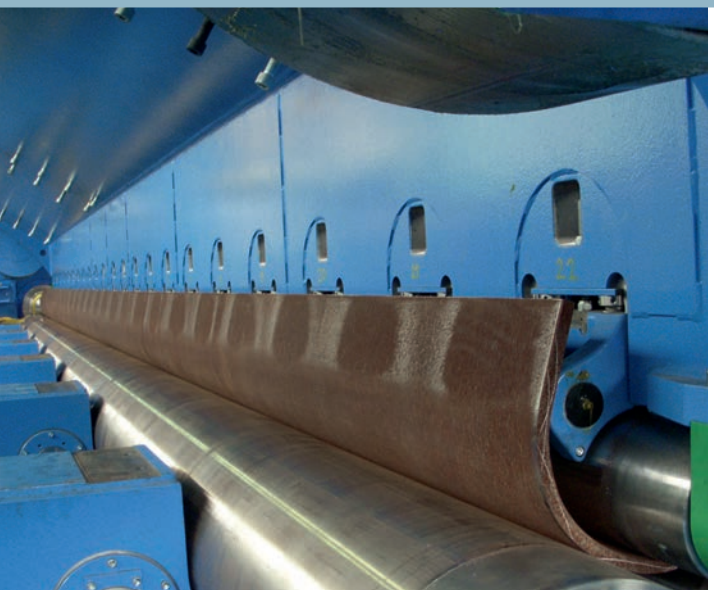
HAEUSLER

the forming factory



Pipe Mill

The solution for LSAW pipe production

“Machine construction is our profession – using inventive talent and passion.”

The Häusler family
Standing, from left to right: Camille Häusler, Corinne Häusler, Stefan Neumann, Raymond Häusler
Sitting, from left to right: Christian Häusler, Jörg Häusler, Elisabeth and Werner Neumann-Häusler

We at HAEUSLER

As a global operating company, HAEUSLER is constantly setting new standards in the metal forming industry. Our innovative culture has been developing for over 75 years, and harks back to a long family tradition. This experience enables us to constantly exceed technological limits for our customers throughout the world. We have grown from a small locksmith’s shop to world market leader in the forming sector and the associated welding technology.

The third generation of the Häusler family is already taking responsibility for the business, and continuing the tradition of innovation, reliability and premium quality with new ideas and new energy. Machine construction is our profession, but our mission is partnership-based collaboration with our customers. We are constantly seeking new challenges that will enable us to grow in order to assure your success.

Left
HAEUSLER headquarters in Duggingen, Switzerland

Above
German plant in Rheinfelden-Herten, Germany

HAEUSLER – World leader in RB pipe mills

HAEUSLER entered the business of complete long seam submerged arc welded (LSAW) pipe mills 1990 with the delivery of two pipe mills. HAEUSLER has acquired extensive experience with the roll bending (RB) process in pipe production.

Since 1990 HAEUSLER is involved in most of LSAW pipe mills which were realized worldwide in complete mills on turn-key basis (65 to 75 % market share). The roll bending process is the most advanced technology currently on the market.

Each HAEUSLER LSAW pipe mill reached within a couple of weeks the requested national and international certificates (e. g. API 5L).

Capacities of HAEUSLER RB LSAW pipe mills

Pipe diameter range	16 to 80”	406 to 2032 mm
Pipe length	20 to 40 ft (80 ft on request)	5 to 12.2 m (24.4 m on request)
Wall thickness	$^{1}/_{4}$ to $1^{5}/_{8}$”	6 to 42 mm
Output	up to 20 pipes/hour	

Sustainability through service

With first-class products, we ensure the success of both, our customers and ourselves. We offer comprehensive services that guarantee the efficiency of the equipment.

Roll bending

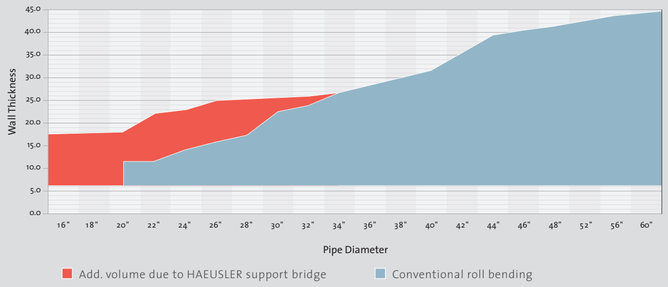
For pipe forming HAEUSLER relies on roll bending (RB). RB shows several distinct advantages over comparable forming processes as JCO or UO press forming procedures and is unmatched for the production of pipes.

Facts

- The output of pipes of a RBE pipe mill is significantly higher than that of a JCO press pipe mill while the investment costs are by far lower compared to the UO press pipe mill.
- The high output rate of a RBE pipe mill, as well as the high flexibility, allows a fast return on investment.
- In a RBE pipe mill less tools manage to cover a wider range of pipe diameters and wall thicknesses. This means lower cost for tooling and fewer tool changes in the running production. Tool changes that are required in the running production, can be done quickly, reducing the downtime of the plant. This makes HAEUSLER RBE pipe mills the most flexible on the market, allowing to produce small and big volumes economically.
- The RB process allows a high degree of automation which leads to continuously high quality.
- The continuous forming of the RB is a soft process that causes the least possible amount of stress in the pipes.

Based on the long experience of HAEUSLER with RB and the know-how, earned as the leading manufacturer of RBE pipe mills, HAEUSLER developed a new technology for pipe forming: a top roll with the HAEUSLER support bridge. This newly developed equipment pushes the RB process to unprecedented limits, reaching far into the market usually reserved for JCO presses, but still offers the speed and advantage of the RB.

Capacity of roll bending and HAEUSLER support bridge LSAW pipes



Comparison HAEUSLER RB process vs. others

The HAEUSLER RB process represents the most efficient way to produce LSAW line pipes up to a diameter of 80". Compared to other pipe production methods, the ratio between output, flexibility, investment and return on investment, the HAEUSLER RBE process is by far the most economic method for pipe production.

	HAEUSLER RBE pipe mills	UOE pipe mills	PFE pipe mills
Return on Investment The consequence of high output, low investment and low running costs of RBE pipe mills is an extremely short pay back and a high return on investment. With normal productivity pay back is reached within 18 to 24 months.	high	medium	low
Investment The investment for a RBE pipe mill is extremely competitive. While considering the output of a RBE pipe mill the investment is unrivalled.	low – medium	very high	medium
Output With the RBE pipe mill the max output is approximately 20 pipes/hour. Only the UOE method is faster. Compared to the RBE other methods are extremely limited.	high	high	low – medium
Production Flexibility The necessary time for tool changes to produce a new pipe dimension at RBE pipe mills is only 60 to 90 min. Therefore the flexibility reaches an incomparable level.	high	low	medium
Stress uniformity and level The level of material stress within the pipe body is one of the key-criteria for the pipe quality. Because of the continuous forming process at roll bending, the RB pipe mills reach by far the best figures.	homogeneous – low	heterogeneous – high	heterogeneous – medium

Layout example for HAEUSLER RBE pipe mill

Scale
one pipe
40 ft./12.2 m

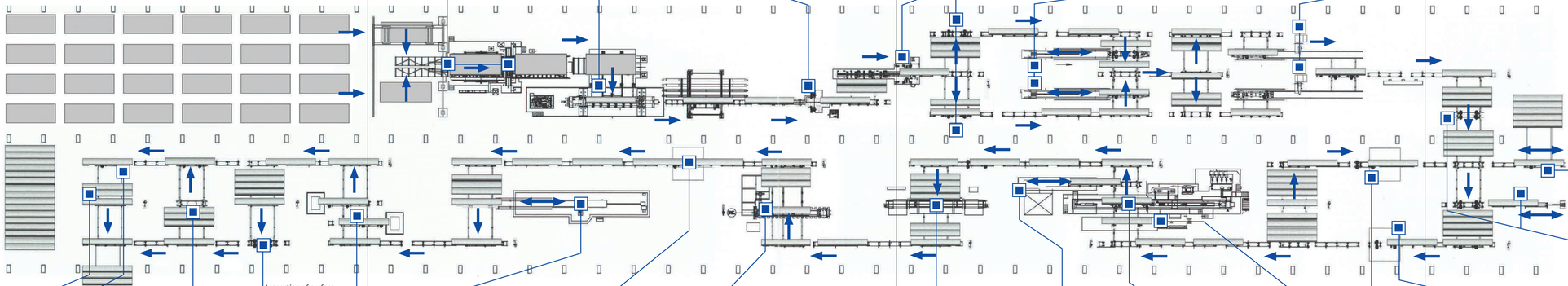


Plate de-stacking and edge preparation area
From the de-stacking area the plate is loaded by crane with a vacuum traverse on to the infeed conveyor of the edge milling machine where the two long seam edges are machined for the proper weld preparation and to the required plate width.

Roll bending area
The forming in the HAEUSLER RBE pipe mill is accomplished through the use of a hydraulic 3-roll bending machine type RMS-hy-vo with pre-stressed top roll. In only 2 to 3 passes a plate is bent into an open seam pipe. The flexibility of RBE pipe mills starts here.

Post bending area
In the post bending machine, which works by an innovative roll/die process, the remaining flat ends are formed to the proper pipe diameter.

Root welding area
The pipe is finally adjusted and tack-welded with a continuous root in the tack-welding machine, under gas shielded arc. The root weld also serves as backing for the inside welding of the pipe.

Longitudinal internal SAW welding area
The internal welding station consists of a height-adjustable welding boom including SAW equipment. The pipe moves on a transport carriage. A video system and a guiding wheel help the operator to control the process.

Visual inspection

Longitudinal external SAW welding area
The external welding station consists of a pipe transport carriage and an outside height-adjustable welding boom equipped with SAW equipment. The pipe is transported through the station on a carriage. The whole system is controlled by laser tracking and digital weld control.

Pipe repair

Pipe cleaning and visual inspection area
At the visual weld inspection, the pipe is cleaned from flux and slag and visually inspected by a video camera or an operator (depending on the pipe diameter).

Customer inspection

Marking and final inspection area

Final inspection, measuring and weighing

Inspection of surface

Pipe weighing, measuring and magnetic particle inspection area
In compliance with special standards and/or further customer requirements an additional NDT-test at both pipe ends by magnetic particle inspection can be conducted. Afterwards the pipe is weighed, measured, marked and checked by a customer's inspector. The finished pipe is then transported to pipe storage, coating or dispatch area.

X-Ray control area II (filming of pipe end)
In the X-ray station both pipe ends and the weld seam are filmed according to the required standard. Eventual suspected defects observed in the ultrasonic station are also filmed. The equipment can be also extended for a real-time X-ray over the full pipe length. Afterwards a visual inspection covers the complete pipe surface in order to detect and remove any visual defects.

Ultrasonic control area II
In the second ultrasonic station both the full weld seam length and the circumferential pipe body of approx. 100 mm of each end are tested.

Hydro-tester area
The hydrostatic pipe tester, necessary for all quality standards, tests each pipe by internal water pressure. Each pipe must withstand without leackage a hydrostatic test at the requested pressure specified in the standards.

Pipe endbevelling area
The pipe-end bevelling machine chamfers simultaneously both ends to the requirements. By bevelling both ends simultaneously their parallelism is guaranteed. The bevel is concentric to the pipe inside diameter.

Pipe post-washing area
The post-washing station removes the expander lubrication oil from the internal pipe body by high water pressure.

Full body pipe expander
In the mechanical expander the pipe is sized to tighter tolerances of diameter and straightened according to any international standards or customer requirements.

Pipe pre-washing area
The pre-washing station serves to remove all remaining flux, slags and milling scales by water.

X-ray control area I (real time system) and weld repair area

Ultrasonic control area I
In the first ultrasonic testing station the weld seam is tested for any defects. Satisfactory pipes are transported to the pre-washing station while pipes with defects are diverted to the repair x-ray station where the defects are documented and repaired.

Forming of pipes

To reach the high output and short cycle times the forming process must be optimized. In HAEUSLER pipe mills the forming process is split into two steps: The RB process for the rounding of the plates and the subsequent post bending of the flat ends (edge crimping). This fast and efficient forming process offers excellent quality.

Roll bending with the HAEUSLER 3-roll bending machine RMS

The HAEUSLER 3-roll bending machine RMS with the newly developed HAEUSLER support bridge is the heart of HAEUSLER RB pipe mills. HAEUSLER's long experience with roll bending has enabled us to develop this exceptional machine.

This extraordinary machine can produce pipes either in a conventional way with a pre-stressed top roll or with the new HAEUSLER support bridge.

This machine design shows a remarkable improved area of application for RB, reaching far into the market usually reserved for JCO presses but still offers the speed advantage of the RB.

Aditionally, to the fewer top roll changes compared to the JCO die changes, the top roll changes are much faster. This offers much higher production flexibility.

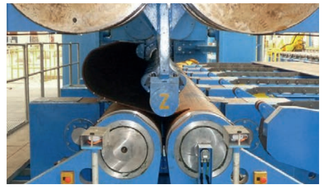
Post bending of the remaining flat ends

In the HAEUSLER post bending machine NABM, which works with an innovative roll/die process, the remaining flat ends will be formed to the proper curvature between a hydraulically cushioned top ball and matching hourglass roll.

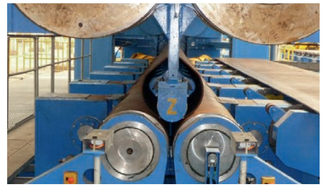
Pipe forming sequences on the RMS with the HAEUSLER support bridge and subsequently post bending on the NABM

1. After aligning of the plate, the top roll presses into the plate

2. "Normal" roll bending forms the first half of the pipe.



3. The plate is moved to the other machine side ...



4. ... and the second half of the pipe is formed.

5. To round the remaining flat ends, the pipe is transferred to the post bending machine ...

6. ... where the forming process ends with a perfect rounded pipe blank.

After post bending the pipe, the out-feed conveyor will move it into the following welding process.

Root welding

Executing the longitudinal welding of the pipe is one of the most delicate processes in a pipe mill. In HAEUSLER pipe mills this process is divided into 3 steps; the continuous root welding, the internal and the external welding.

Continuous root welding with the HAEUSLER CRWM

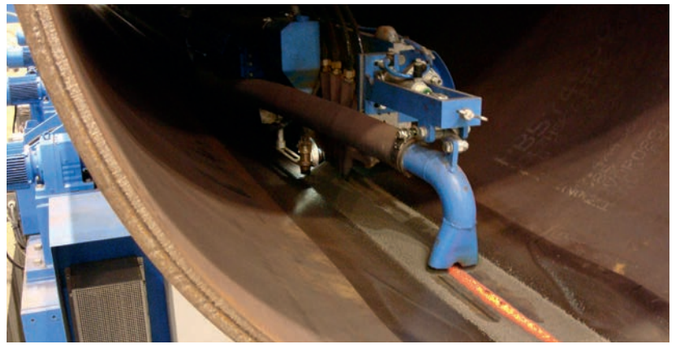
In the CRWM the gap is closed by pushing the pipe through a hydraulically adjusted and controlled cage. The moving pipe is continuously root welded by a single-wire with MAG-metal active arc welding.

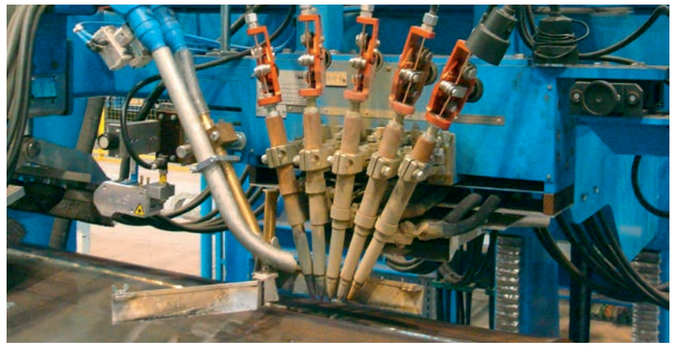
This continuous root weld is used as the backing for the internal submerged arc welding process.

CRWM

- No tooling is required.
- Very quick process changeover and therefore suitable also for small volumes.
- Operation of the whole process by one operator due to a high automation degree.
- This machine is required for all pipe forming processes.

Internal and external welding





The internal and external welding is both carried out by multiple wire submerged arc welding while the pipe is transported on a carriage over a stationary welding head.

By the internal welding the welding head is mounted on the point of a self-supported boom to bring the equipment inside the pipe. For the external welding the welding head is located on a platform above the pipe.

Depending on the required output it is necessary to install one, two or three internal and external welding stations.

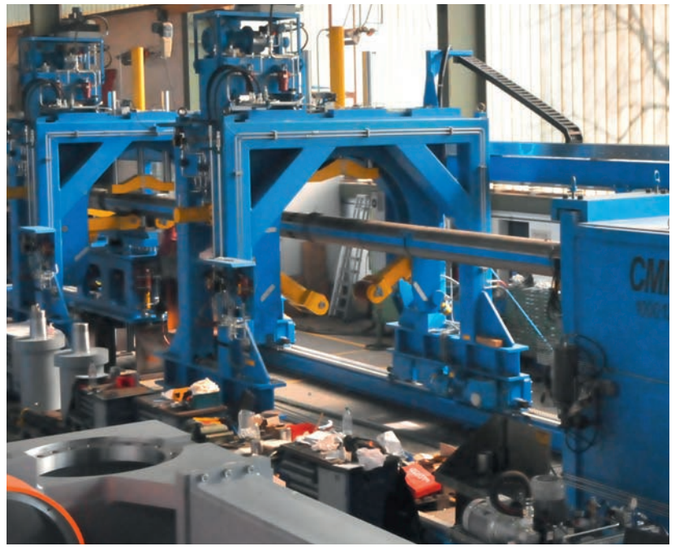
Welding

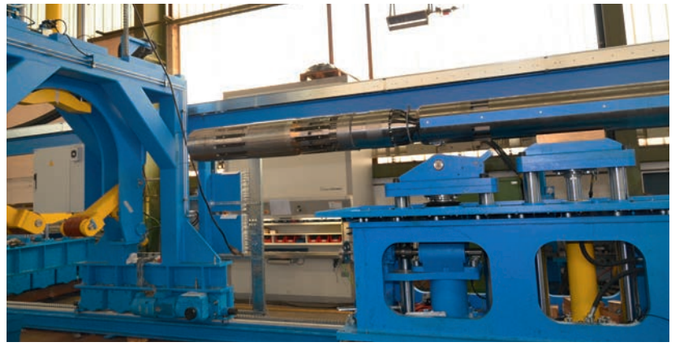
- Multiple wire submerged arc welding (up to 5 wires).
- Online monitoring of the welding quality through digital controlled welding process.
- Welding head and earthing point are stationary and therefore the internal resistance is constant.
- Integrated flux feeding and recovery system.

Pipe expander CMR

The CMR pipe expander is a key machine in any state-of-the-art pipe mill. The market requests expanded pipes, so the purchase of a pipe expander is strongly recommended.

The pipe expander stretches the pipe to ensure the sizes of the pipes are kept within a tight margin and is also used to straighten out weld deformation of the pipes. These deformations are the result of a contraction of the pipe along the welding seam.



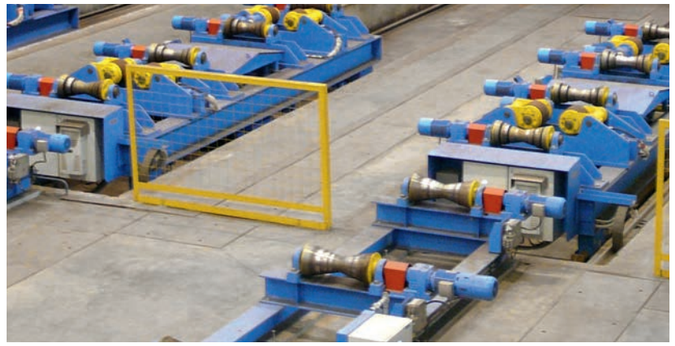


Expander

- Expanded pipes are a market requirement.
- New developed head with large life time due to smaller surface pressure.
- Improved pipe straightening due to new pipe handling system.

As stand-alone equipment available starting 2013

Equipment for the pipe transportation, handling and manipulation



This often neglected equipment is actually a huge part of a pipe mill. It is the backbone of a pipe mill and transports the pipes from station to station. Due to years of experience, HAEUSLER has the necessary know-how to plan the transportation and handling areas to ensure an optimized and smooth process flow, which is one of the conditions for a high output of the complete production line.

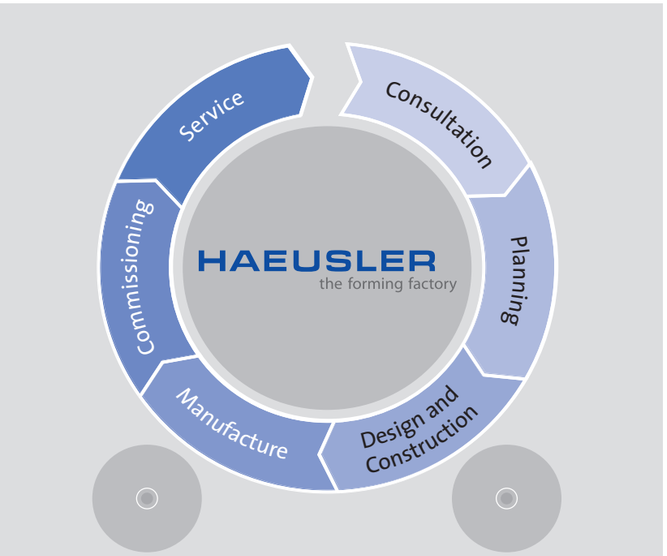
Equipment

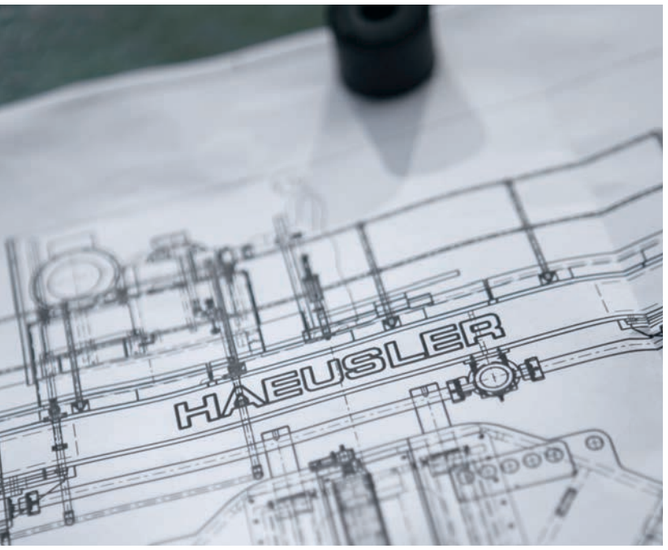
The equipment for the pipe transportation, handling and manipulation includes approx.:

- 800 to 1000 m of longitudinal roller conveyors.
- 30 lateral transport carriages each equipped with its own hydraulic power pack.
- 40 turning rolls stations for weld seam orientation.
- 400 m of buffer racks for pipe buffering and storage between different process steps.

Sustainability through services

HAEUSLER offers a wide range of additional services.





Services

- Financial and commercial support
- Consultation services:
  - General consultation (e.g. location and general arrangement of the plant
  - Quality certificates and monograms
  - Quality systems
  - Company organization (e.g. Production, Quality control, Maintenance, etc.)
- Technical services:
  - Engineering for all listed hardware and infrastructure
  - Services
  - Installation
  - Commissioning
  - Training of staff
  - Production support for requested duration (normally few years)
- After sales services:
  - Supply of spare parts
  - Remote maintenance includes hotline services
  - On-site maintenance
  - Inspections
  - Overhauls and modernisation of complete machines

In use worldwide

HAEUSLER is almost 100 % an export-oriented company. Our machines and plants are already in use on all continents, and in more than 70 countries in total.

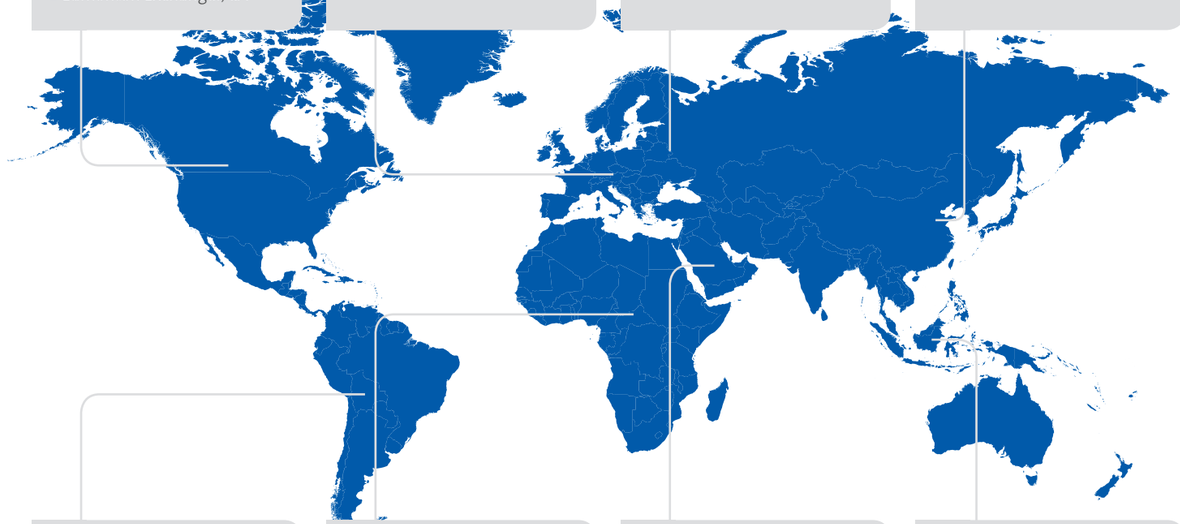
The customers cited here are an extract from HAEUSLER's reference lists.

North America
- General Electric, US
- Trinity Industries, US
- McDermott, US
- Berg Steel Pipe, US
- Caterpillar, US
- John Deere, US
- Aker Solutions (ehem. Kvaerner), US
- Northrop Grumman (ehem. NNS), US
- Swecomex (Carso), MX
- Edmonton Exchanger, CA

Western Europe
- Daimler, DE
- EADS (ehem. MBB), DE
- Liebherr, DE
- Dillinger Hütte GTS, DE
- Viessmann Werke, DE
- Alstom, FR
- Michelin, FR
- DAF Trucks, NL
- Corus (Tata Steel), GB
- Navantia, ES
- Felguera Caldereria Pesada, ES

Eastern Europe/CIS
- TMK (Volzhsky Pipe Plant), RU
- Uralmash, RU
- KAMAZ, RU
- Energomash, RU
- Khrunichev Space Center, RU
- GAZ, RU
- Gagarinsky Machine Building Plant, RU
- Khartsyzsk Tube Works, UA
- Minsk Tractor Works, BY

Far East
- Sumitomo Corporation, JP
- Hokkai Steel Works, JP
- CSIC - China Shipbuilding & Offshore International, CN
- Hyundai Heavy Industries, KR
- Seah, KR
- Samsung, KR
- Formosa Plastics, TW
- Histeel, KR
- Dong Yang, KR



South America
- IMPSA, AR
- TenarisSiat, AR
- Estaleiro Atlântico Sul, BR
- Voith Paper, BR
- Atlas Schindler, BR
- Alstom, BR
- TenarisConfab, BR
- Engebasa Mecânica e Usinagem Ltda., BR

Africa
- Dorbyl Heavy Engineering, ZA
- Steinmüller, ZA
- Atlantic Diesel Engines, ZA
- Petrojet, EG
- Helwan Engineering Industries, EG
- Westcom Technologies & Energy, NG
- SMT – Sudan Master Technology, SD

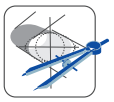
Middle East
- Ahvaz Pipe Mills, IR
- Safa Rolling And Pipe Mills, IR
- McDermott Middle East, AE
- NPCC – National Petroleum Construction Com, AE
- APC – Arabian Pipes Com, SA
- NPC – National Pipe Com, SA
- Gulf Engineering Com, SA
- KPIOS (M. A. Kharafi & Sons), KW

Southeast Asia/Australia
- L&T – Larsen & Toubro, IN
- Cochin Shipyard, IN
- Bharat Heavy Electricals, IN
- Thermax, IN
- Godrei & Boyce, IN
- Mazagon Dock, IN
- Canadoil Group, TH
- Vietsovpetro, VN
- Rolco, AU
- Australian Submarine, AU

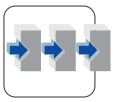
HAEUSLER
the forming factory

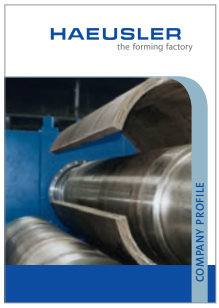

PLATE BENDING


PROFILE BENDING


SPECIAL FORMING


ASSEMBLING EQUIPMENT


PRODUCTION LINES



HEAD OFFICE

HAEUSLER AG Duggingen
Baselstrasse 21
4202 Duggingen
Switzerland

CONTACT

Telephone +41 61 755 22 22
Fax +41 61 755 22 00
sales@haeusler.com
www.haeusler.com