Schmidt & Heinzmann

COMPOSITE EQUIPMENT & MACHINERY

Automated Cutting & Stacking Cell for Dry Fiber Textile Reinforcements (GF/CF) in Automotive and Aerospace Applications

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Schmidt & Heinzmann GmbH | Key Facts

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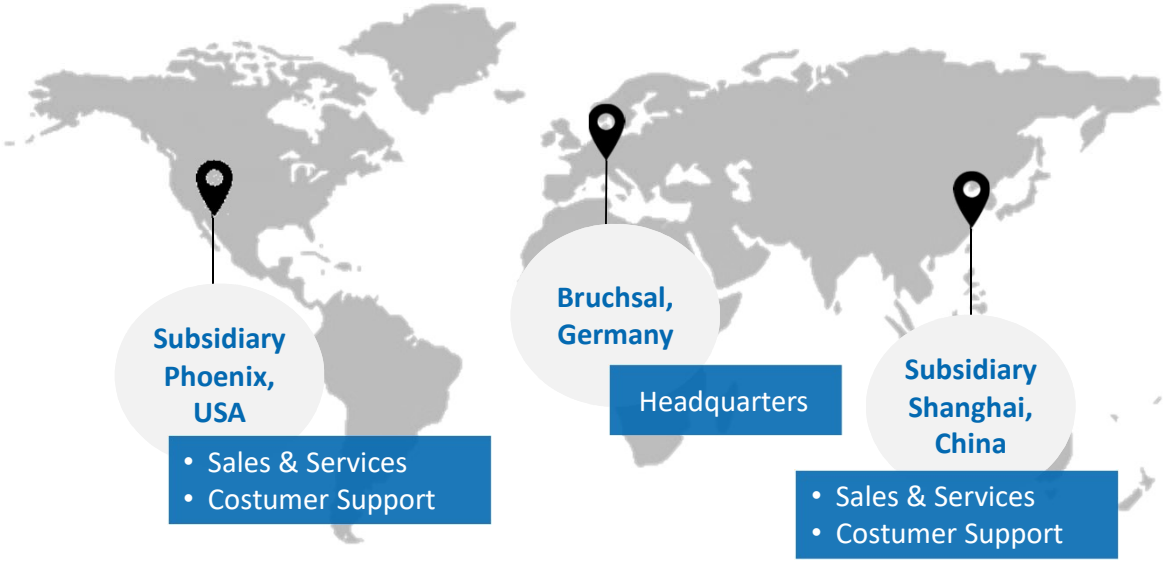
1949
Founding

130
Employees

Privately
owned company

Manufacturer
of composite machinery

World wide
delivery



Schmidt & Heinzmann GmbH | Product Portfolio

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FIBER PROCESSING

Wide Roving Cutter

SMC Production Line

SMC Press Automation

Prepreg machinery

Service

FiDoCut

Bonding Line

Gripper systems

Roving impregnation

Consulting

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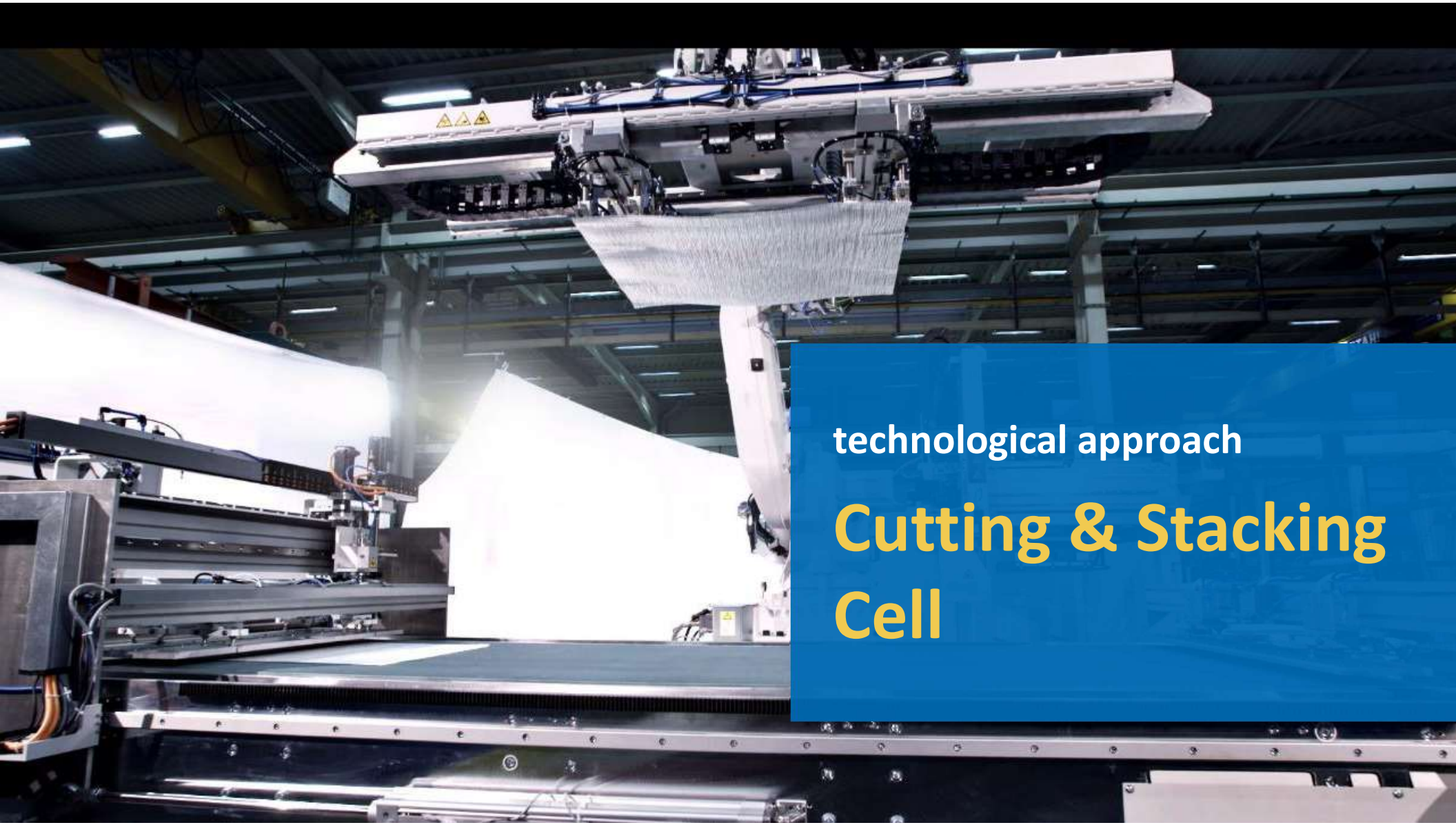
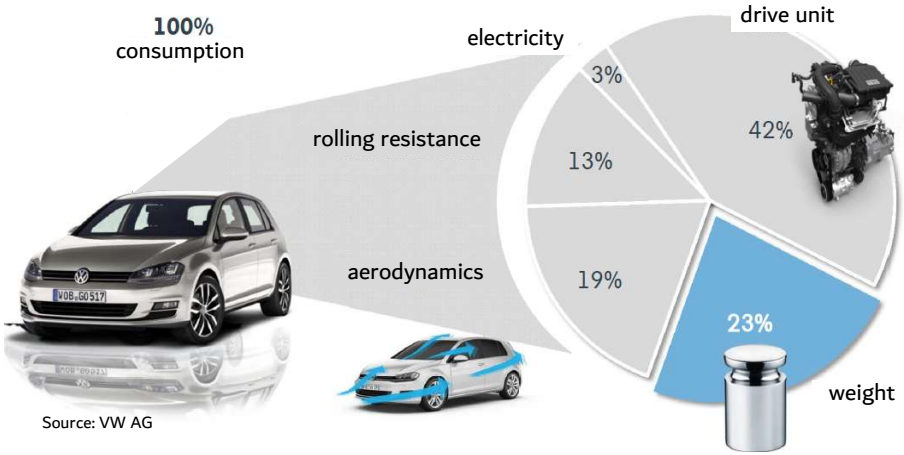


technological approach

Cutting & Stacking Cell

Lightweight design with Fiber Reinforced Plastics (FRP)



Source: VW AG

- Necessity for **lightweight design** in the automobile industry
  - Reduction of CO2-emission until 2021
  - Trends: electric mobility, hybrid drives, etc.
- Lightweight strategy: **Composite construction**
  - High-strength steels, Aluminium, Magnesium alloys
  - Fiber reinforced plastics (CFRP, GFRP,…)
- Premise: Availability of **automated manufacturing processes**
  - Conflict area: weight reduction ⇔ arising costs

Big potential for weight reduction in transport industry

Source: BMW Group

Source: BMW Group

Source: Volvo Cars, Langzauner

Source: Mubea

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Approach

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Cutting

- Textiles
- Non Wovens
- Pre-Consolidated Layups
- Prepregs
- SMC

Stacking

- Taylored Fiber orientation
- Local Patches

Preforming

- Binder activation
- Active wrinkle prevention

Resin Transfer Molding

Wet Compression Molding

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Objective in Stacking

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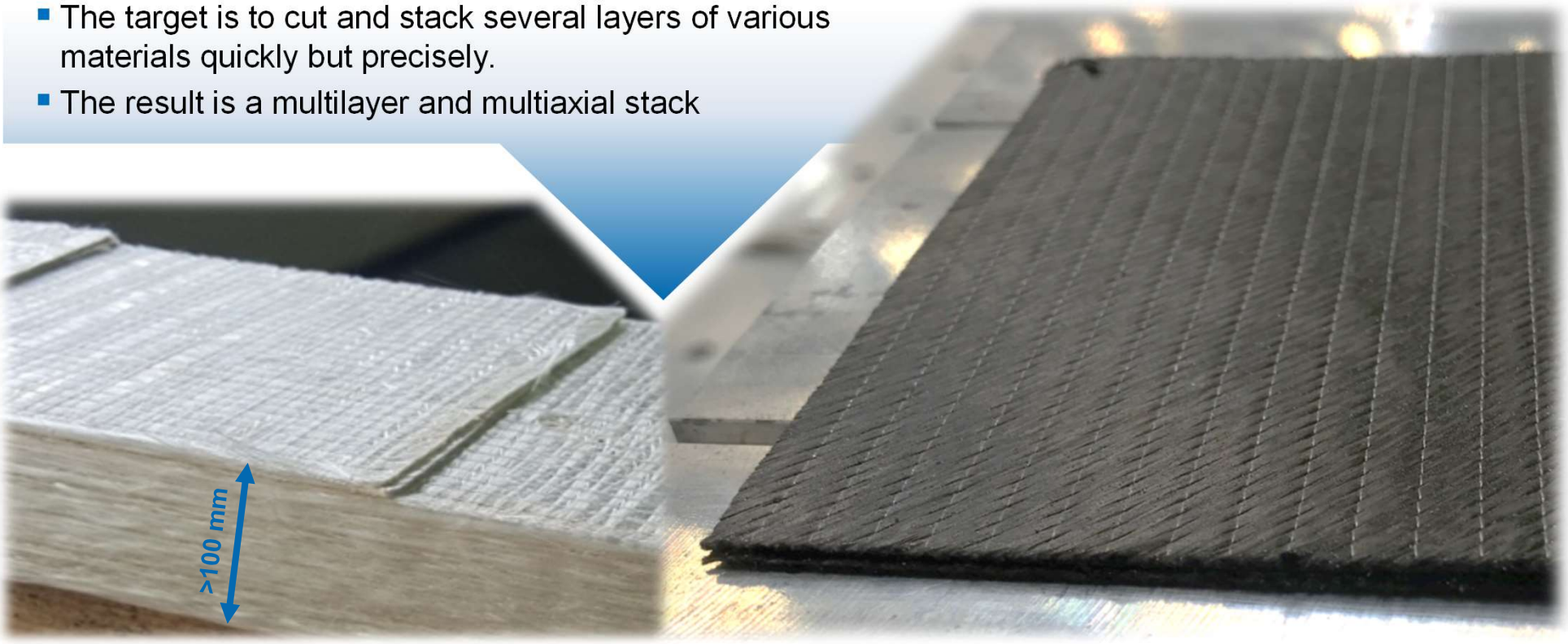
- The target is to cut and stack several layers of various materials quickly but precisely.
- The result is a multilayer and multiaxial stack



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Cutting Unit

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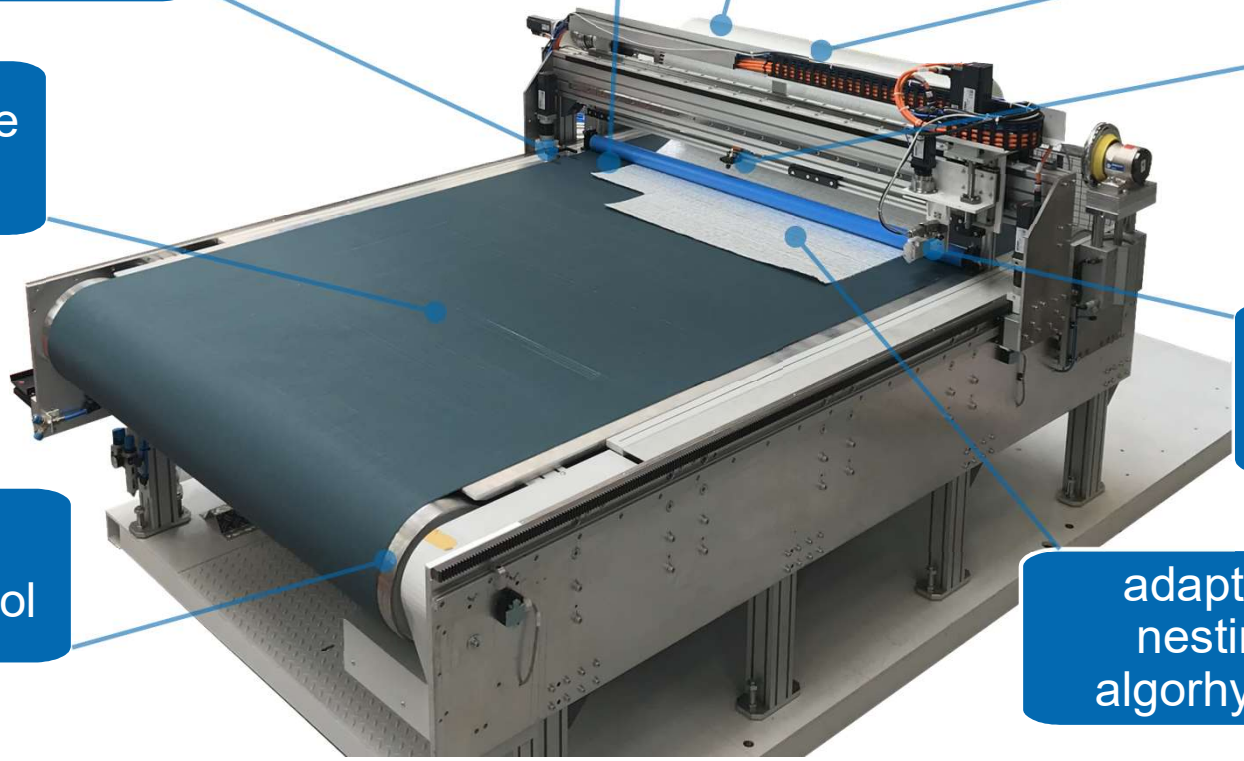

active blade wear measurement

material position sensing

material flow count

continuous material traceability

automatic table calibration

unwinding slip compensation

exchangeable cutting heads

active belt guiding control

adaptive nesting algorhythm

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Exchangeable Cutting Heads

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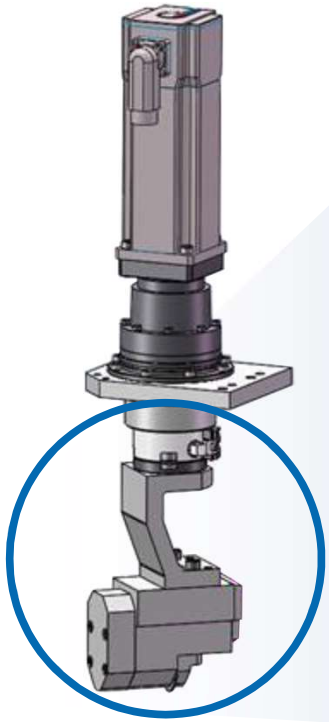
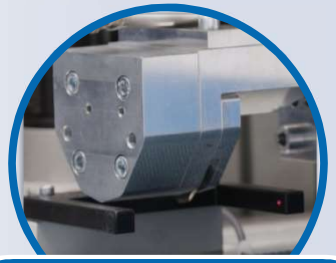
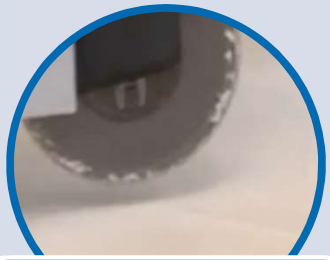
Quick Exchange System





driven rotary polygon blade

Ultra Sonic vibrating blade



undriven wheel blade

robot calibration pin

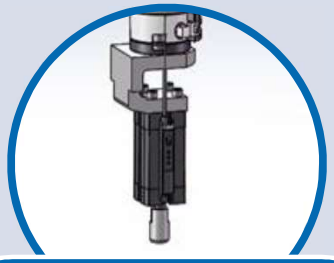


table calibration

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Material Position Sensing

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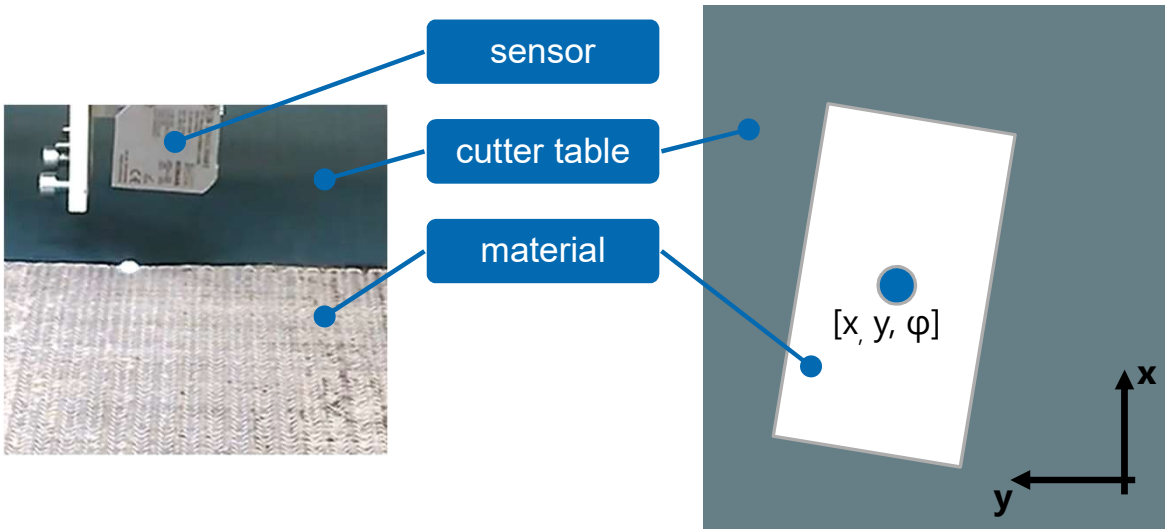
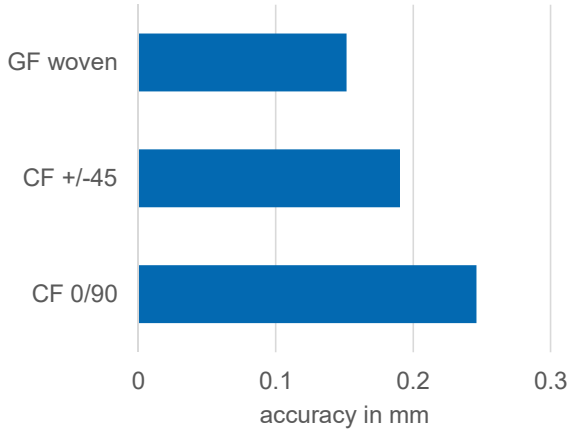
Sensors allow for fast and precise measurement relative to the cutter table of:

- materials position (x, y)
- material angle (φ)





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Stacking Unit

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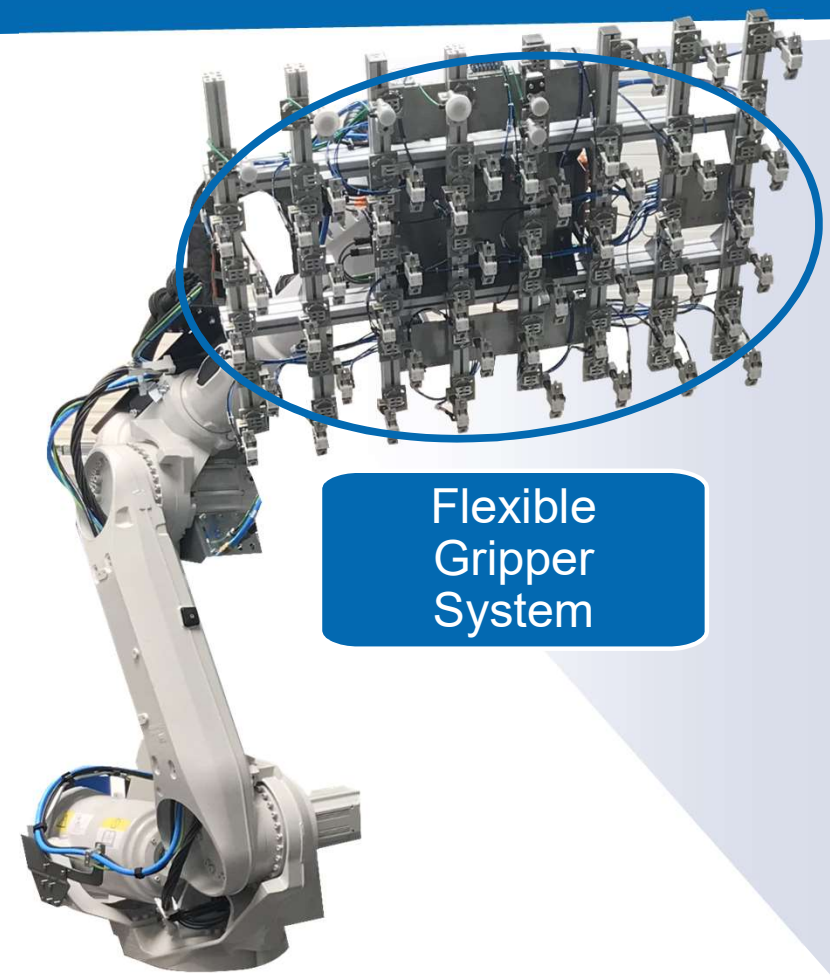
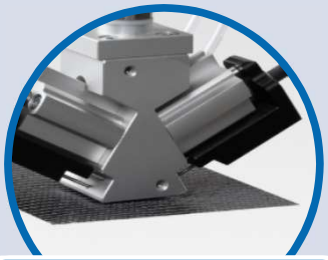


Flexible Gripper System



needle gripper

vacuum grippers

material detection

online size adjustment

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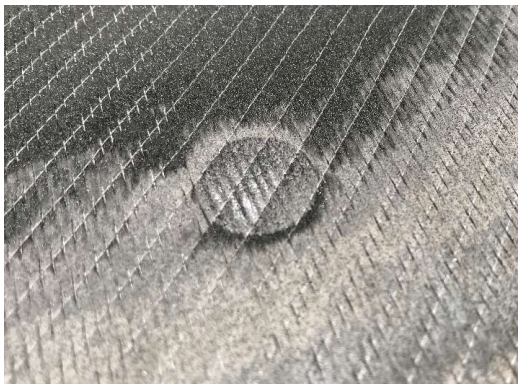
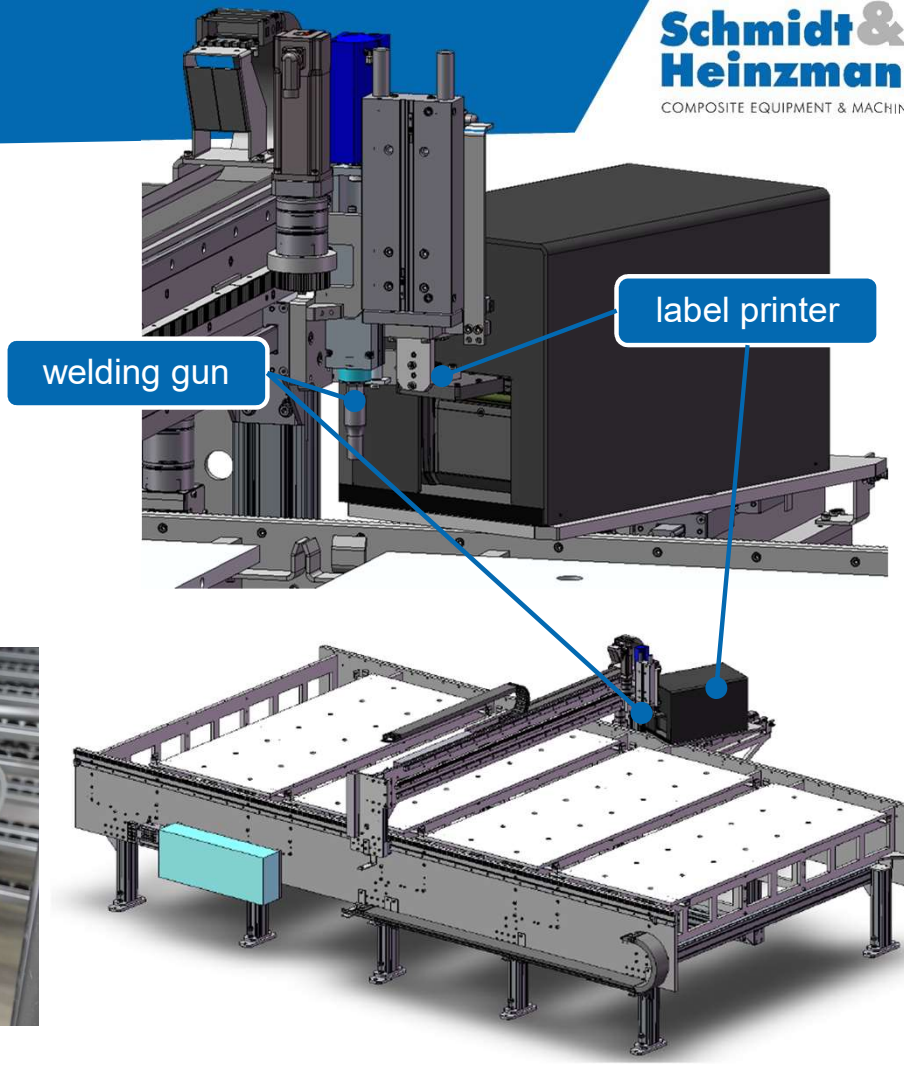
Fixation of Stacks

- Automated fixation of the stacks by local Ultrasonic welding spots allow for handling operations and transport
- Automated labeling of the stacks garantees tracebility of the parts



US welding spot

Label on CF-parts



Welding and Labeling Table

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Adaptive Nesting Algorhythm

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Material definition

material-related definition of cutting parameters

Stacking definition

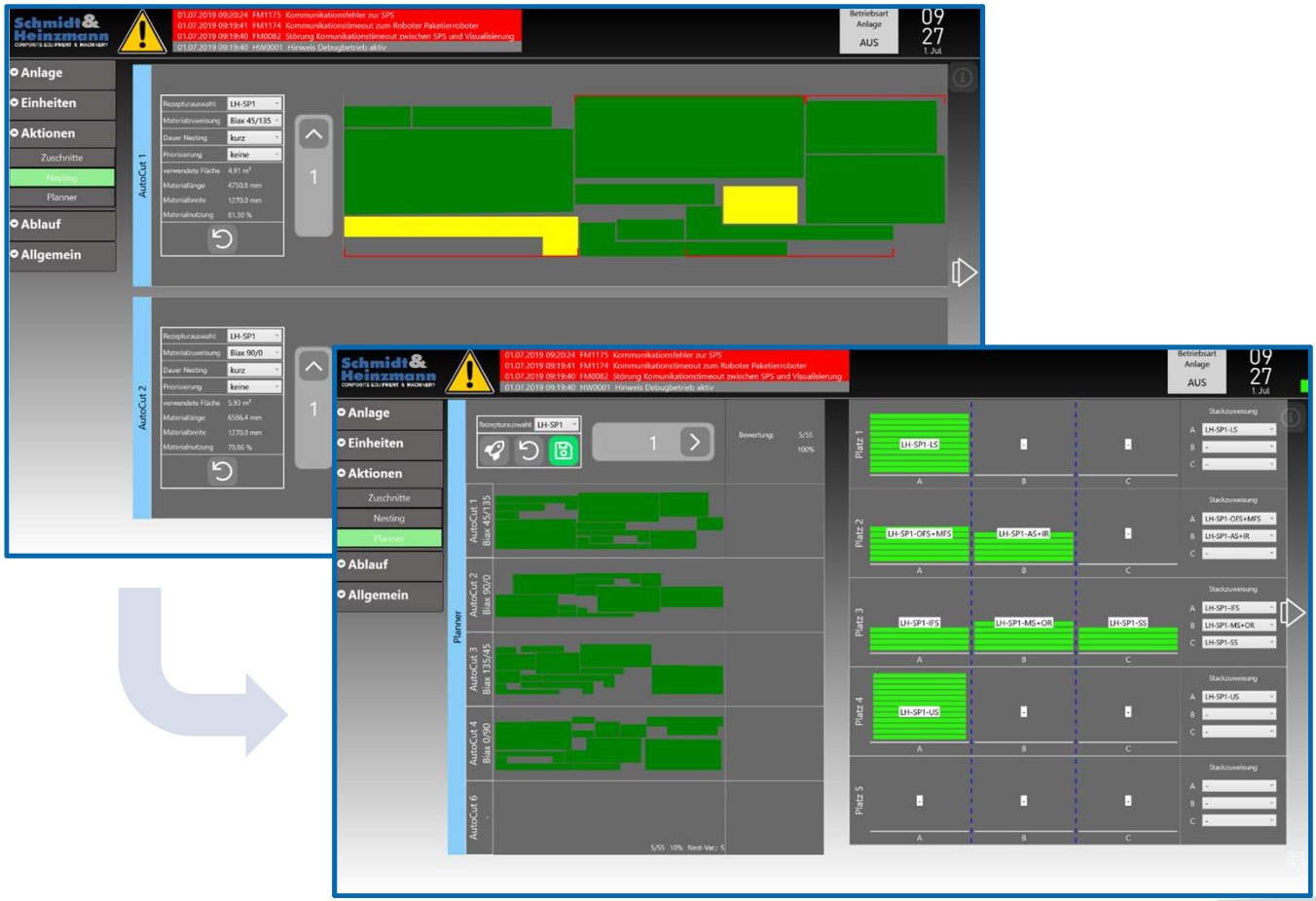
Logical and easy data input to define each stack

Nesting

Optimized Nesting for perfect material usage of each cutter

Production process improvement

Automatic optimization of overall process including all cutters and robots



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Adaptive Nesting Algorhythm

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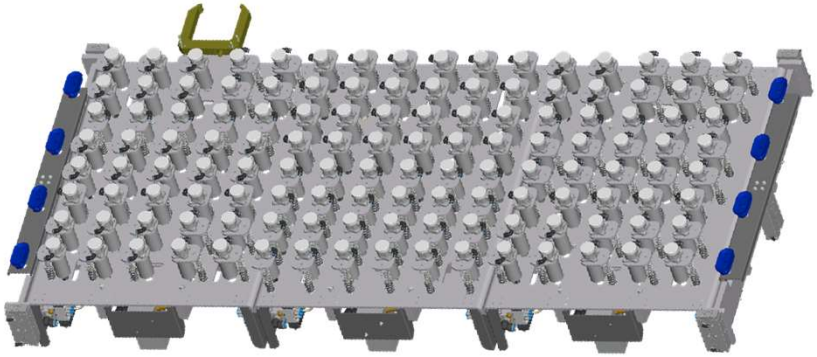
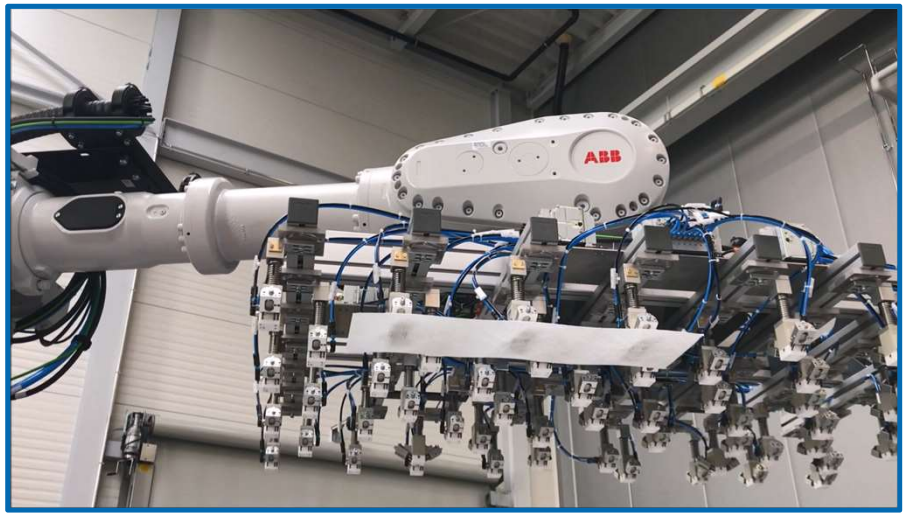
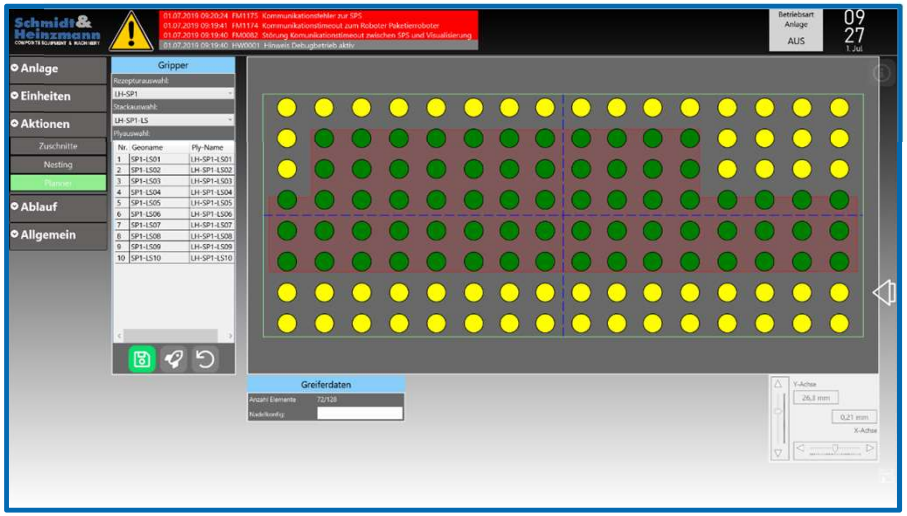
Automatic setting of parameters by the algorhythm for:

- cutters
- robots
- gripper







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Layout of an Existing Aerospace Stacking Center

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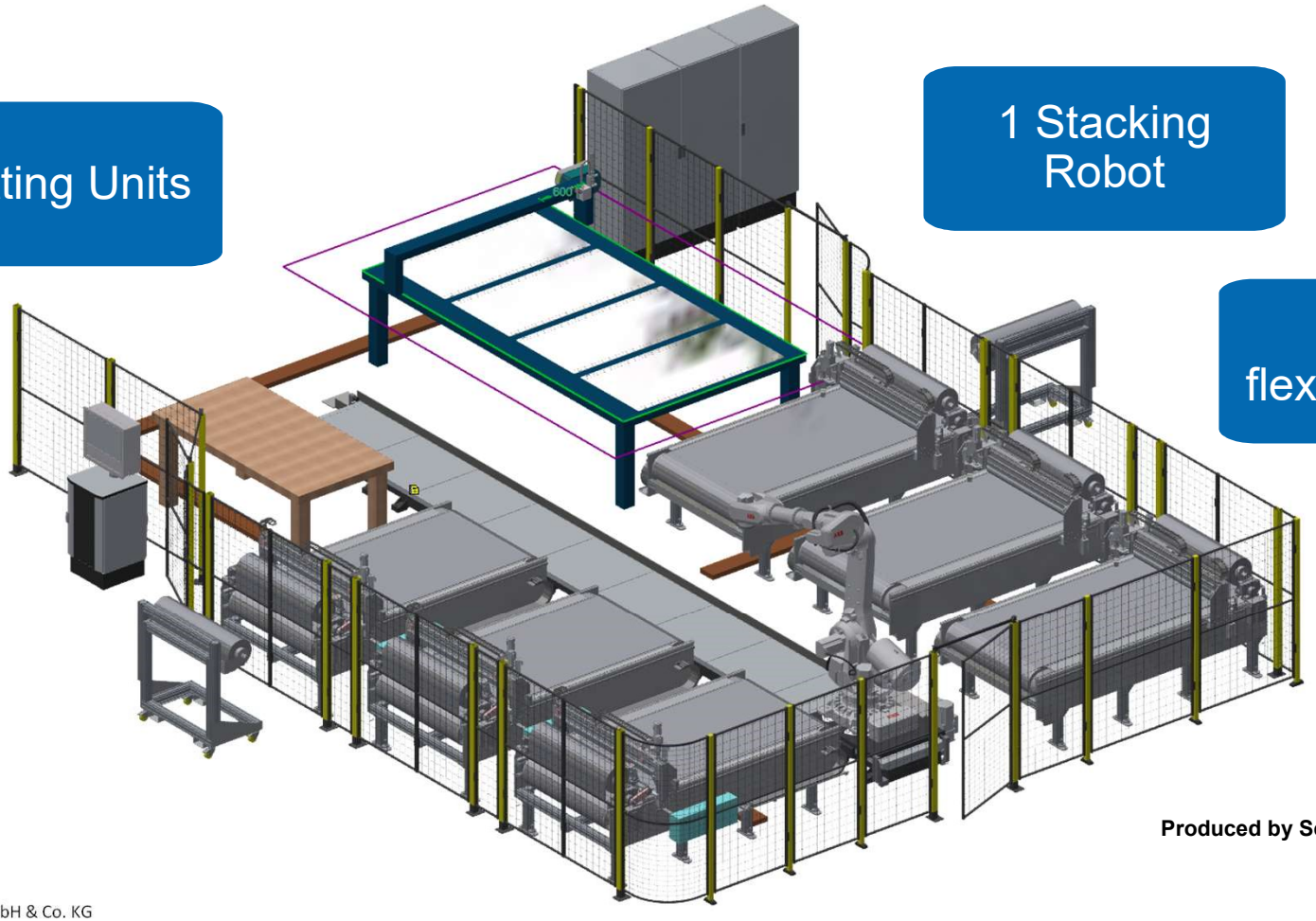
6 Cutting Units

1 Stacking Robot

1 Highly flexible Gripper

1 Welding and Labeling Table



Produced by Schmidt & Heinzmann

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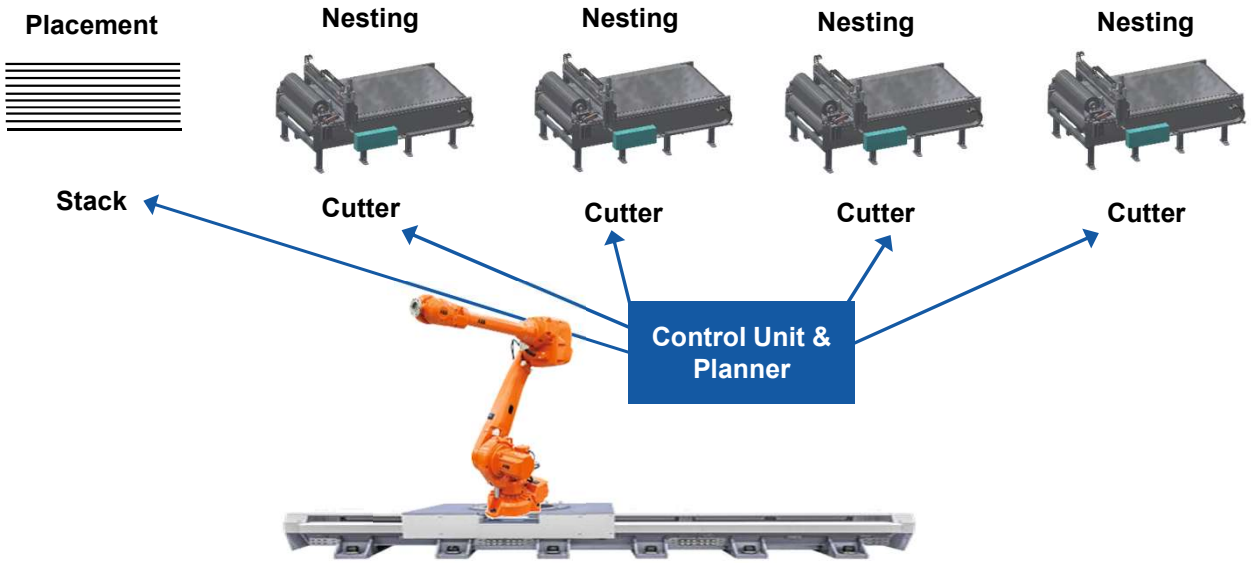
Superordinate Control

Central control unit manages all cutters directly for optimized process and includes nesting of each cutter.

Data input	Jobs for cutter	Nesting	Autom. Optimization Process (Planner)
– Stack (definition material/shape)	– PLC assigns and synchronizes automatic all cutters	– Nesting of all cutters	– Automatic and intelligent optimization of production process



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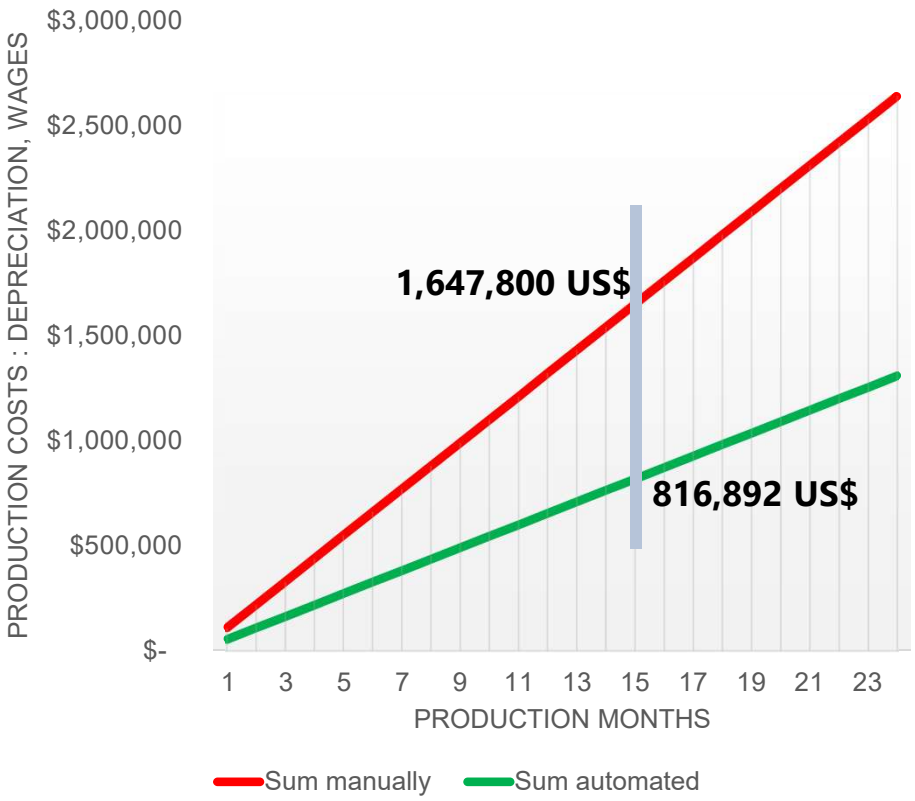
Case Study: ROI based on Labor cost

Production specification		Manuell	Automatic
Amortization Period	a	6	6
Investment	US$	600,000	1,400,000
Amount on shifts	-	3	3
Amount on hours per day	h/d	8	8
Hourly wages	US$/h	18	25
Number of cutting tables	-	6	6
Number of workers per table	-	1.5	0.33
Number of stacking/labelling	-	1	1
Number workers per table	-	3	1
Wages per day	US$	5,184	1,788
Working days per year	-	235	235
Working days per month	-	19,58	19,58
Wages per year	US$	101,520	35,015



ROI after 15 month

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Variety of Materials can be processed

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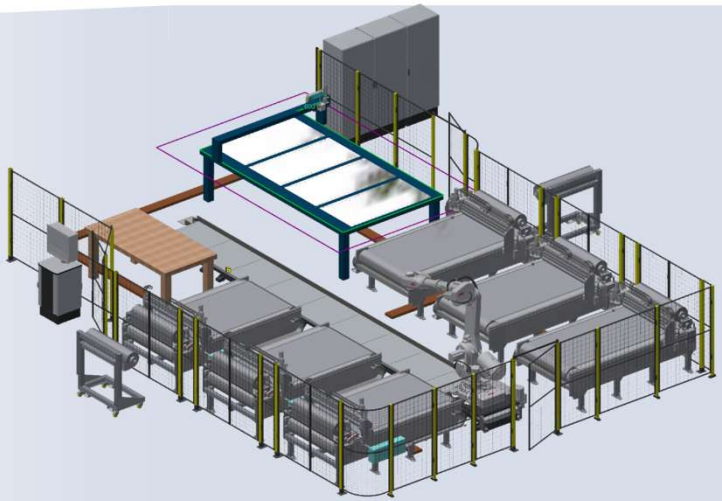
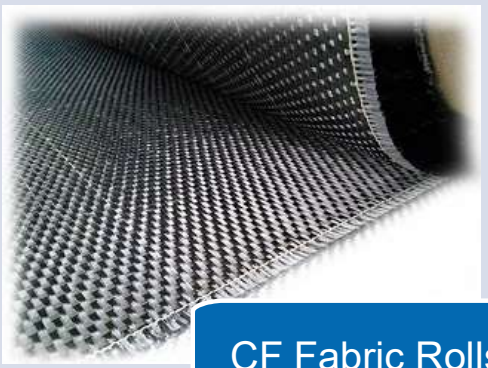
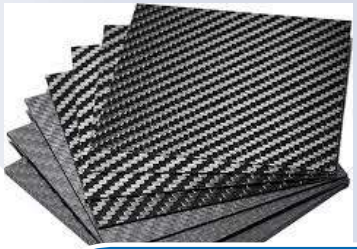
GF Fabric Rolls



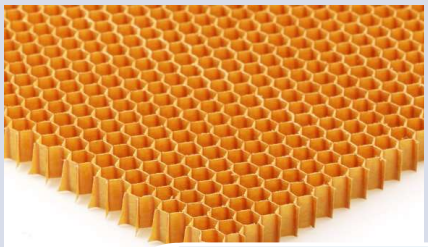


CF Fabric Rolls

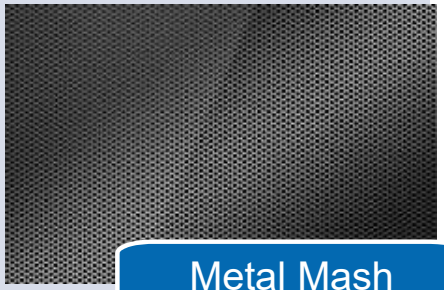
Foam



Prepregs



Honeycomb



Metal Mash Sheets

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Potential Application in Automotive Parts

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Roof Cover

Hoods

Underbody parts

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Process Simulation

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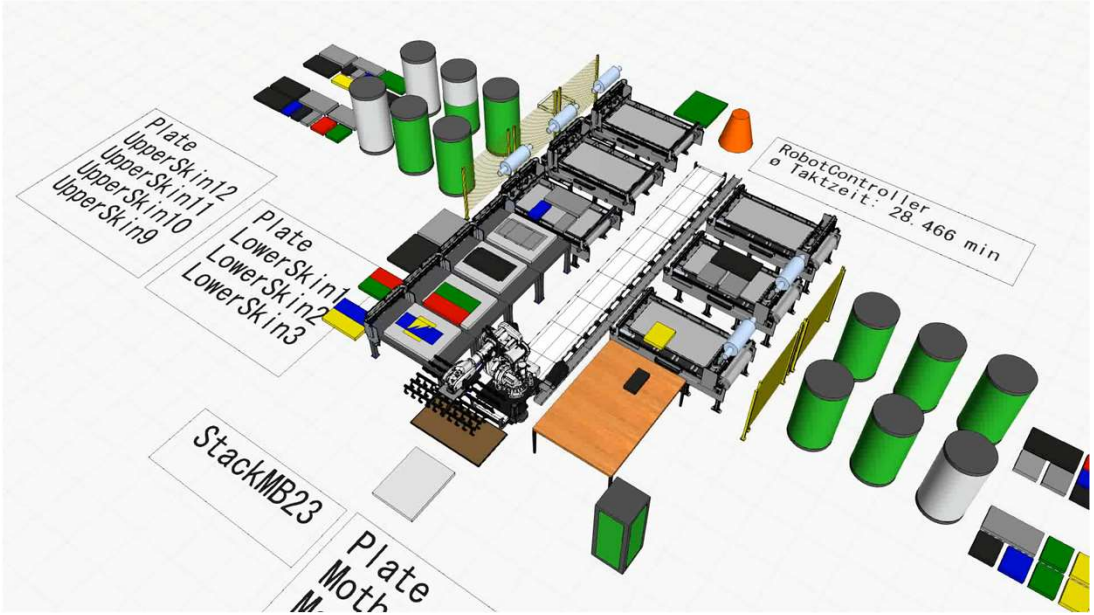
Features:

- Early stage cycle time calculation in the conceptional phase
- Parametric models helps to generate quick 3D Layout, which will be close to the final setup later
- Models can be modified in size and function very easy during the project phase



Advantages:

- Reachability of the robots
- Identification of the bottle neck process
- Complete visual process available

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Virtual Start-up & Commissioning

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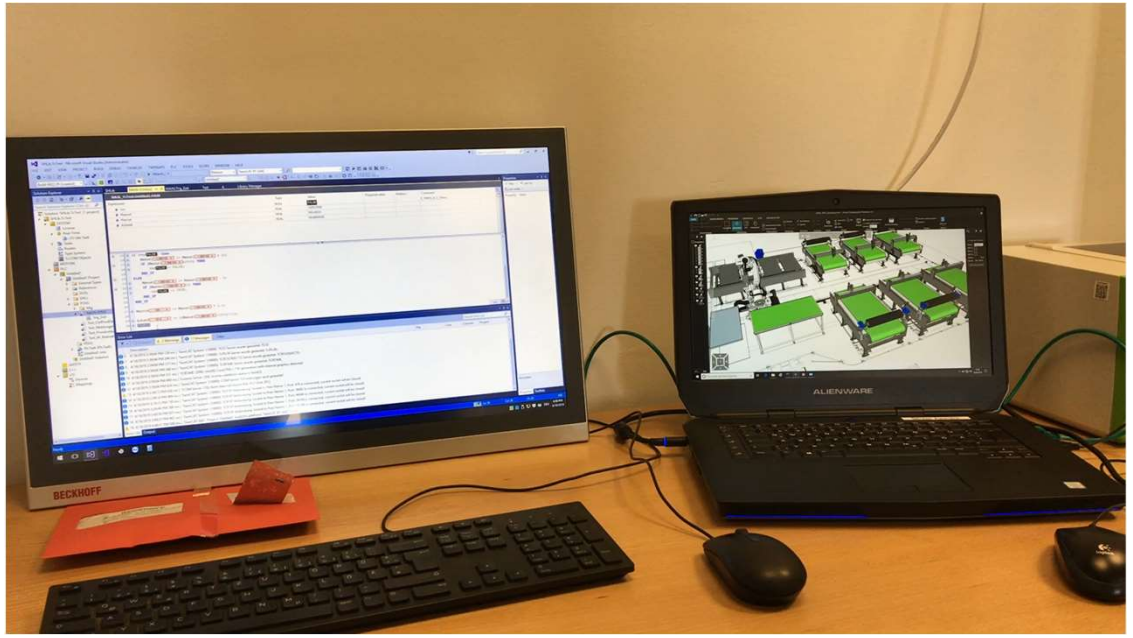
Features:

- Virtual start-up & commissioning of the line
- PLC program operates the simulation model on the PC
- Virtual simulation can operate all actors/axes in order to check the correct function → virtual I/O check

Advantages:

- Debugging of the program before the line is installed
- Simultaneous engineering possible
- Complex processes can checked easily on misfunctions



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Virtual Setup of the plant / line

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Features:

- Virtual setup of the line
- Walking through the complete line in virtual reality
- Virtual plant after a cloud measurement

Advantages:

- Real dimension of the line in virtual reality
- Organizing the plant/line setup with a pick and place tool
- Reduce the pinch points

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Summary of Advantages

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Machine Features		Benefit
Each cutter only uses 1 material, no change!	→	Continuous production, stable and high availability
Universal gripper system with advanced needle/vacuum modules	→	Fast product change, during process needle modules on/off following different shapes
Sensors for: – Material edge detection – n.io sign detection – Material feeding supervision – …	→	Stabilized production process and self regulation for best quality
One process one machine! Schmidt & Heinzmann produces cutter, robotics, gripper and software	→	Standard system consisting of cutter, robots, gripper and software

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Thank you for your kind attention

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