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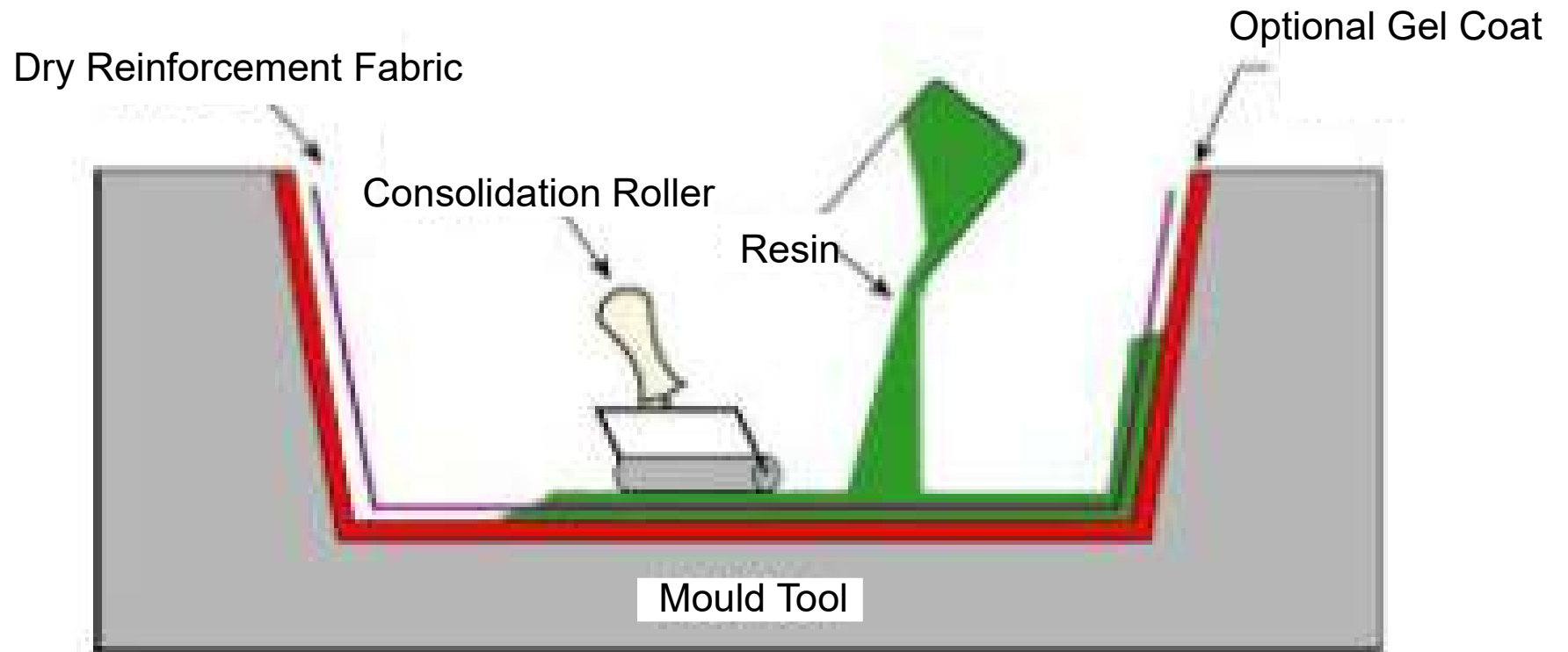
Composite Manufacturing

Book 'Composites for Construction', L. Bank, Chapter 2.3

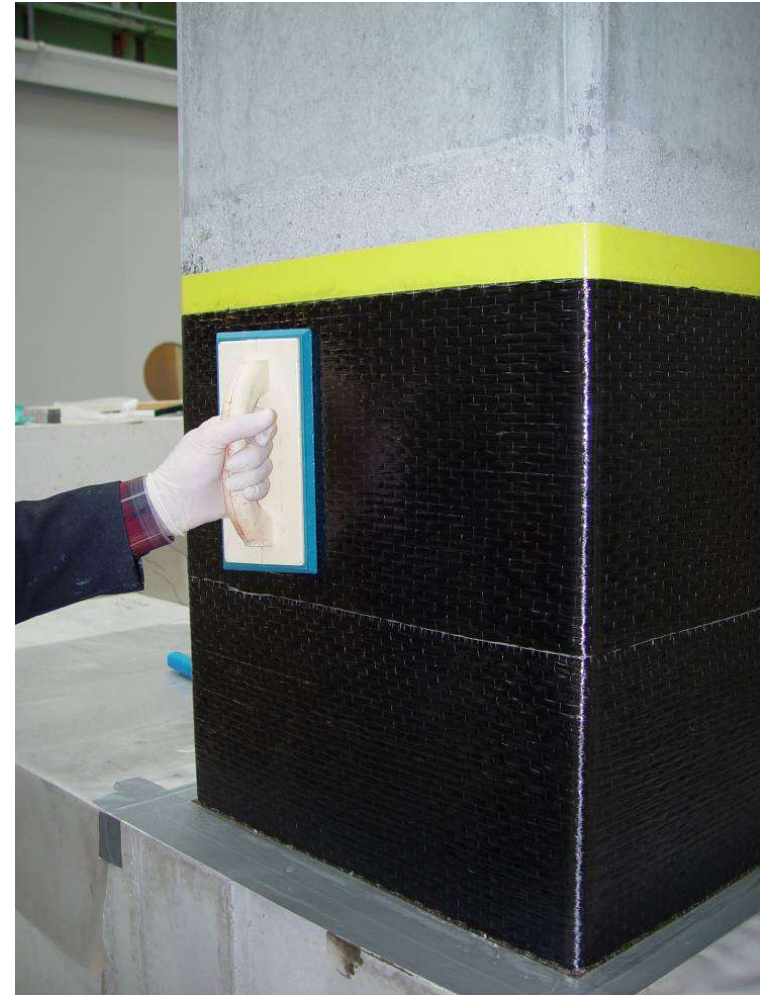
Tape Lay-up



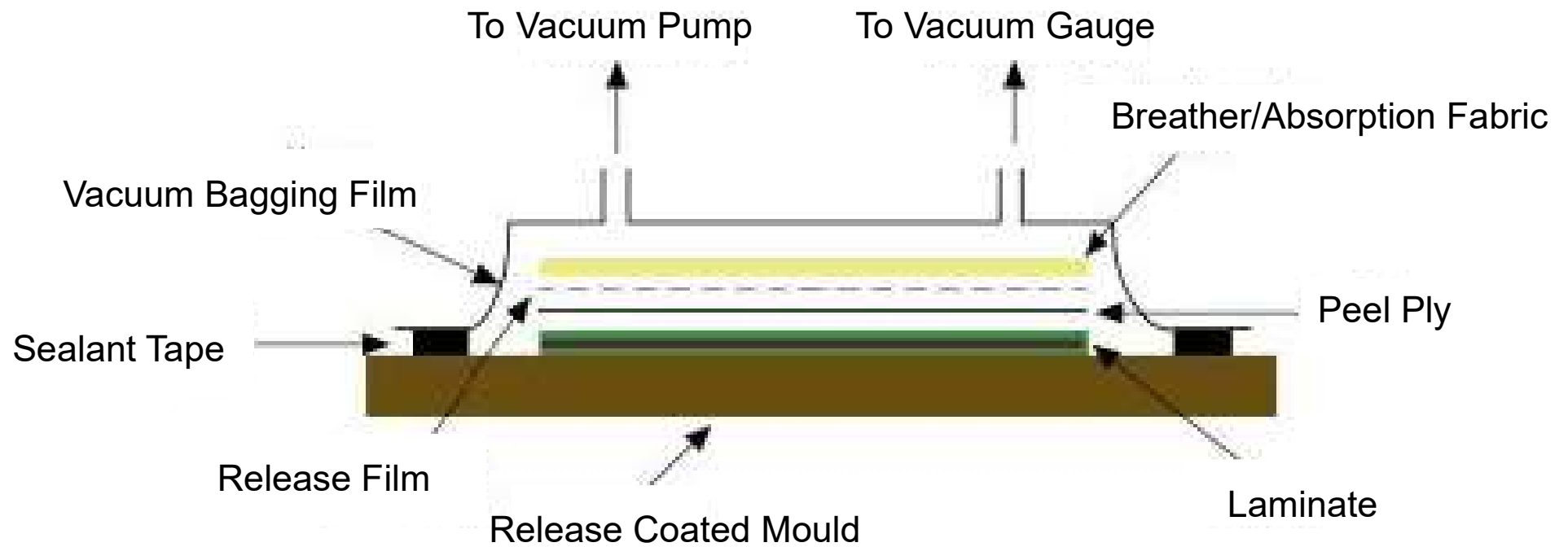
Wet Lay-up



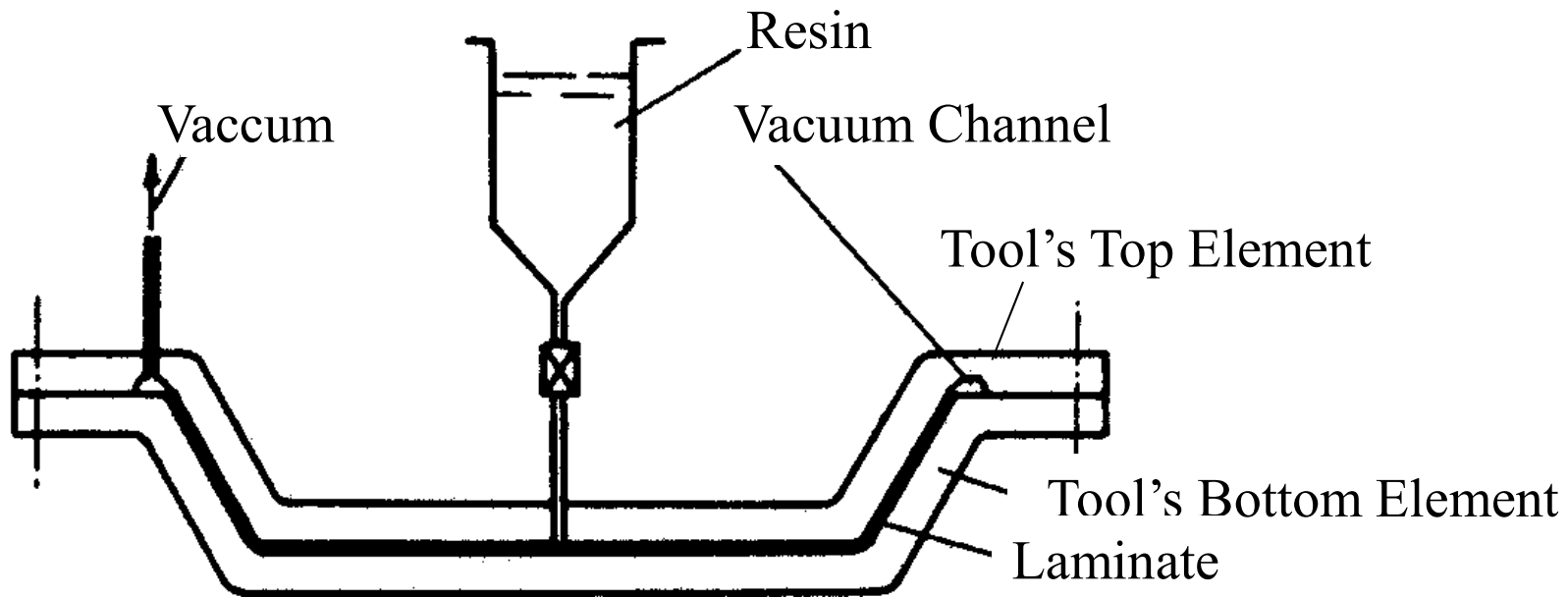
Wet Lay-up: application of CFRP sheets on a concrete column at Structural Engineering Laboratory of Empa-Switzerland



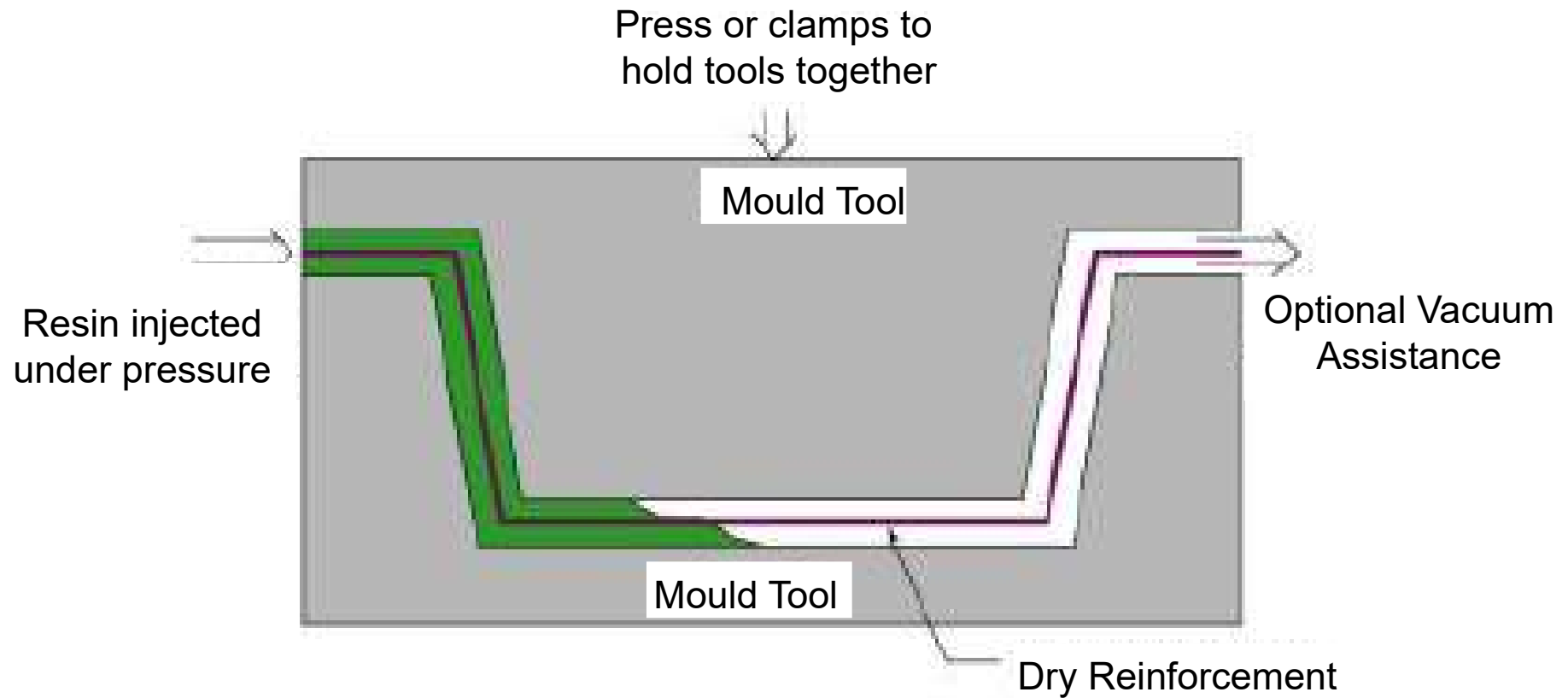
Vacuum Bag Process



Resin Transfer Moulding (RTM) by applying vacuum

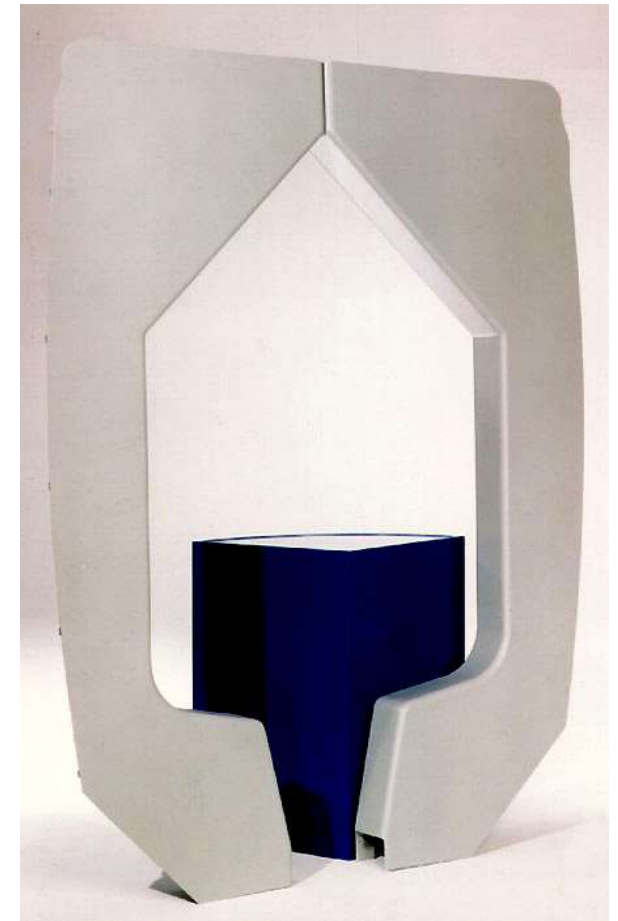


Resin Transfer Molding



RTM of large, complex elements with foam core (compotech AG, Weinfelden)

<https://www.compotech.ch/en/application-areas/railway>



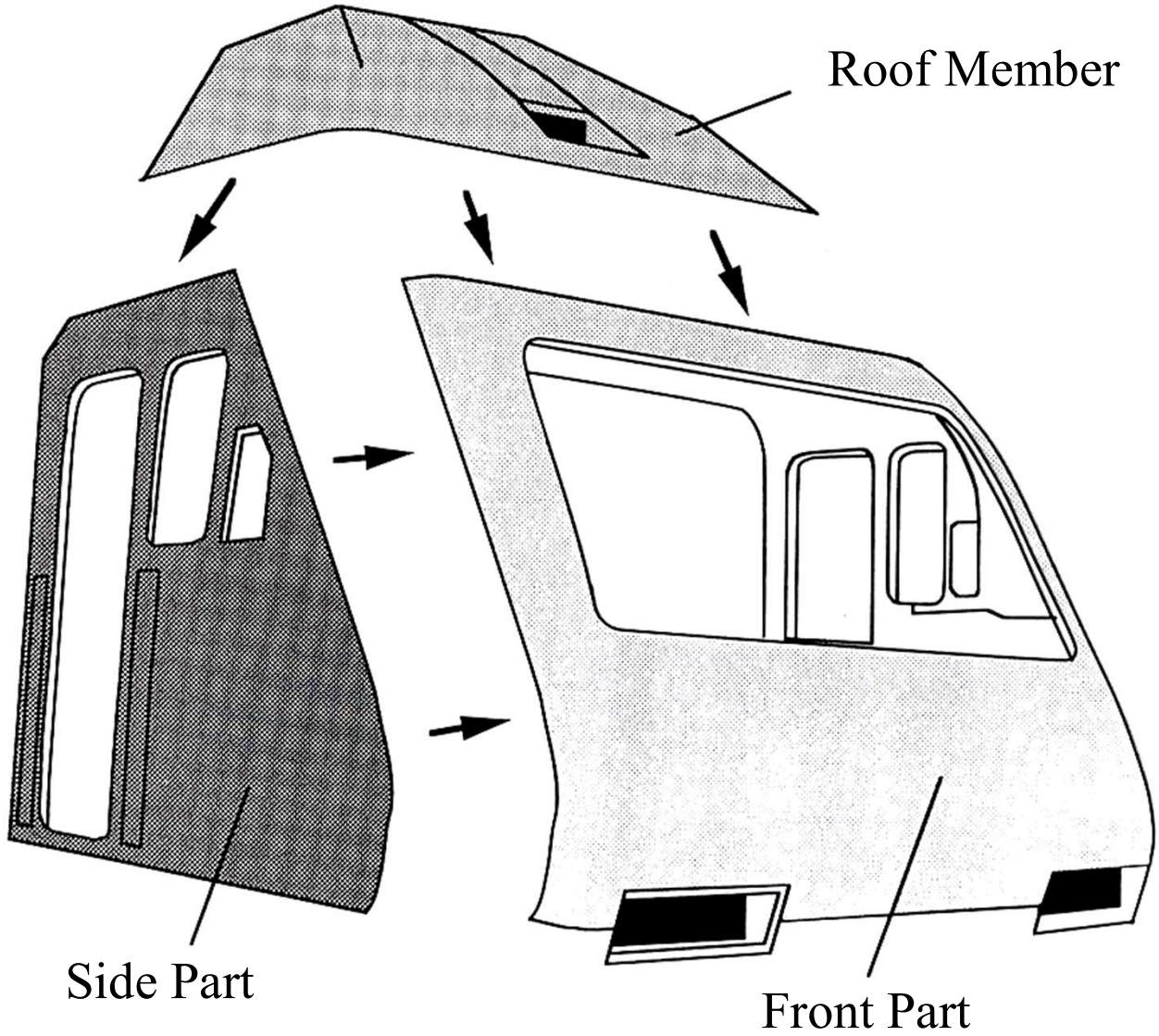
Korvette YS2000

- **Manufacturer:** Kockums AB
- **Length:** 72 m
- **Width:** 10.5 m
- **Velocity:** > 65 km/h
- **4 Gas Turbine:** each 4000 kW
- **Carbon Fiber** T700: 45 t
- **Matrix:** Vinyl ester
- **Manufacturing Process:** RTM

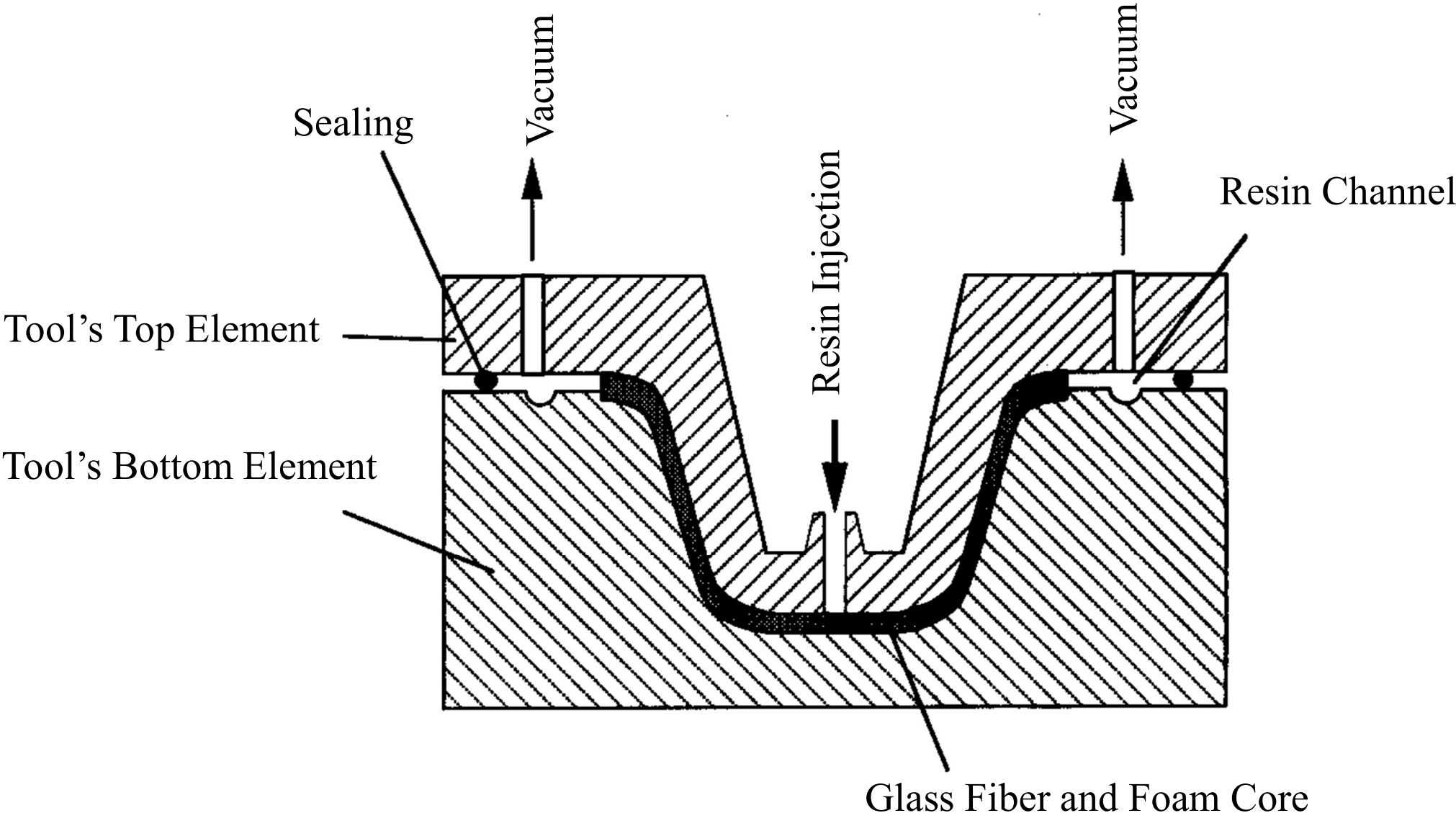
Lok 2000, The Cab



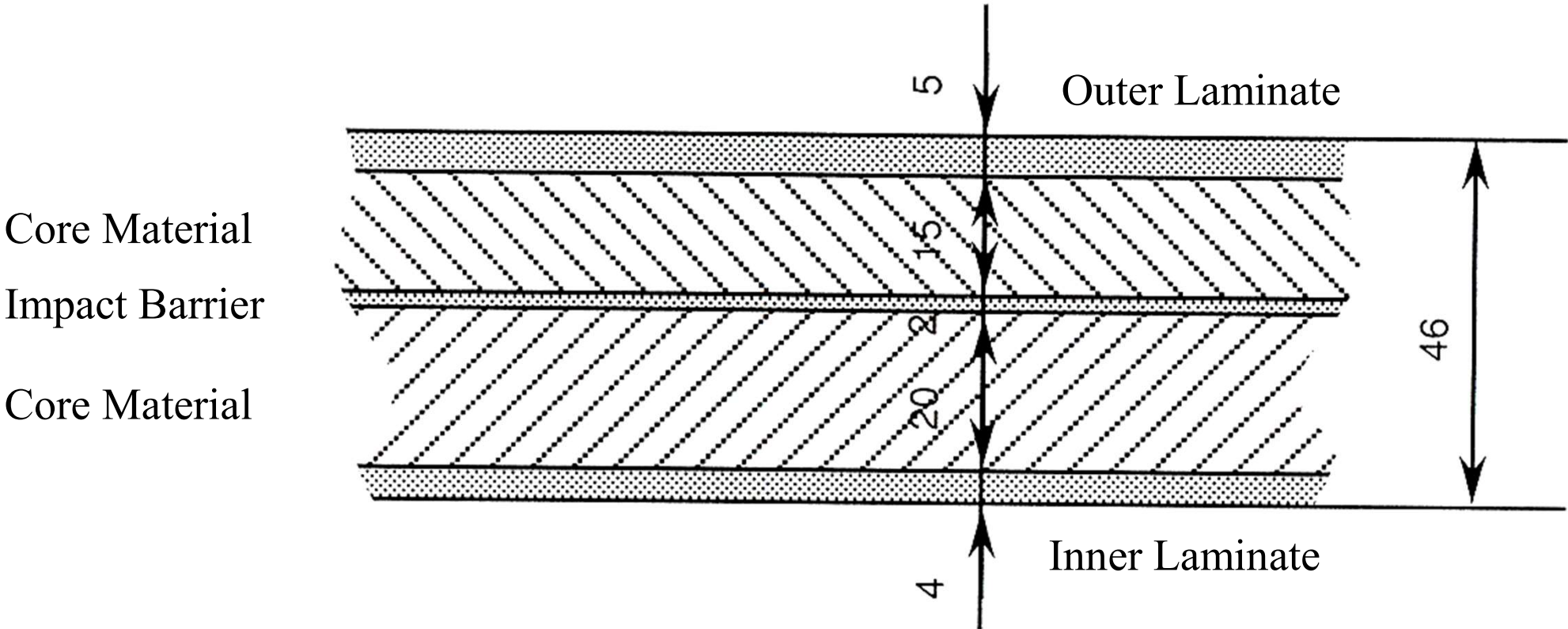
Lok 2000, The Cab



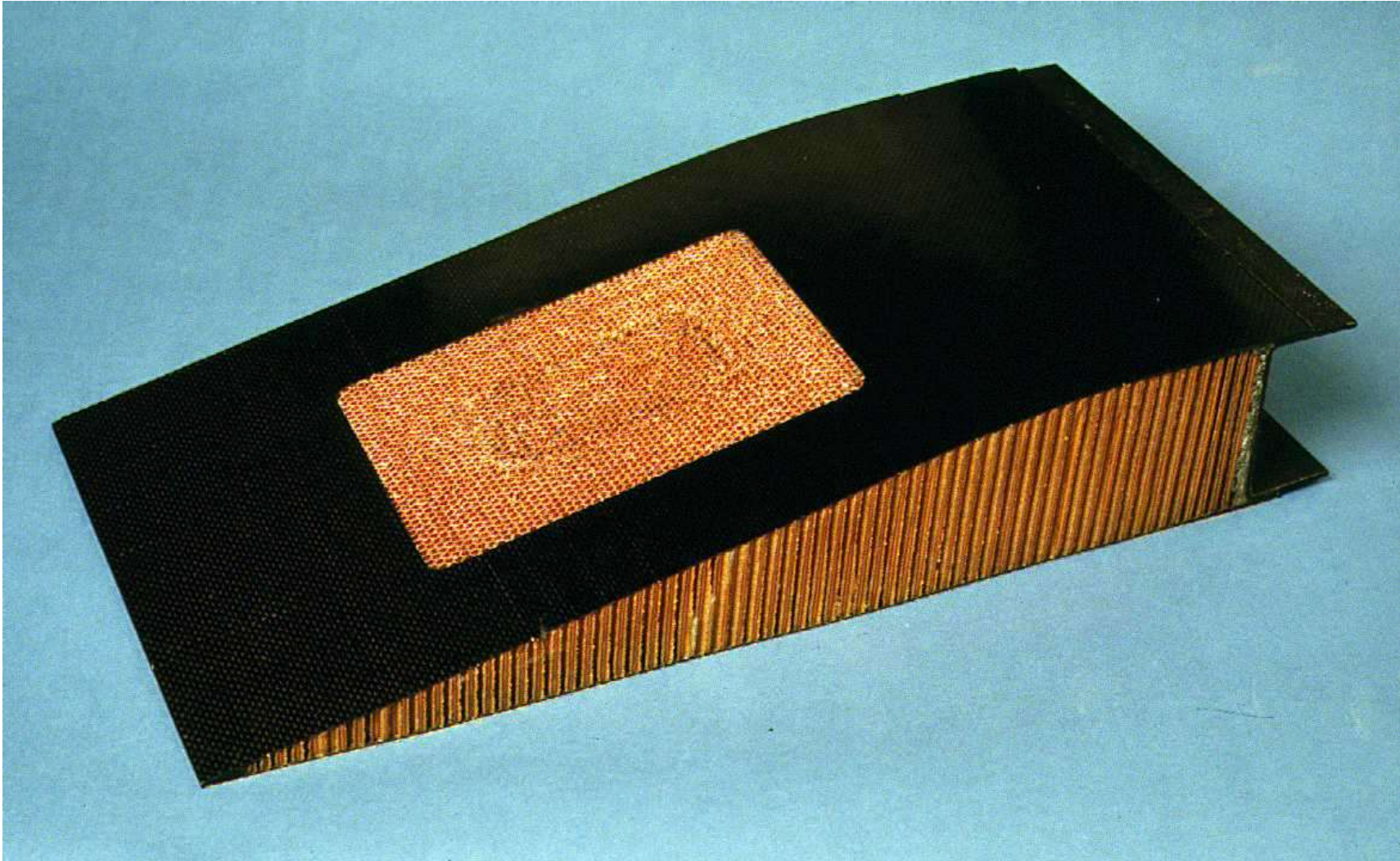
Lok 2000, Resin Transfer Moulding



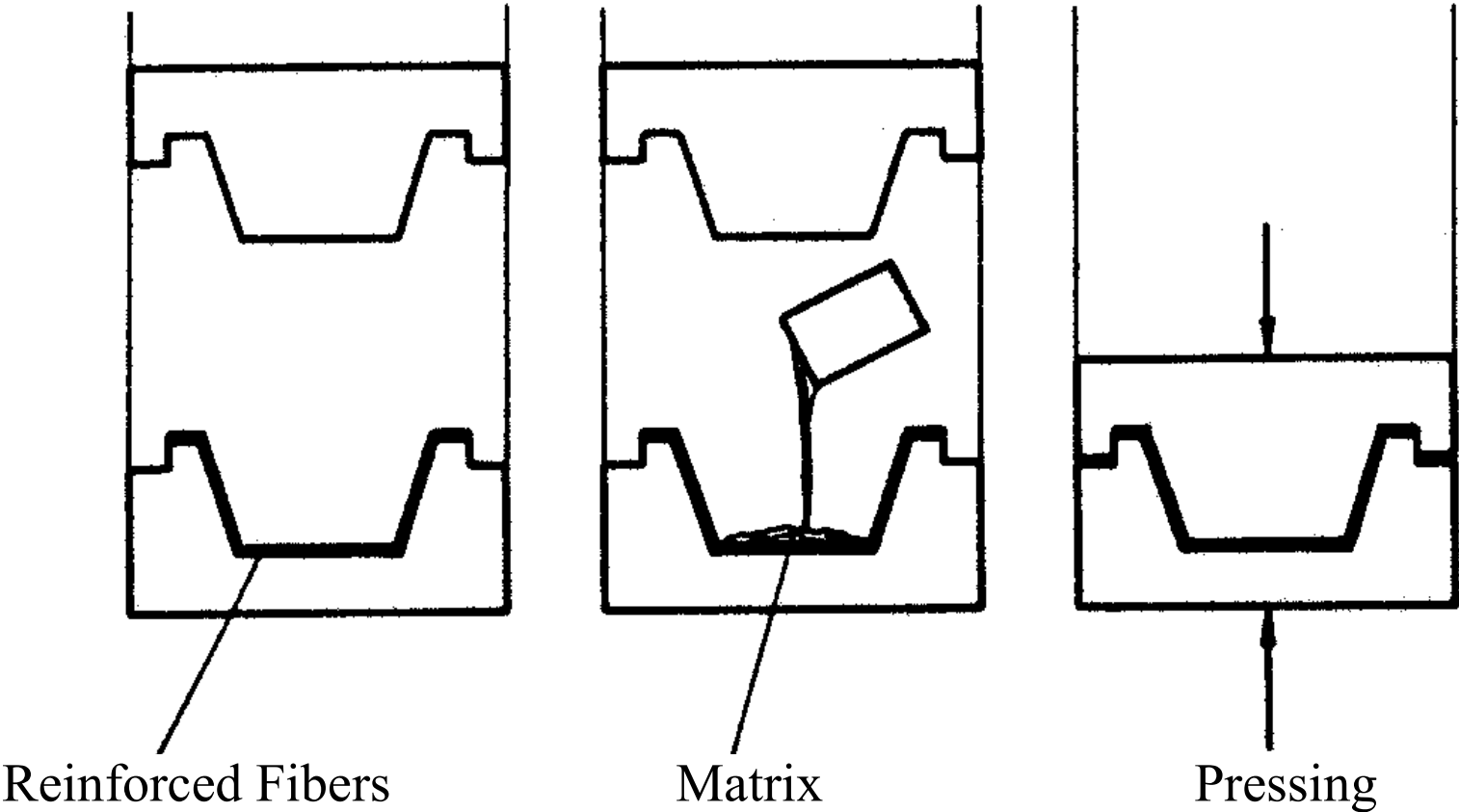
Lok 2000, Laminate Structure of the Wall



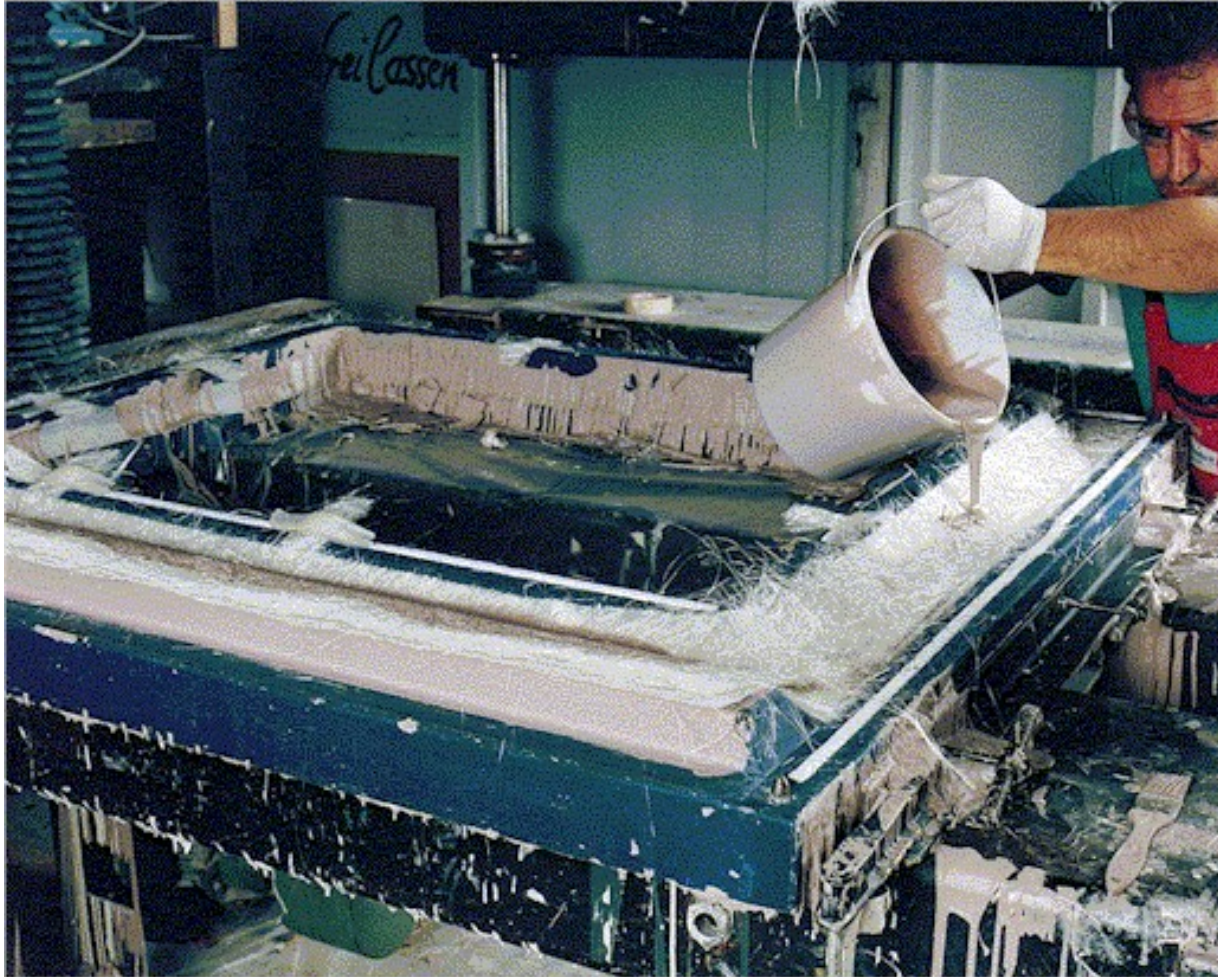
CFRP Flap of Boeing 757



Press Moulding Process



Press Moulding of a simple window element with small number of production items, Compotech AG, Weinfelden, Swiss



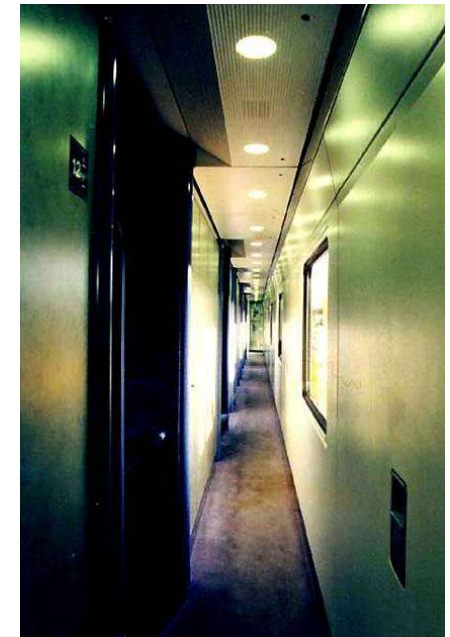
Press Hall SMC-Press, compotech AG, Weinfelden



Composite Manufacturing

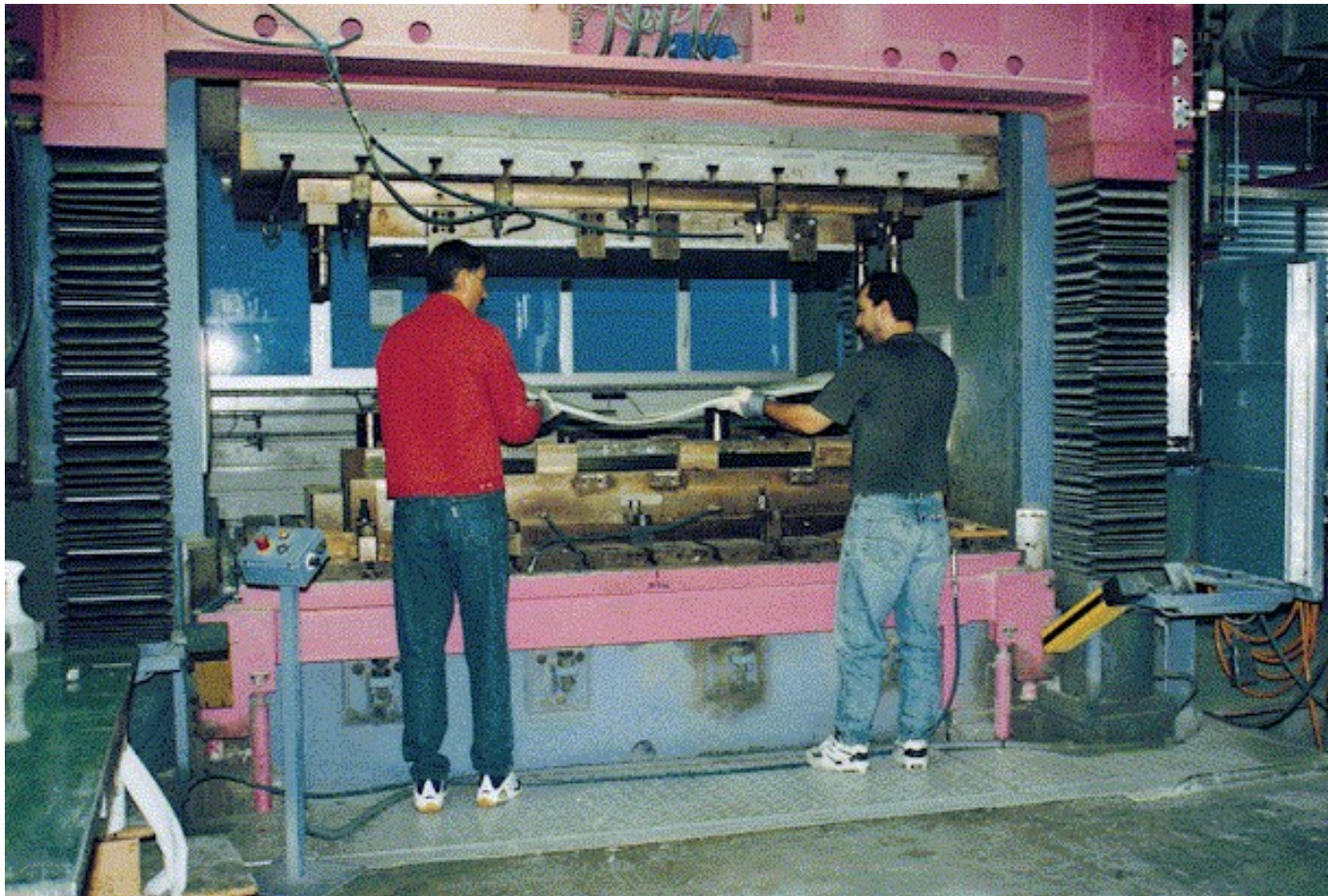


Fibre Composites, FS23

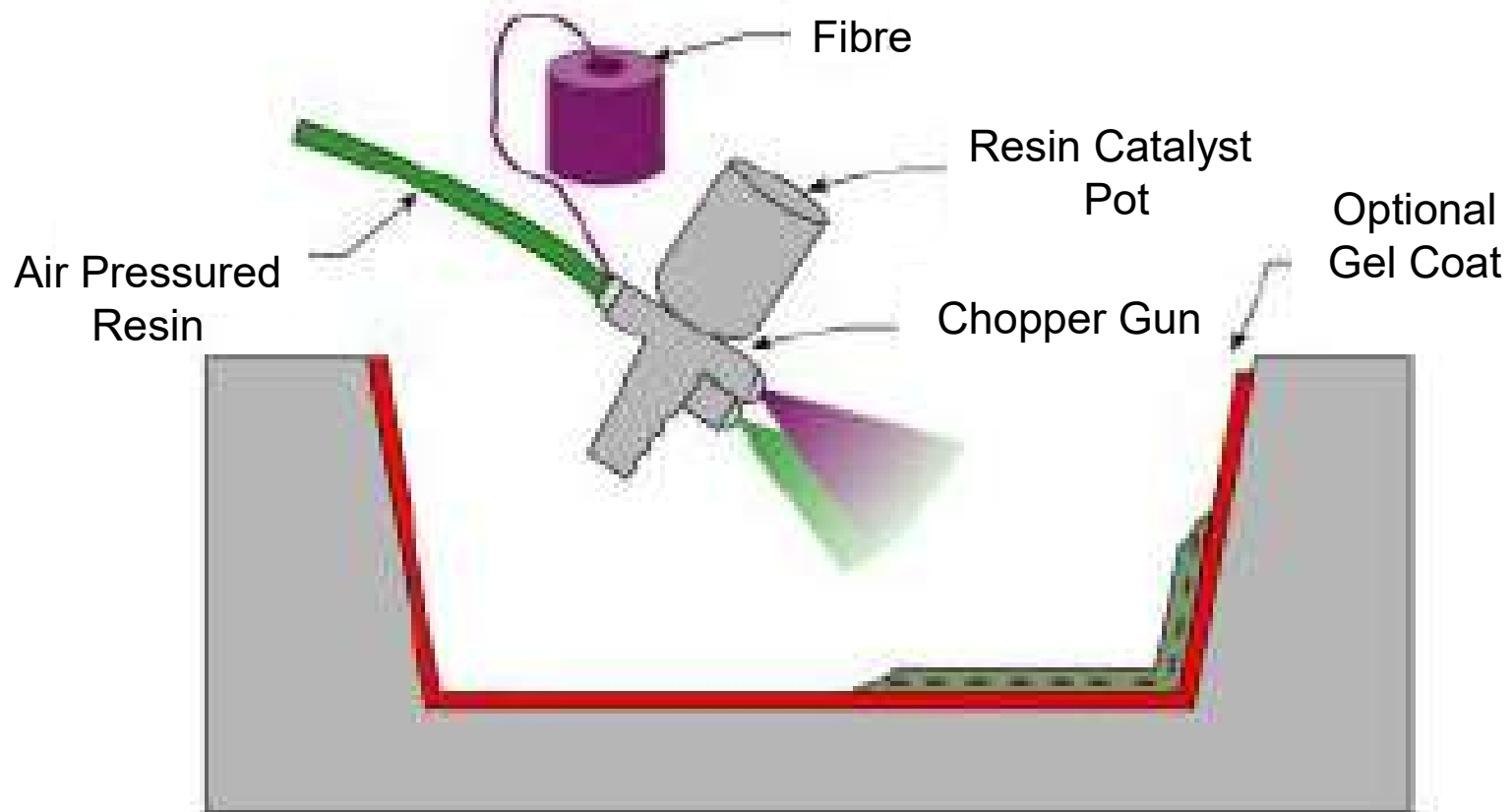


Masoud Motavalli

Press with a closing force of 1600 Tons makes the production of elements with a dimension of 2 x 3 m possible (compotech AG, Weinfelden)



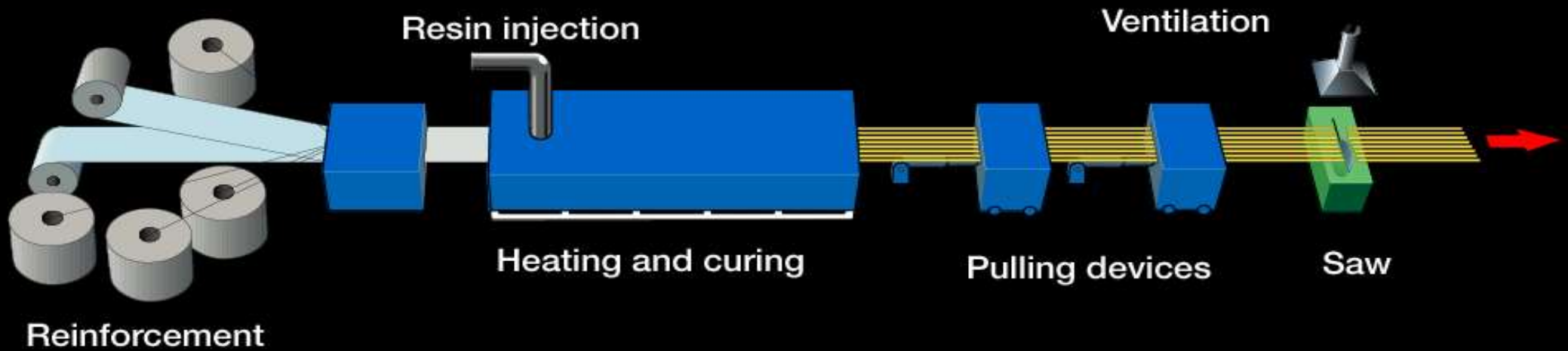
Spray Up



Robot

Fiber Spraying



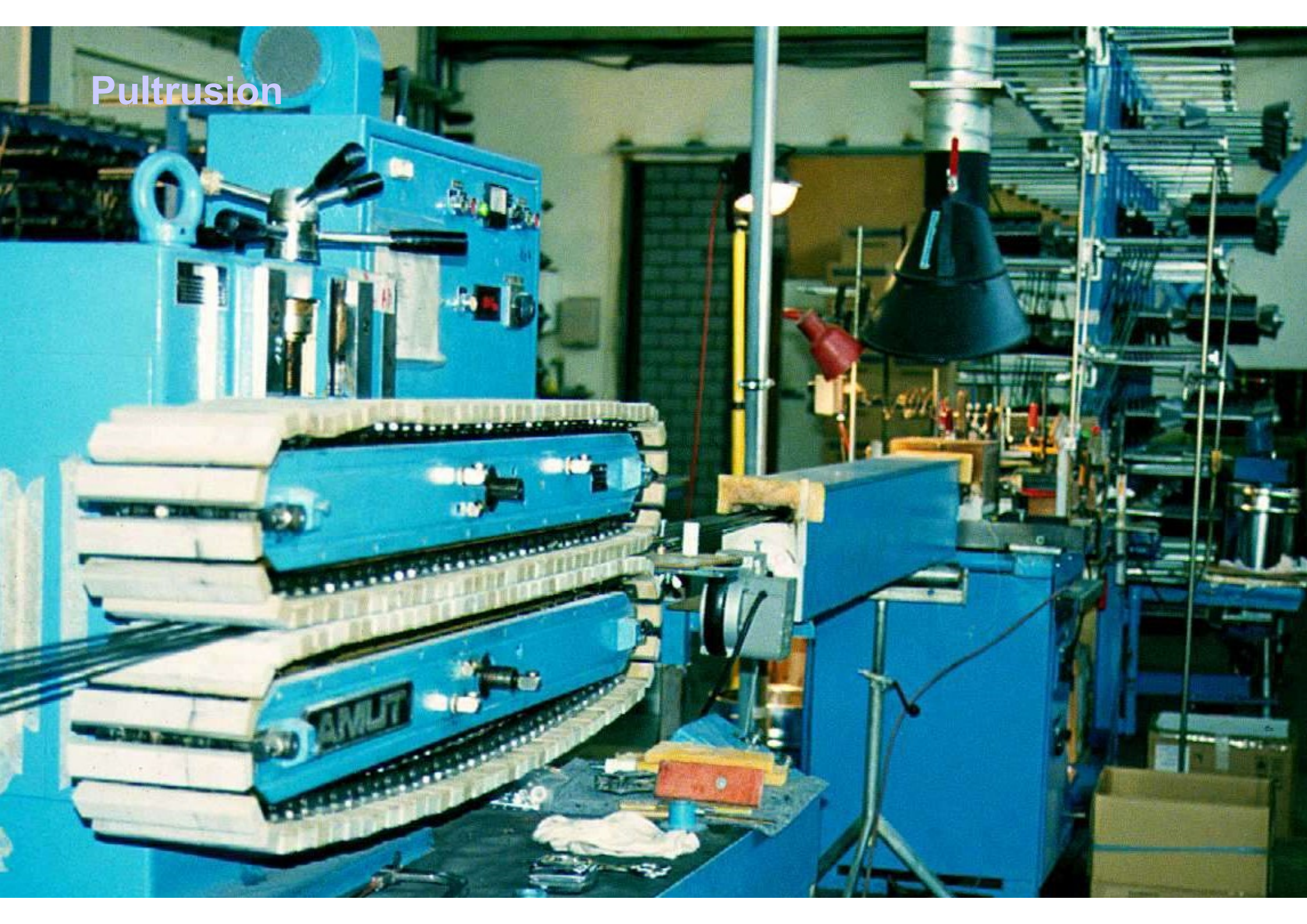


The Pultrusion Process

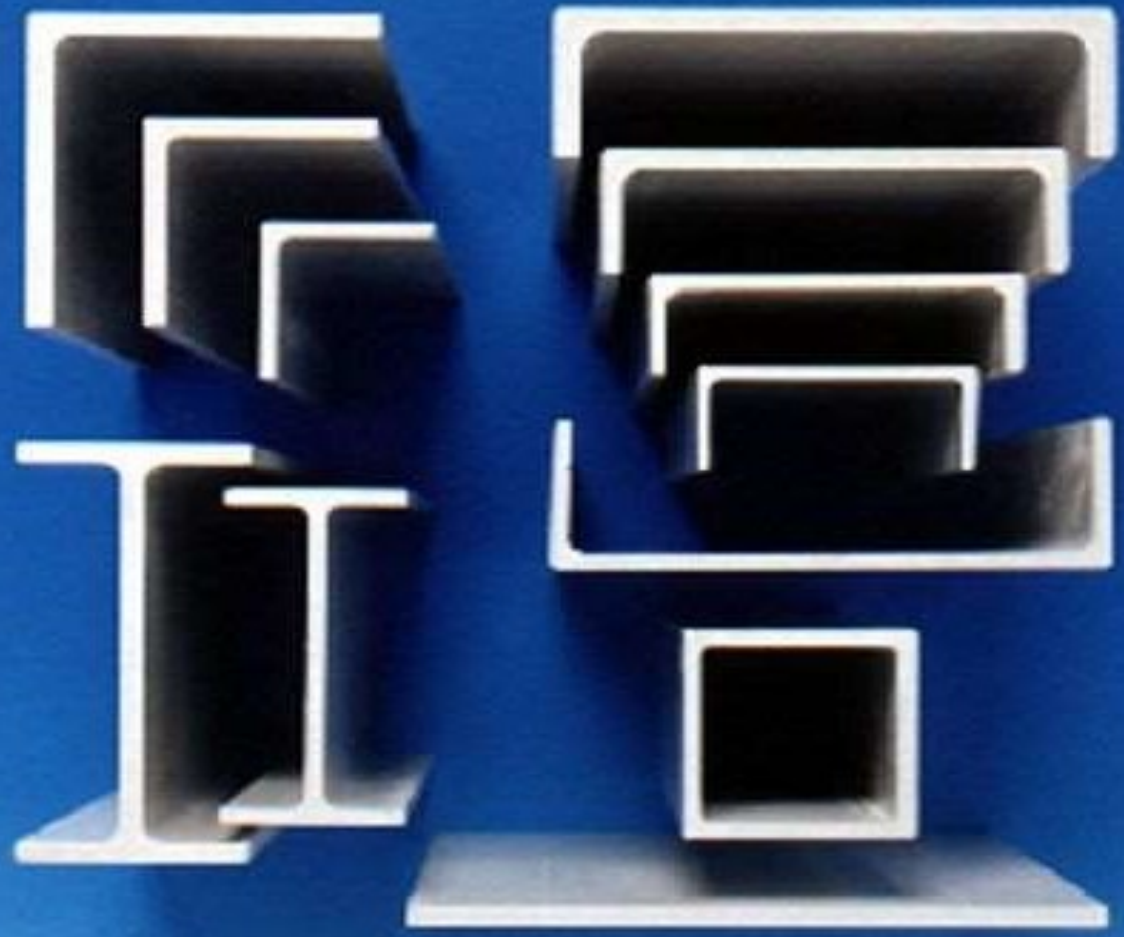
Pultrusion



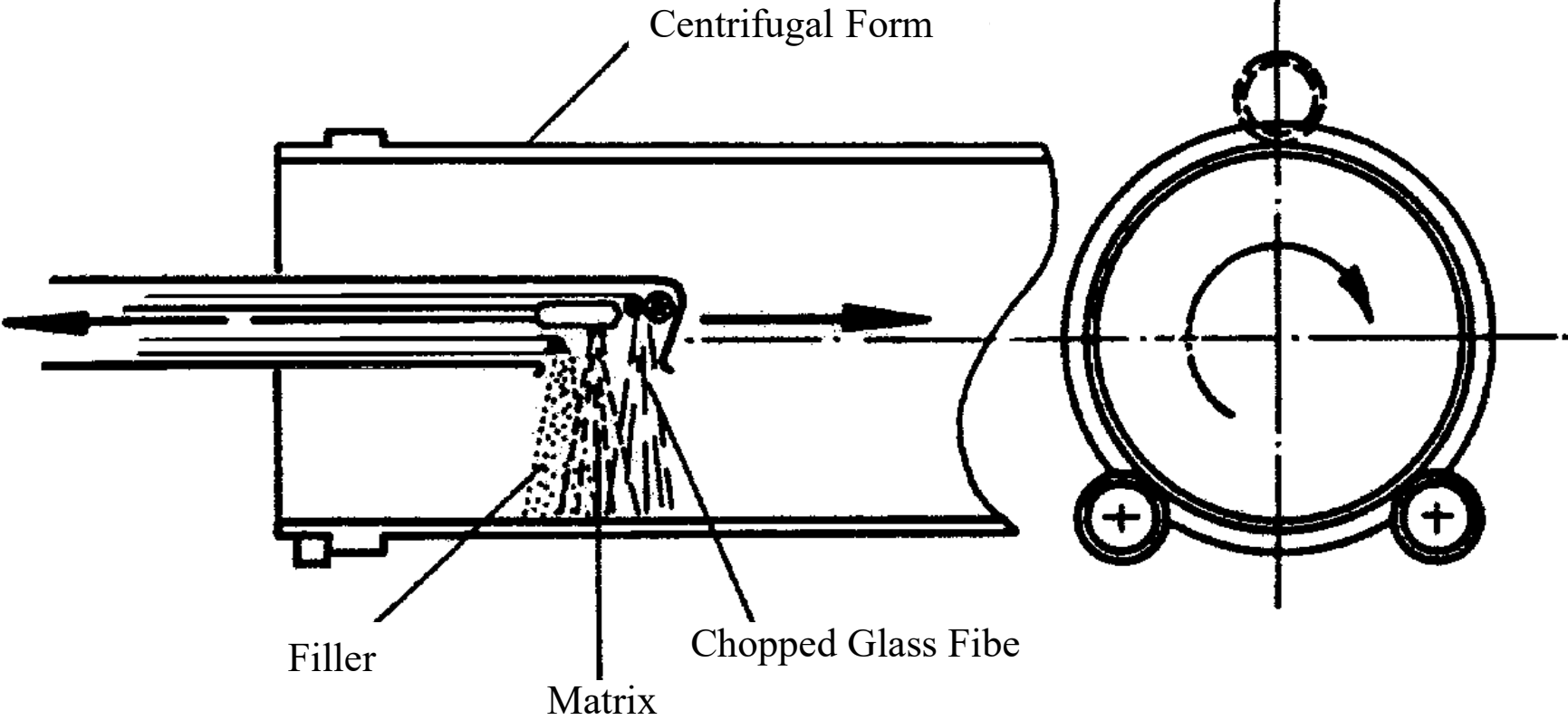
Pultrusion



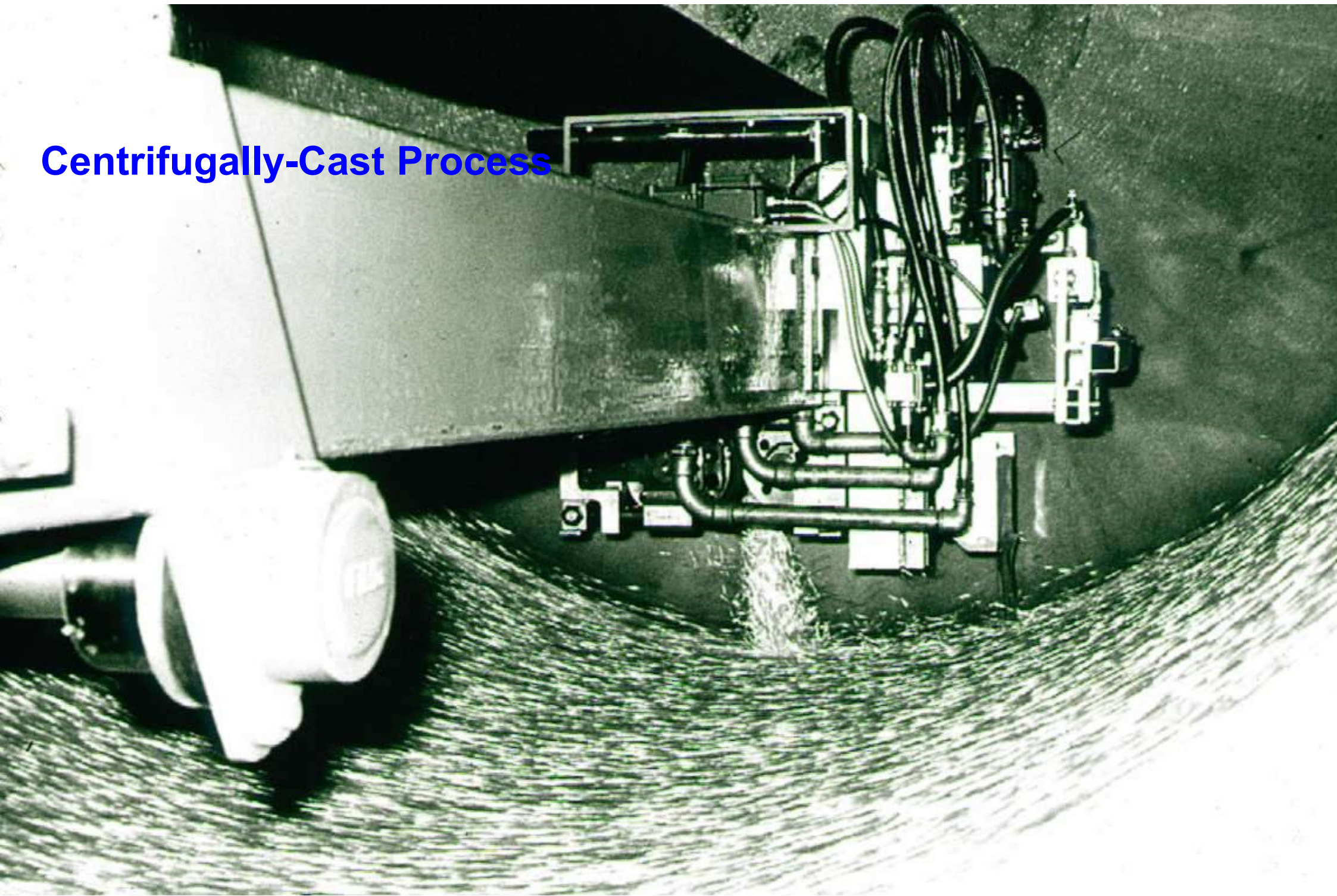




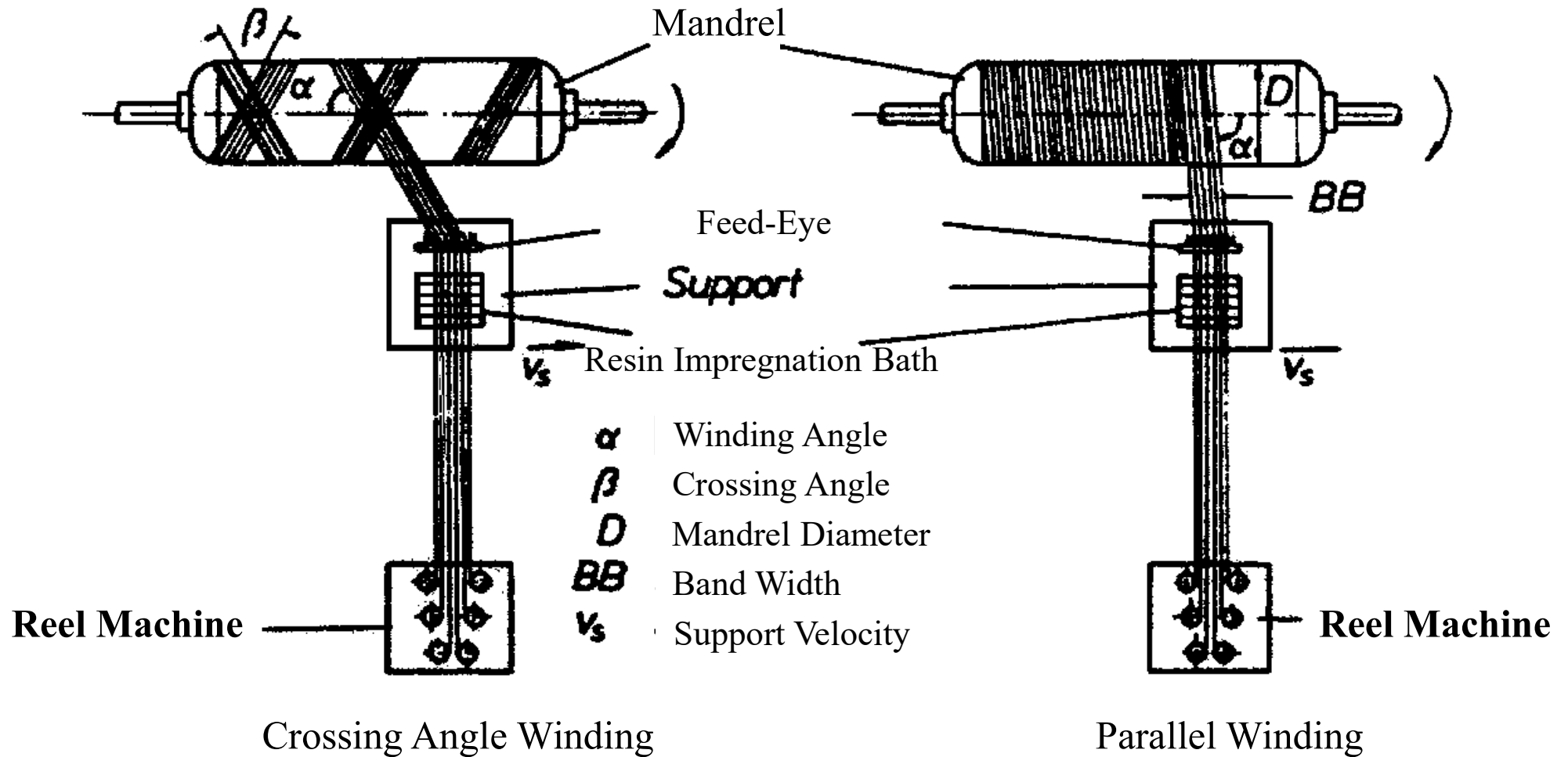
Centrifugally-Cast Process



Centrifugally-Cast Process



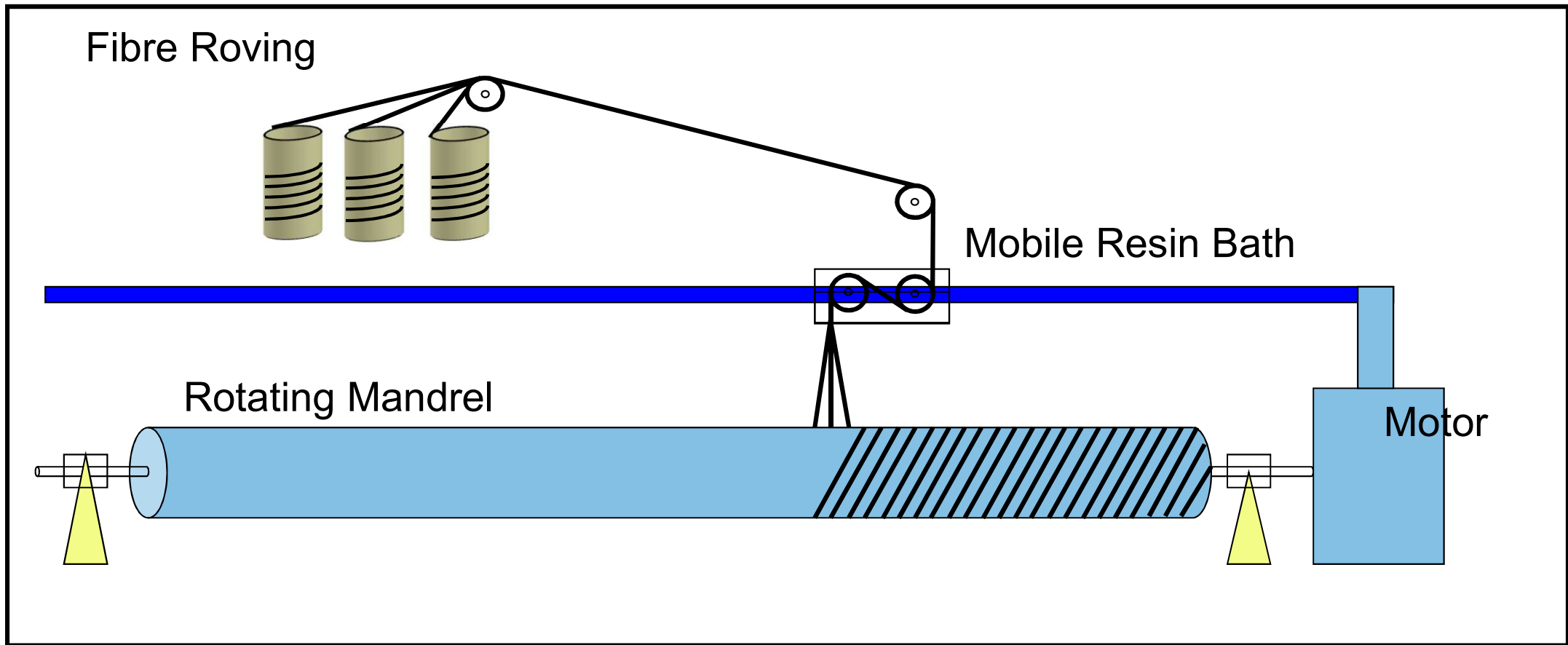
Filament Winding



Manufacturing FRP Materials

Filament winding:

- FRP tubes, poles, tanks, forms

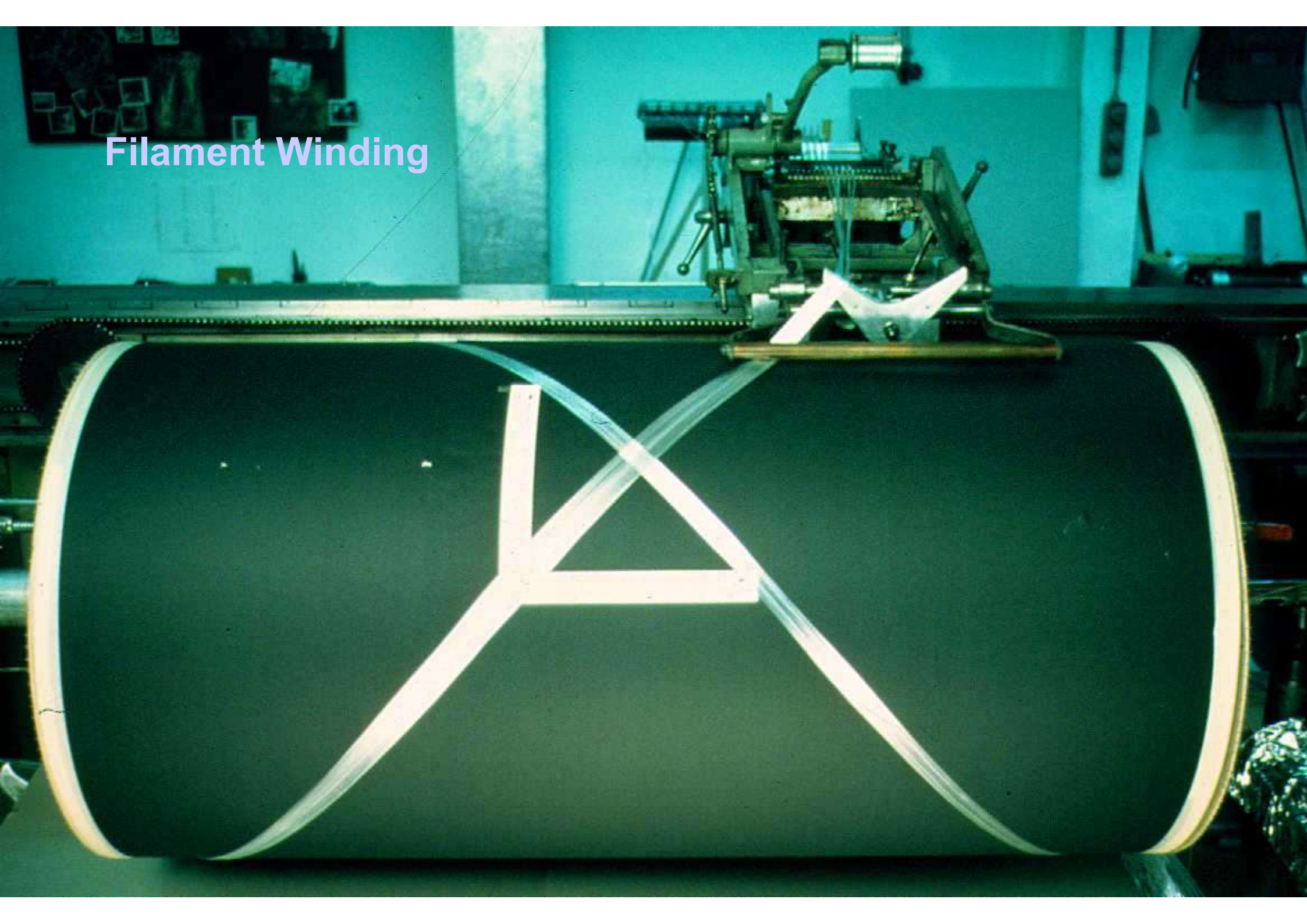


Manufacturing FRP Materials

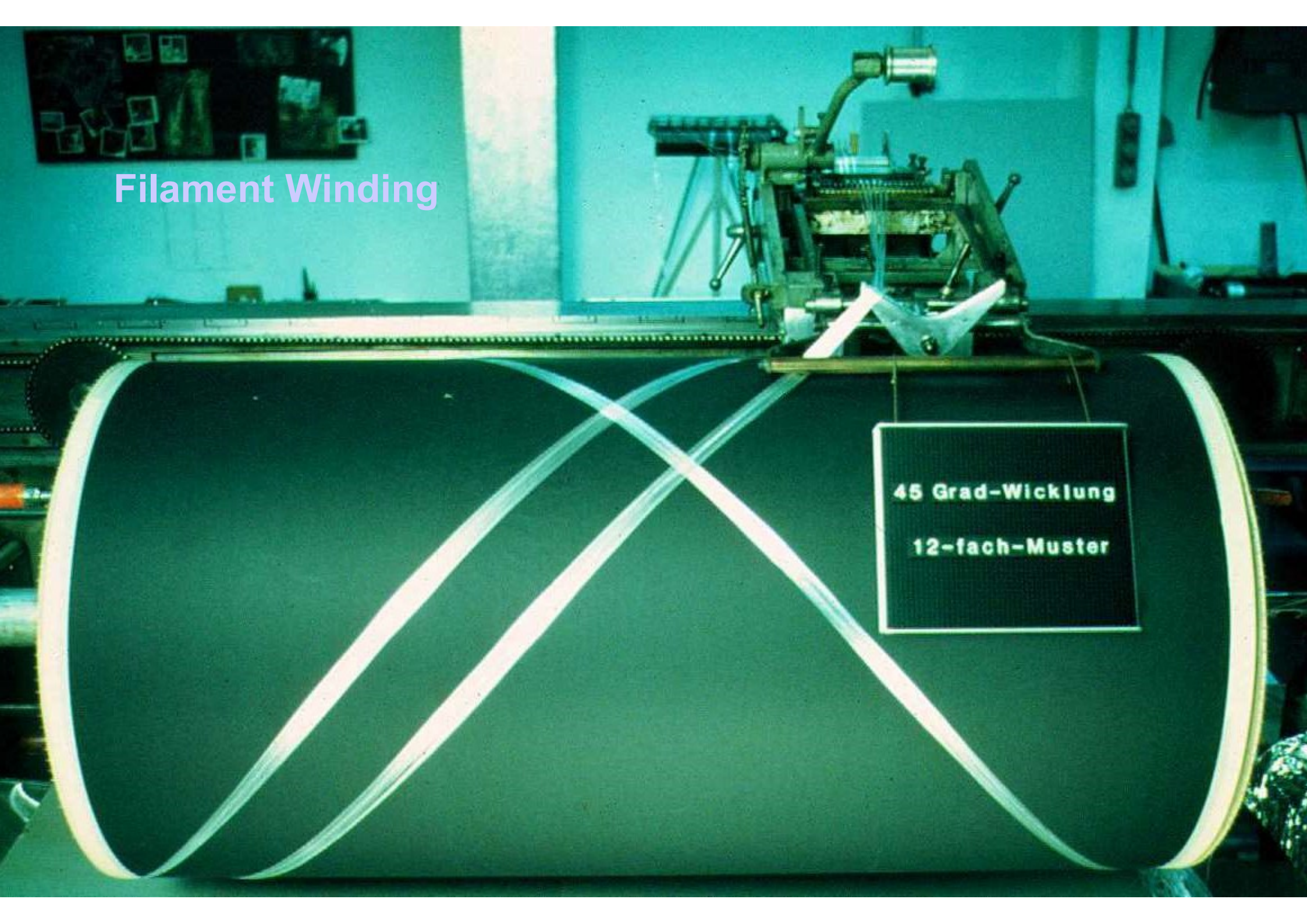
Filament winding



Filament Winding

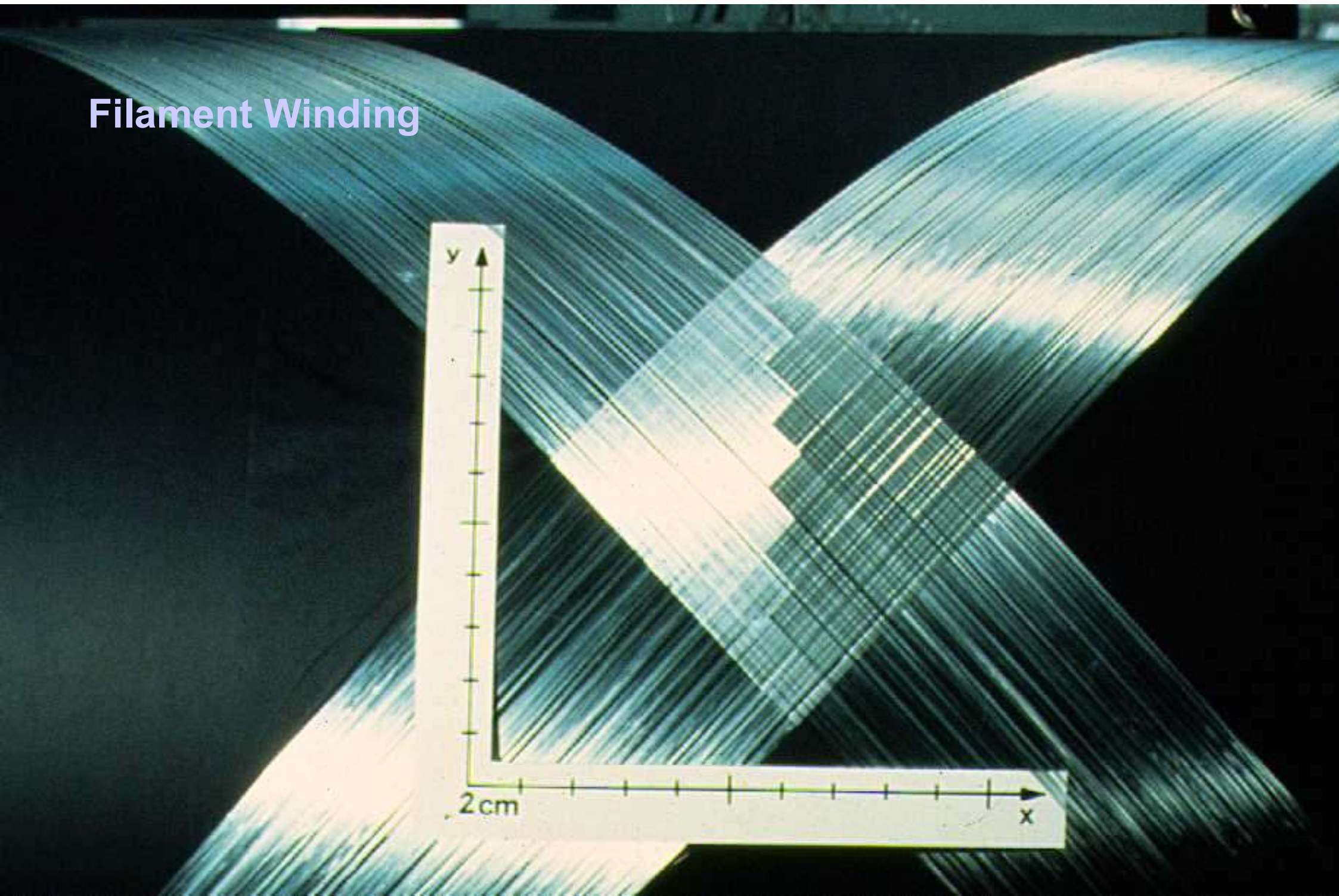


Filament Winding

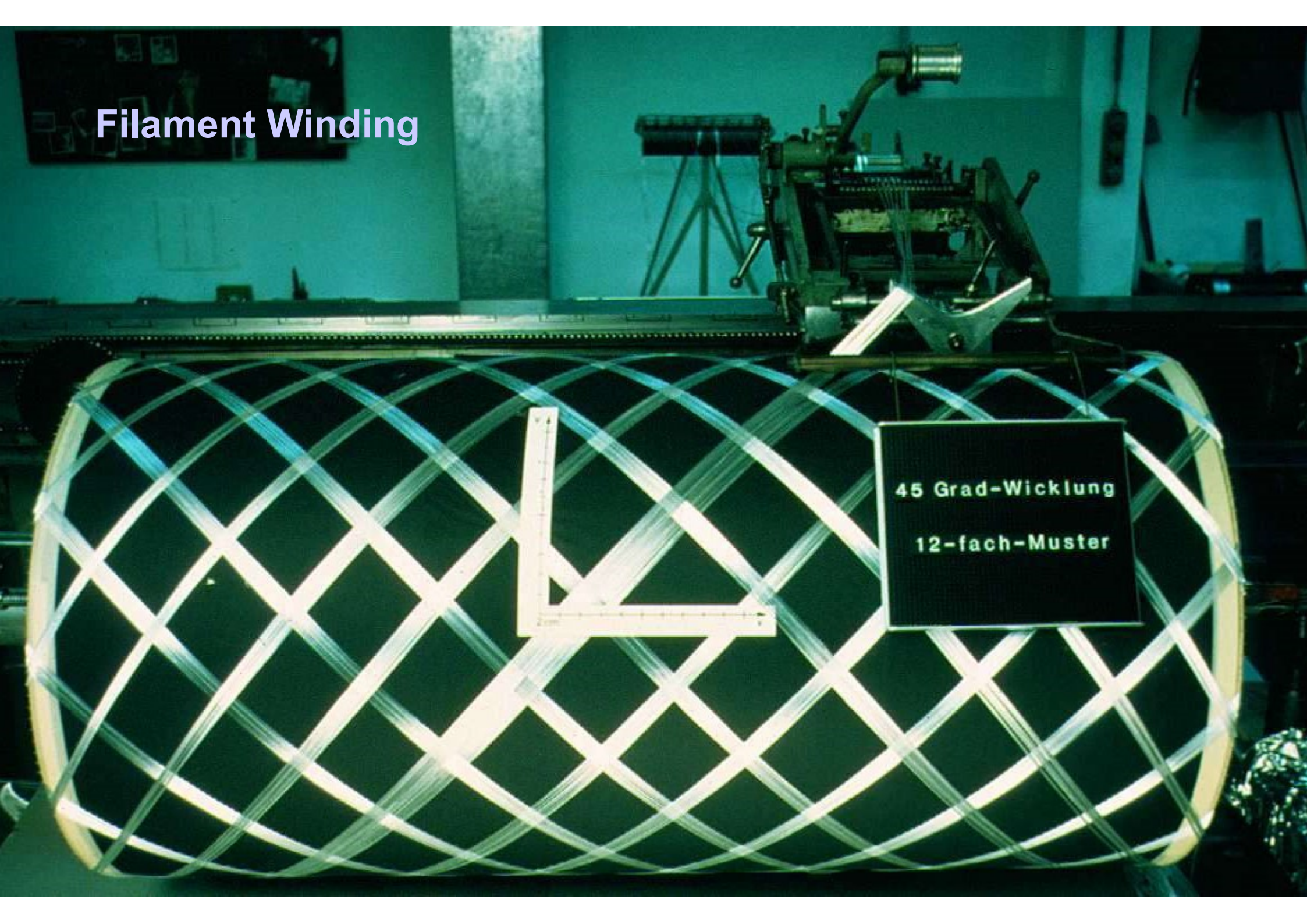


45 Grad-Wicklung
12-fach-Muster

Filament Winding

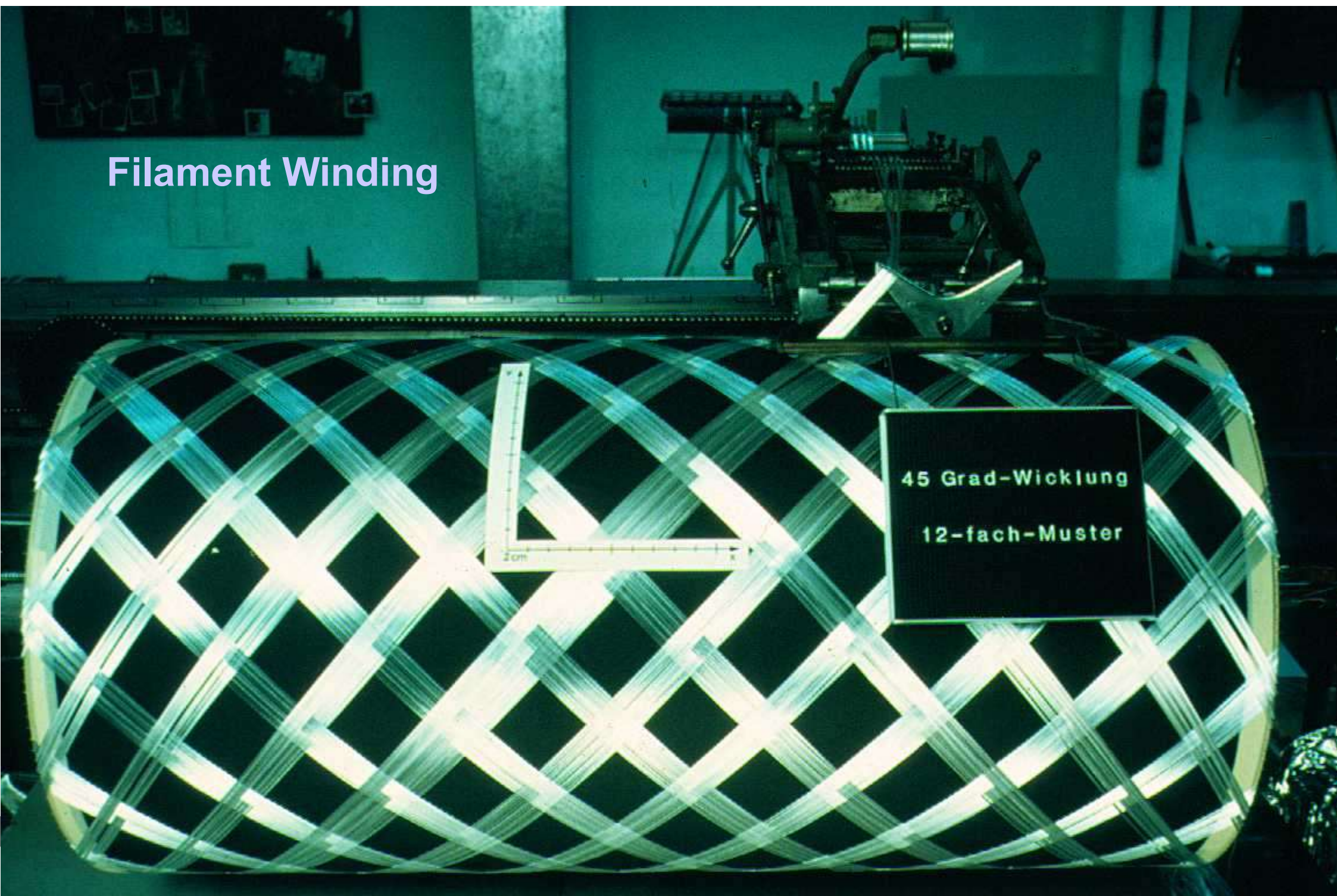


Filament Winding



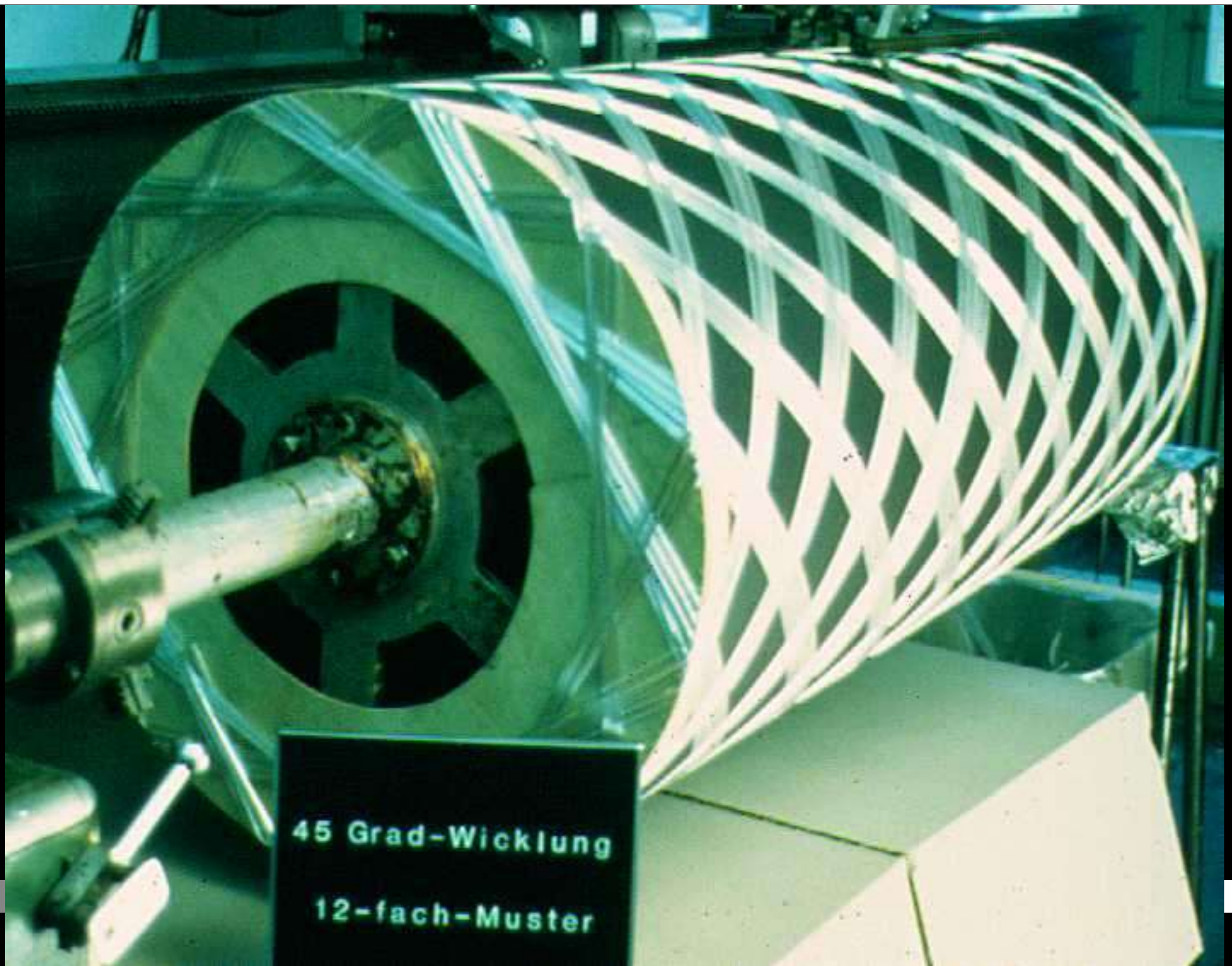
45 Grad-Wicklung
12-fach-Muster

Filament Winding



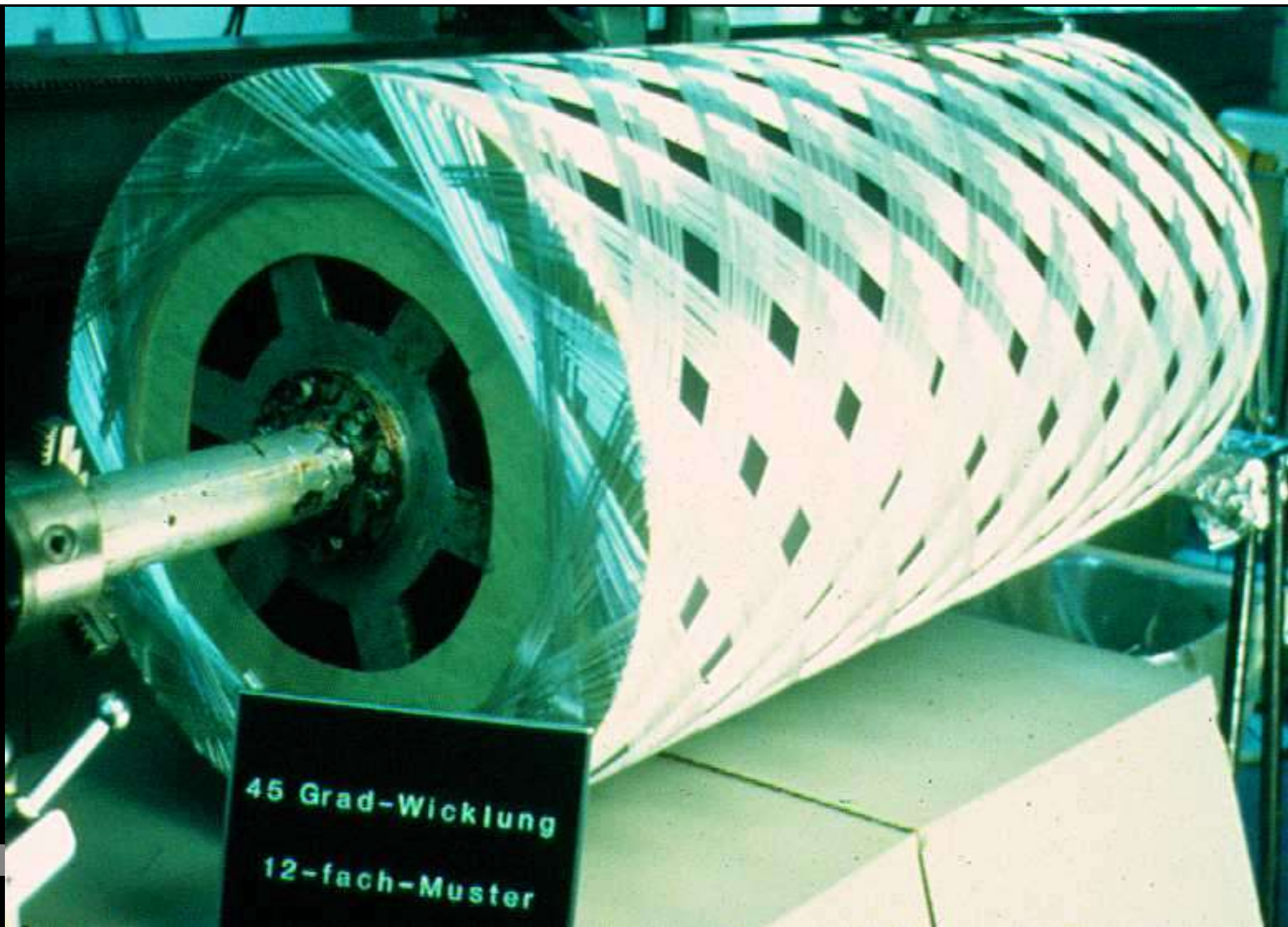
45 Grad-Wicklung

12-fach-Muster



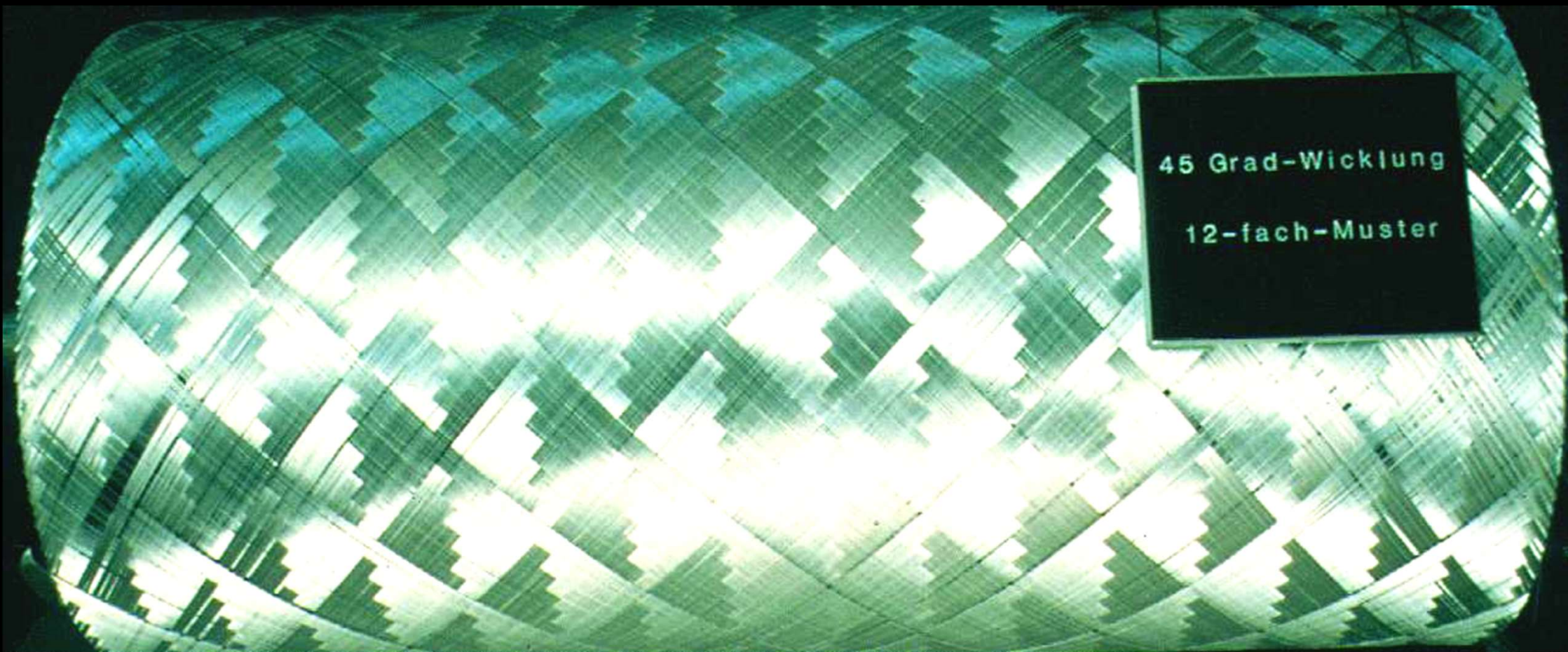
45 Grad-Wicklung

12-fach-Muster



45 Grad-Wicklung

12-fach-Muster



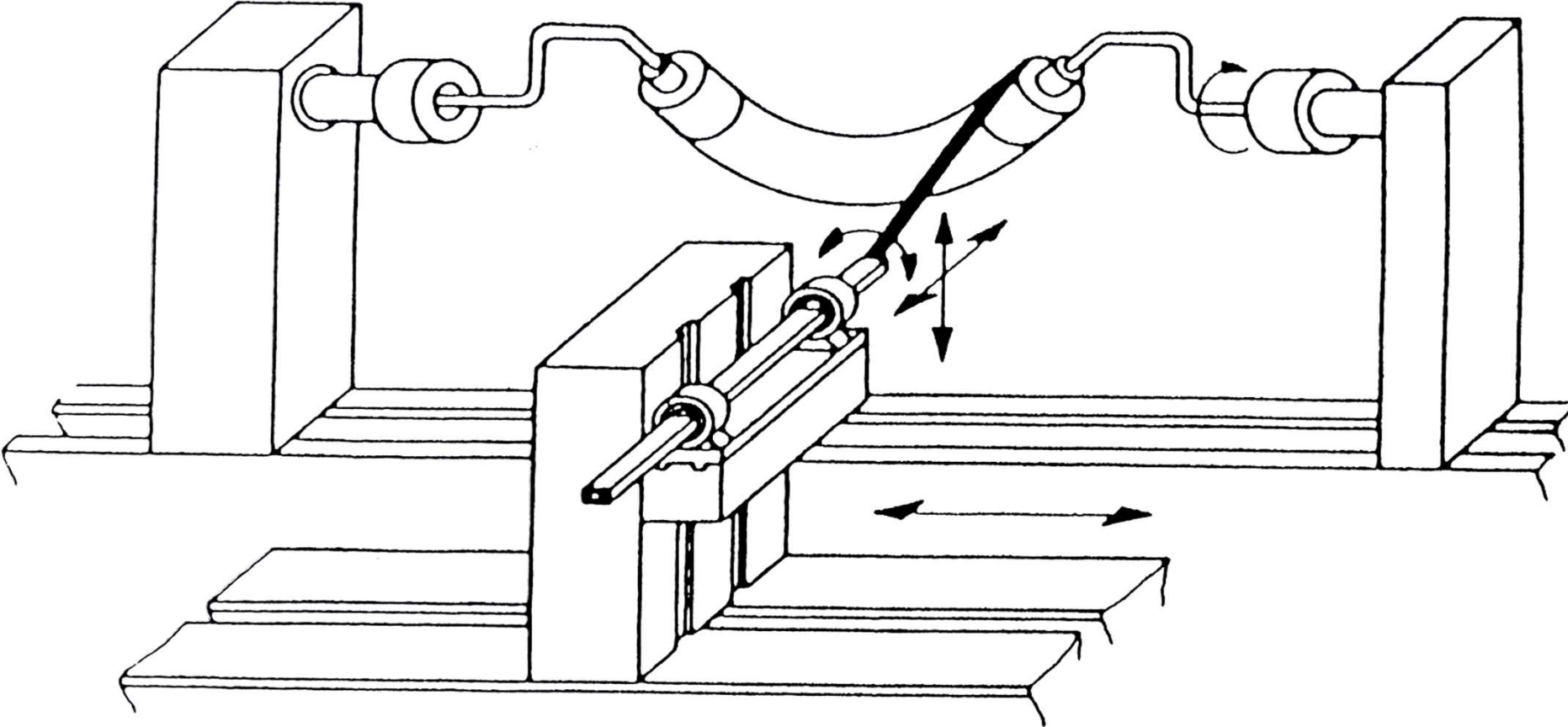
45 Grad-Wicklung
12-fach-Muster

Filament Wound CFRP-Shaft



$$T_{\text{nom}} = 102.7 \text{ kNm}, \quad m = 32 \text{ kg/m}$$

Filament Winding, Degree of Freedom



Filament Winding, another example

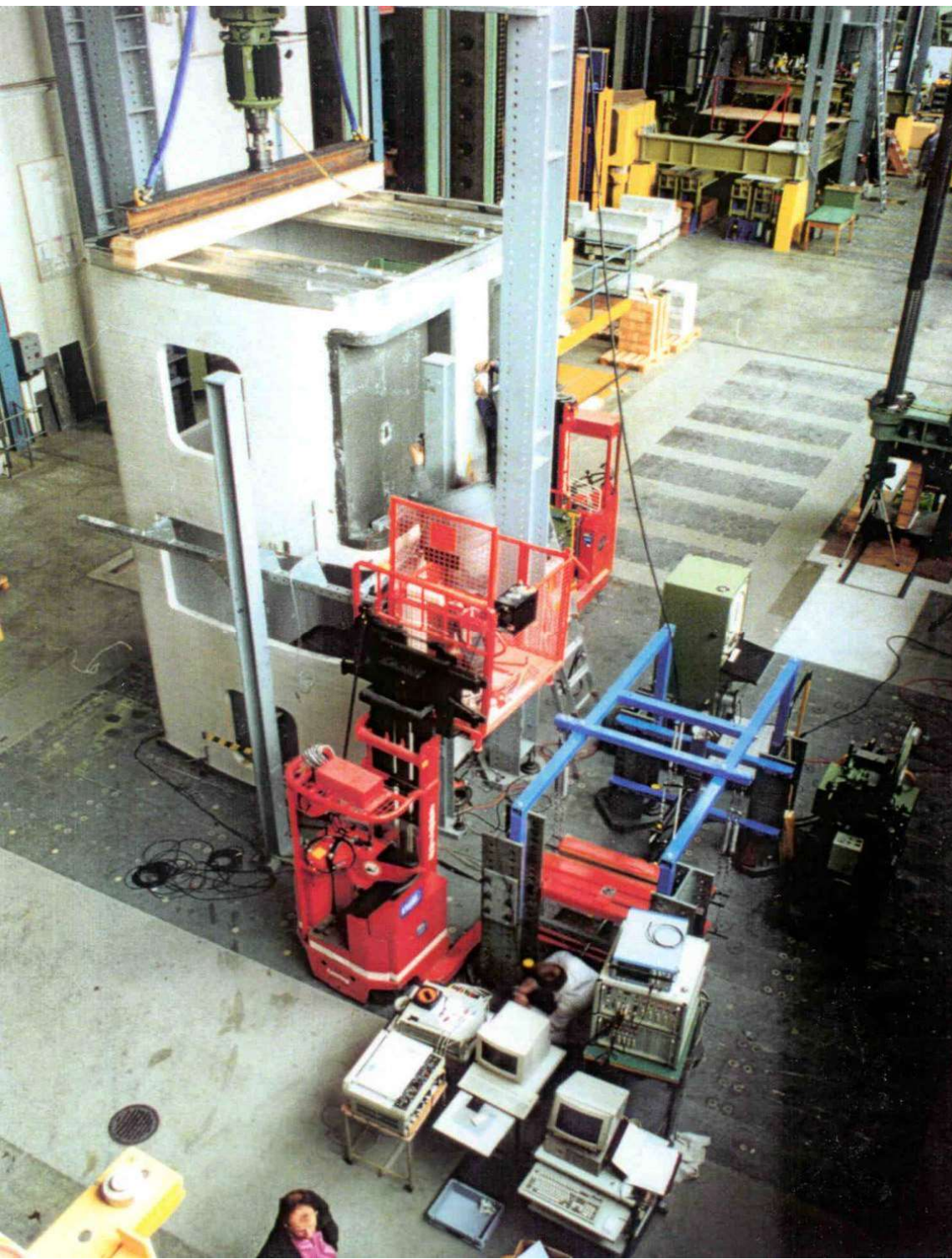


Schindler Waggon, made of GFRP



Schindler Waggon, made of GFRP





FRP Pre-Fabricated Component

