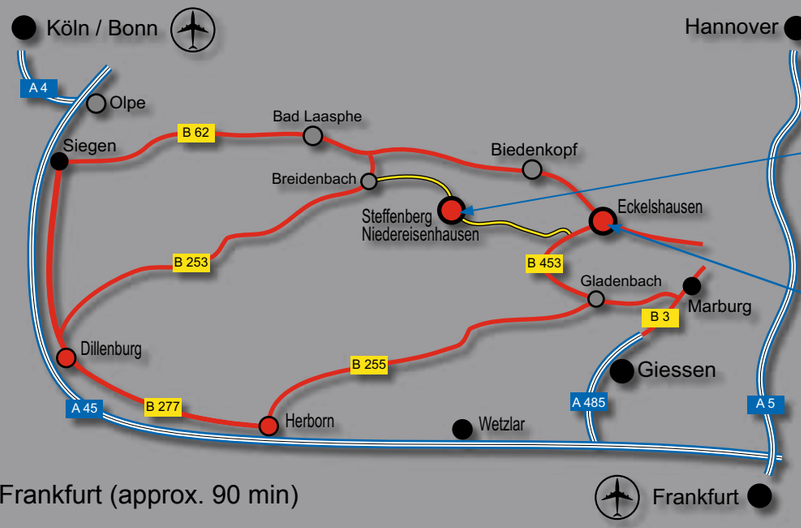
EHA facilities

**Route to Airport Köln (Cologne) and Frankfurt / "Steffenberg and Biedenkopf"**

Köln / Bonn (approx. 90 min)

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Niedereisenhausen
Bauhofstr. 2
35239 Steffenberg

Composite Machinery GmbH
c/o Bolenz & Schäfer
FW Technology
Eckelshausen
Lahnstr. 34
35216 Biedenkopf

Frankfurt (approx. 90 min)

## EHA Composite Machinery GmbH


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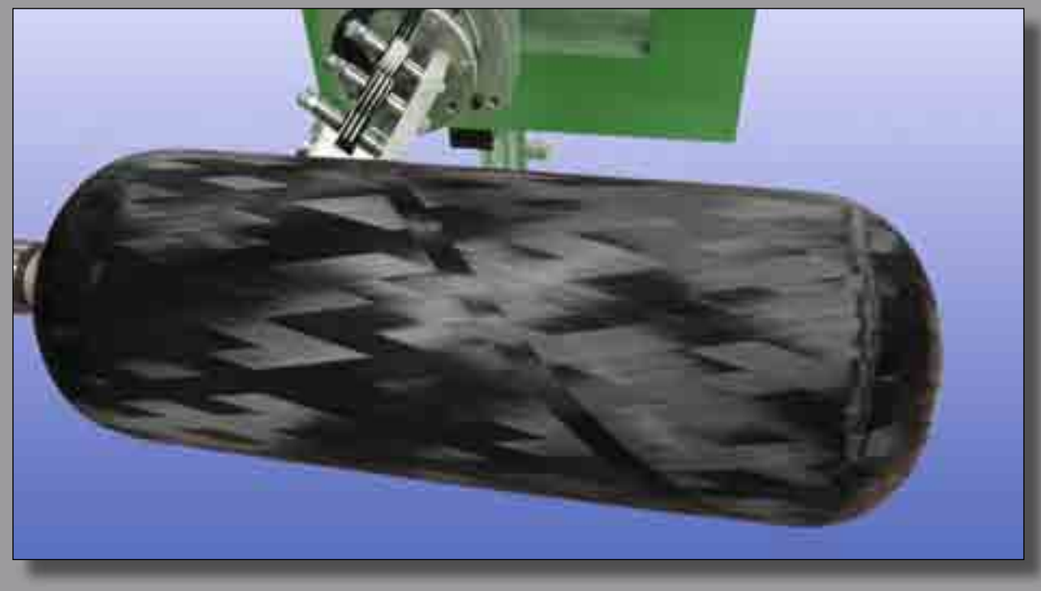
A subsidiary of ROTH INDUSTRIES

# EHA Composite Machinery

## Filament Winding Machinery



## Prepreg Plants

A subsidiary of ROTH INDUSTRIES

## History of EHA
formerly Bolenz & Schäfer-BSD

1933 Founding of Bolenz & Schäfer

1943 Production of clutches and brakes

1952 Production of hydraulic elements and aggregates

1963 Start of development of Filament Winding Machinery

1979 BSD uses a commercial CNC control for a Filament Winding Machine for the first time

1988 First Filament Winding Machine with 6 CNC axes of motion

1989 BSD becomes a member of the ROTH Industries.

1989 BSD builds the first winder with integrated tape placement head. The machine has 13 axes of motion

1990 BSD builds their first equipment for a prepreg plant. The prepreg is used to produce bicycles

1995 EHA becomes a member of ROTH Industries

1999 EHA incorporates the Filament Winding Machine division of BSD

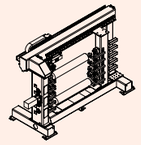
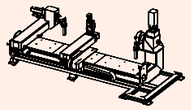
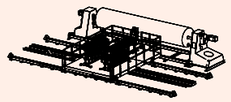
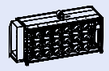
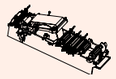
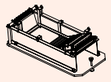
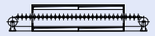
1999 EHA designs and builds the most advanced, completely automatic Filament Winding Machine for pressure vessels

2000 EHA designed, built and installed the most efficient Filament Winding plant for the high production of pressure vessels to a Norwegian customer

2009 EHA designed and installed the most advanced full automatic plant to produce high voltage pipes

2011 EHA has sold over 450 composite machines and turnkey facilities around the world

2012 Start of co-operation with AFPT for automatic tape placement heads with laser welding

| | | | | Application | Specification |
|---|---|---|---|---|---|
| Prepreg Plant | | *page 4-7* |  | Production of highest quality materials. Use of hot melt or solvent type resins. Process can be adapted to meet your exact needs. | The plant will be designed for your needs. Reverse Roller Coater (RRC) for highest accuracy or Knife system for medium accuracy. |
| Filament Winding Machines | Type 1 | *page 8-11* |    | **Best Seller:** Overhead beam for pressure vessels and/or electric industry. | For single spindle and multiple spindle applications. Particularly suitable for series production. Ø max: 2.000 mm L max: 10.000 mm |
| | Type 2 | *page 8-11* |    | Compact winder for R & D and small production plants. | Carriage support on the floor (compact design); for single spindle applications. Particularly suitable for mid-sized products. Ø max: 500 mm L max: 2.000 mm |
| | Type 5 | *page 8-11* |    | Large diameter and long length parts used in paper pulp machines, wind energy, oilfield, aviation industry and space. | Large machine for one or two spindle applications, with large volumes. Ø max: over 1.200 mm L max: over 10.000 mm |
| Spool Creels | EPS | *page 12-13* |   | For sensitive carbon and glass fibres. | Electronic closed loop control for each individual spool. Diameter compensation and fibre end control. Application: Outside pull fibre spools. Number of rovings: 3 - 40 each creel Tension range: 5 - 80N |
| | SFT | *page 12-13* |   | For sensitive carbon and glass fibres at low tension ranges. | Tensioning manually adjustable Mechanically controlled brake system. Closed loop with diameter compensation. Application: Outside pull fibre spools. Number of rovings: 3 - 24 each creel Tension range: 5 - 15N |
| | SI | *page 12-13* |   | Inside pull fibres. | Tensioning manually adjustable friction brake. Application: Inside pull fibre spools / continous production. Number of rovings: 10 - 200 each creel Tension range: 5 - 15N |
| Impregnating Baths | Roller 1 | *page 14-15* |   | Roller impregnation for sensitive carbon and special fibres. | Number of rovings: 4 - 48 or divided rollers for multiple spindle machines. Resin adjustment: with doctor blade at the impregnation roller. |
| | Roller 2 | *page 14-15* |   | Roller impregnation for standard glass, carbon, aramid and other fibres. | Number of rovings: 4 - 48 or divided rollers. Resin adjustment: with doctor blade at the impregnation roller. |
| | Dip | *page 14-15* |   | Dip impregnation for easy fibres. | Number of rovings: 5 - 200 Heatable upon request. |
| Curing Ovens | Continuous Oven | *page 16-17* |   | Continuous operation with 3 temperature zones. | |
| | Batch Type Oven | *page 16-17* |   | Batch operation with infinite temperature profile. | |

Hot melt plant for prepreg production

Spool creel

Calender for prepreg

Unwinder with separator foil

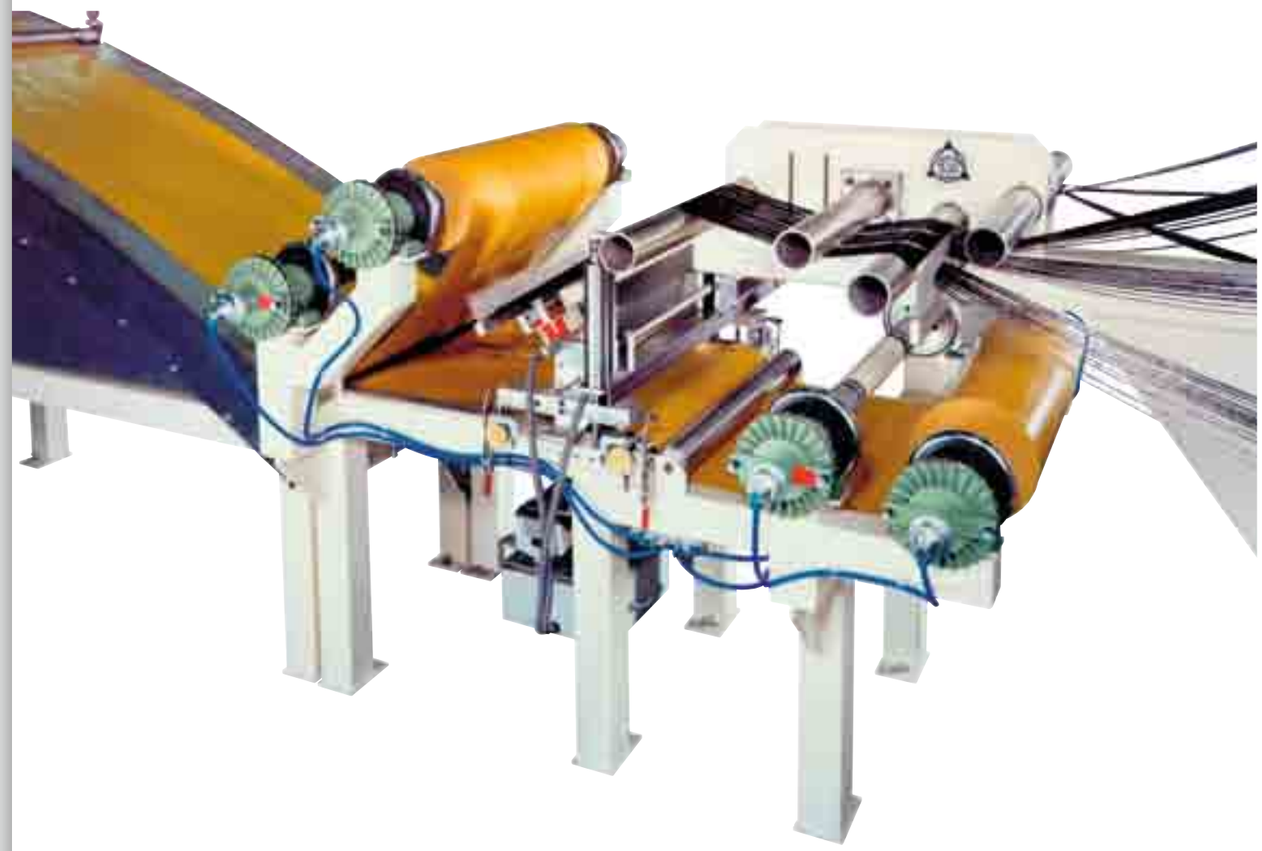
Rewinder for prepreg

Recycling of silicon-paper

Reverse roll coater

Glas fabric prepreg

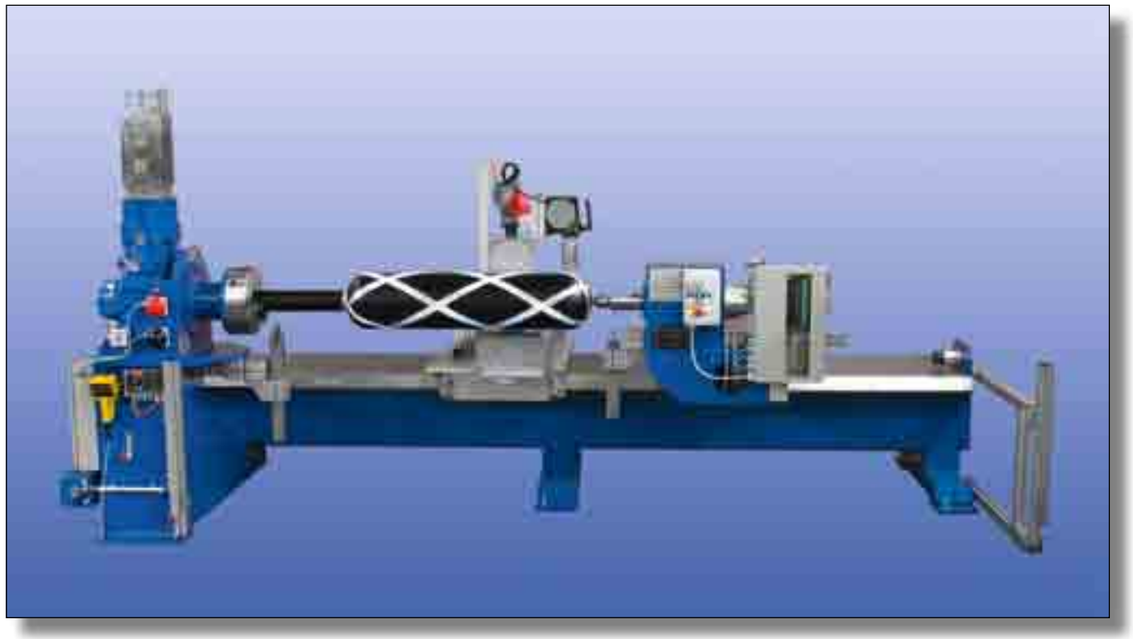
UD-carbon fibre prepreg



Fibre distribution system

Complete production plant

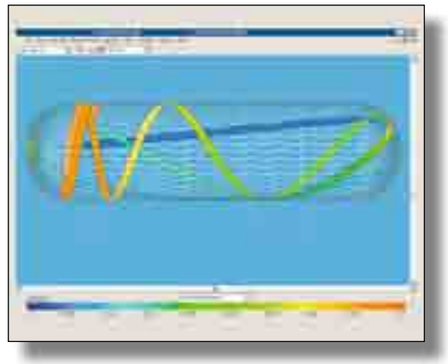
PLC-control



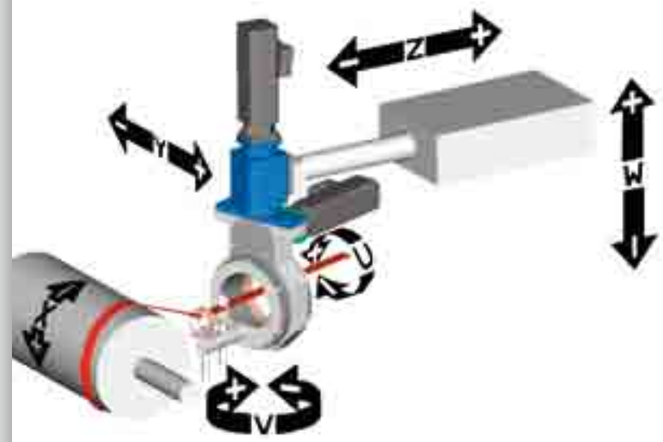
FWA 2/4/1 compact production winder

CNC-control

RCA: automatic cutting and re-applying of fibres



Simulation of winding path




Scheme of axes


Tape placement head with laser



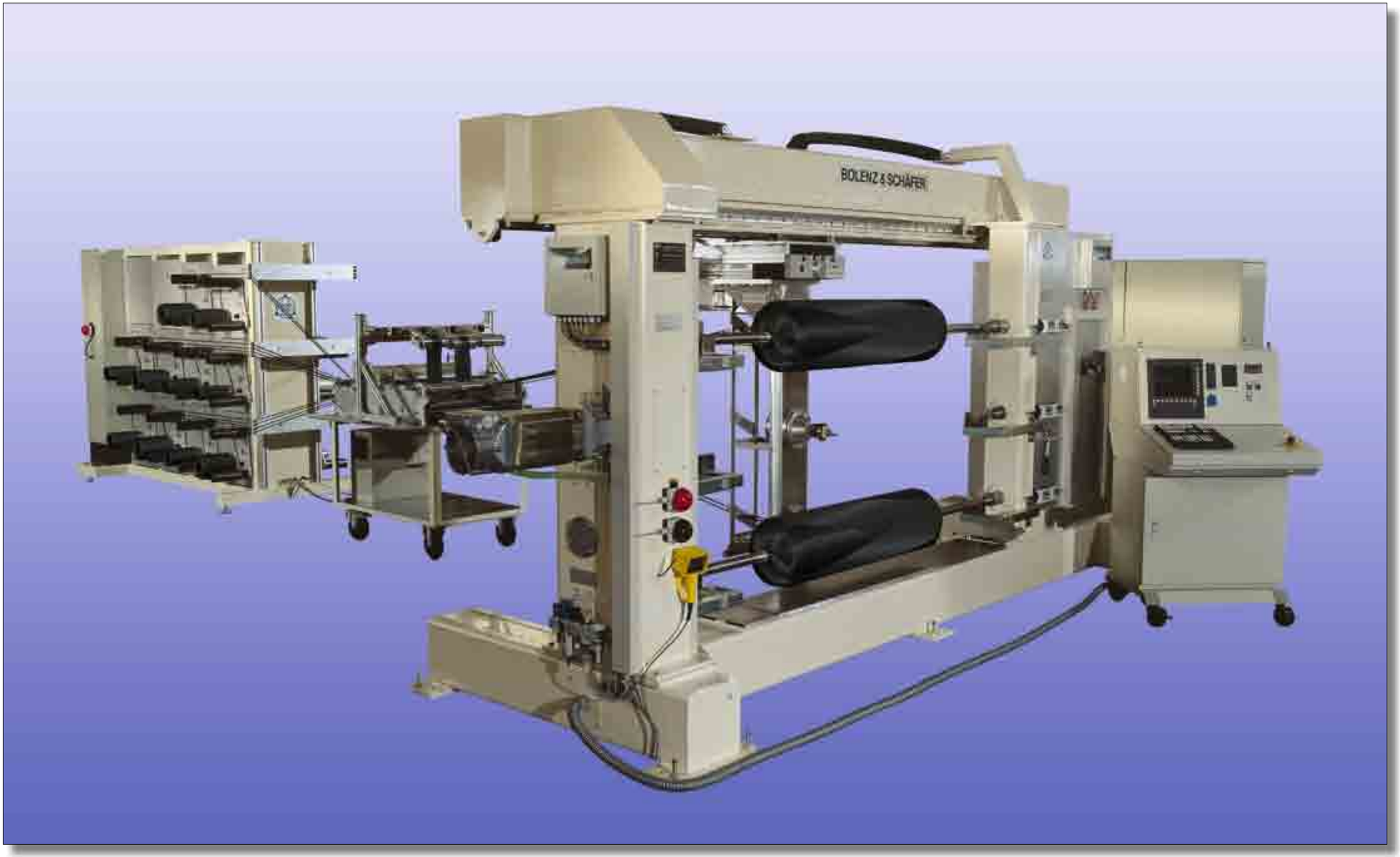
FWA 5 Filament Winding Machine for huge products


Carriage of FWA 5

D-ring

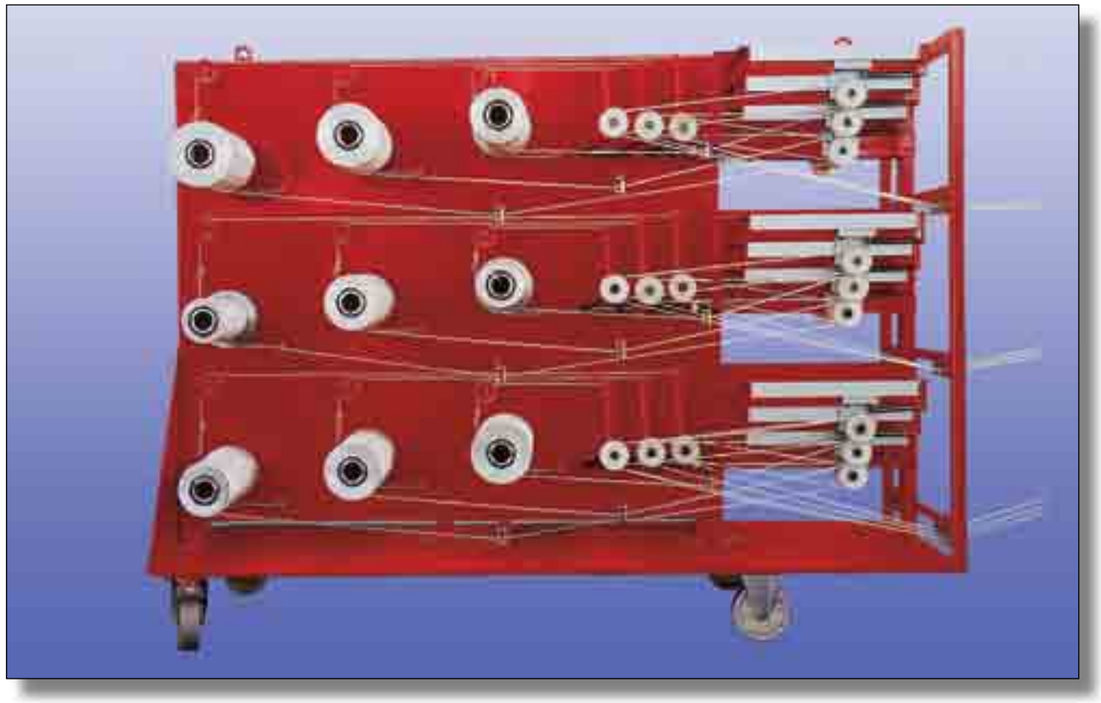
Winding of thermoplastic tape with torch

Delivery device



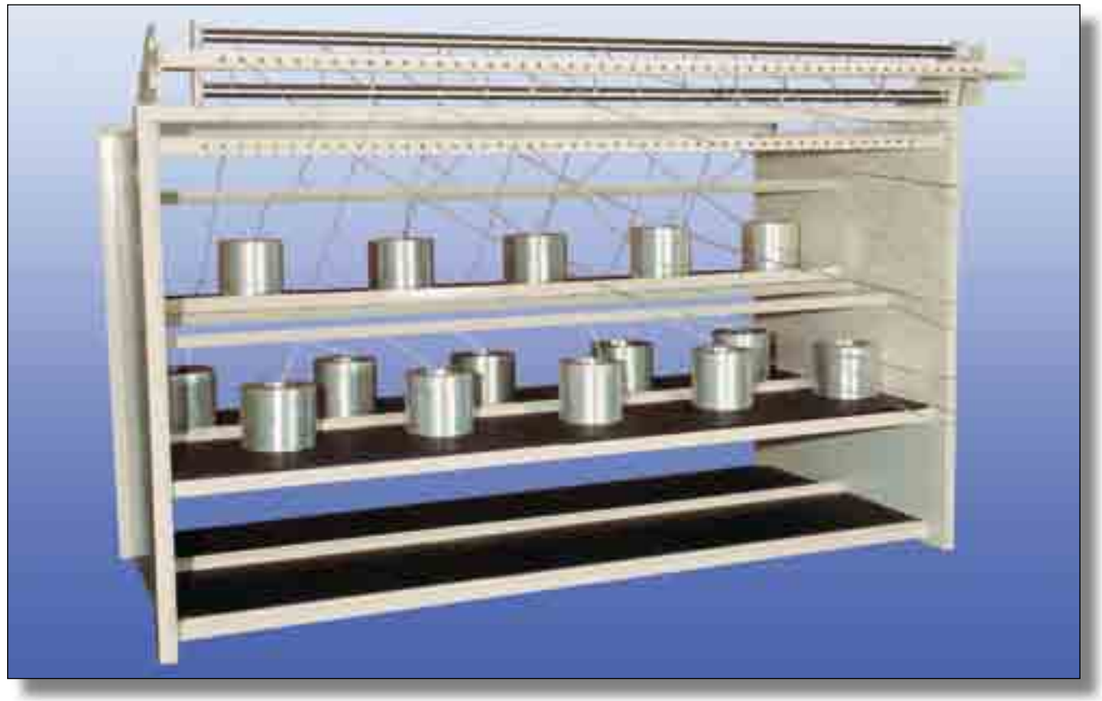

FWA 1/4/3 Filament Winder with overhead beam

Spool creel with electronic closed loop control, Type EPS

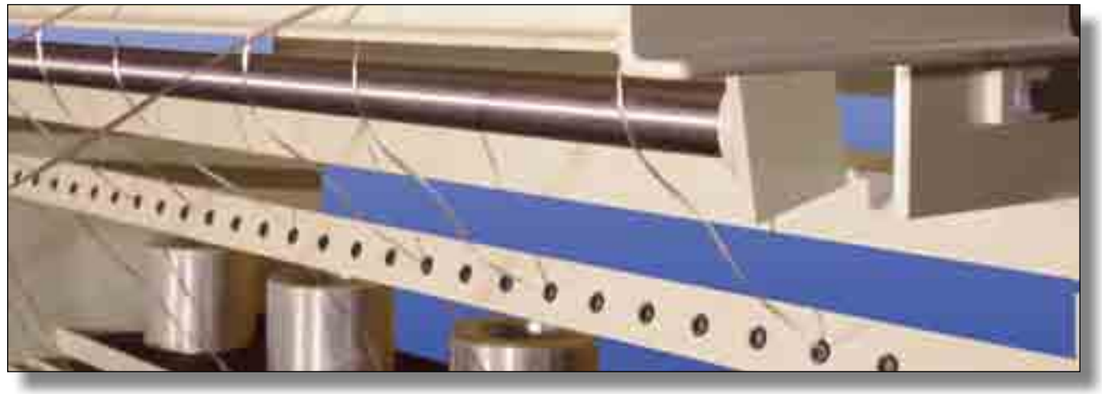


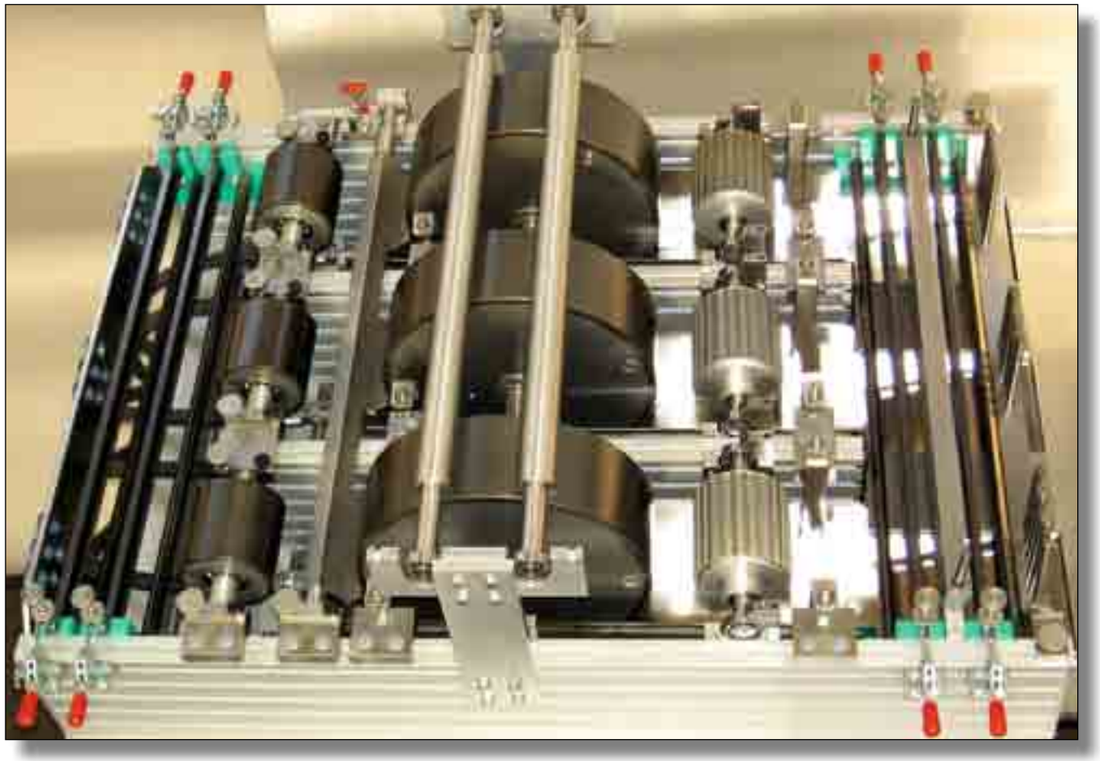
Spool creel with closed loop control, Type SFT





Spool creel for inside pull, Type SI





Roller impregnation for sensitive fibres

Roller impregnation for standard fibres



Dip impregnation for easy fibres

Fibres in a roller impregnation bath

Fibres in a dip impregnation bath

Doctor blade with precise adjustment

$TiO_2$ eye lets

Continuous oven

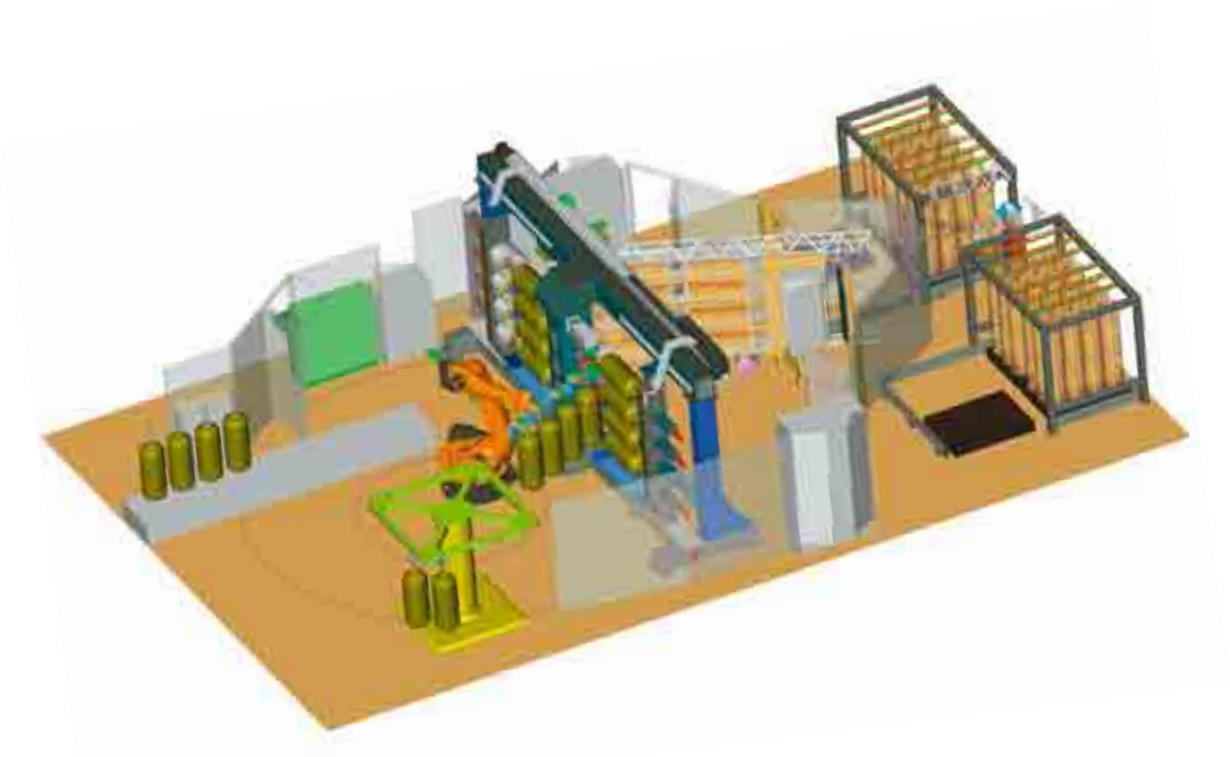
Batch type oven

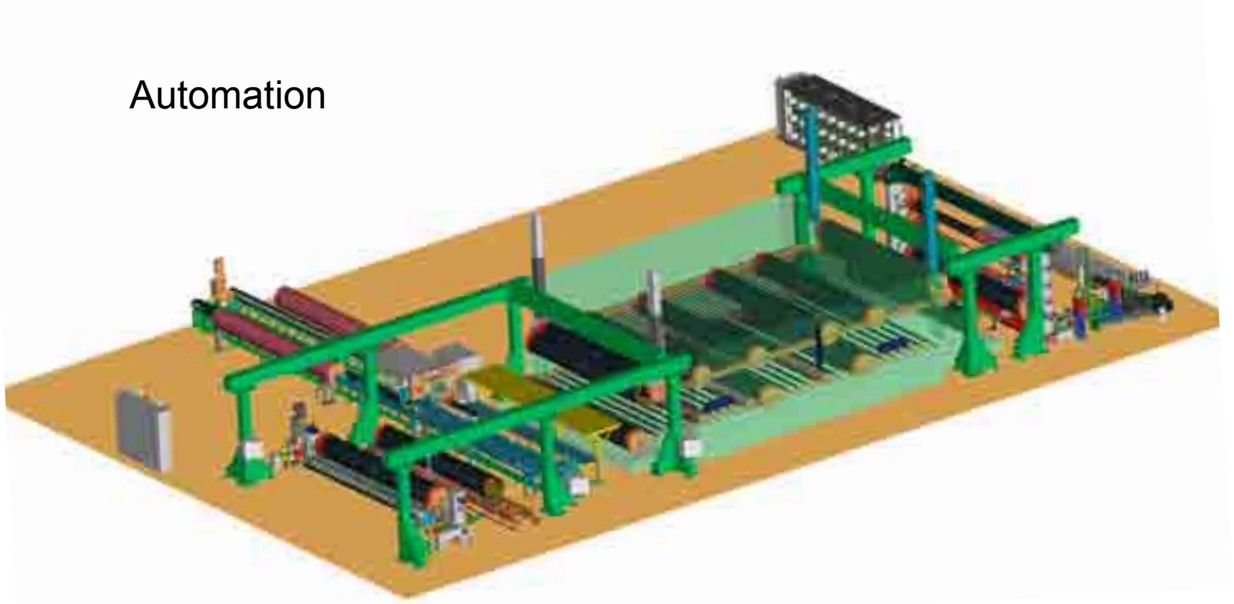
Automatic handling

Curing of pressure vessels

Conveyor system for mandrels

Infra-red curing





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***e-mail: sales@ehacomma.com***

SENDER:

Company: _____

Contact Person: _____

Address: _____

Post Code, City, Country: _____

FAX / e-mail: _____

**The <u>product or production program</u> has the following description:**

Name of product _____

Diameter (mm) max. _____

Winding length wl (mm) max. _____

Mandrel length (mm) max. _____ (standard is wl plus 1.000 mm)

Thickness of laminate (mm) max. _____

Weight of laminate/mandrel (kg) max. _____ /_____

Content of fibre (%) approx. _____ ☐ weight or ☐ volume ?

Shape: ☐ pipe ☐ pressure vessel ☐ others _____

Shape of cross section: ☐ round, oval or rectangular

☐ others _____

**Do you have <u>experience</u> ?**

with the filament winding process ☐ yes ☐ no

with CNC-control ☐ yes ☐ no

**Which <u>raw materials</u> will be used ?**

**Fibre:** _____

(Glass, Aramid, Carbon (HT or HM)

**Matrix:** _____

☐ Polyester ☐ Epoxy

☐ Vinylester ☐ others

**Winding process:** _____ (wet or dry with prepregs/towpregs)

**Numbers of fibres:** _____

**Which <u>curing cycle</u> is requested?** ☐ no oven required

typical temperature profile: _____ C° (e.g. 90° C) _____ C° (e.g. 120° C) _____ C° (e.g. 140° C)

time: _____ min (e.g. 80 min) _____ min (e.g. 80 min) _____ min (e.g. 80 min)

**<u>Required delivery date:</u>** approximately _____