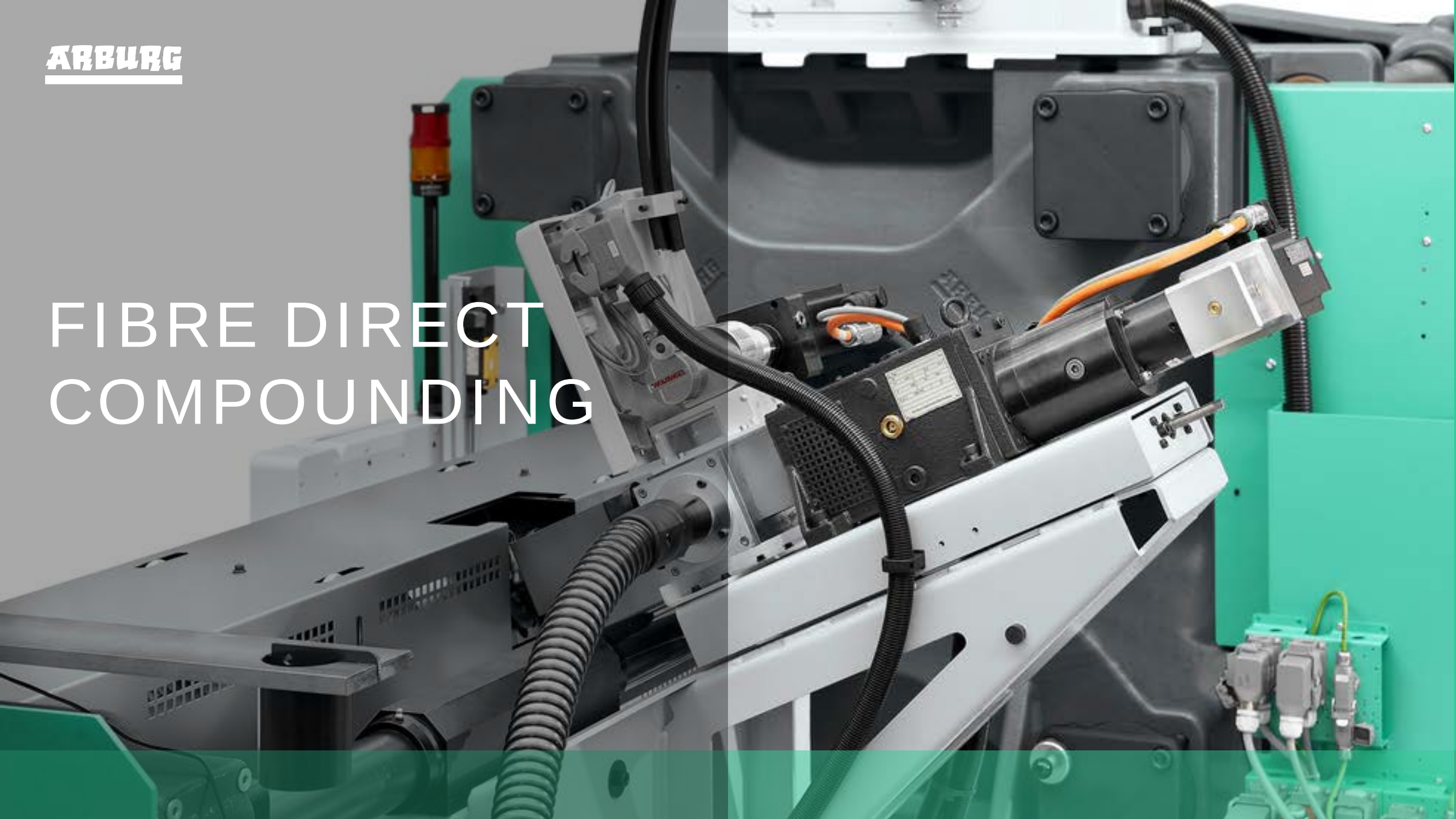
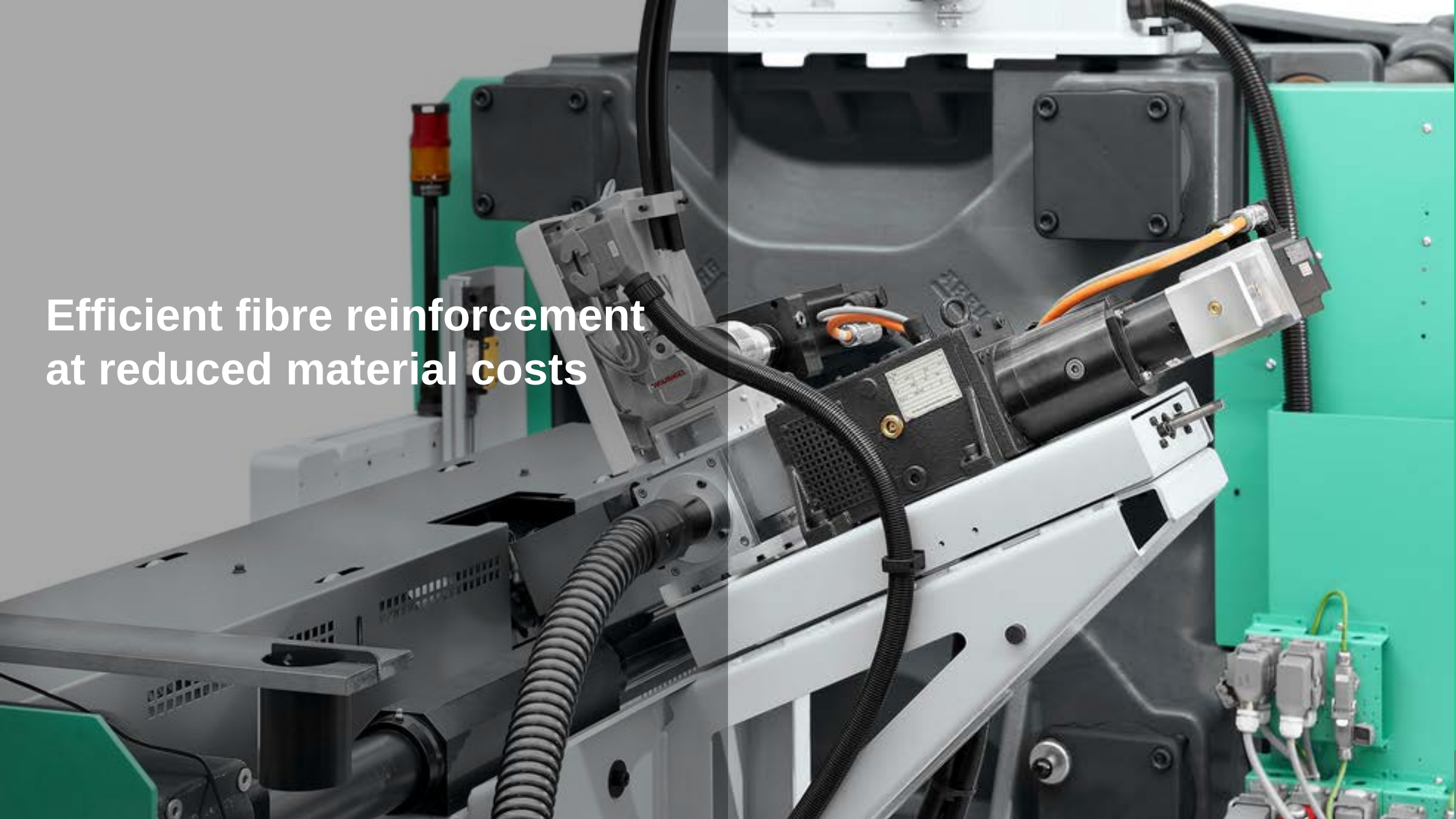
ARBURG

FIBRE DIRECT COMPOUNDING





Efficient fibre reinforcement at reduced material costs

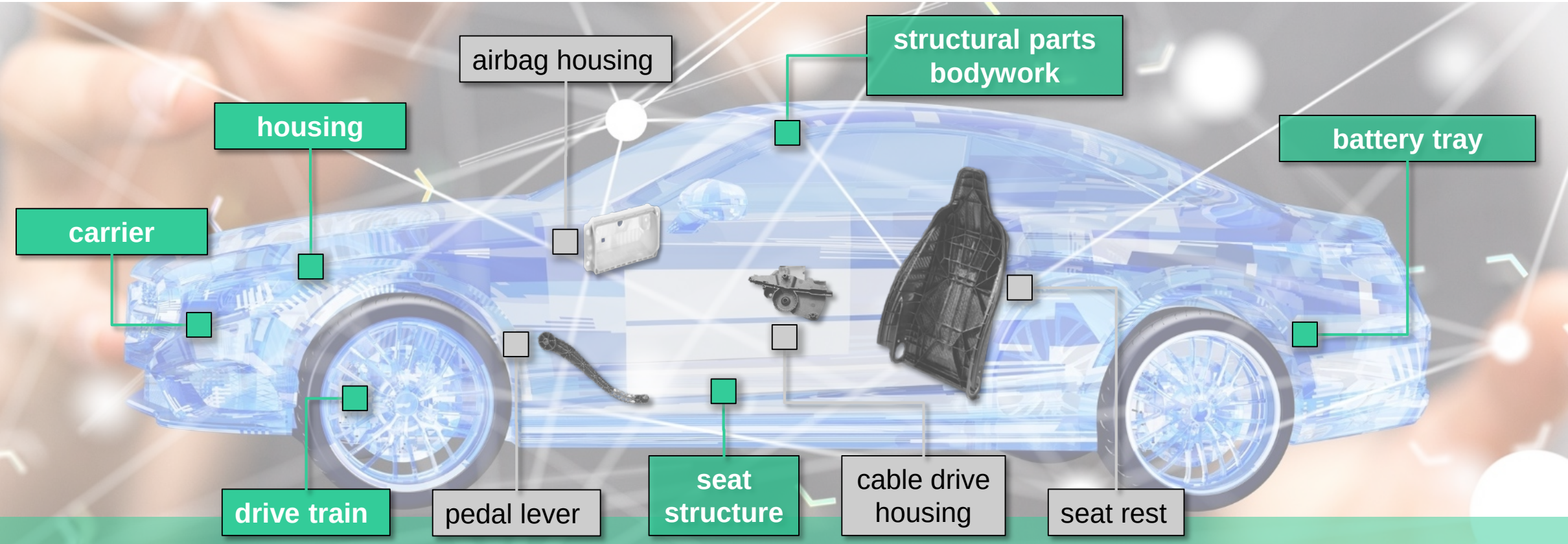
MANUEL WOEHRLE

SENIOR SALES MANAGER LIGHTWEIGHT

SPE Automotive Composites Conference & Exhibition

September 4 – 6, 2019

LONGFIBRE APPLICATIONS– VARIED POTENTIAL



SOLUTION FOR CURRENT TRENDS

design for recycling

PCR-material

wall thickness

longer fibres

Circular Economy

substitution

CO_2 footprint

flexible material selection

FIBRE DIRECT-COMPOUNDING

competitiveness

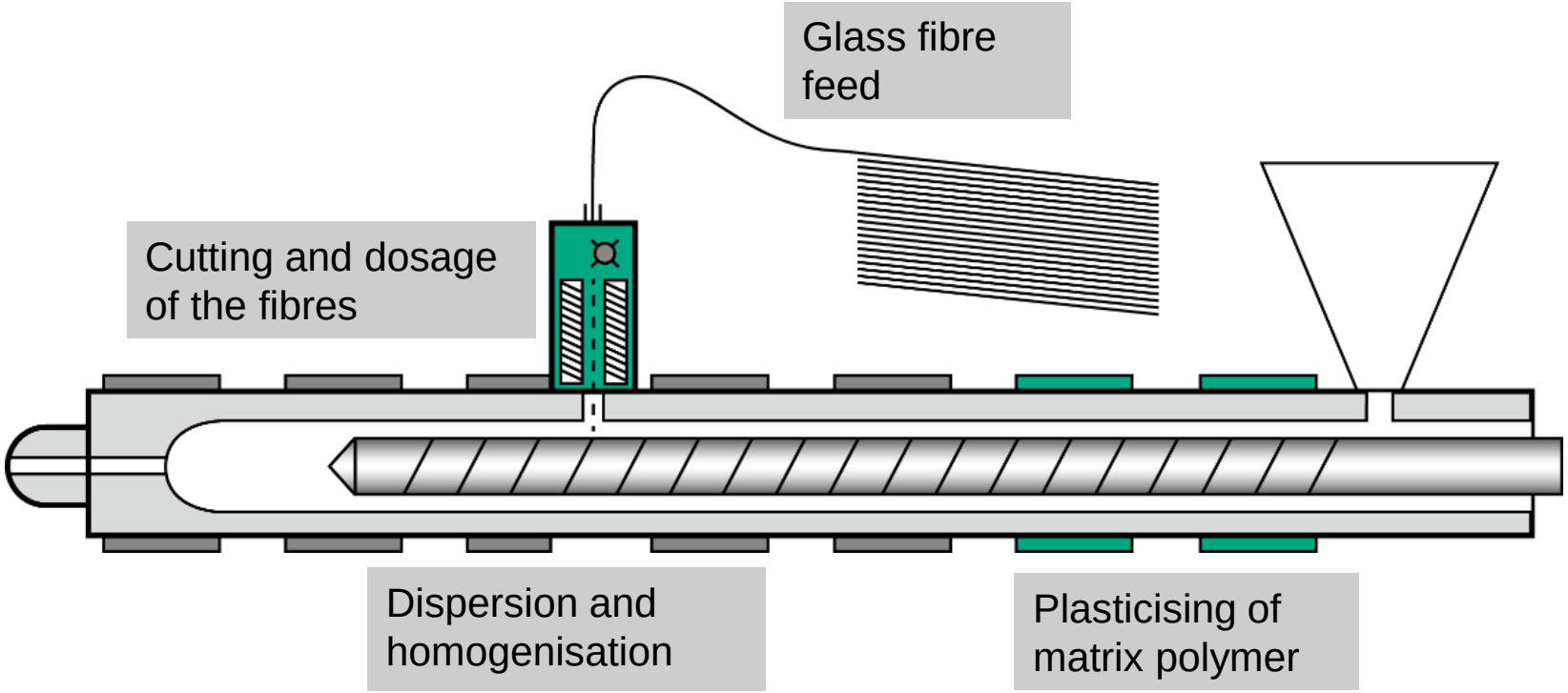
material cost savings

efficiency

part cost reduction

mould design

PROCESS PRINCIPLE



INJECTION UNIT AND FDC-UNIT

Two-stage screw

Plasticising of granulate; insertion of fibres and homogenization of material

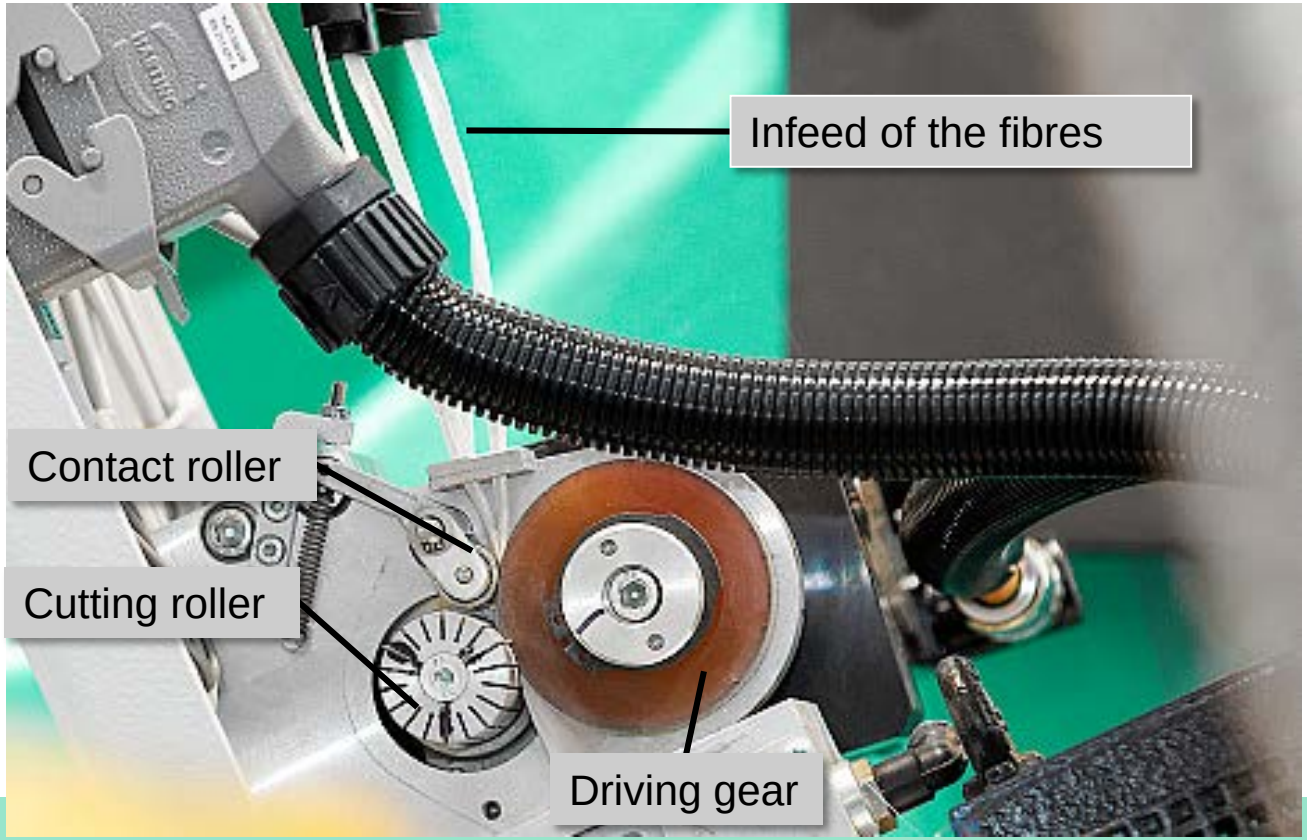
Cutting device

Cuts continuous fibre strands into different lengths

Side feeder

Adds fibres directly to the liquid melt

CUTTING FIBRES TO VARIABLE LENGTHS



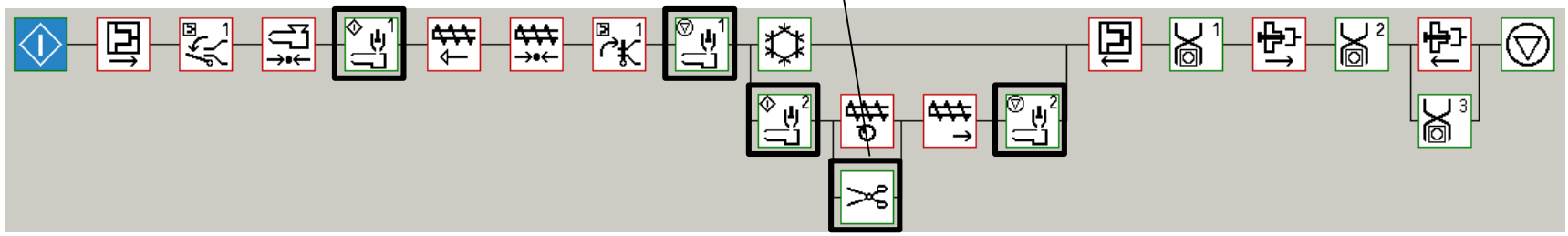
Number of blades	Cutting length [mm]
18	5.6*
9	11.2*
6	16.8*
3	33.6*
2	50.4
1	100.8

* Recommended length

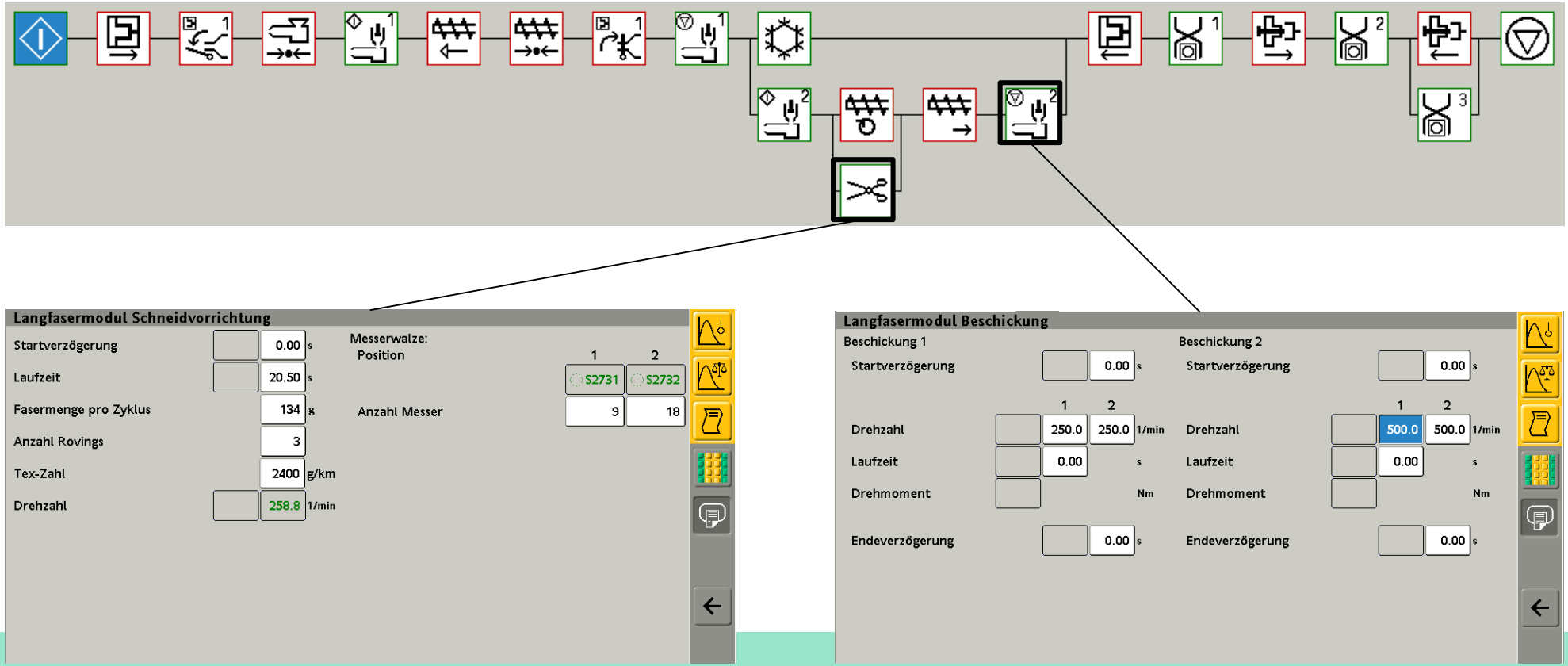
INTEGRATION IN SELOGICA CONTROL SYSTEM

- Simple programming with dedicated symbols
- Full integration in SELOGICA via real-time interface
- Integrated quality control

FDC symbols



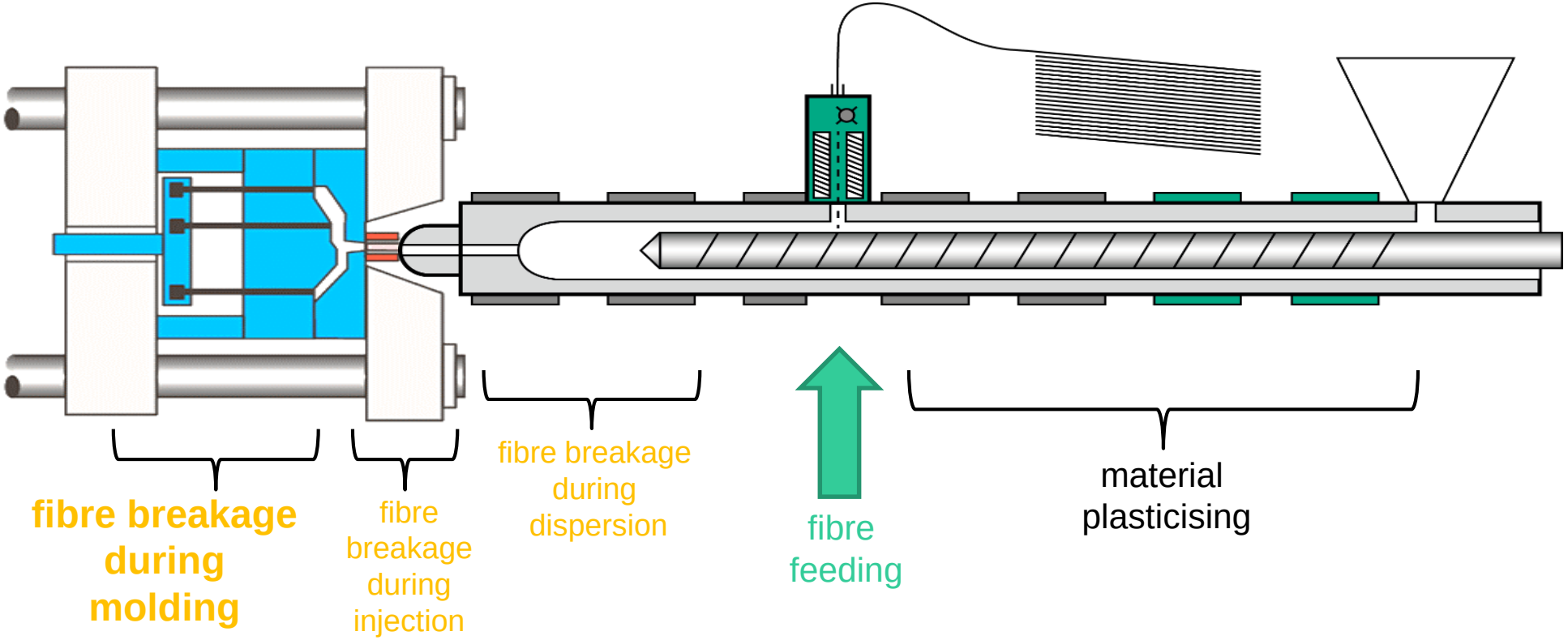
INTEGRATION IN SELOGICA CONTROL SYSTEM



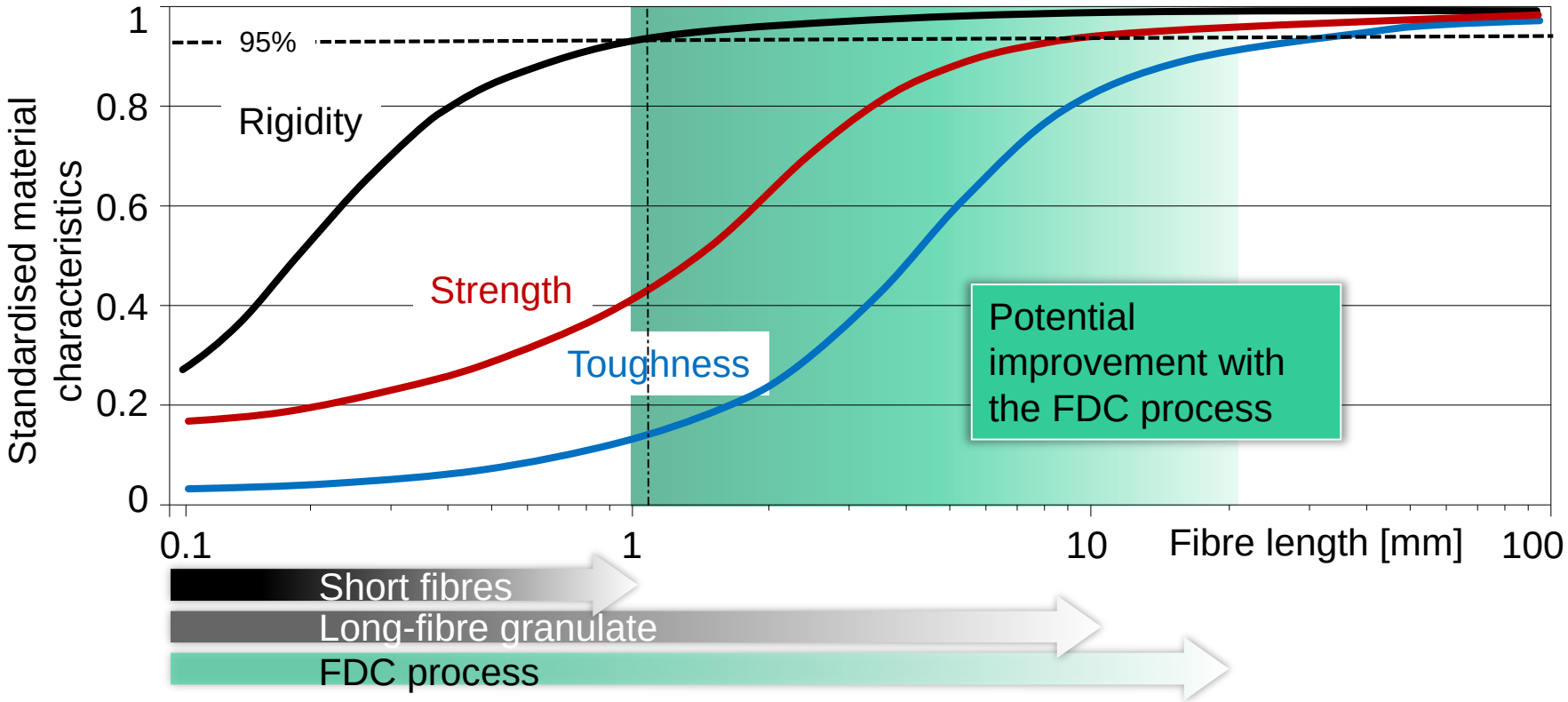
QUALITY CONTROL

- Process parameters
  - Amount of fibres
  - Vacuum side feeder
  - Melt cushion
  - Injection pressure
  - Dosage time
- Inline weight control
  - Shot weight control with scale
  - Shot weight as protocol parameter

FACTORS FOR FIBRE LENGTH



POTENTIAL



Source: Thomason and Vlug – Influence of fibre length (PP/GF qualitative)

ECONOMIC COMPARISON*

Long-fibre granulate	PP LGF 30			**EUR 2.35**

FDC process	PP	67%	EUR 1.40/kg	EUR 0.94
	Glass-fibre roving	30%	EUR 1.25/kg	EUR 0.38
	Bonding agent	3%	EUR 3.50/kg	EUR 0.11
				EUR 1.43

Cost benefit per kg	**EUR 0.92**
	39 %

* depending on region / purchase quantity

ECONOMIC COMPARISON*

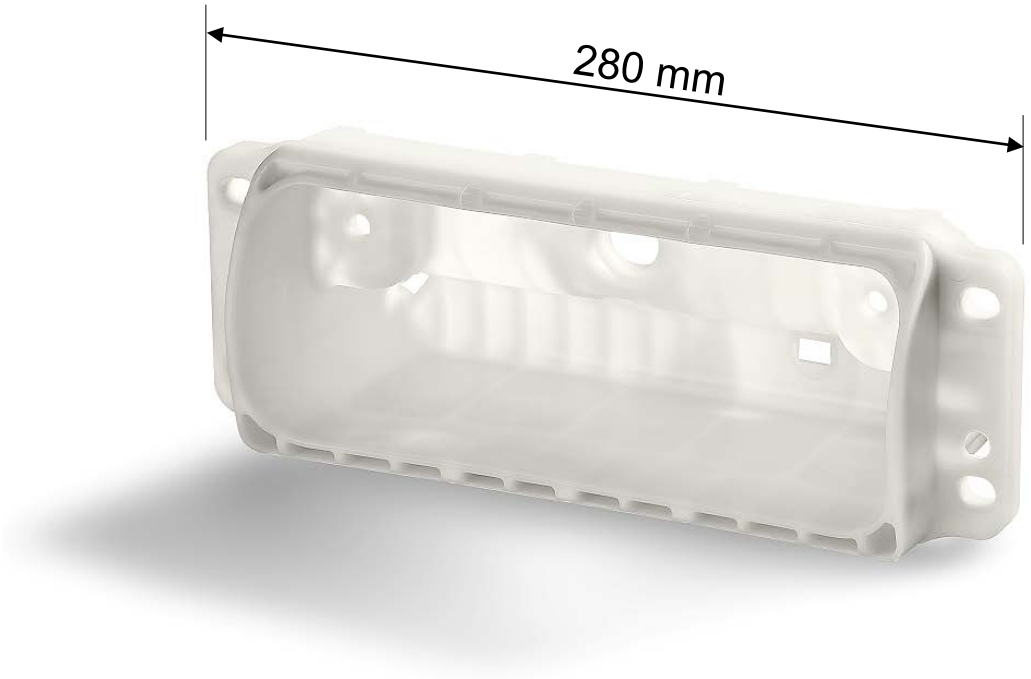
- Shot weight: 791gr
- Cycle time: 45s
- PP LGF 30

	PP LGF 30	FDC
Material costs*	2,35 EUR / Kg	1,45 EUR / Kg
Material costs / year**	803.277 EUR	495.639 EUR
Savings of material costs / year		**307.639 EUR**

** estimated
250 days / Year
3-shift
90% Availability

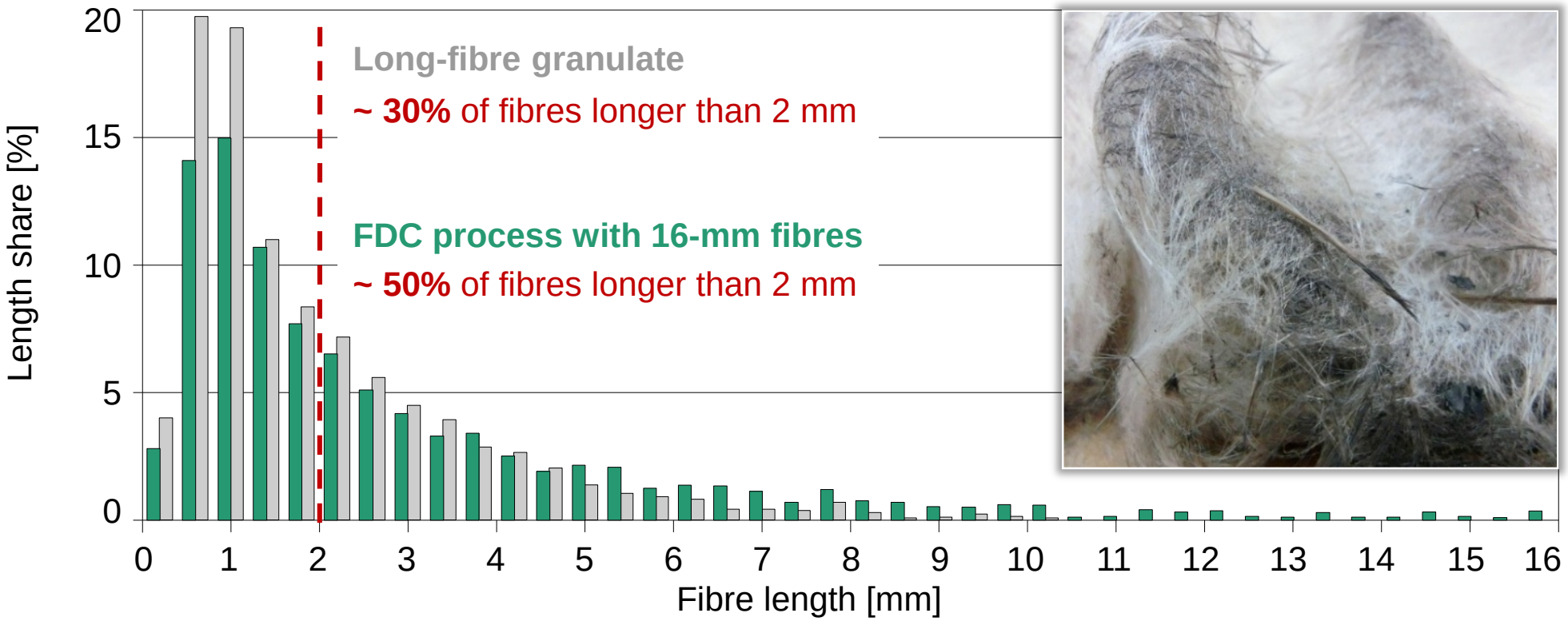
* depending on region / purchase quantity

EXAMPLE: AIRBAG HOUSING



Cavities	2
Part weight	330 [g]
Material	PP GF 30

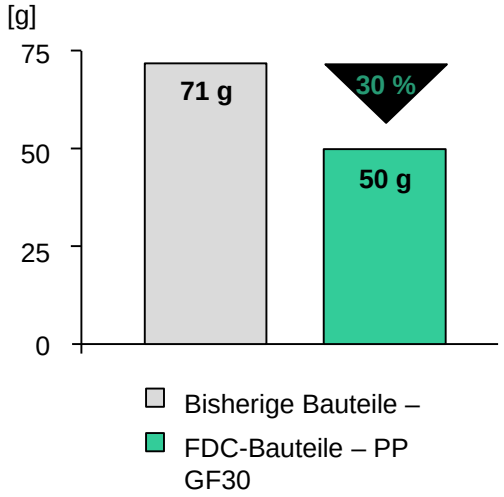
DETERMINED FIBRE LENGTH IN PART



Source: SKZ – Extract from laboratory report on material testing

EXAMPLE: CABLE DRIVE HOUSING

- Replacement of PBT through PP LGF material
- Cost-effective high-volume production through FDC process
- Cooperation and exchange of knowledge with customers
- Fulfilment of all required quality specifications



EXAMPLE: CABLE DRIVE HOUSING

Serial production:

- ALLROUNDER 630 S 2500 - 2100 / FDC
- 4 cavity mold
- Part removal with robot

Cycle time [s]	33
Shot weight [g]	186
Matrixmaterial	PP
Fibre type	Johns Manville LFT 490
Fibre length [mm]	11,2
Fibre content [%]	30

Ros received Brose Innovation Award Europe for implementation of innovative ideas (2017)

EXAMPLE: CABLE DRIVE HOUSING

- 8 cavity mold
- About 50% longer fibres in the part (compared to LGF-material)
- Competitiveness thanks to FDC
- Fibre content monitored via shot weight

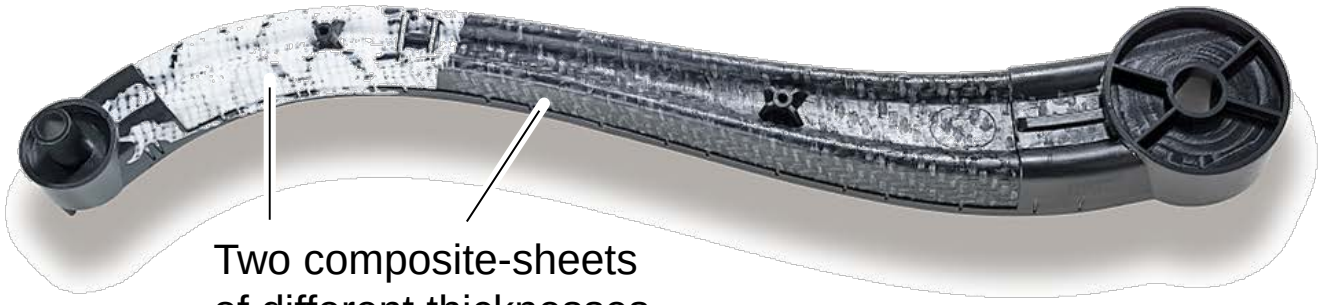
EXAMPLE: JOINT

Machine:

- ALLROUNDER 820S 4000 – 3200 / FDC
- 1 cavity mold
- Part removal with robot

Cycle time	[s]	40
Shot weight	[g]	214
Martrix material		PA 6
Fibre type		Johns Manville LFT 895
Fibre length	[mm]	11,2
Fibre content	[%]	15

FDC* WITH THERMOPLASTIC COMPOSITES



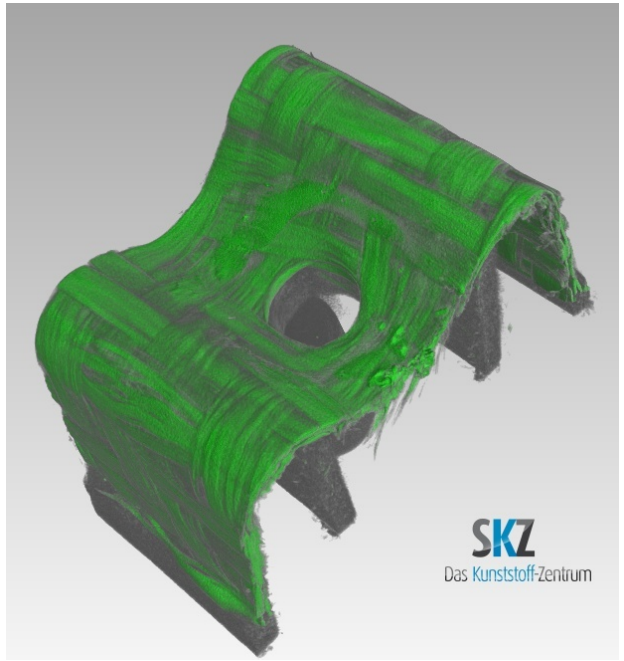
Two composite-sheets of different thicknesses as inserts

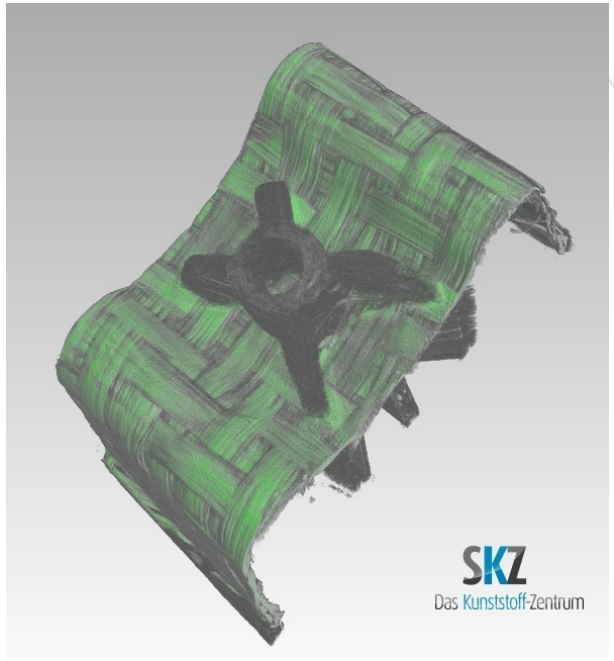
Functional and reinforcement elements through FDC

Cavities	1
Part weight	202 [g]
Material	PP + GF

* fibre direct-compounding

FDC* WITH THERMOPLASTIC COMPOSITES





EXAMPLE: SEAT REST

- Hybrid part
  - Glasfibre reinforced Organosheet
  - Carbon-Fibre reinforced UD-Tape
  - Metall inserts
  - PP LGF with Fibre Direct Compounding
- Modular production system
  - Dieffenbacher 3.600to press
  - ARBURG SPE 4600 / FDC
  - Automation (fibre forge, robot, heating, feeding of inserts,…)

MO·PA·HYB

SUMMARY

- Longer fibres in the part
- Mechanical properties optimised in a targeted approach
- Individual adjustment of
  - Fibre length
  - Fibre content
  - Material combination
- High material availability
- Reduced part costs


QUALITY KNOW-HOW
MACHINES TECHNOLOGIES
THE HOME OF
INJECTION MOULDING
MARKET LEADERSHIP
PASSION VISION
INNOVATION
WIR SIND DA.