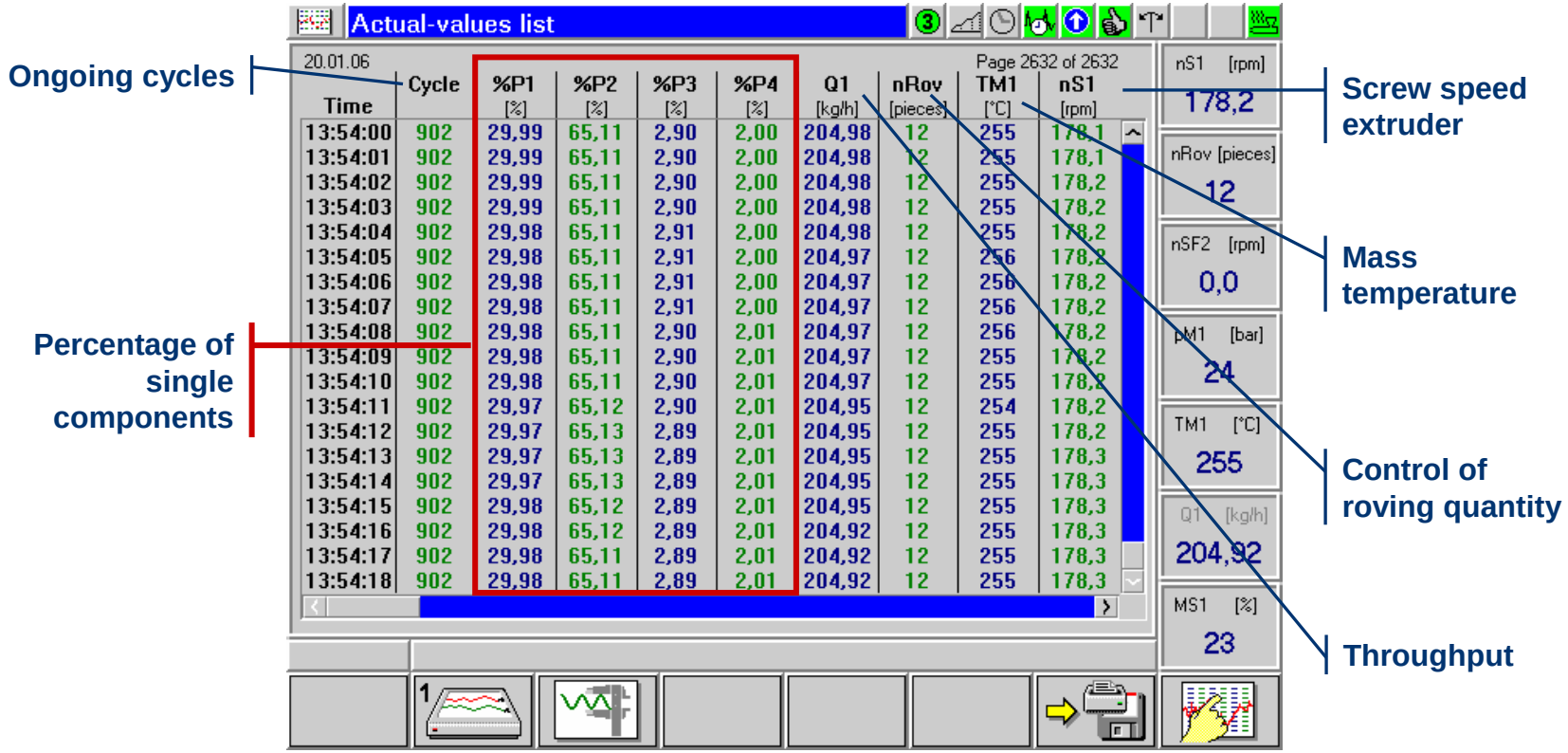

### Continuous mode




In the part  undefined  defined

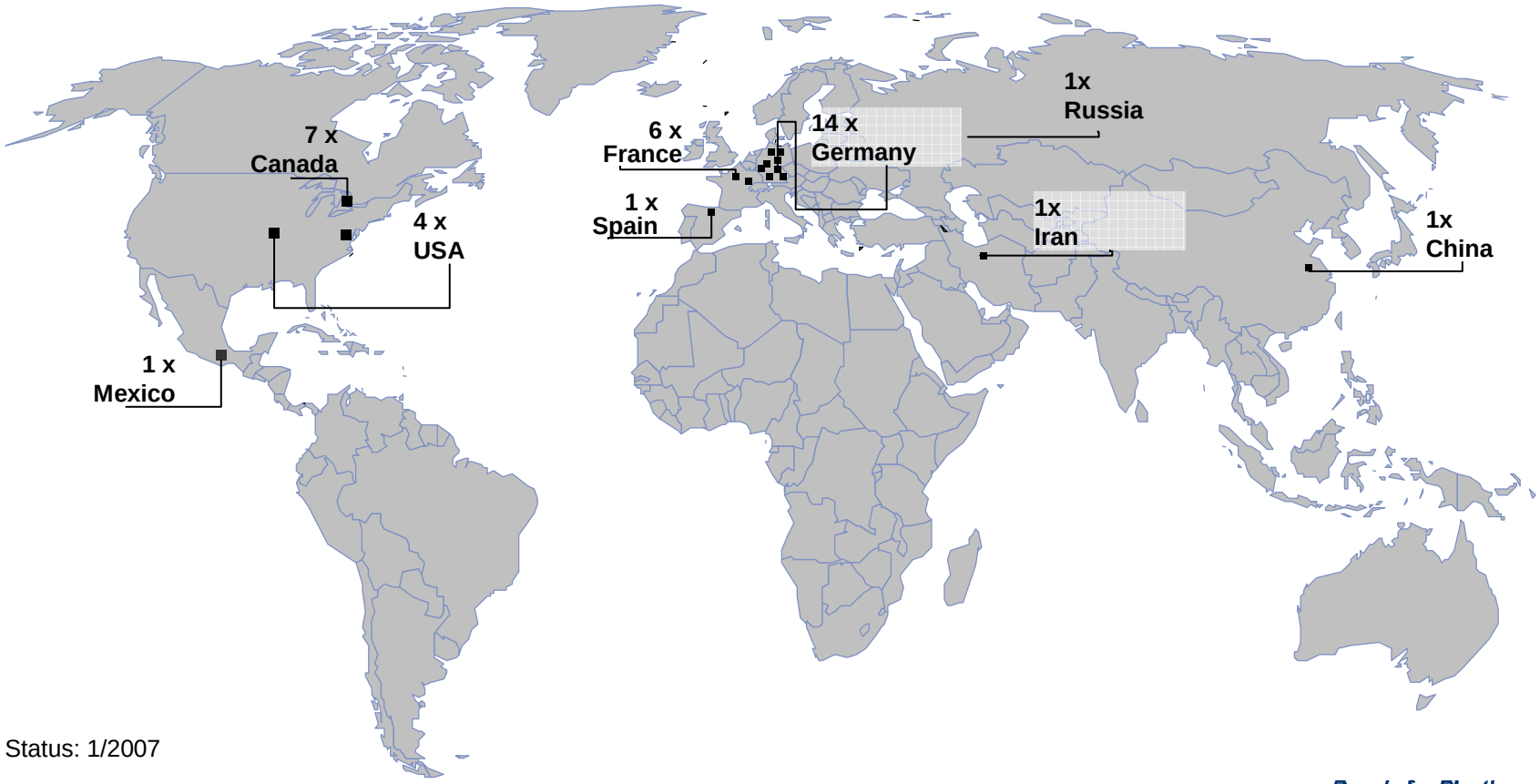
# Material responsibility – We assist you

## Continuous extrusion process – Clear-cut documentation



# The IMC technology – Worldwide in use

## References



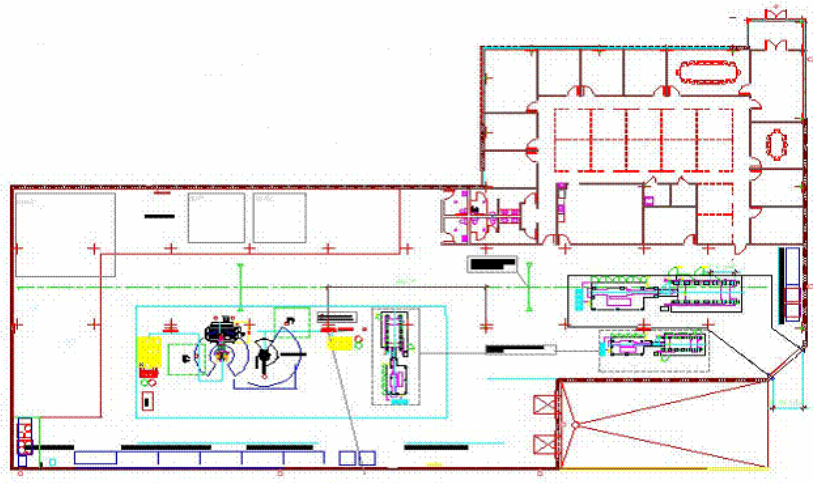

Status: 1/2007

# Next step are trials…

## Lab machinery

Detroit

- KM 1000-6100 MX IMC
  - KMG 81, 23 D, 110 kW
  - Shot volume: ~ 4 liters

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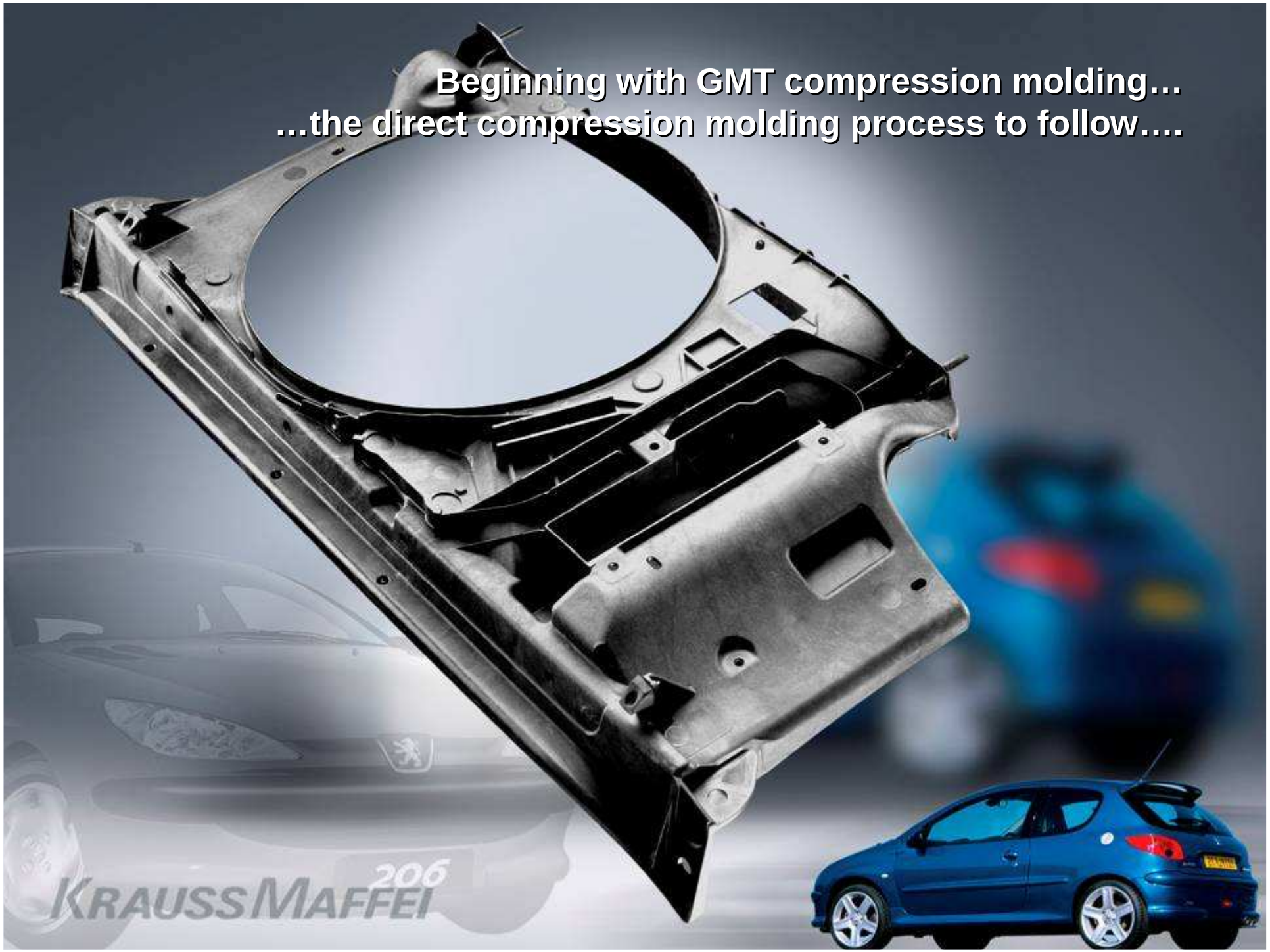
Beginning with GMT compression molding…
…the direct compression molding process to follow….
206
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…ending up with the direct injection moulding process!
No rework, no scrap material
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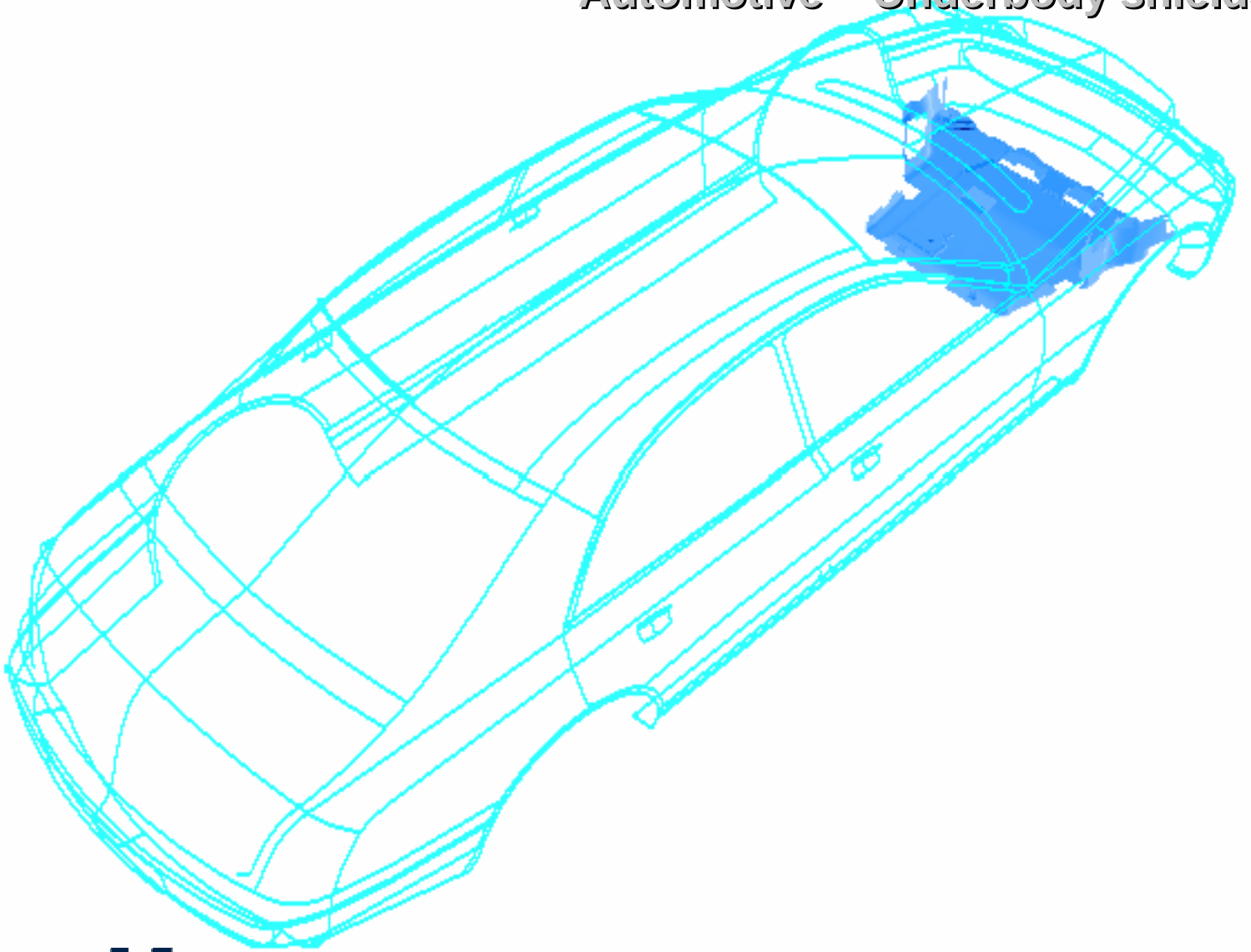
# State of the art

## Automotive – Underbody shields



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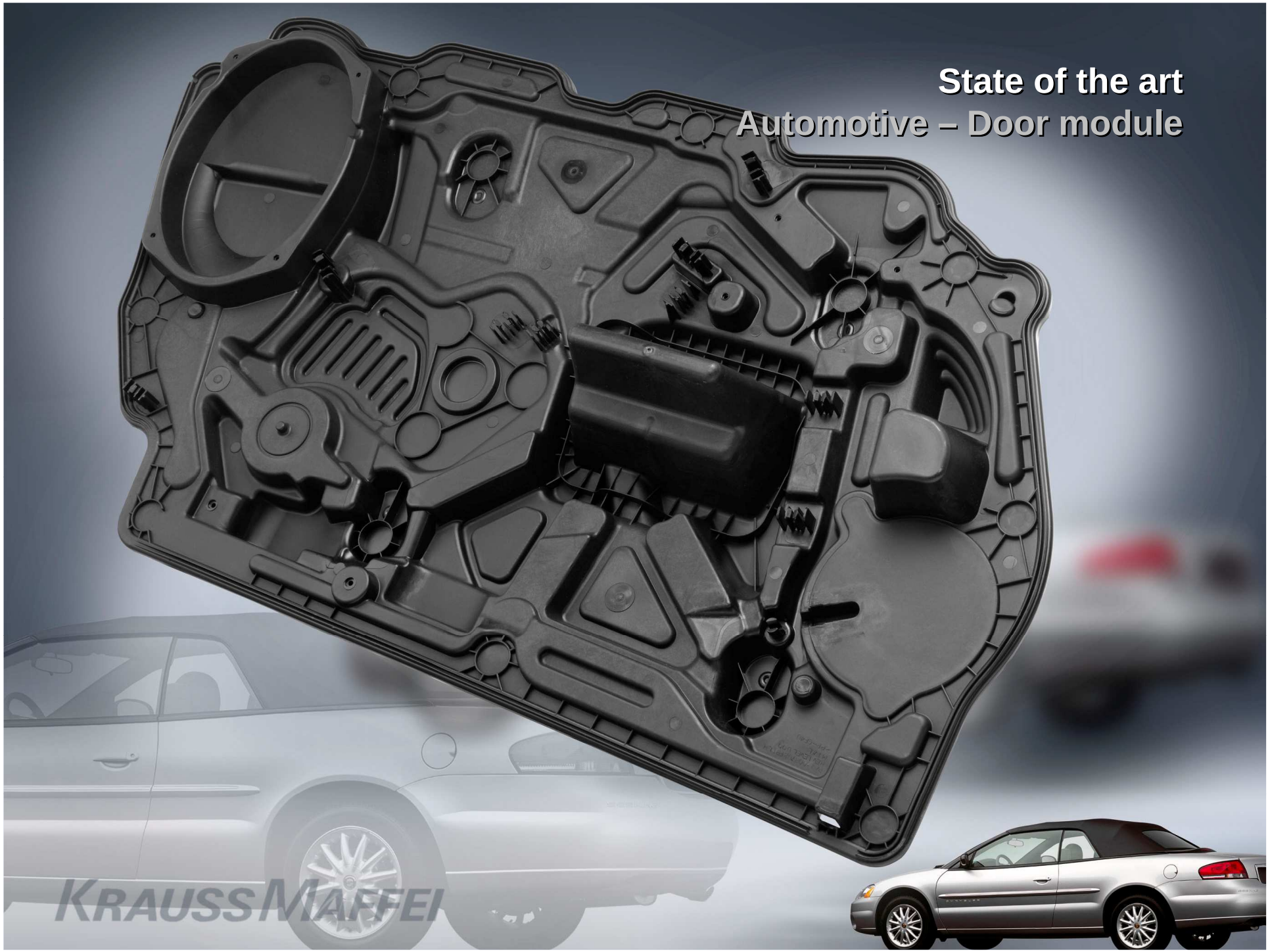
Source: HP Pelzer
Application example


State of the art
Automotive – Door module
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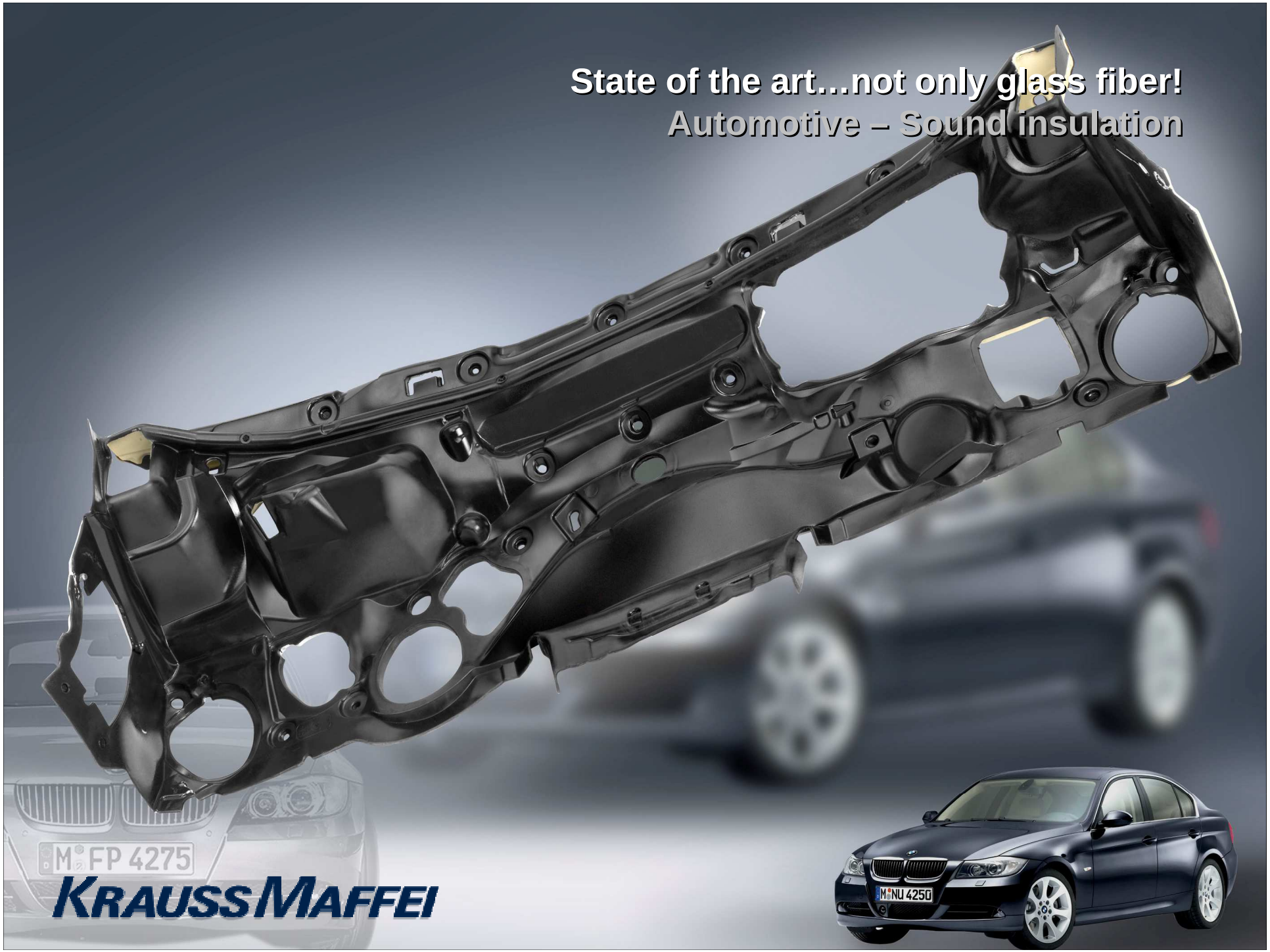
# State of the art

## Automotive – IP structural-duct assembly

AUTOMOTIVE INNOVATION AWARDS COMPETITION & GALA

HONORING THE BEST IN AUTOMOTIVE PLASTICS


State of the art…not only glass fiber!
Automotive – Sound insulation
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...and the potentials are not yet spent
Automotive – Rear door
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# ...and the potentials are not yet spent

## Automotive – Exterior parts with back injected foil


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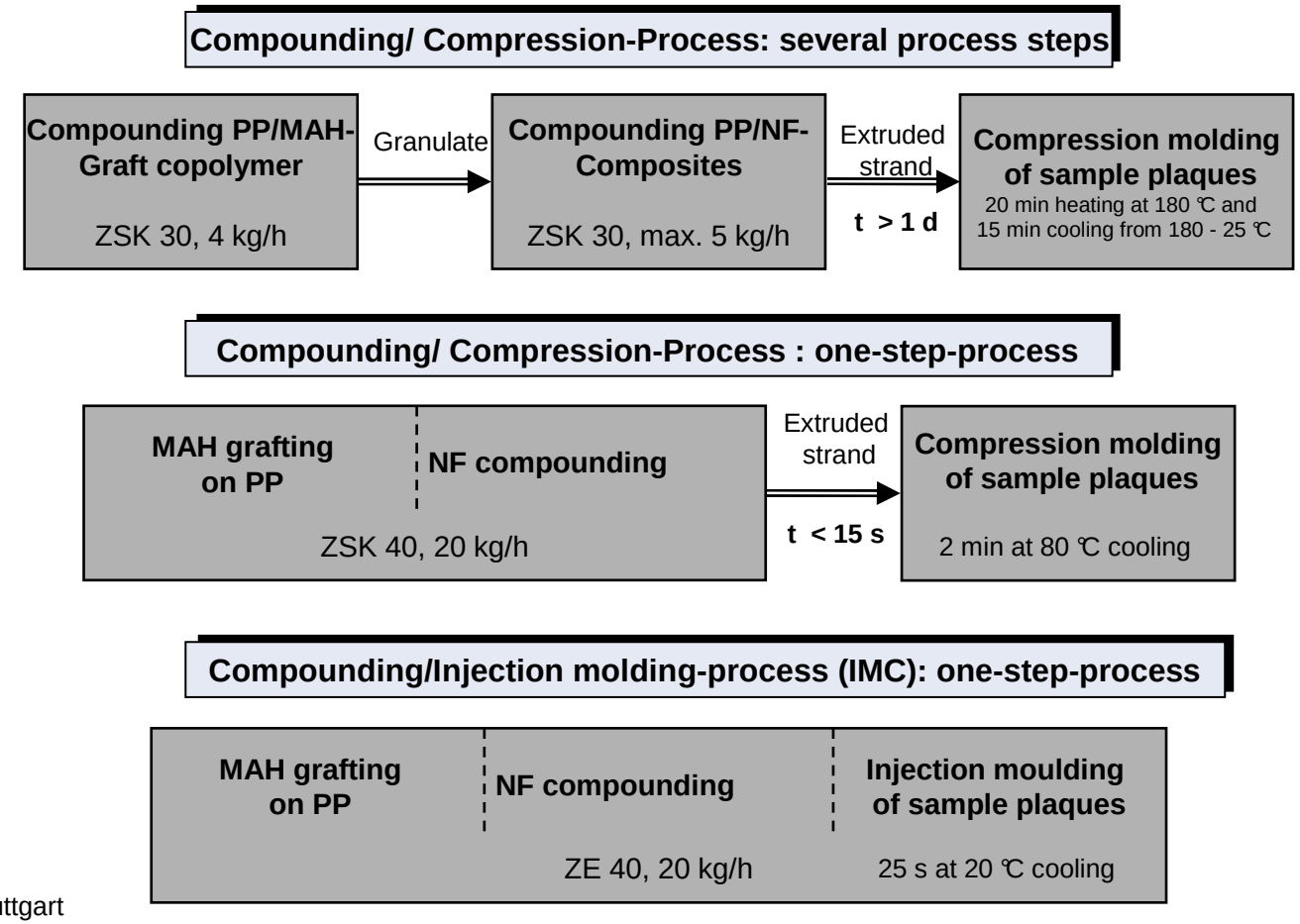
  - Local reinforcement
  - Combination with fiber processes

# Process steps for natural fiber reinforced composites production

## Direct processing at IKT Stuttgart




Source: IKT Stuttgart

# We know, what we are talking about...
## Packaging

### Application
- Transportation box
- PP 40% wood pellets, 2% coupling agent
- ~ 60 sec cycle time

### Innovation
- Injection Moulding Compounder KM 2700 – 24.500 MC IMC
- Inline-compounding of fillers
- Gentle melting process and low mass temperature

### Value
- Material substitution by cheap fillers – Wood: 0,15 €/kg
- Exact temperature control for sensitive materials
- Short cycle time due to shorter cooling times

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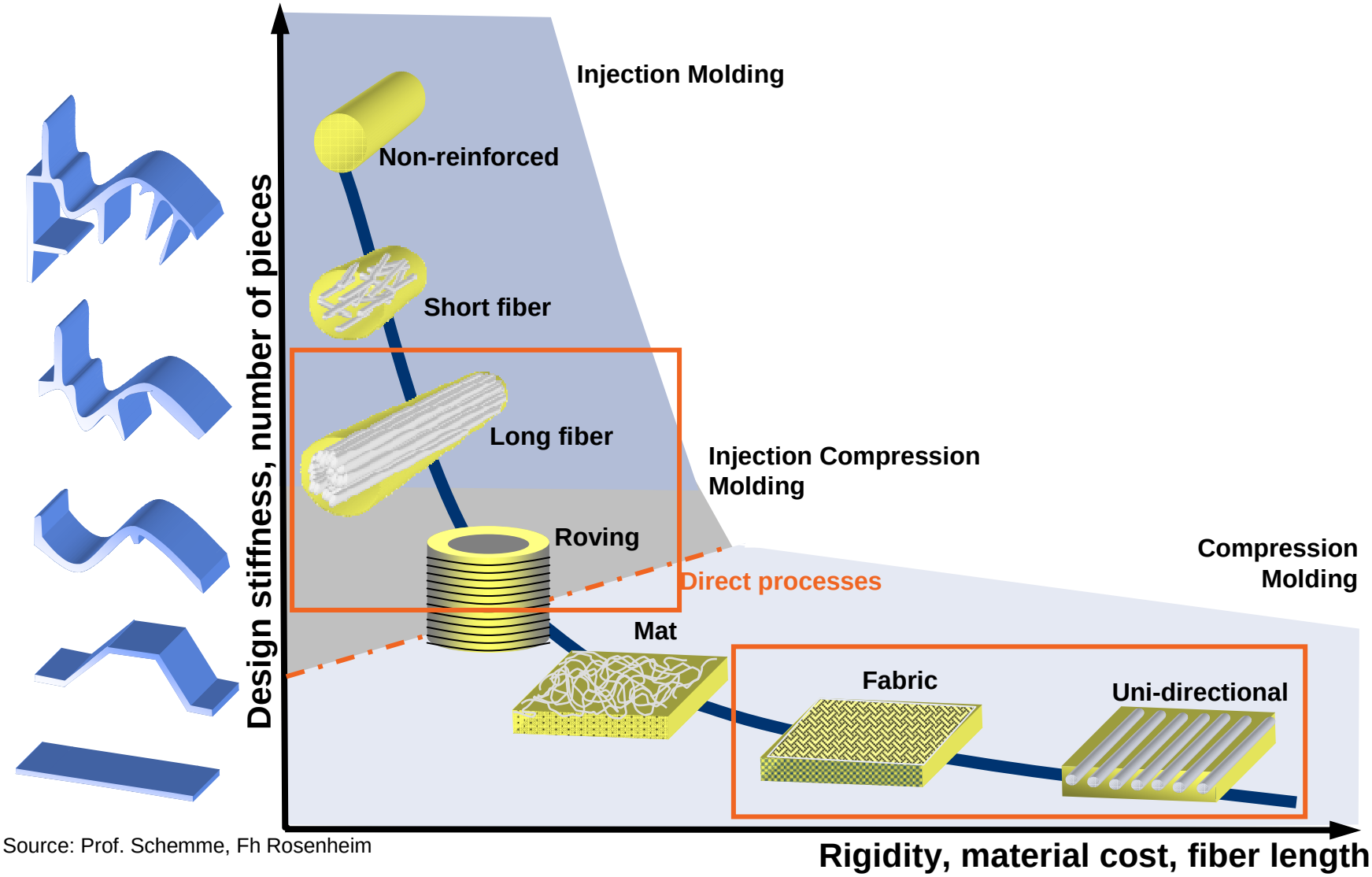
# Properties of fiber reinforced thermoplastic processes

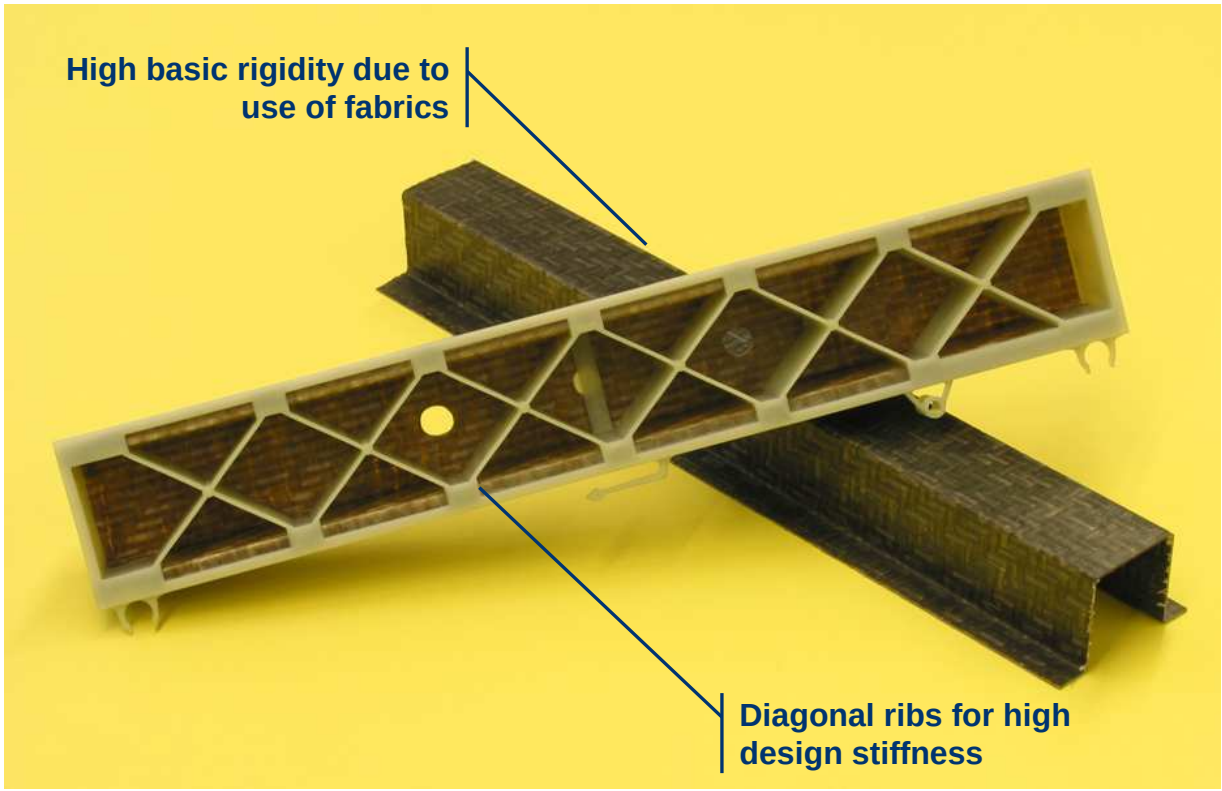





Source: Prof. Schemme, Fh Rosenheim

# Full plastic hybrids: High mechanics, no rework, design freedom

## L-LFT-IM – In combination with fabrics




Source: Neue Materialien Fürth, LKT Erlangen


...and the potentials are not yet spent
Automotive – Structural parts
S NR 3028
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# Fiber-reinforcing processes within Krauss Maffei