HAEUSLER
the forming factory

4-Roller
Plate Bending Machine VRM
We at HAEUSLER

HAEUSLER is one of the world’s leading companies in the field of metal forming. With 70 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.

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.
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.

<table>
<thead>
<tr>
<th>Advantages of the 4-Roller Plate Bending Machine</th>
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<tbody>
<tr>
<td>• Easy plate alignment using one of the side rolls as a stopper</td>
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<tr>
<td>• Automatic minimization of the flat end length</td>
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<tr>
<td>• 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</td>
</tr>
<tr>
<td>• Guaranteed rotation traction on work piece even for very thin sheets</td>
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<tr>
<td>• Easy plate and precise edge handling allows for work piece tack welding on the machine</td>
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<tr>
<td>• Easy cone rolling and cone pressing using angled side roll positions and cone bending accessories</td>
</tr>
<tr>
<td>• Very good calibrating capability for apple- or pear-shaped work pieces</td>
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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.

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

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

Guiding length of side roller carriage
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.

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 rollers. 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.

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.

The Bottom Roller and it’s 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.

The 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.

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.

3. Conventional Construction

4. Patented HAEUSLER Construction

The mentioned conceptual advantages aside, numerous other design aspects, such as rigid machine frame design or robust spherical roller bearing dimensioning help our VRM’s 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.

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

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PLATE BENDING

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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.

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

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

Silo Construction
Cylindrical silos for the storage of various goods

In collaboration with one of the world’s leading manufacturers of wind towers (Hywind) 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 typically require 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.

<table>
<thead>
<tr>
<th>Diameter [mm]</th>
<th>Wall thickness [mm]</th>
<th>Length [mm]</th>
<th>Efficiency [Pieces/h]</th>
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<tr>
<td>200</td>
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<td>200</td>
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<td>30</td>
<td>4</td>
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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.
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