

HAEUSLER

| the forming factory

VRM

HIGH PERFORMANCE – ALWAYS...



4-RollerPlate Bending Machine

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We at HAEUSLER

HAEUSLER is one of the world's leading companies in the field of metal forming. With more than 80 years of experience we have always been and still are pioneers in developing innovative bending machines. What once started as a small locksmith's shop in 1936 is now a successful, future-oriented family business in the field of metal bending, forming and general assembly technologies. Our goal is to provide our customers with first class one-off machines, innovative custom solutions and entire highly efficient production lines. All designed and manufactured at HAEUSLER.



Left
HAEUSLER-Main Office in Duggingen, Switzerland

Right
German plant in Rheinfelden-Herten, Germany

HAEUSLER Know-How

Today's HAEUSLER VRM type 4-roller plate bending machines are the result of 50 years of development. Many of today's standard features in 4-roller bending machines all over the world are based on HAEUSLER designs. Our drive for innovation, our strictly quality-oriented thinking and our close collaboration with our customers form the foundation of our world leadership in the field of bending machines.

HAEUSLER Bending Machines

- HAEUSLER was the first to bring the hydraulic 4-roller plate bending machine on the market.
- A few years later HAEUSLER initiated the first hydraulic rotation drive of the top and bottom rolls.

1947
Design and production of the first HAEUSLER plate bending machine

1957
Design and production of the first automatic plate bending machine

1964
Design of the world's first hydraulic 4-roller plate bending machine

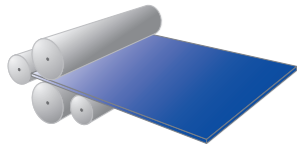
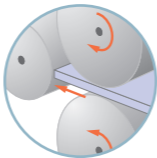
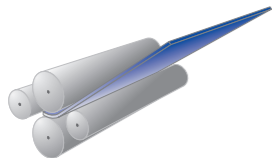
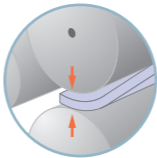
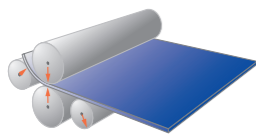
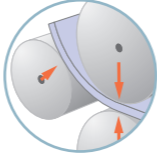
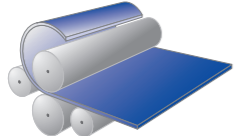
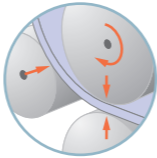
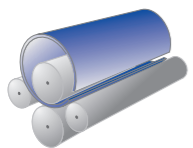
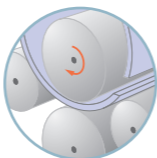
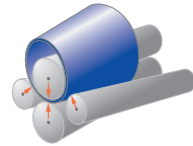

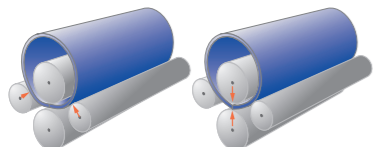
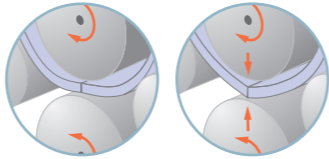
1986
Delivery of the biggest plate bending machine at that time (wall thicknesses of over 200 mm)

2001
Delivery of the world's biggest 4-roller plate bending machine at that time (wall thicknesses of up to 320 mm)

4-Roller Plate Bending Machine

Plate bending machines with movable, rotating rolls can be found with 2, 3 or 4 rolls. 4-roller versions which can be designed for the whole range of wall thickness offer some decisive advantages.

Advantages of the 4-Roller Plate Bending Machine

	▪ Easy plate alignment using one of the side rolls as a stopper	
	▪ Automatic minimization of the flat end length	
	▪ Very high degree of process automation and minimal use of cranes, etc. thanks to permanent clamping of the work piece between top roll and bottom roll	
	▪ Guaranteed rotation traction on work piece even for very thin sheets	
	▪ Easy plate and precise edge handling allows for work piece tack welding on the machine	
	▪ Easy cone rolling and cone pressing using angled side roll positions and cone bending accessories	
	▪ Very good calibrating capability for apple- or pear-shaped work pieces	

Design and concept of the roll movement in a plate bending machine has a major impact on bending quality and machine longevity. Two major categories can be described as swiveling side roller positioning versus linear side roller positioning.

All HAEUSLER 4-roller plate bending machines use linear roll positioning only which allows more compact machine geometries, thus increasing general bending accuracy and machine stiffness. Compact machine geometries also improve bending quality for work pieces with very high yield strength (which typically show higher backspring rates) and for very small bending diameters.



Guiding length of side roller carriage



4-roller plate bending machine
Type VRM-hy 3 000-610
Max. sheet width: 3 000 mm
Max. wall thickness: 80 mm

The HAEUSLER VRM

A 4-roller plate bending machine with linear side roller positioning offers the following advantages:

- Maximum bending quality and repeatability independent of material characteristics and bending diameter
- Minimal process times
- Maximum process safety
- Maximum degree of process automation



Specific Characteristics of the HAEUSLER VRM type 4-Roller Plate Bending Machine

The mentioned conceptual advantages aside, numerous other design aspects, such as rigid machine frame design or robust spherical roller bearing dimensioning help our VRM achieve unique quality and longevity. A HAEUSLER VRM machine consists of several thousand parts, all of which have to meet our demanding quality standards.

Functionality and quality of a machine are mainly defined by the following core components.



1 The Base Frame

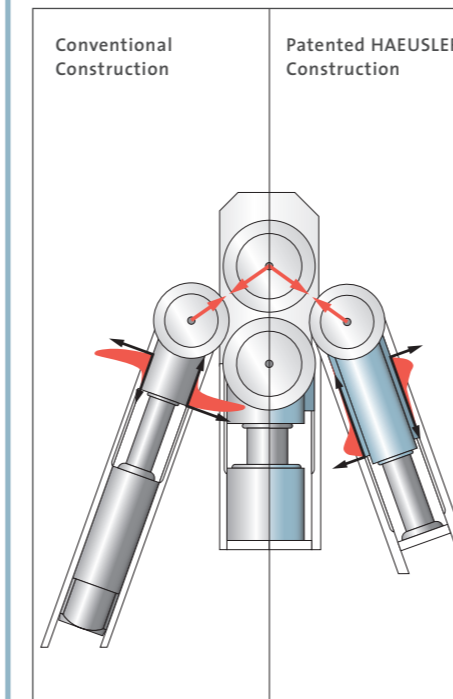
All machine frames are designed for maximum stability under bending forces, including asymmetric loads and torque. A very compact design and the fact that no dynamic process forces will be inducted into the foundations allow for low machine pit constructions costs.

2 Rotational Top and Bottom Roller Drives

Roller drives are defined by the installed maximum power and torque. The bigger **maximum torques** will be the bigger bending steps can be during roll bending which typically allows for shorter production times.

All drives feature **fast-reacting hydraulic brakes** to stop the rolls and avoid unexpected plate movement during pre-bending.

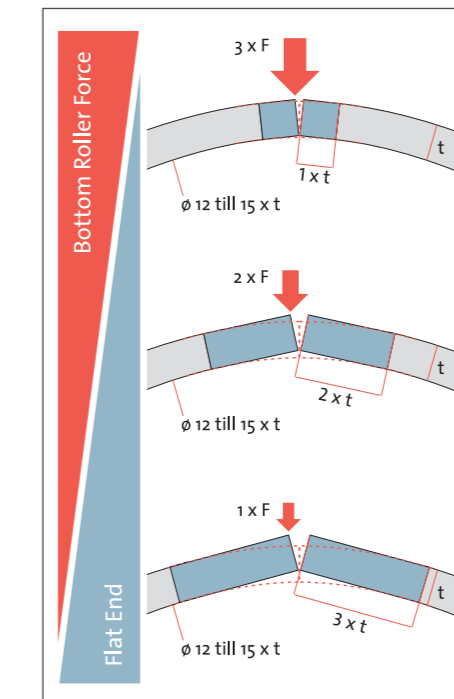
Functionalities and Characteristics of HAEUSLER Rolls



The Rolls

Each of the **four rolls** is exposed to extreme stress during the bending process. HAEUSLER uses high alloy steels only which eliminates the danger of surface cracks which can be found on surface hardened rolls.

3 During every bending process the machine's **top roller** will carry the heaviest load resulting from the bending forces induced by the bottom and side roller. The top roll's diameter thus becomes a critical parameter which will determine both minimum bending diameter and roll deflection under load. A smaller roll will allow smaller bending diameters but also bigger roll deflection. Our standard HAEUSLER rolls are designed to fulfill an ideal compromise between both criteria.



4 **Side roll** positioning will define the resulting bending diameter. The bending forces created during the process will be guided from the side roller carriage onto the machine frame. The longer these guiding areas, the lower material stress will be, thus reducing wear and tear and improving machine precision and longevity. HAEUSLER's patented design of using "top down" cylinders (moving cylinder tube, resting piston rod) allows for **100% longer guiding lengths** compared to conventional designs.

5 The **bottom roller** and its installed maximum **bottom roller force** define how long the remaining flat ends will be during pre-bending. Bottom roller force and achievable flat ends are the most important characteristics in determining the capacity of a plate bending machine.

VRM: Product-range

The HAEUSLER VRM series machine is available in more than 20 different sizes that cover a pre-bending range of wall thicknesses of up to 320 mm. Standard sizes can be built with roll lengths of up to 4 500 mm. Special designs with roll lengths of up to 8 000 mm are feasible.



Plate width 3 000 mm, wall thickness 14 mm



Plate width 4 300 mm, wall thickness 320 mm



Plate width 2 100 mm, wall thickness 26 mm



Plate width 3 000 mm, wall thickness 60 mm



Wall thickness
up to 320 mm



Plate width 4 000 mm, wall thickness 200 mm



Plate width 3 000 mm, wall thickness 170 mm



Plate width 3 000 mm, wall thickness 80 mm



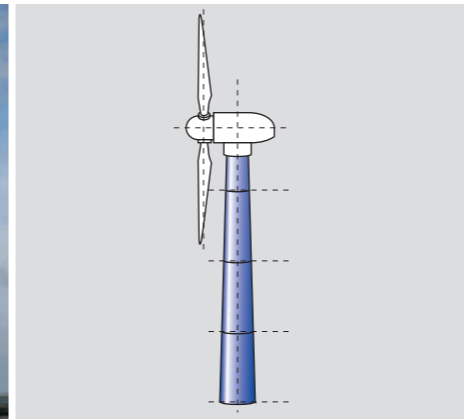
Plate width 3 000 mm, wall thickness 100 mm

Fields of Application and Products

HAEUSLER offers a wide range of special solutions for various industries. Only few of them are shown below.

Wind towers and monopiles

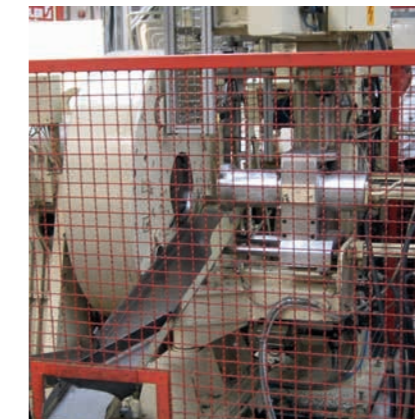
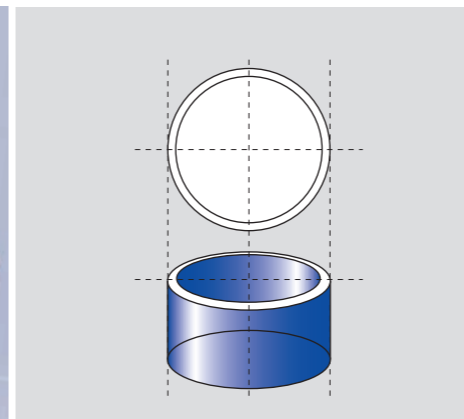
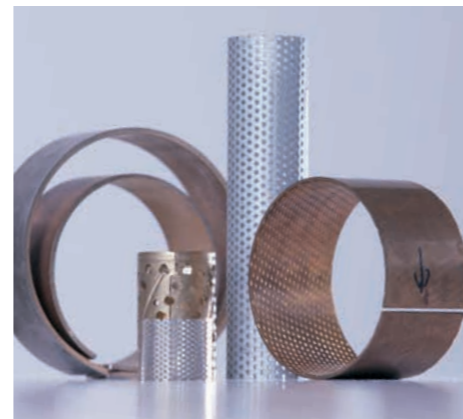
For on- and off-shore use



In collaboration with one of the world's leading manufacturers of wind towers HAEUSLER designed a collection of auxiliary devices which, together with a VRM machine, form a very efficient system for the production of high quality wind tower and monopile segments.

Semi-finished Products

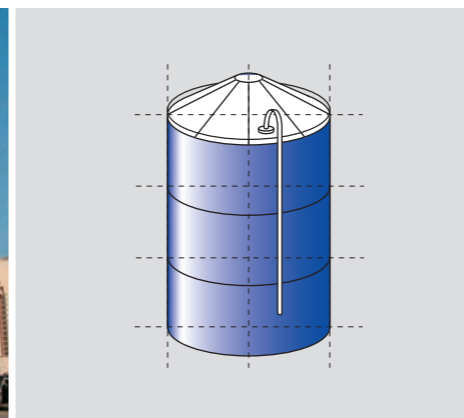
HAEUSLER is manufacturing a wide range of special bending machines for products such as bushes, bush bearings, crankcases and catalyser housings



	D [mm]	L [mm]	W [mm]	Efficiency [Pieces/h]
Bush bearing	20-270	20-150	1-5	1200
Crankcase	to 200	to 200	to 20	150
Catalyser	90-150	70-250	1-1,4	300

Silo Construction

Cylindrical silos for the storage of various goods



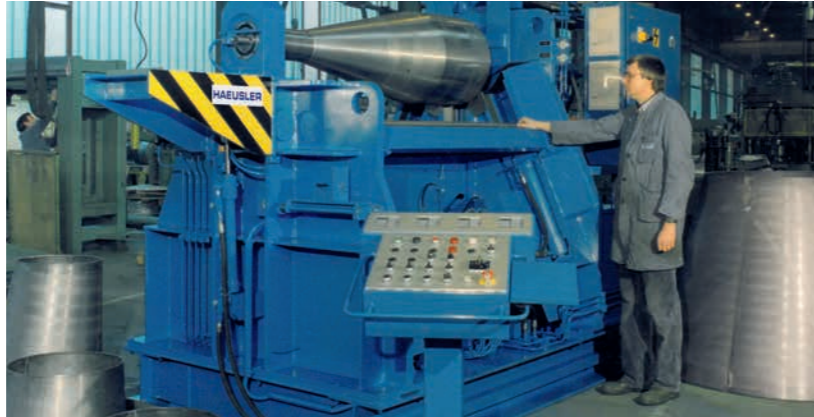
Silo production typically requires very large bending radii. Using vertical VRM machines offers decisive advantages regarding work piece handling in such applications. Almost all VRM machine sizes are also available in vertical designs.

Special Designs

A short selection of special VRM designs

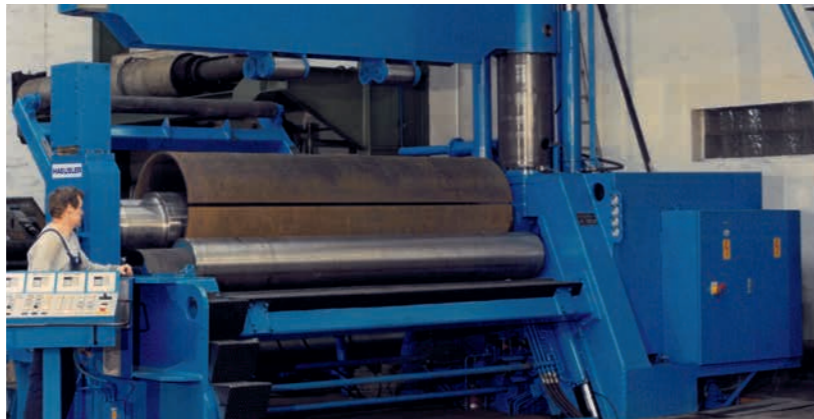
Machines with cone-shaped top roller

Cone-shaped top rollers can be used for the production of asymmetric cones, very narrow cones, cones with very large cone angles or in applications where only cone bending is required.



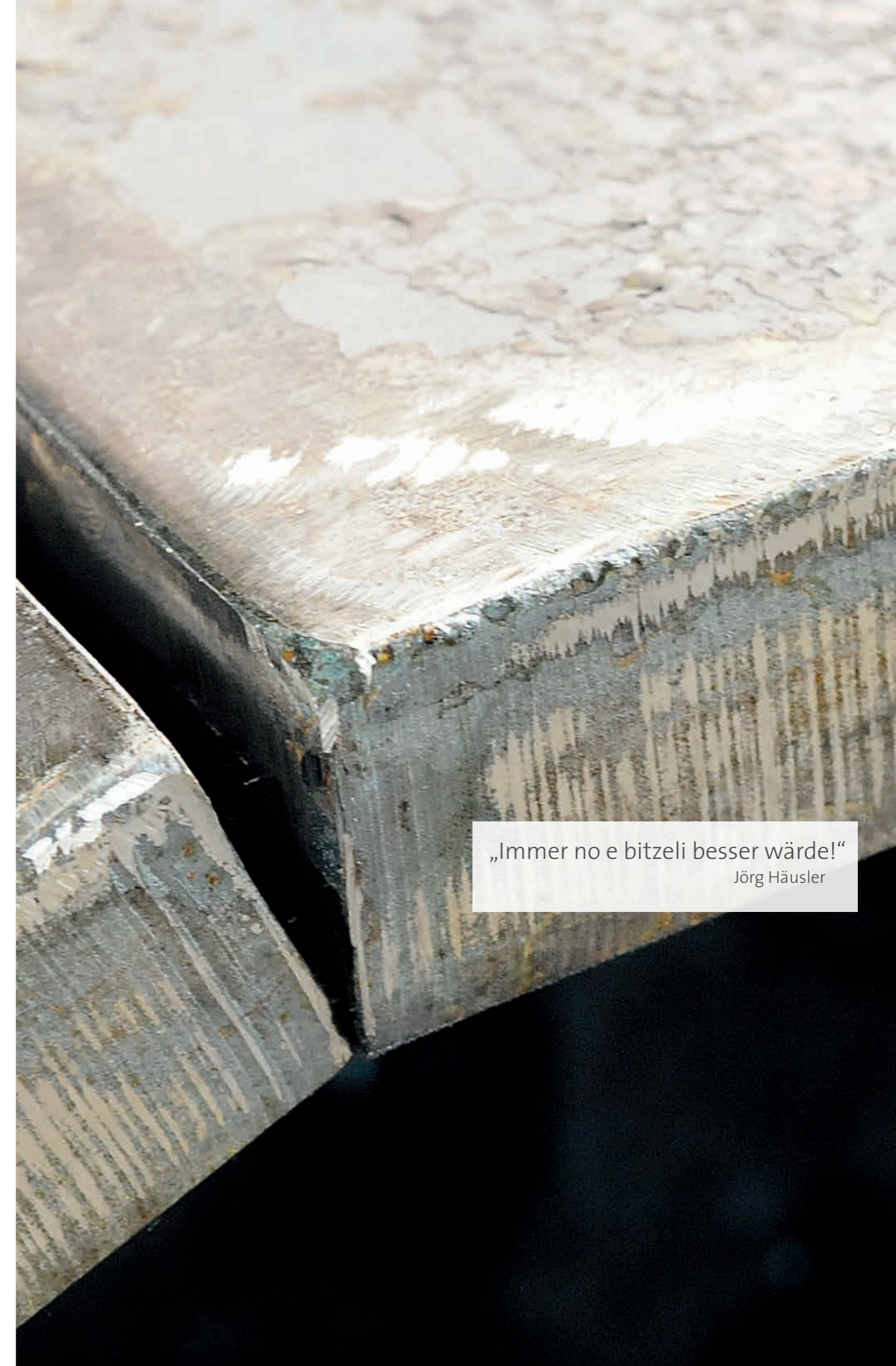
Machines with supported rolls

If extremely large wall thicknesses (in relation to bending diameter) have to be bent the physical limits of the roll materials will set limits. That is when using supported rolls comes into play. HAEUSLER is the only manufacturer with more than 40 years of experience in building such machines.



Mobile Machines

Where transport costs for finished work pieces become too high, using a mobile bending machine can make sense. Shown mobile VRM offers a nominal rounding capacity of 130 mm wall thickness.



„Immer no e bitzeli besser wärde!“
Jörg Häusler

VRM

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ALWAYS...*



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