Progress in typical materials for agricultural machinery

Structure

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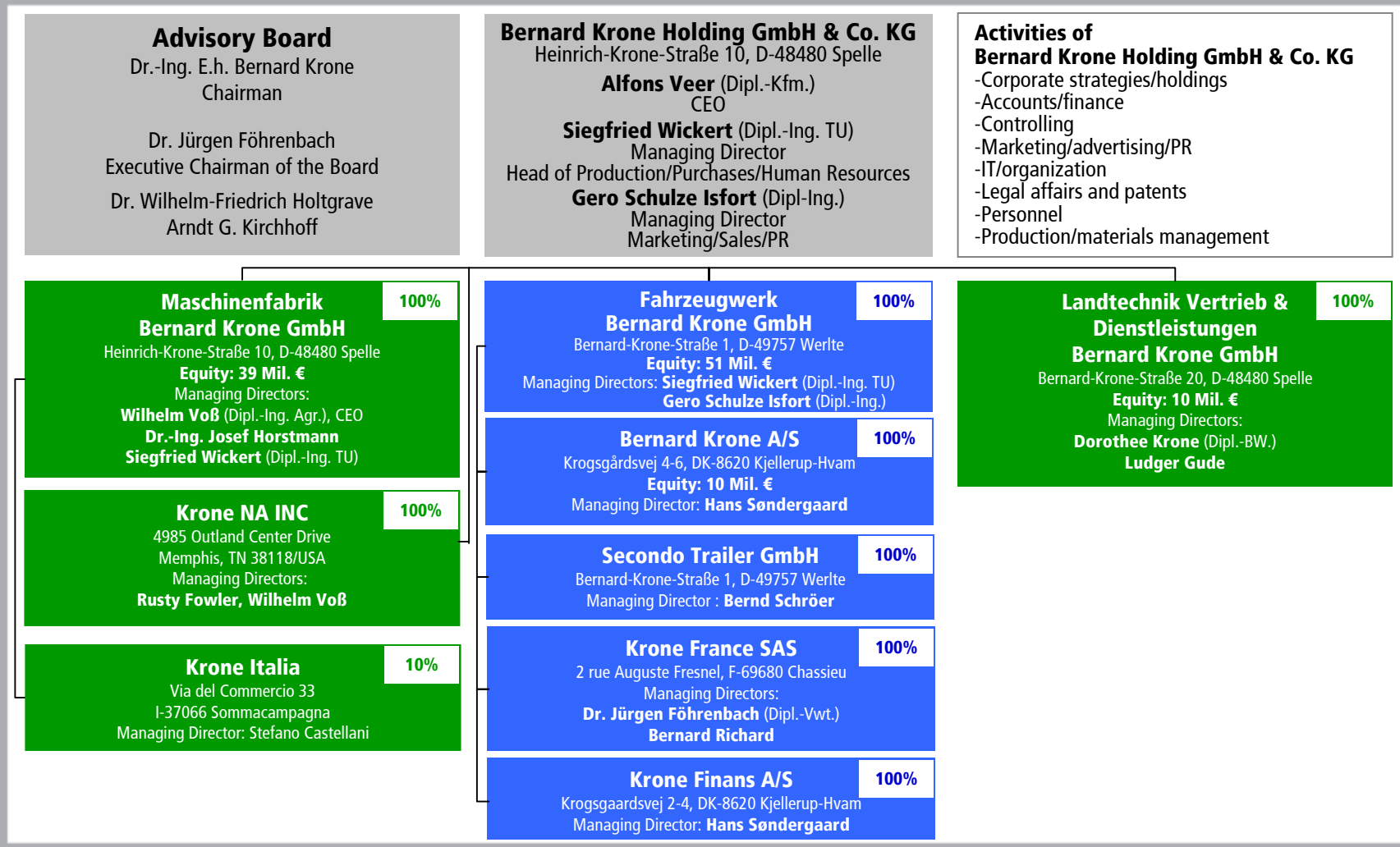
The Organizational Structure of the KRONE Group



Leader in technology for Hay & Forage equipment

Program:

- Full Line of Hay & Forage equipment
  - Mowers, Tedders, Rakes
  - Round & Large Square Balers
  - Forage Wagons
- Self-Propelled machinery
  - BiG M:
    First self propelled mower
  - BiG X:
    Most powerfull forage harvester

Employees: 761
Sales: 172 Mio. €

Commissioned Production

Program:

- Refrigerated trailers
- Semitrailers / Drawbar Trailers
- Container chassis
- Swap bodies
- Truck bodies

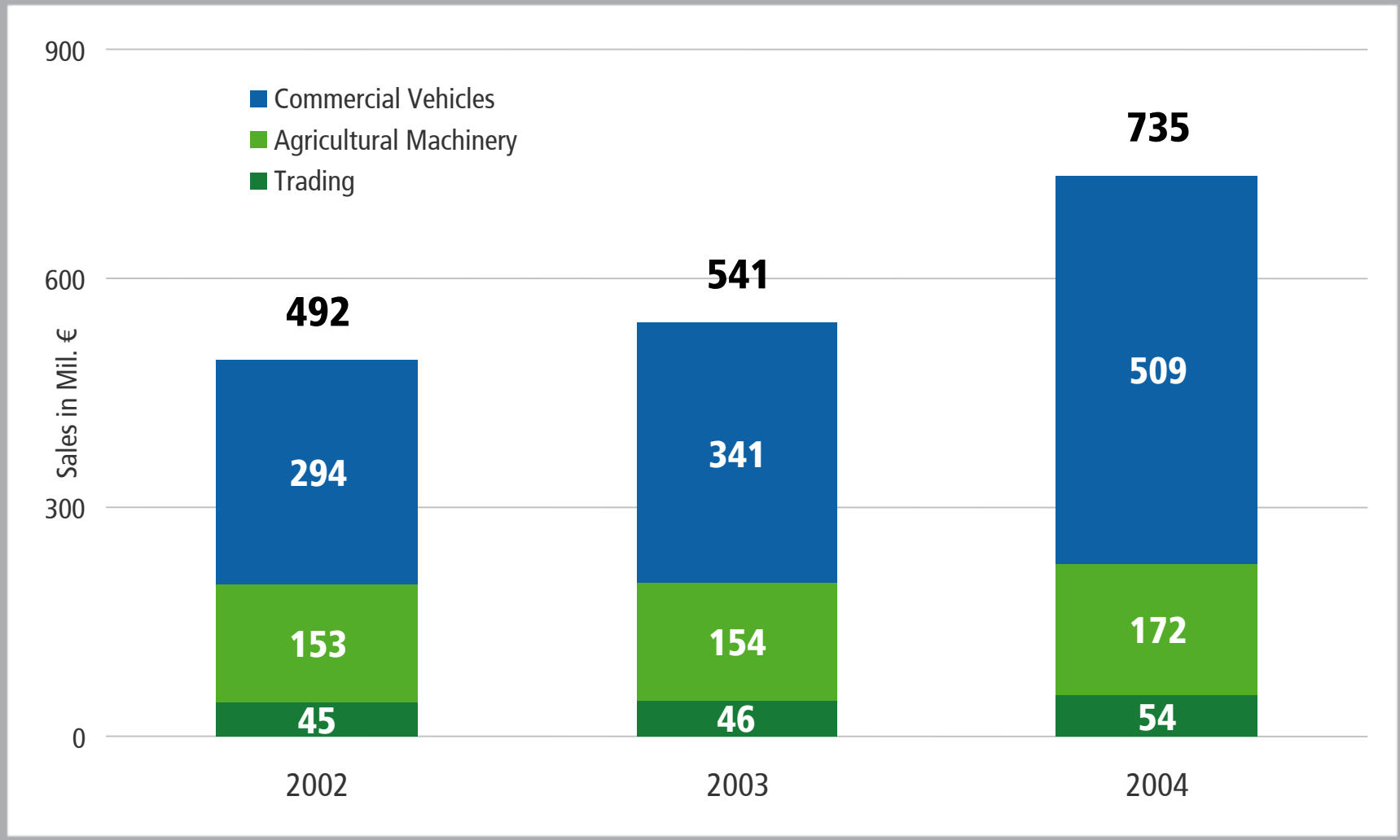

Trade/Service

Program:
Representation of leading Ag equipment, and supply's Farmers, Contractors & Machine Rings

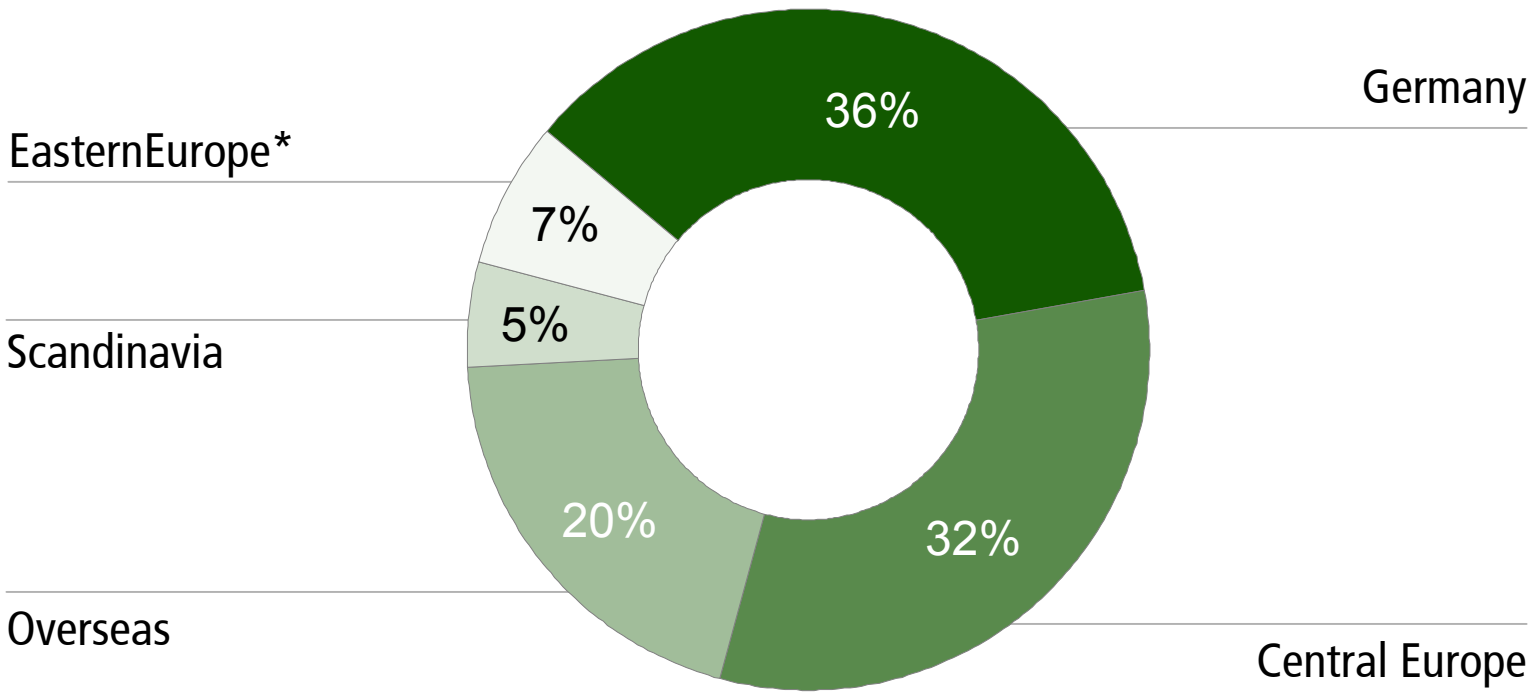
- Ground care machinery
- Agriculture spare parts service
- After sales service and Workshop



Sales Trend of the KRONE Group by Division

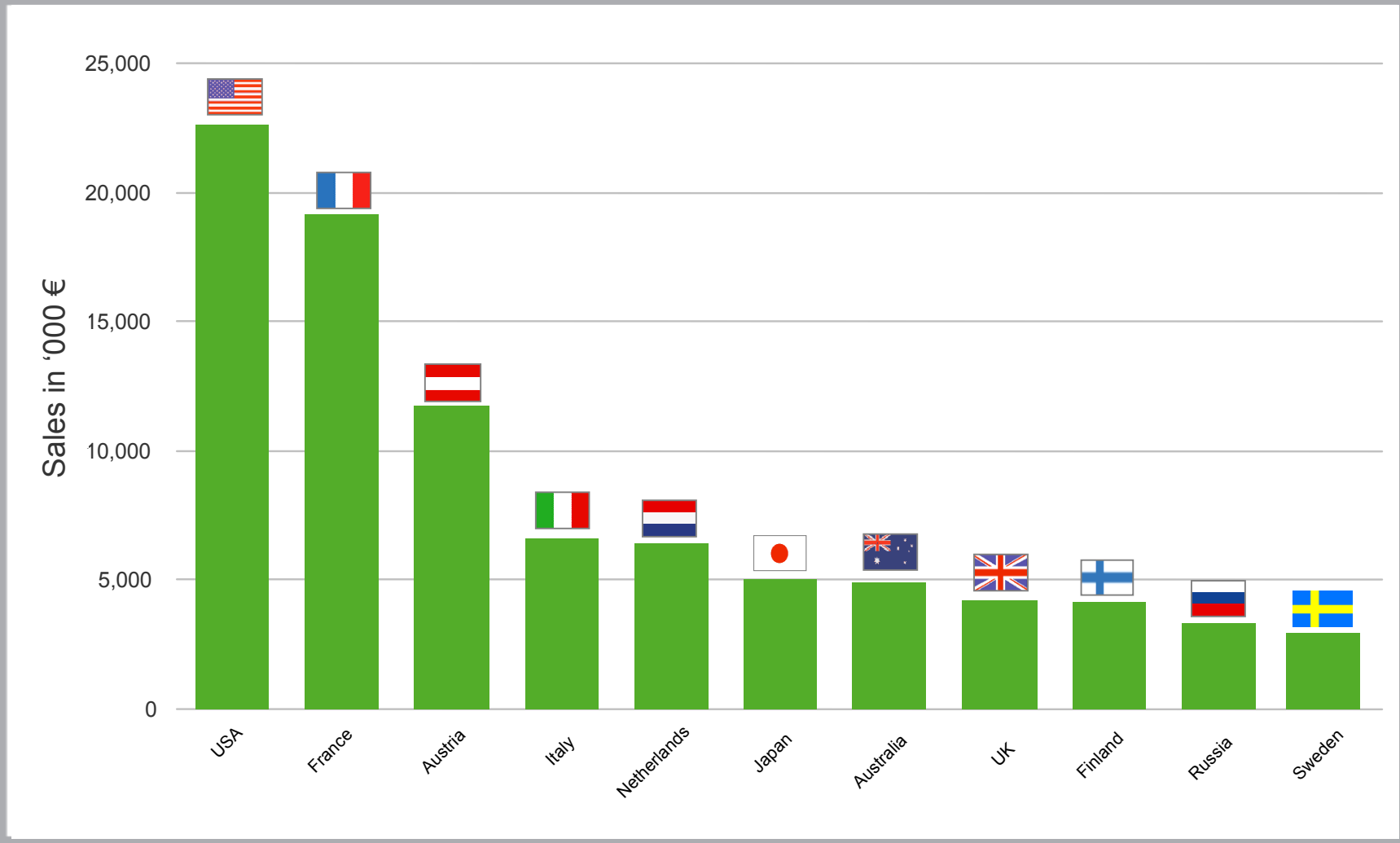


Regional Sales Breakdown: Agricultural Machinery Division, 2004



* Former Eastern Bloc

The Strongest Export Sales Countries 2004



1. Introduction

Milestones of development

- Combination of several process steps in one machine.
- Oil hydraulic drives and controls.
- Electronic controls.
- Extreme increase in the performance of individual machines.

Reasons for development of material

- Higher load on the components due to increased machine performance.
- In parts, light-weight design is imperative on account of legal regulations and avoidance of soil compaction.
- Increase of the resistance to wear due to higher loads on components and higher area capacities.
- Increased demands on lifetime of professional agricultural machines.
- Increased demands on design and ergonomics of the machinery.

2. Groups of materials

2.1. Structural steels

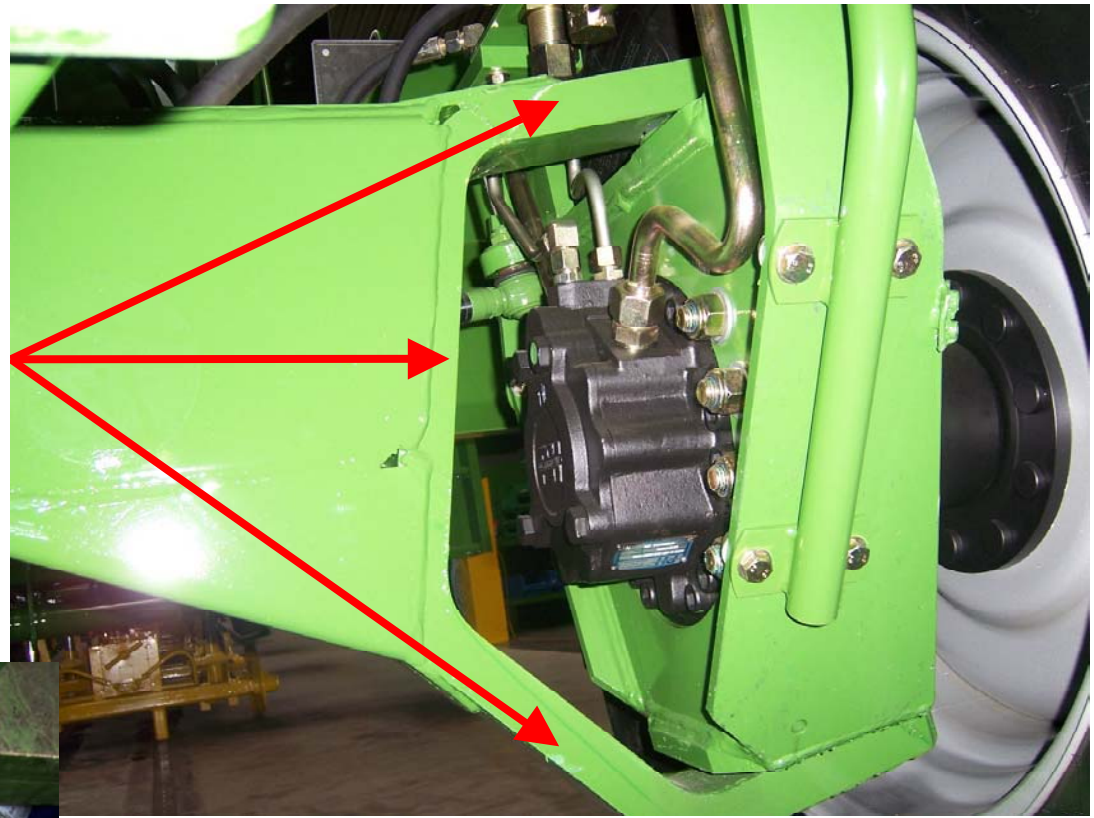
Frames of fine-grained structural steel

Material comparison of structural steels

Designation			Apparent yielding point	
DIN (old)	EN			
USt 37-2	S235JRG1	1.0036	240 N/mm²	General structural steels
St 52-3	S355J2G3	1.0570	360 N/mm²	
QStE 380 TM	S380MC	1.0978	380 N/mm²	Fine-grained structural steels
QStE 690 TM	S700MC	1.8974	690 N/mm²	

2.2. Alloyed steels

K 27V



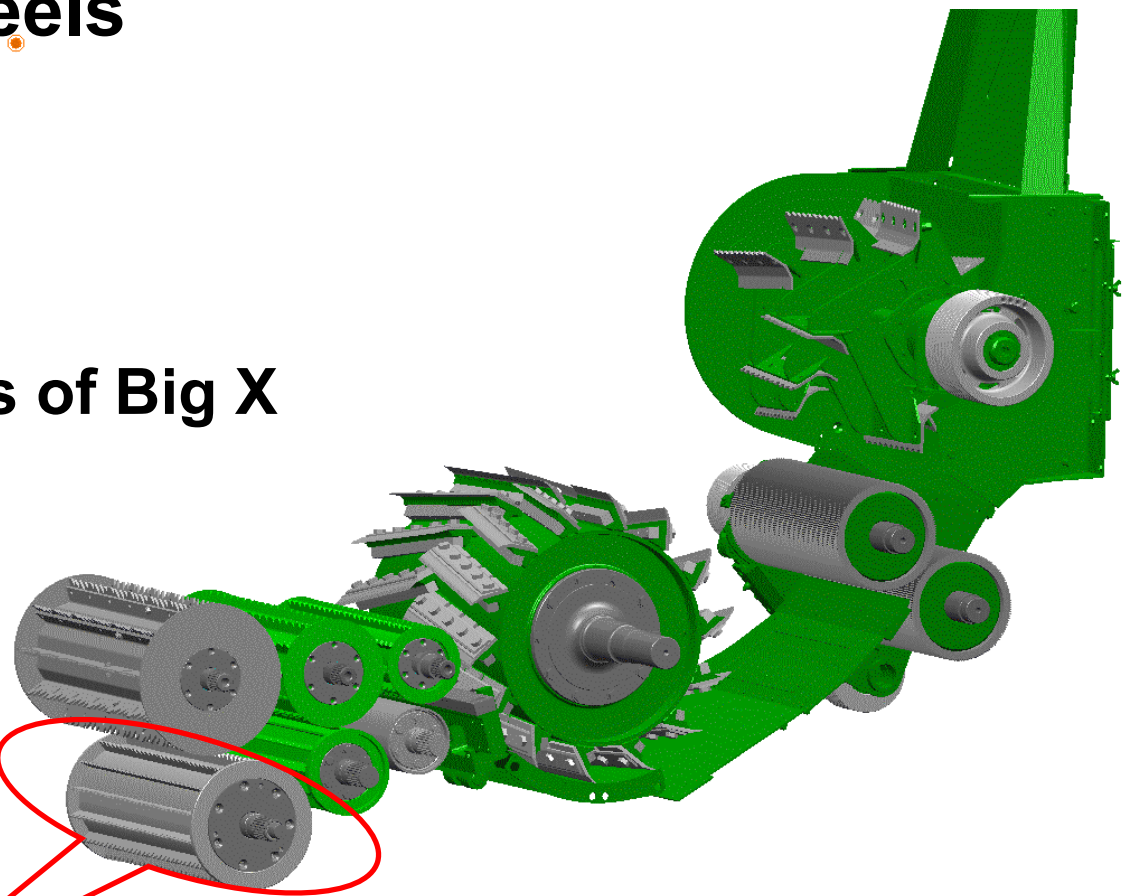
42CrMo4V

18CrNiMo7-6

Non-Corroding Steels

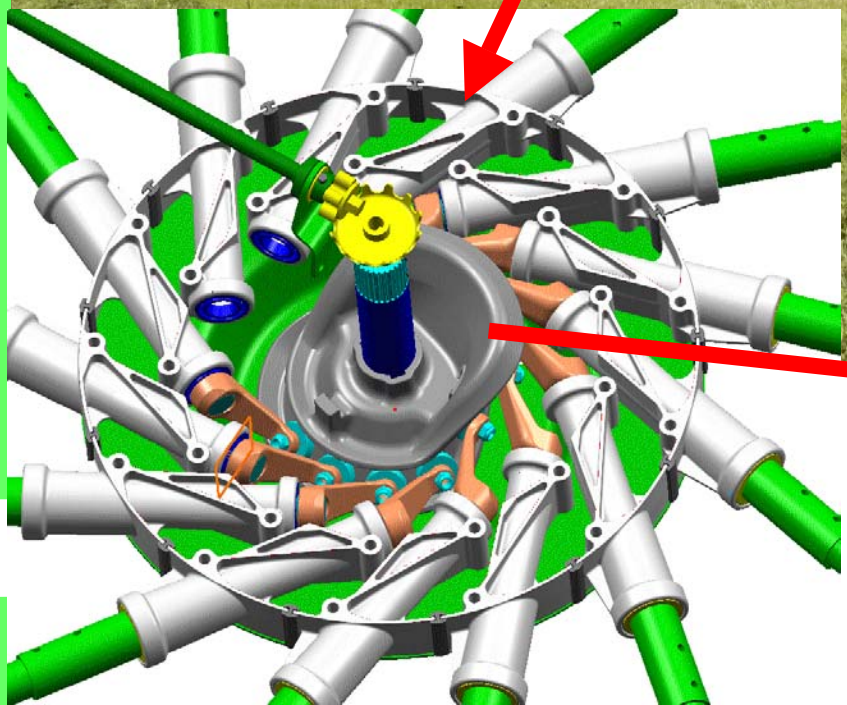
Pre-compression rollers of Big X

made of X15CrNiSi2520



Metal Detector inside

2.3. Cast materials



ADI „austempered ductile iron“

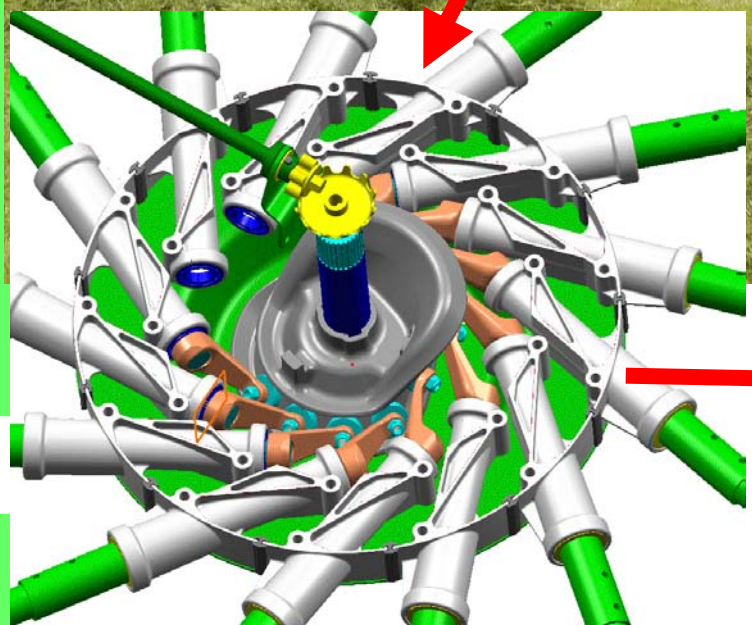
2.4. Light alloys

Maize header EasyCollect

AlSi7MgO

Minus 120 kg!

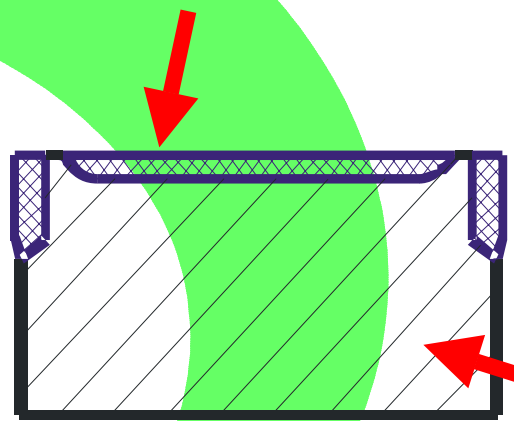
Bearing housing of the swather tine arms



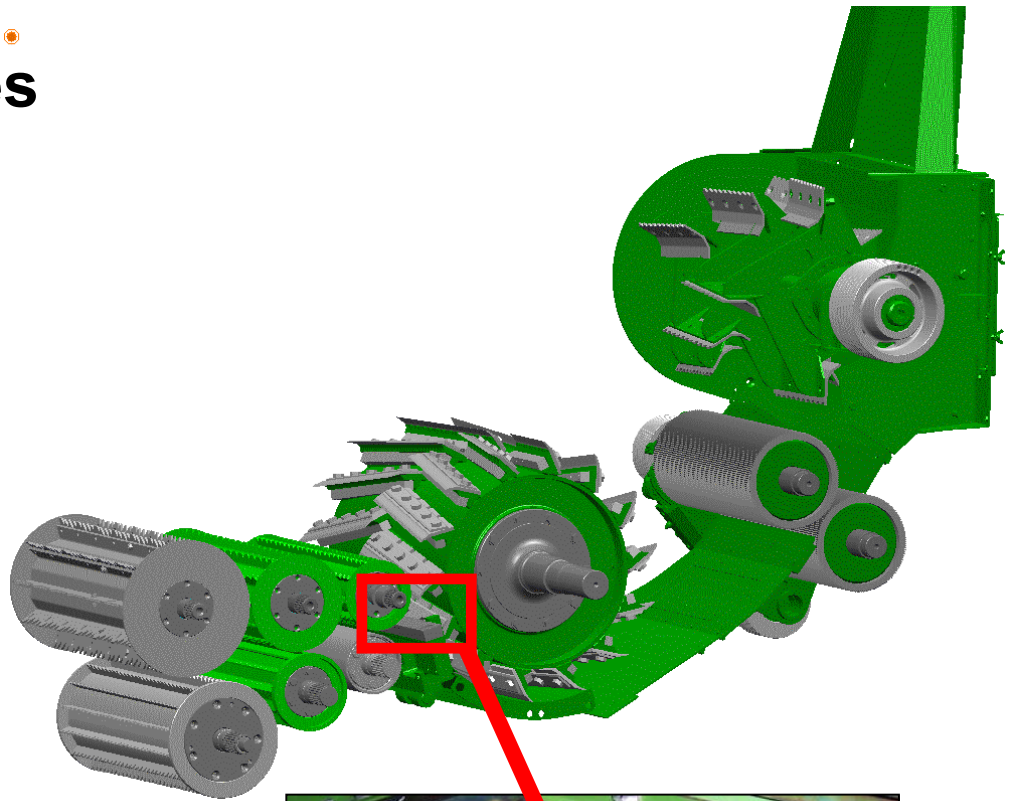
2.5. Wear-resistant materials

Blades and Counterblades

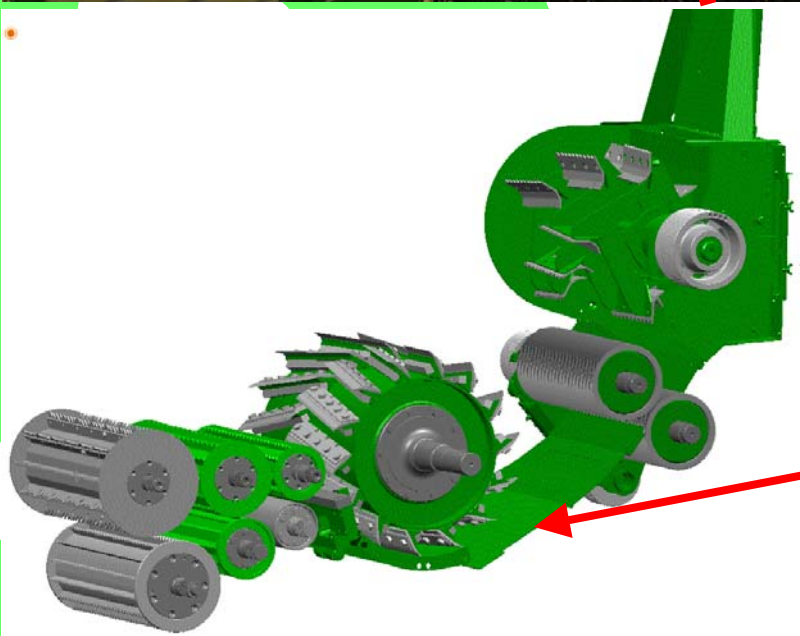
Tungsten carbide bedded
in a matrix of NiCrBSi



Counterblade



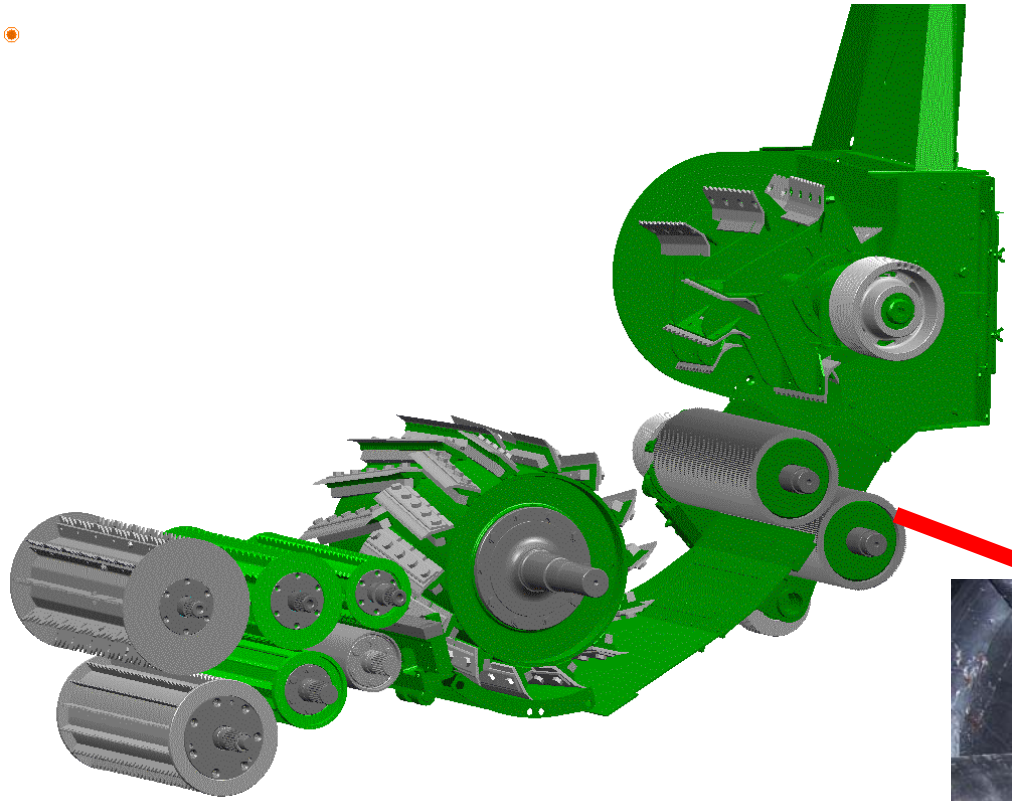
Wear plates

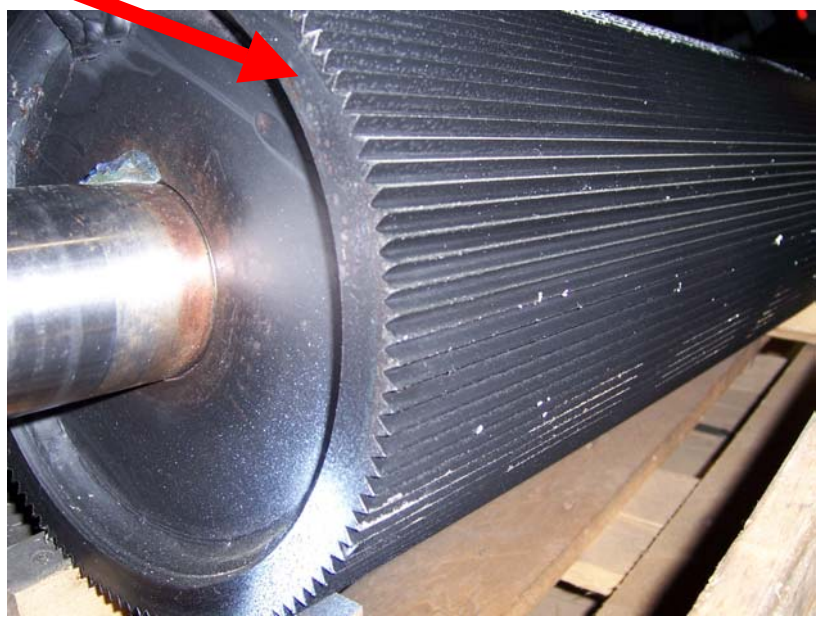


Hardened wear plates

Made of HARDOX

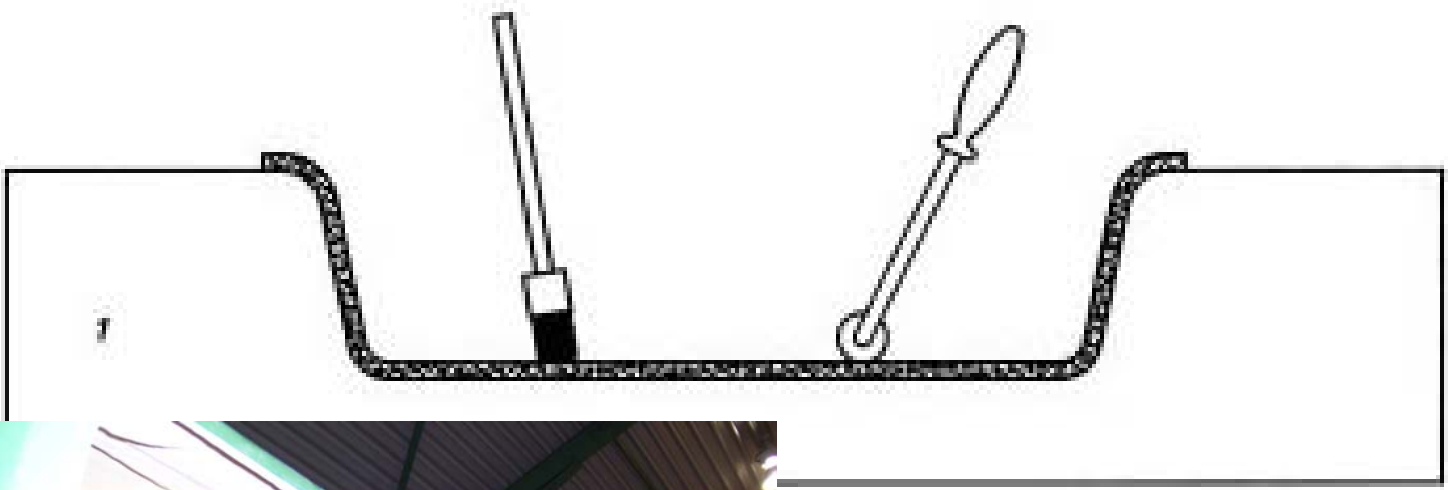
Corn Cracker



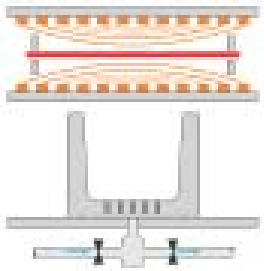


4.6. Plastics Machine panelling

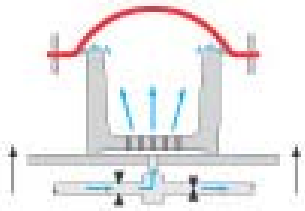
Hand laminate process of glass-fibre reinforced plastic



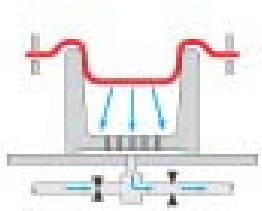
Principle of the thermo-forming process



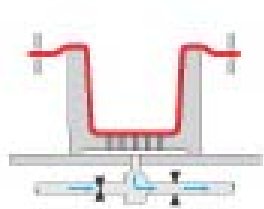
Both sides of the plate are heated until elastically mouldable.

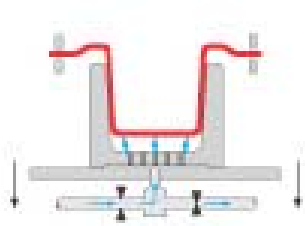


Pre-stretching of the hot plate by blowing in compressed air.



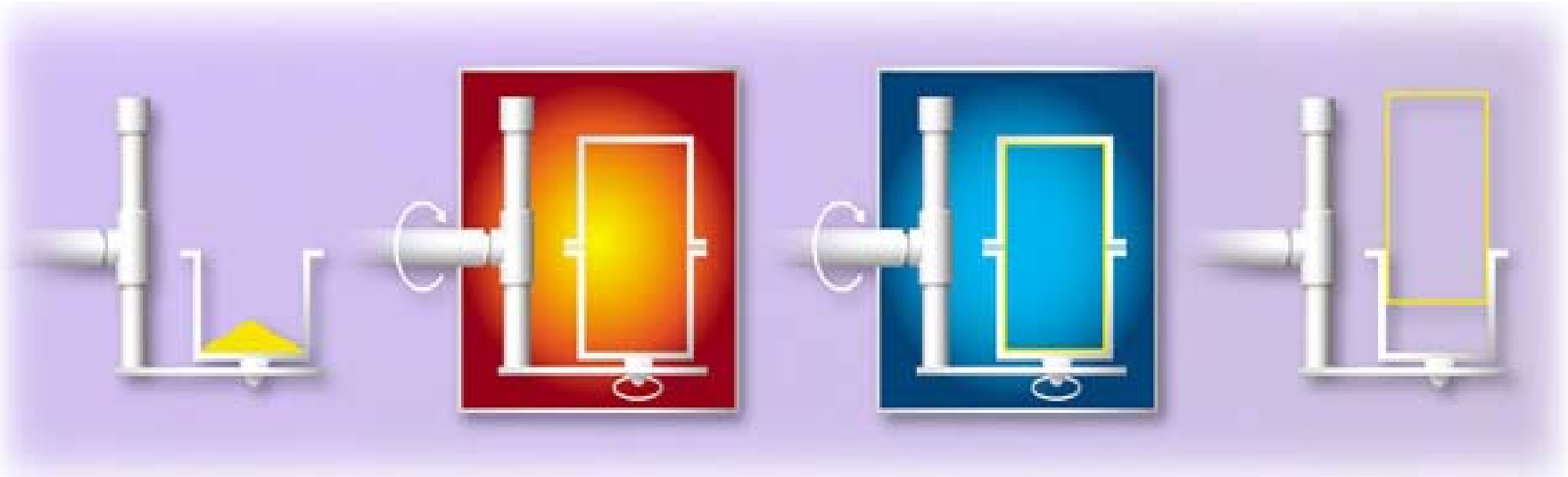
The air between the plate and tool is drawn off until the plate completely contacts the mould. A cooling air blower is used to cool down the plate.





The shaped part is detached by blowing in compressed air.

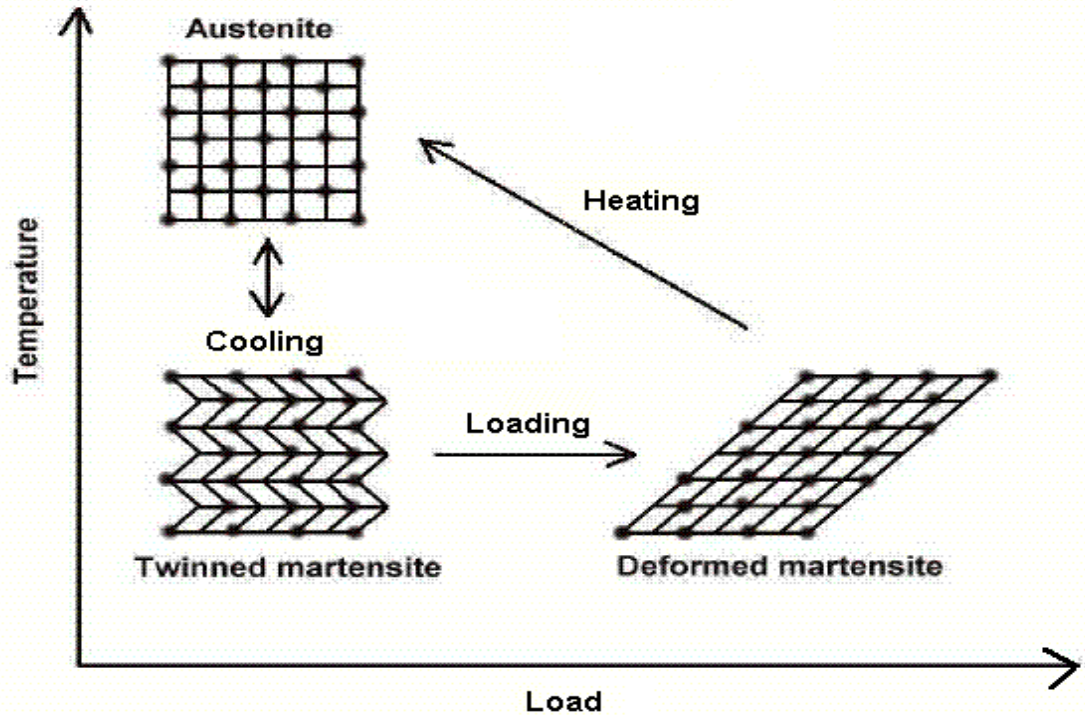
The rotational moulding process



3. Abstract and outlook

Future developments

- Metal matrix composite materials
- Smart materials
  - Piezoelectric materials
  - Shape memory alloys



The shape memory effect

2te

3te

Thank you for your attention!