

Progress in typical materials for agricultural machinery



Structure

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2. Alloyed steels

3. Cast materials

4. Light alloys

5. Wear-resistant materials

6. Plastics

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The Organizational Structure of the KRONE Group

Advisory Board

Dr.-Ing. E.h. Bernard Krone
Chairman

Dr. Jürgen Föhrenbach
Executive Chairman of the Board
Dr. Wilhelm-Friedrich Holtgrave
Arndt G. Kirchhoff

Bernard Krone Holding GmbH & Co. KG

Heinrich-Krone-Straße 10, D-48480 Spelle

Alfons Veer (Dipl.-Kfm.)
CEO

Siegfried Wickert (Dipl.-Ing. TU)
Managing Director
Head of Production/Purchases/Human Resources

Gero Schulze Isfort (Dipl.-Ing.)
Managing Director
Marketing/Sales/PR

Activities of

Bernard Krone Holding GmbH & Co. KG

- Corporate strategies/holdings
- Accounts/finance
- Controlling
- Marketing/advertising/PR
- IT/organization
- Legal affairs and patents
- Personnel
- Production/materials management

Maschinenfabrik

Bernard Krone GmbH

Heinrich-Krone-Straße 10, D-48480 Spelle

Equity: 39 Mil. €

Managing Directors:

Wilhelm Voß (Dipl.-Ing. Agr.), CEO
Dr.-Ing. Josef Horstmann
Siegfried Wickert (Dipl.-Ing. TU)

100%

Krone NA INC

4985 Outland Center Drive

Memphis, TN 38118/USA

Managing Directors:

Rusty Fowler, Wilhelm Voß

100%

Krone Italia

Via del Commercio 33

I-37066 Sommacampagna

Managing Director: Stefano Castellani

10%

Fahrzeugwerk

Bernard Krone GmbH

Bernard-Krone-Straße 1, D-49757 Werlte

Equity: 51 Mil. €

Managing Directors: **Siegfried Wickert** (Dipl.-Ing. TU)

Gero Schulze Isfort (Dipl.-Ing.)

100%

Bernard Krone A/S

Krogsgårdsvej 4-6, DK-8620 Kjellerup-Hvam

Equity: 10 Mil. €

Managing Director: **Hans Søndergaard**

100%

Secondo Trailer GmbH

Bernard-Krone-Straße 1, D-49757 Werlte

Managing Director: **Bernd Schröer**

100%

Krone France SAS

2 rue Auguste Fresnel, F-69680 Chassieu

Managing Directors:

Dr. Jürgen Föhrenbach (Dipl.-Vwt.)
Bernard Richard

100%

Krone Finans A/S

Krogsgaardsvej 2-4, DK-8620 Kjellerup-Hvam

Managing Director: **Hans Søndergaard**

100%

Landtechnik Vertrieb &

Dienstleistungen

Bernard Krone GmbH

Bernard-Krone-Straße 20, D-48480 Spelle

Equity: 10 Mil. €

Managing Directors:

Dorothee Krone (Dipl.-BW.)
Ludger Gude

100%

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

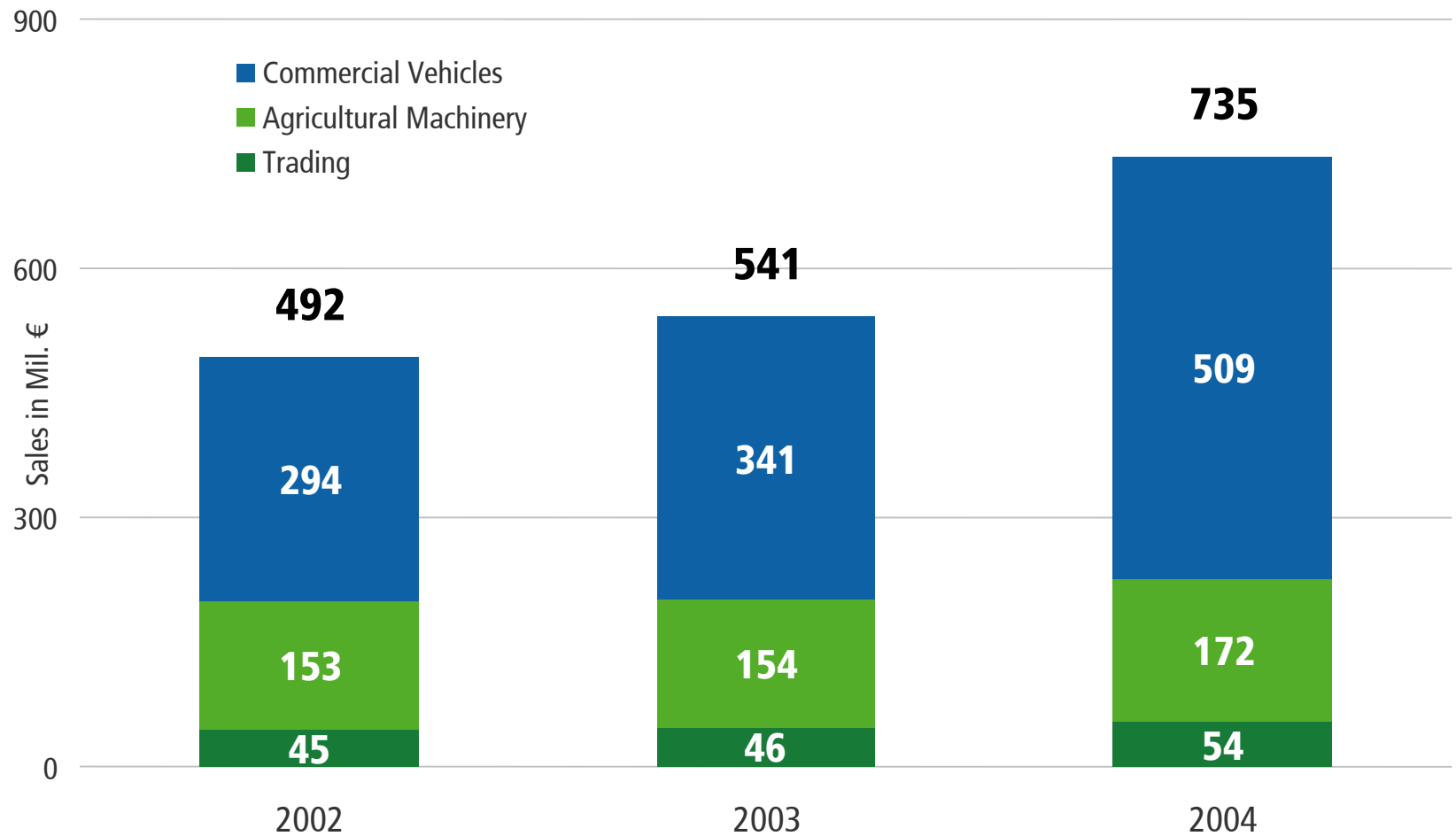
Program:

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

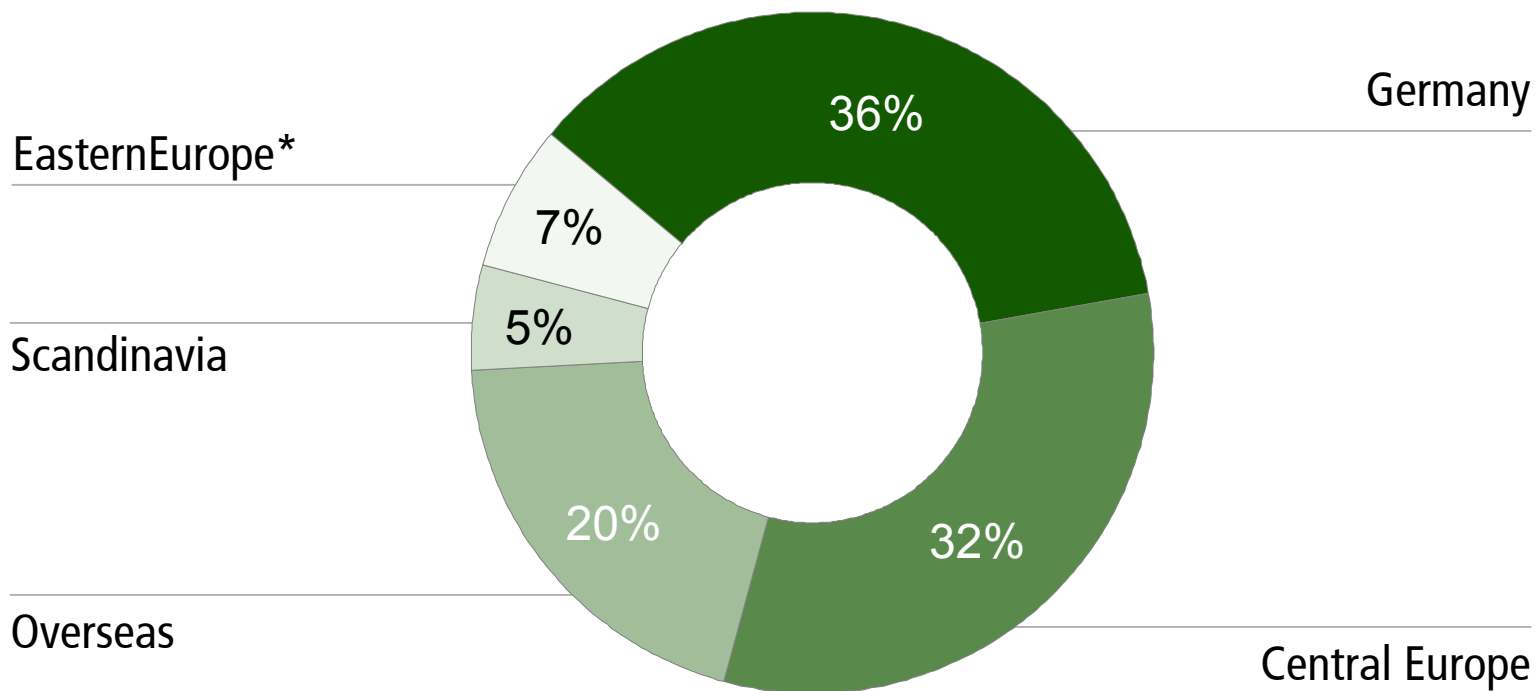
- Ground care machinery
- Agriculture spare parts service
- After sales service and Workshop



Sales Trend of the KRONE Group by Division

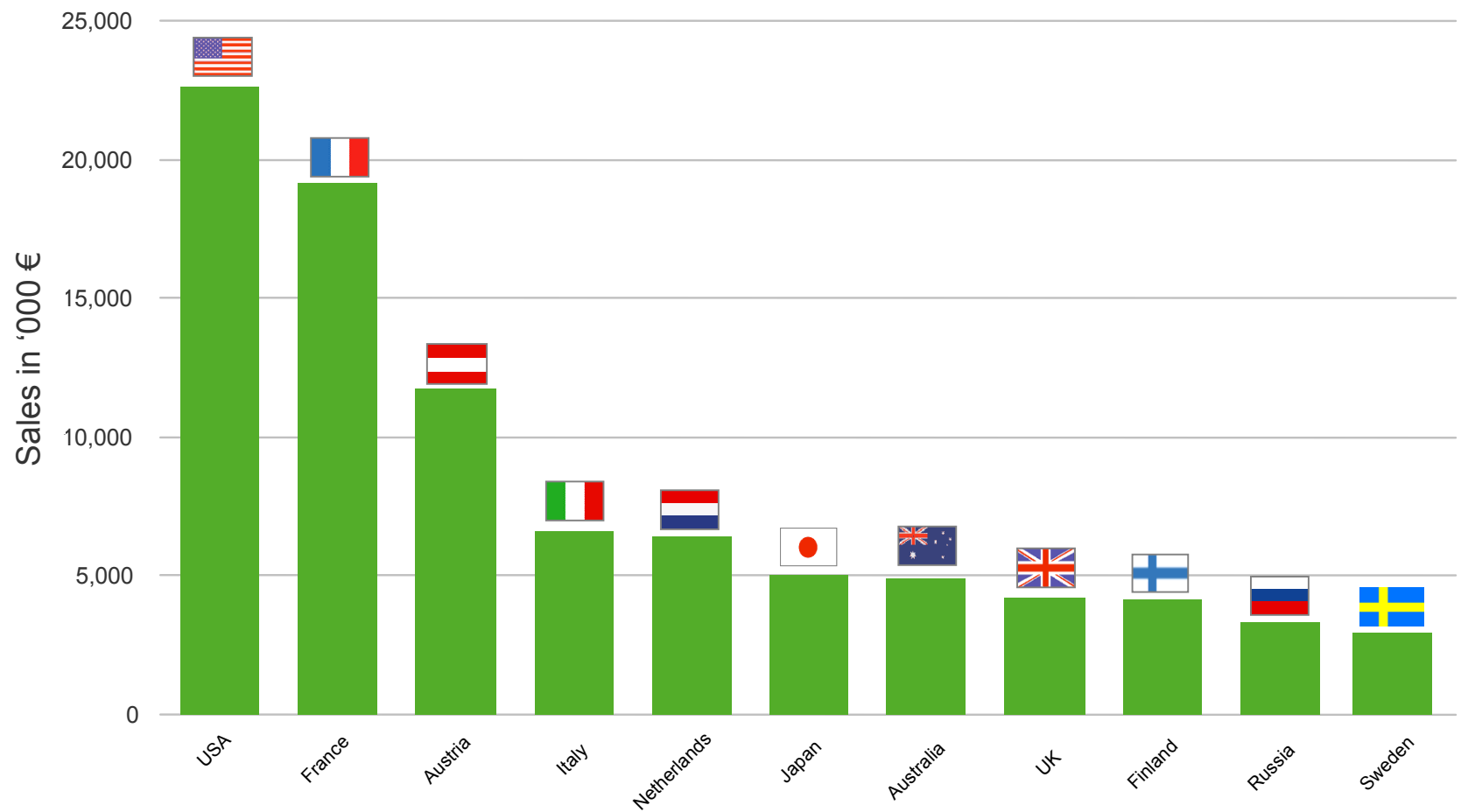


Regional Sales Breakdown: Agricultural Machinery Division, 2004



* 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

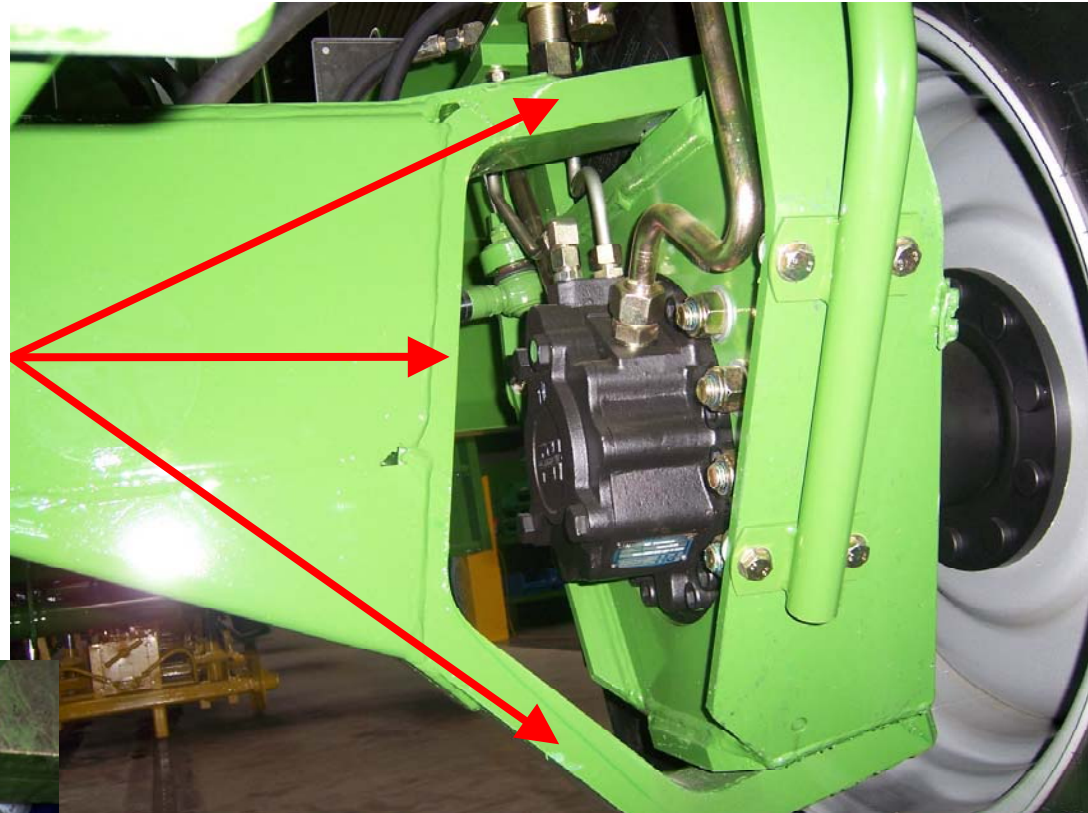


Material comparison of structural steels

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

2.2. Alloyed steels

K 27V

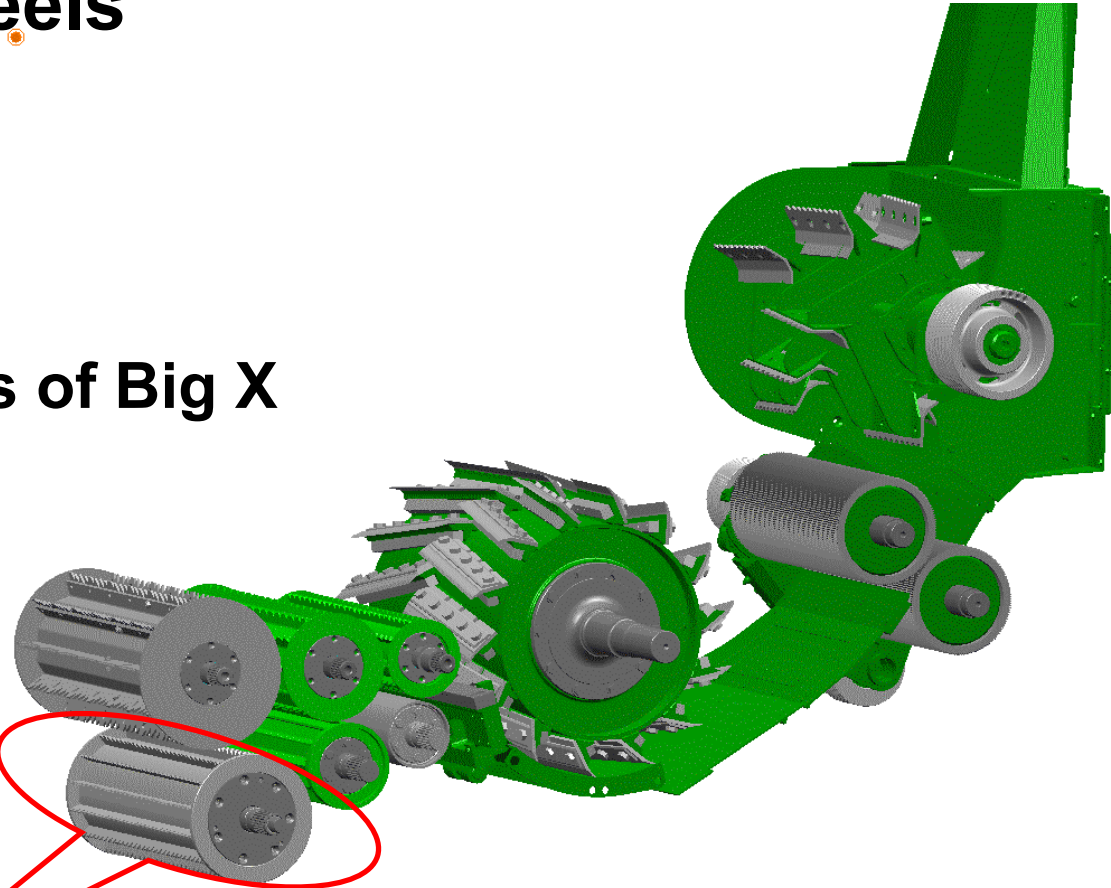


42CrMo4V

18CrNiMo7-6

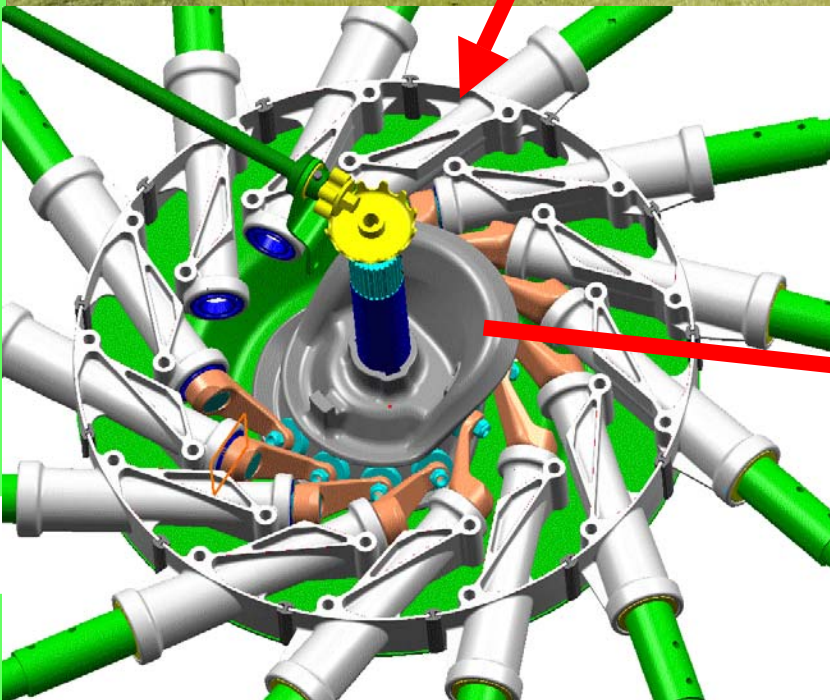
Non-Corroding Steels

**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

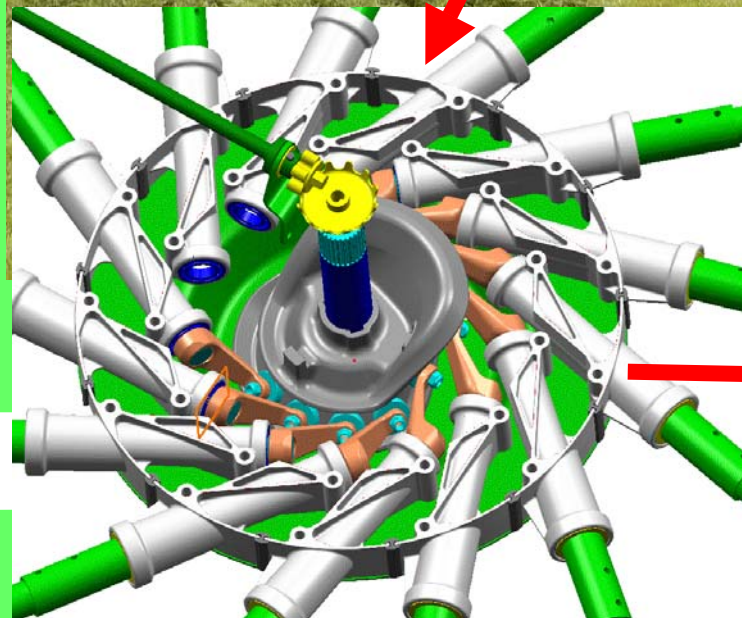


AlSi7MgO



Minus 120 kg!

Bearing housing of the swather tine arms



Minus 34 kg!

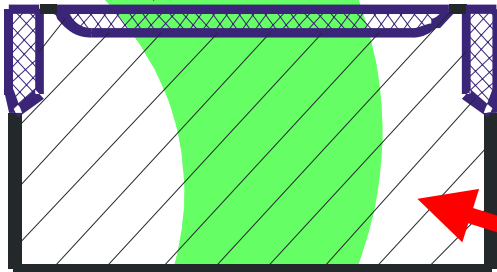


AlSi10Mg

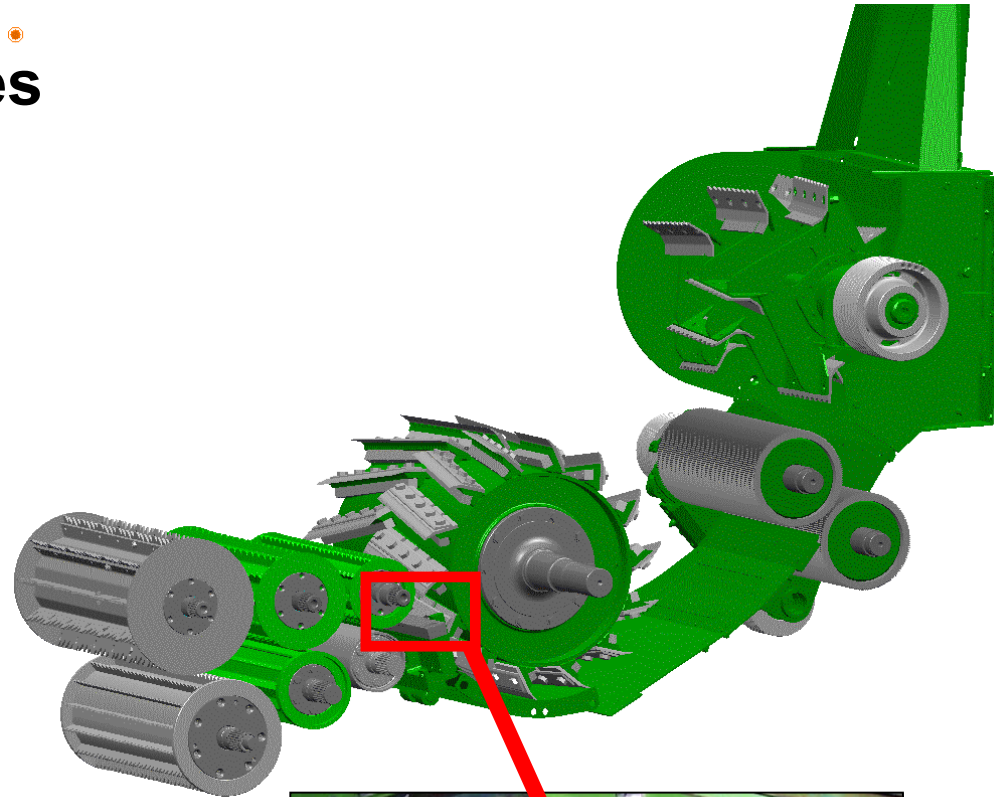
2.5. Wear-resistant materials

Blades and Counterblades

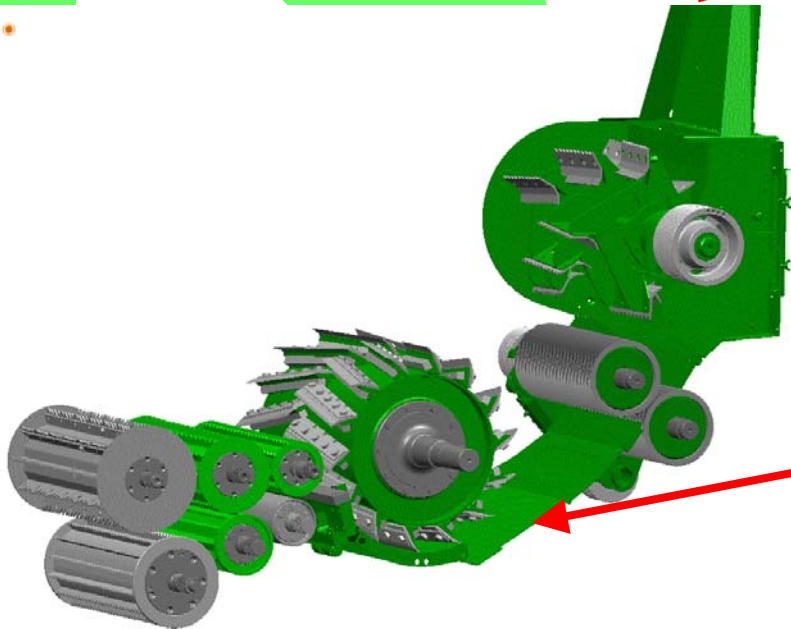
Tungsten carbide bedded
in a matrix of NiCrBSi



Counterblade

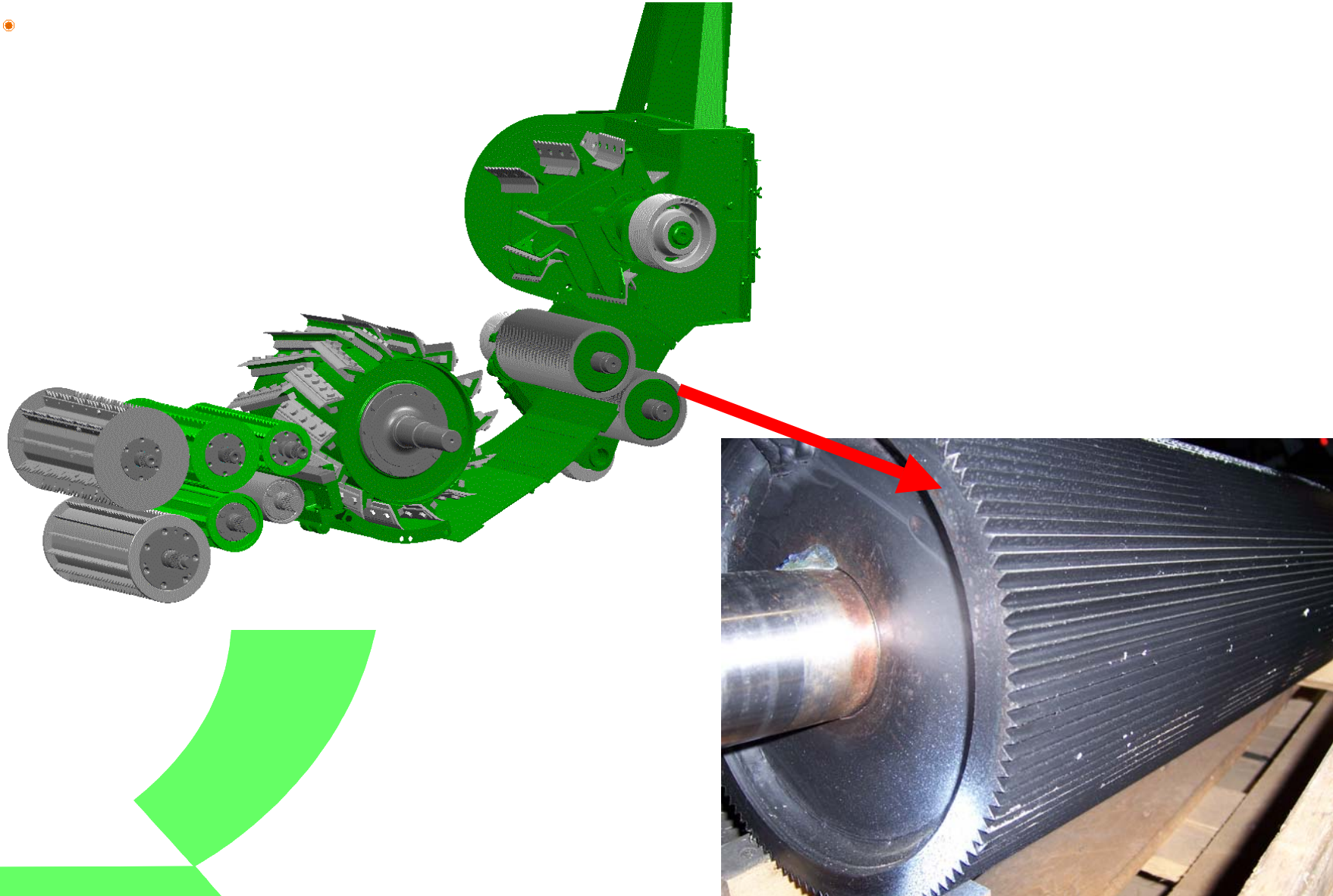


Wear plates



Hardened wear plates
Made of HARDOX

Corn Cracker



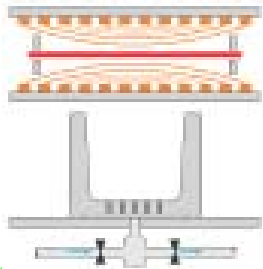
4.6. Plastics Machine panelling



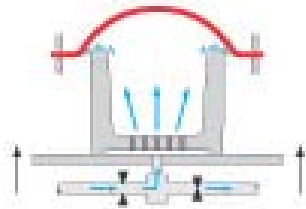
Hand laminate process of glass-fibre reinforced plastic



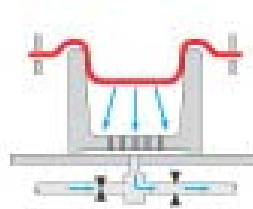
Principle of the thermo-forming process



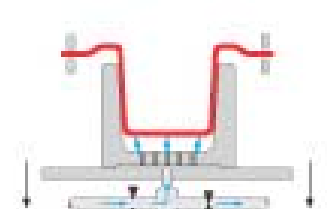
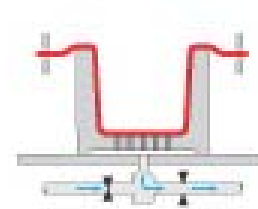
Both sides of the plate are heated until elastically mouldable.



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



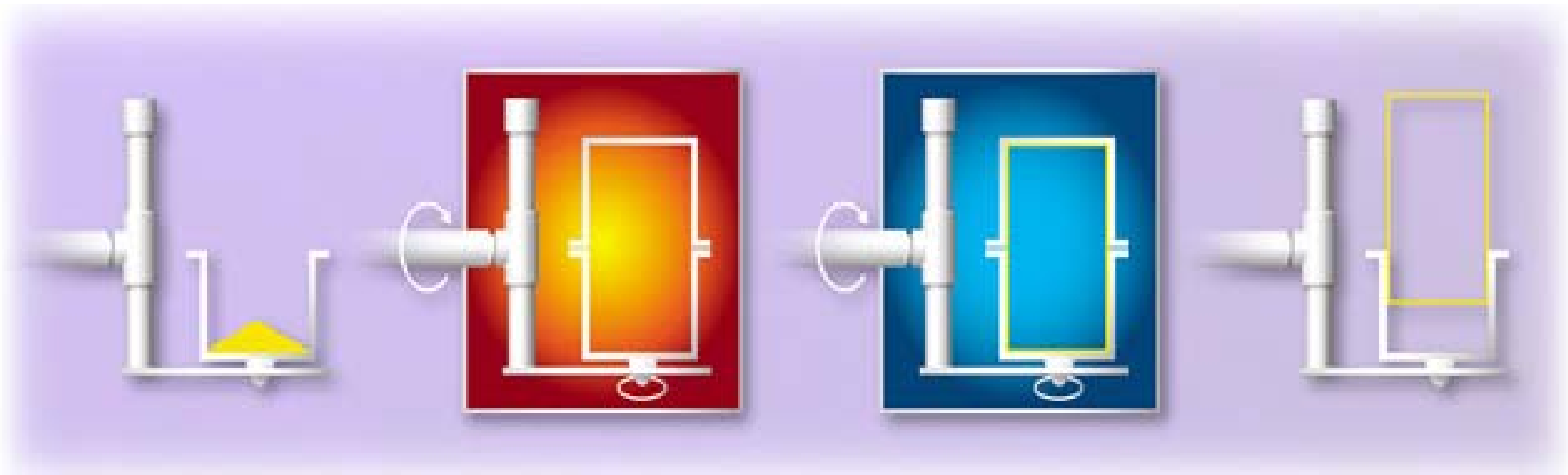
The air between the plate and tool is drawn off until the plate completely contacts the mould. A cooling air blower is used to cool down the plate.



The shaped part is detached by blowing in compressed air.



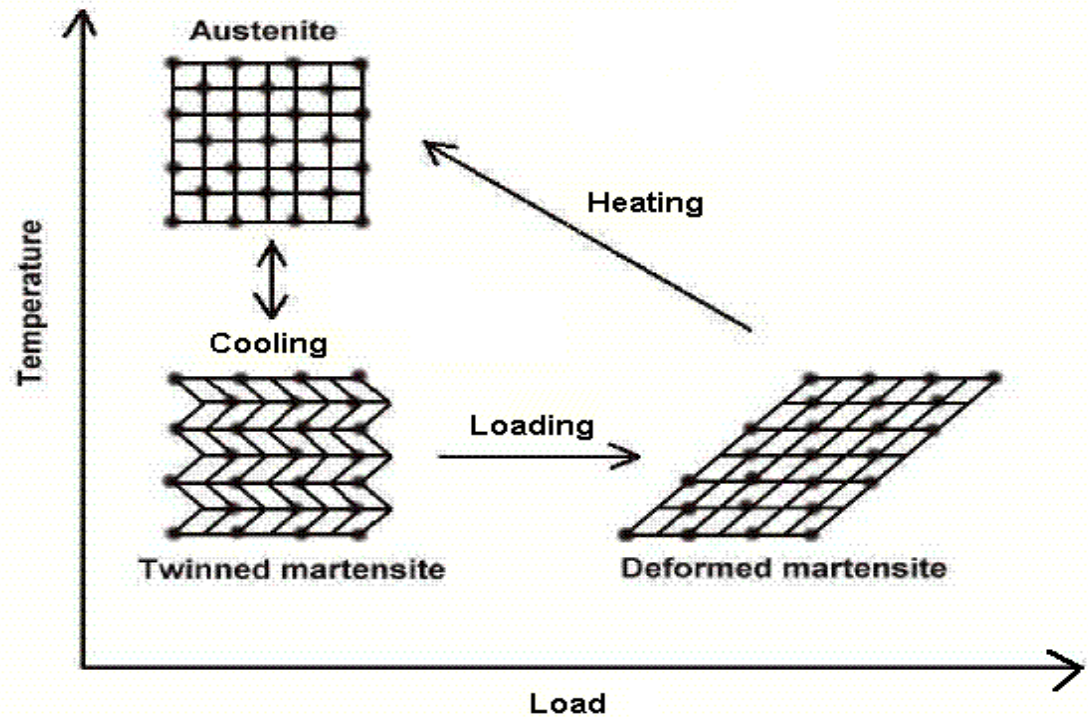
The rotational moulding process



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!

