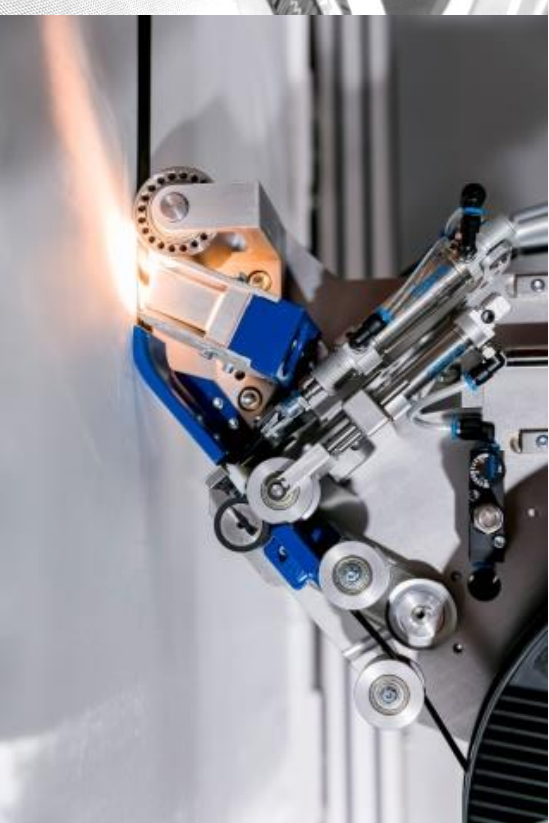
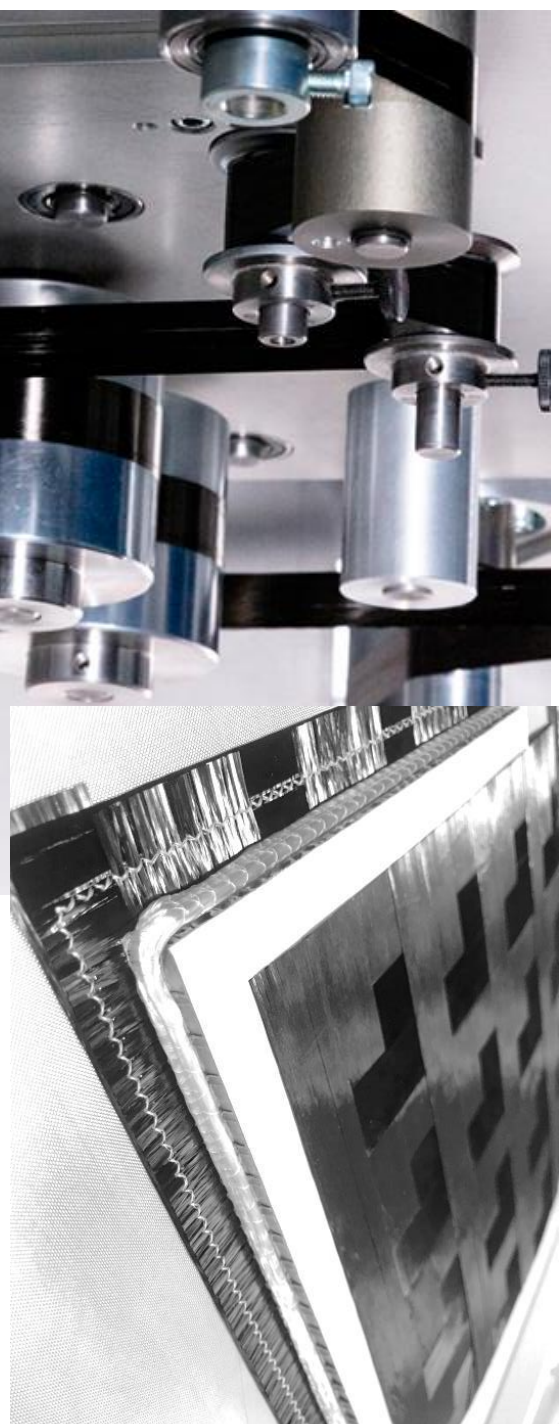


Automated Composites Manufacturing

Flexible Fiber Processing from Roving to Part

Composite Production made simple



Dr. Bettina Schrick

bettina.schrick@ma-dieterle.de

+49 170 22 40 260

M&A
DIETERLE
MASCHINEN- & APPARATEBAU
GMBH



Wer wir sind

M&A Dieterle GmbH

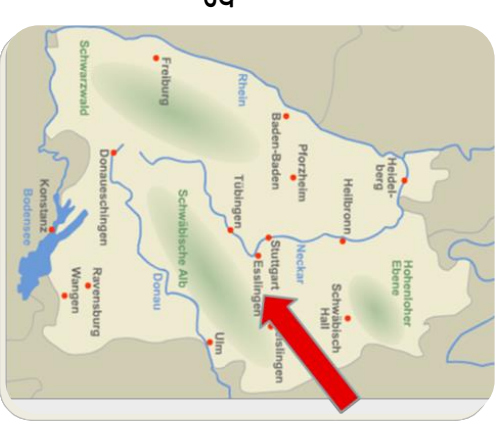
- KMU (seit 1964)
- Ca. 100 Beschäftigte

3 Geschäftsfelder:

1. Zulieferer für die Pharma- & Papier-Industrie, Automation, mechanische Bearbeitung
2. Anlagen für die Herstellung von technischen Transportbändern (Spiralsiebe)
3. Von Heavy Metall zum Leichtbau: seit 2013 Anlagen & Prozesse zur Faseraufbereitung und Verarbeitung zu Composites



Adresse: Neuhoferstraße 26
73113 Ottersbach (Börsen-Strasse)
Parken: Vor der großen Halle



Leinwand



Spiral Maschine



Wickelanlage für
unidirektionale Gelege



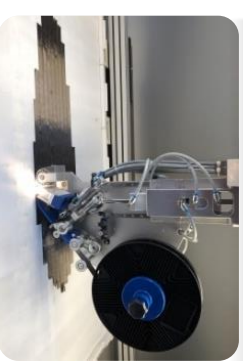
Trockenfaser
Legenanlage

Composite manufacturing

State of the Art vs. „light“ Automation



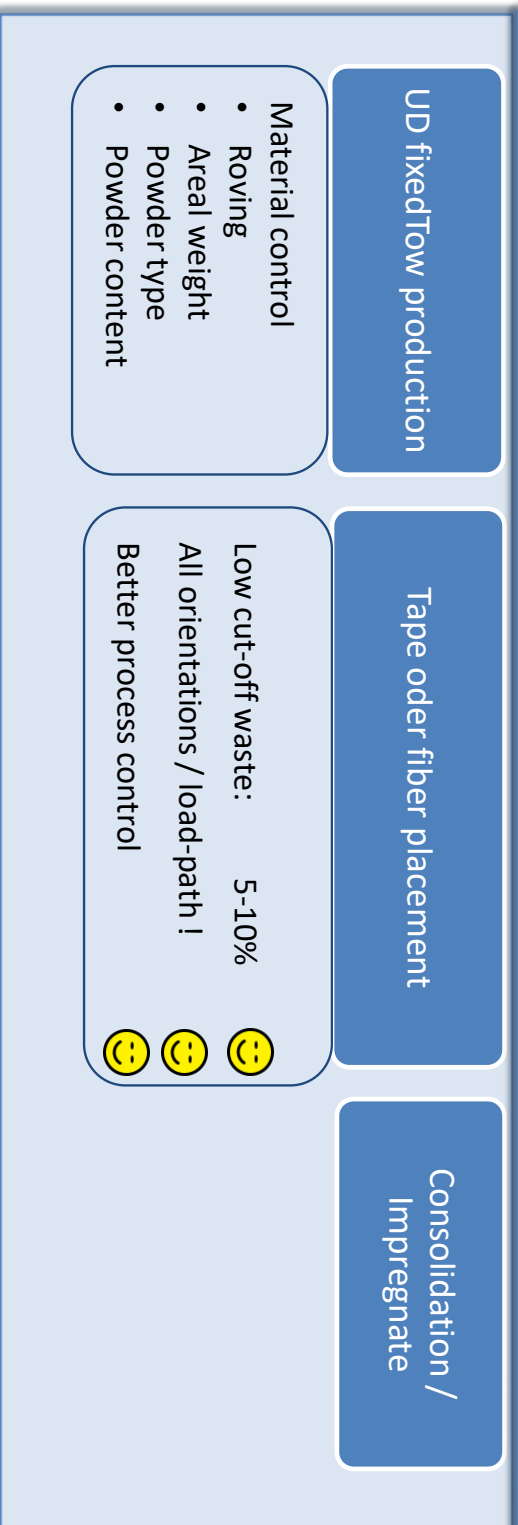
Source: Easy Composites



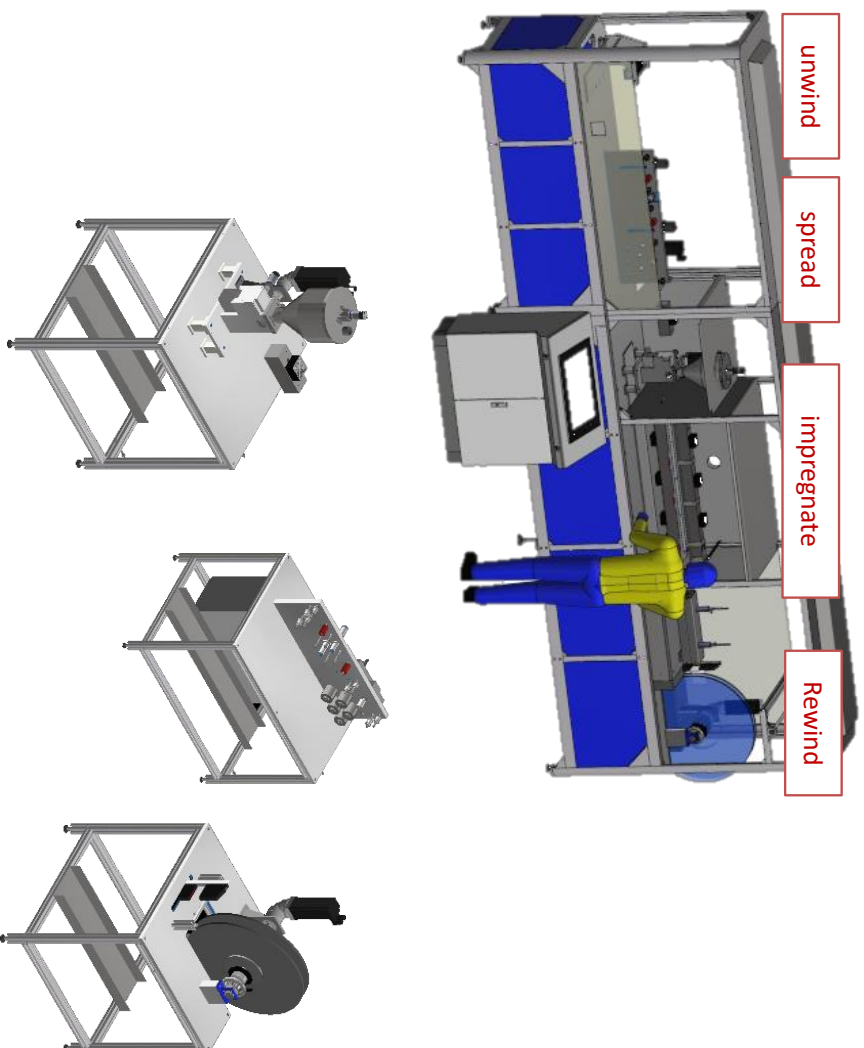
Manual State of the Art Process Chain



Automated Process Chain



Machines for fiber processing and placement: Open Fiber System



Flexible machines for
R&D – small series



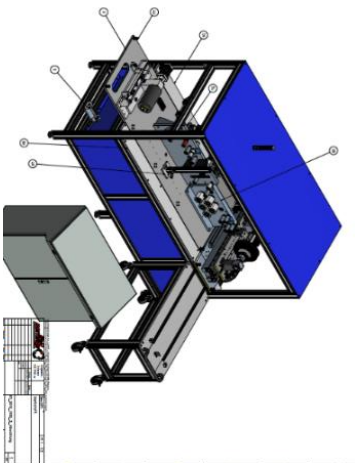
data read out
open source software



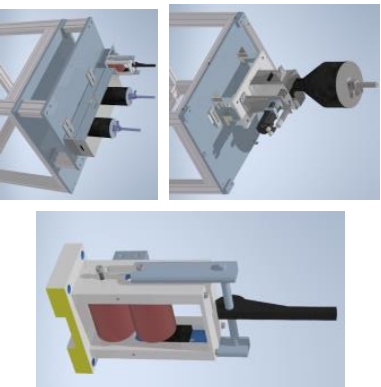
xml programming
reconfigurable

Flexible machine toolbox

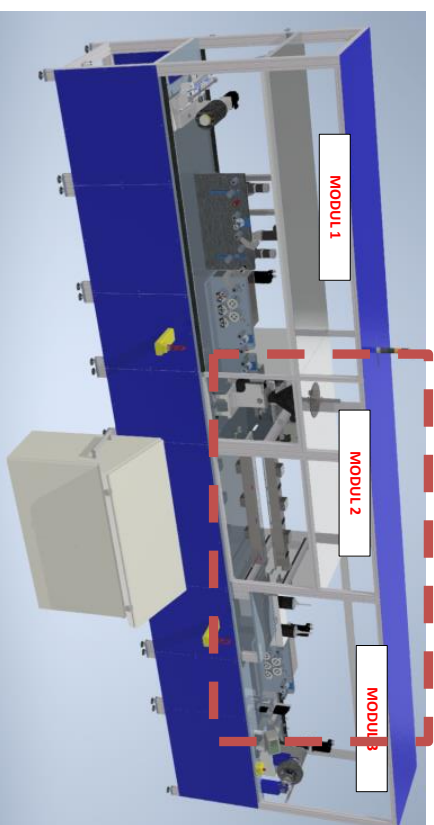
Fiber Processing to Dry Tape or TowPreg



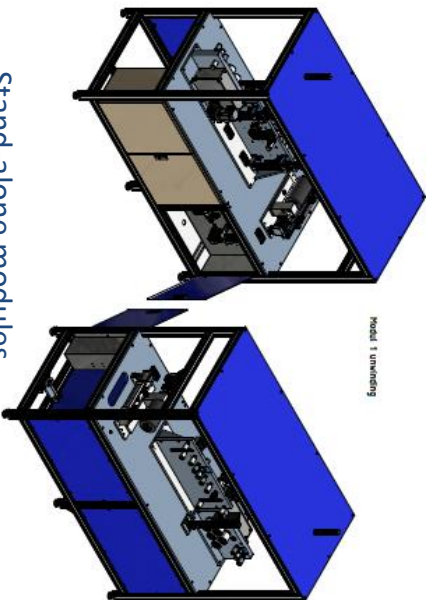
Start configuration



Add components

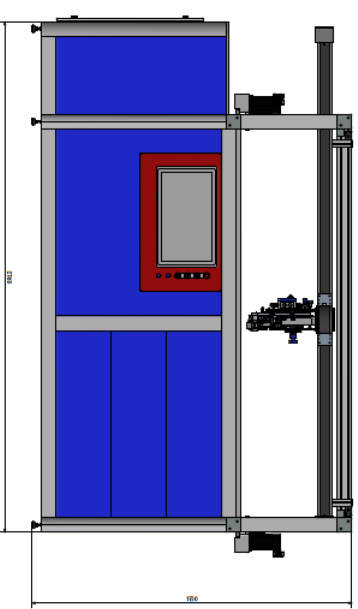


Novel configuration






Stand-alone modules

Fiber Placement



Flexible Machine Toolbox for Automated Fiber Placement

Machine Platform	Mode	Laying Head for
 Crosslayer	2D fiber placement, discontinuous	Prepreg Dry fiber (fixedTow)
 CrosslayerFlow	2D fiber placement, continuous	Prepreg Dry fiber (fixedTow)
 XDLayer	2,5-3D fiber placement	Prepreg Dry fiber (fixedTow)



User Benefits:

- Flexible material choice
- Replace Head for flexible use
- Cost-efficient (frugal)
- Ease of use and programming
- Process control & quality
- Low material scrap, fast results

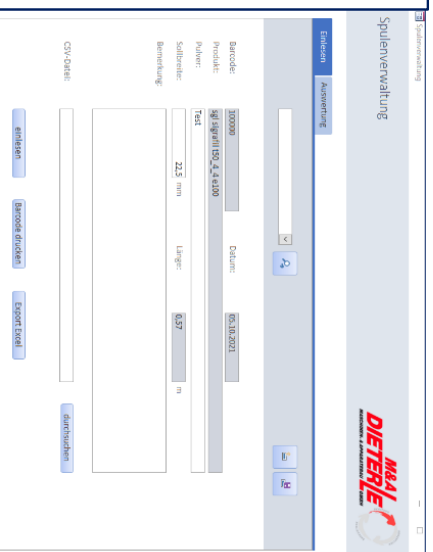
Ind. 4.0 / Open Source / Förderung

Prozessdaten auslesen:
Spannung, T, Geschwindigkeit (einflussnehmende
Faktoren bestimmen, Prozesse optimieren)



QR Code auf Tapespulen:

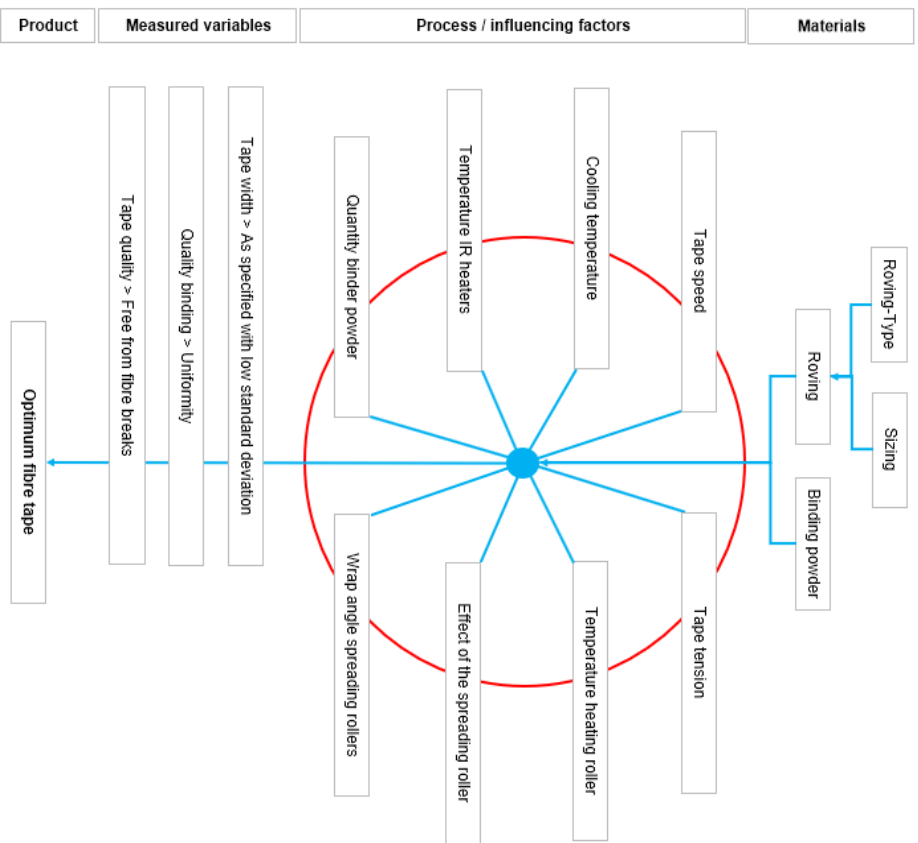
Roving, Pulver, Datum, Fertigungsbedingungen
⇒⇒ Ziel auslesen „schlechter“ Segmente während
Tapelegen



Remote Service / Schulung:
Hololens-2 / Augmented Reality Brille



Ermittlung optimaler Prozess Parameter



Verwendete Materialien:

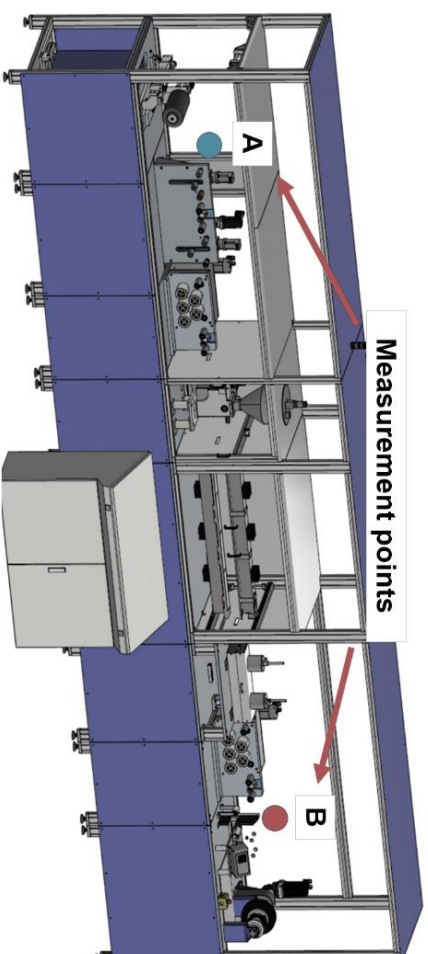
- Roving-Typ
- Schlichte
- Binderpulver

Prozess-Parameter:

- Tow Geschwindigkeit
- Tow Spannung
- Temperatur Heizwalze
- Spreizbreite
- Umschlingungswinkel
- Menge Binderpulvers
- Temperatur IR-Heizung
- Kühltemperatur

Messwerte:

- UDrifted Tow-Breite
- Standardabweichung
- Optische Bewertung

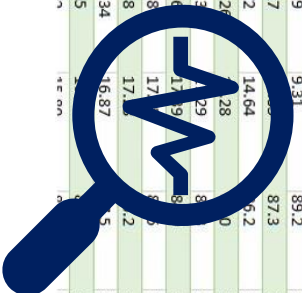


Daten auslesen und auswerten

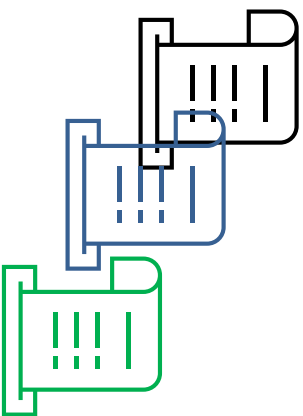
Parameter Datenexport

Name	Value
Tappe length	0,0 m
Cooling	20,8 °C
Front width	0,0 mm
Rear width	15,1 mm
Unwinder	0 N
Omega	2 N
Rewinder	0 N
Pre-heater	21,4 °C
Infrared	20,7 °C
Roller	23,4 °C

1	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column
2	Position(m)	Breitez(mm)	Breitez(mm)	Abwickler(N)	Omega(N)	Aufwickler(N)	Walze(°C)	Vorheizung(°C)	Infrarot(°C)	Kühlung(°C)	Colur
3	0,0	0,0000	23,7754	0,67	2,10	11,01	31,9	26,5	23,2	20,1	
4	0,1	0,0000	23,5216	18,17	4,03	4,68	94,2	152,2	23,3	22,7	
5	0,2	0,0000	23,6826	12,56	5,39	9,31	89,2	184,5	23,3	22,0	
6	0,3	0,0000	23,7705	18,56	8,27	8,73	87,3	162,9	23,3	20,5	
7	0,4	0,0000	23,6241	17,98	8,72	14,64	86,2	155,6	23,4	19,1	
8	0,5	0,0000	23,5314	19,82	11,26	11,26	85,0	145,1	23,4	21,9	
9	0,6	0,0000	23,6534	15,98	11,26	11,26	83,8	136,3	23,4	21,1	
10	0,7	0,0000	23,7314	12,70	10,6	17,9	82,6	124,9	23,4	19,8	
11	0,8	0,0000	24,0633	10,14	10,6	17,9	81,4	124,0	23,4	18,5	
12	0,9	0,0000	24,1072	8,31	9,88	17,9	80,2	123,4	23,5	19,1	
13	1,0	0,0000	24,1511	13,98	10,34	16,87	79,0	120,6	23,5	21,6	
14	1,1	0,0000	24,1170	11,89	9,05	16,87	77,8	117,6	23,5	21,3	



„Rezept“ Datenbank erstellen

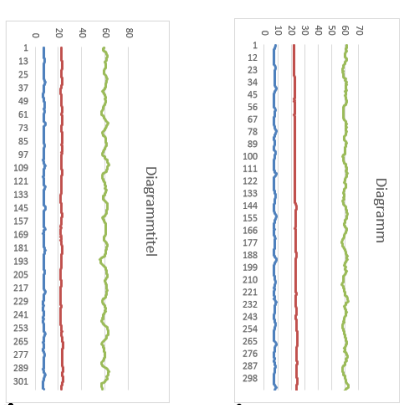


Eingangsspannung-60-NV;-ohne-Regelung¶








Spig-Abwikh	min	max	mittel	Stabwvart
50m_Nr	57,46H	62,24H	60,03H	1,06H
Ausg-Breite	min	max	mittel	Stabwvart
50m_mmt	21,83H	24,67H	23,14H	0,68H
Eing-Breite	min	max	mittel	Stabwvart
50m_mmt	7,00H	9,26H	7,66H	0,47H

Eingangsspannung-60-NV;-Regelung±5-N¶

Spig-Abwikh	min	max	mittel	Stabwvart
50m_Nr	55,75H	63,60H	59,99H	1,58H
Ausg-Breite	min	max	mittel	Stabwvart
50m_mmt	21,53H	23,92H	22,68H	0,53H
Eing-Breite	min	max	mittel	Stabwvart
50m_mmt	6,86H	9,11H	7,53H	0,44H



Flexible Fiber Material Toolbox

Fiber	Impregnation	Dry Tape
 Glasfiber	 PP/PE Powder	
 Carbon fiber	 Binder Powder	
 Flax	 Dispersion	



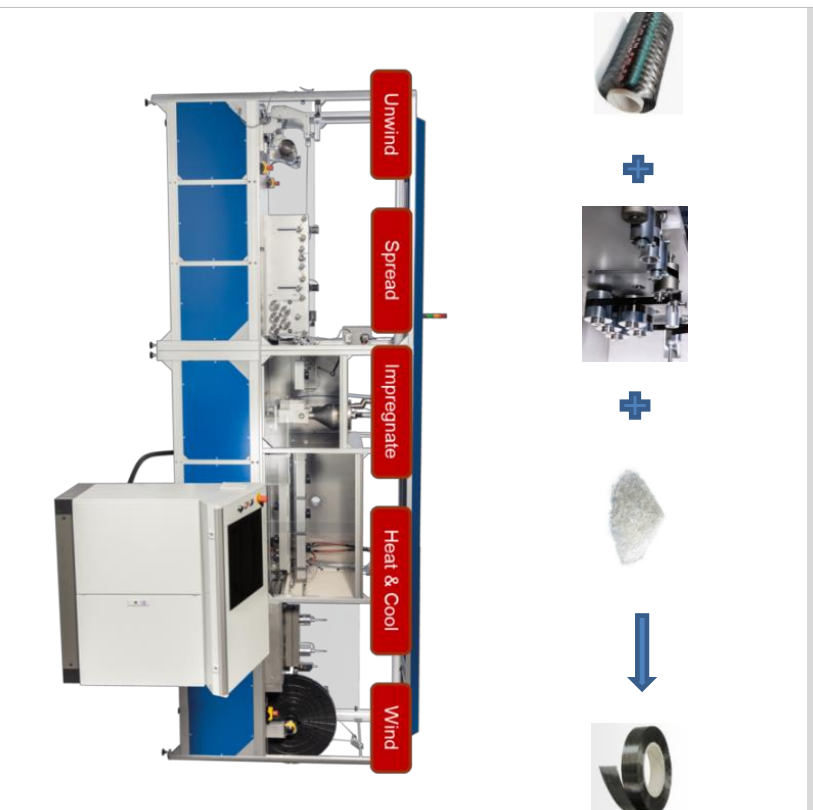
User Benefits:

- Flexible material production
- Fiber / powder combinations
- Vary areal weight



Machines for fiber processing and placement: Open Fiber System

Flexible fiber processing



Flexible fiber placement



- | Adjustable aerial weights
- | Freedom in fibre orientation
- | High mechanical properties
- | Overall frugal process
- | Low Cut-Off
- | easily learned

Can we help you with your next projects?

M&A
DIETERLE
MASCHINEN- & APPARATEBAU
GMBH



R&D Contact:

M&A Dieterle GmbH

Maschinen und Apparatebau

Neuhofstr. 26

D-73113 Ottenbach

Dr. Bettina Schrick

e-mail [bettina.schrick@ma-](mailto:bettina.schrick@ma-dieterle.de)

[dieterle.de](mailto:bettina.schrick@ma-dieterle.de)

phone + 49 170 22 40 260