

HAEUSLER

the forming factory

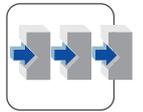


Pipe Mill

The solution for LSAW pipe production

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

The Haeusler family

From left to right, standing: Camille Haeusler, Corinne Haeusler, Stefan Neumann, Raymond Haeusler
From left to right, seated: Christian Haeusler, Joerg Haeusler, Elisabeth und Werner Neumann-Haeusler

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.



Left

HAEUSLER Main Office in Duggingen, Switzerland

Top

German plant in Rheinfelden-Herten, Germany

HAEUSLER – Global leader in RB pipe mills

Back in 1990 HAEUSLER developed two complete LSAW 40-ft pipe mills for the Korean market. The concept was based on previous experience in the construction of roll bending (RB) machines. With a market share of over 60 %, HAEUSLER is now a world leader in the construction of LSAW pipe mills.



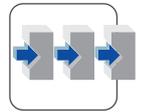
The first RB LSAW pipe mills were already clearly superior to other forming processes such as JCO and UOE in regard of out-of-roundness tolerance and productivity, especially when taking into consideration the differences in initial cost. However the maximum pipe wall thicknesses were limited.

Over the past decade, HAEUSLER continually improved the RB process, so today wall thicknesses of up to 45 mm can be processed at an output of up to 20 pipes per hour, while still maintaining the benefits typical of RB such as excellent production flexibility and bending quality.

Facts

Capacities of HAEUSLER RB LSAW pipe mills

Pipe diameter range	16 to 64" (80" on request)	406 to 1626 mm (2032 mm on request)
Pipe length	20 to 40 ft (80 ft on request)	5 to 12,2 m (24.4 m on request)
Wall thickness	¼ to 1¾"	6 to 45 mm
Productivity	up to 20 pipes/hours	



Practice clearly shows the benefits of the RB process

There are three different technologies for the production of LSAW-pipes. As with most industrial equipment, there are a few key parameters to benchmark the three

technologies. Typical benefits of RB are flexibility, bending quality, investment, output and Return on Investment (ROI).

	HAEUSLER RB PIPE MILL	UO PIPE MILL	JCO PIPE MILL
Low investment costs	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
High wall thicknesses on small diameters	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Output	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Return on Investment	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Process flexibility (Tool changes and their duration)	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> *
Insensitive to material variances	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Roundness after bending (variance in transition zone and polygon effect)	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Stress homogeneity (in the pipe after bending)	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Few bending tools required	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> *

* when using forming die

* when using forming die

In addition to the delivery of complete pipe mills, HAEUSLER offers a wide range of supplementary services for successful completion of your project and the long-term operation of your production plant.

Engineering

- Plant engineering
- Civil engineering documents
- Basic engineering for grounding
- Basic engineering for media networks like water, air, power, cooling systems and technical gases
- Basic engineering for drain systems and waste water treatment

Accessories

- Quality Assurance Laboratory
- Maintenance workshop
- Spare parts logistics
- Consumables
- Transport and lifting equipment

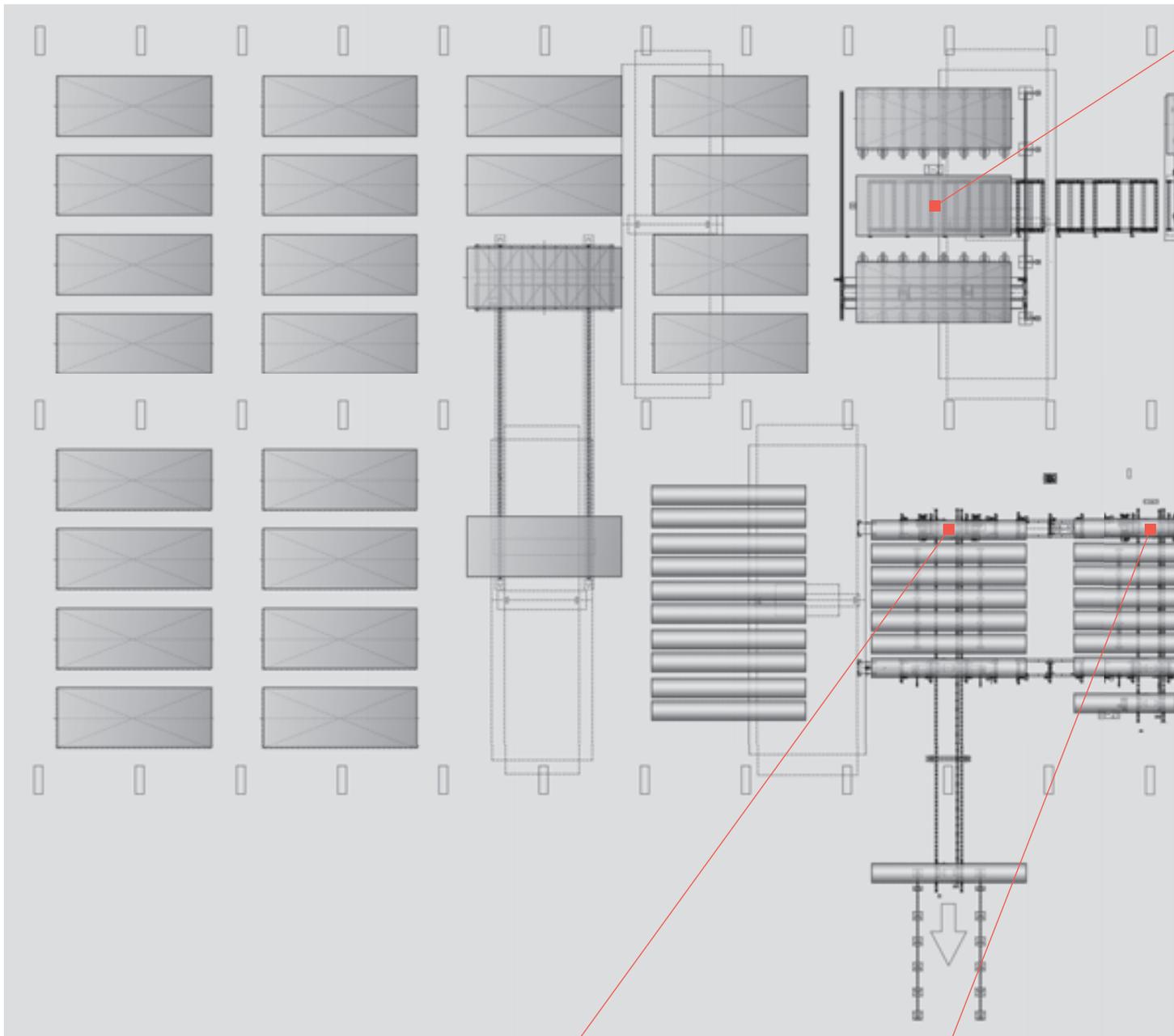
Services

- Site management and installation
- Training
- Production support
- Repair services
- Certification support
- Plant modernization

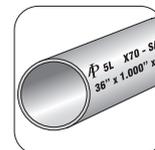


Layout of a HAEUSLER RB Pipe Mill

Working closely with our customers, we are developing tailored solutions for individual requirements. The degree of automation, production output and the quality standard which needs to be achieved are the key factors defining the final structure and workflow of the individual production steps. To merge the different production steps into a well-coordinated, sustainable, economical and long lasting pipe mill is the core competence of HAEUSLER's plant engineers.



End clients' inspection

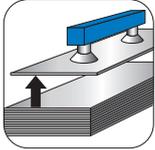


Marking

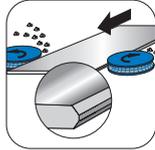


Final inspection

Plate de-stacking



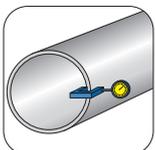
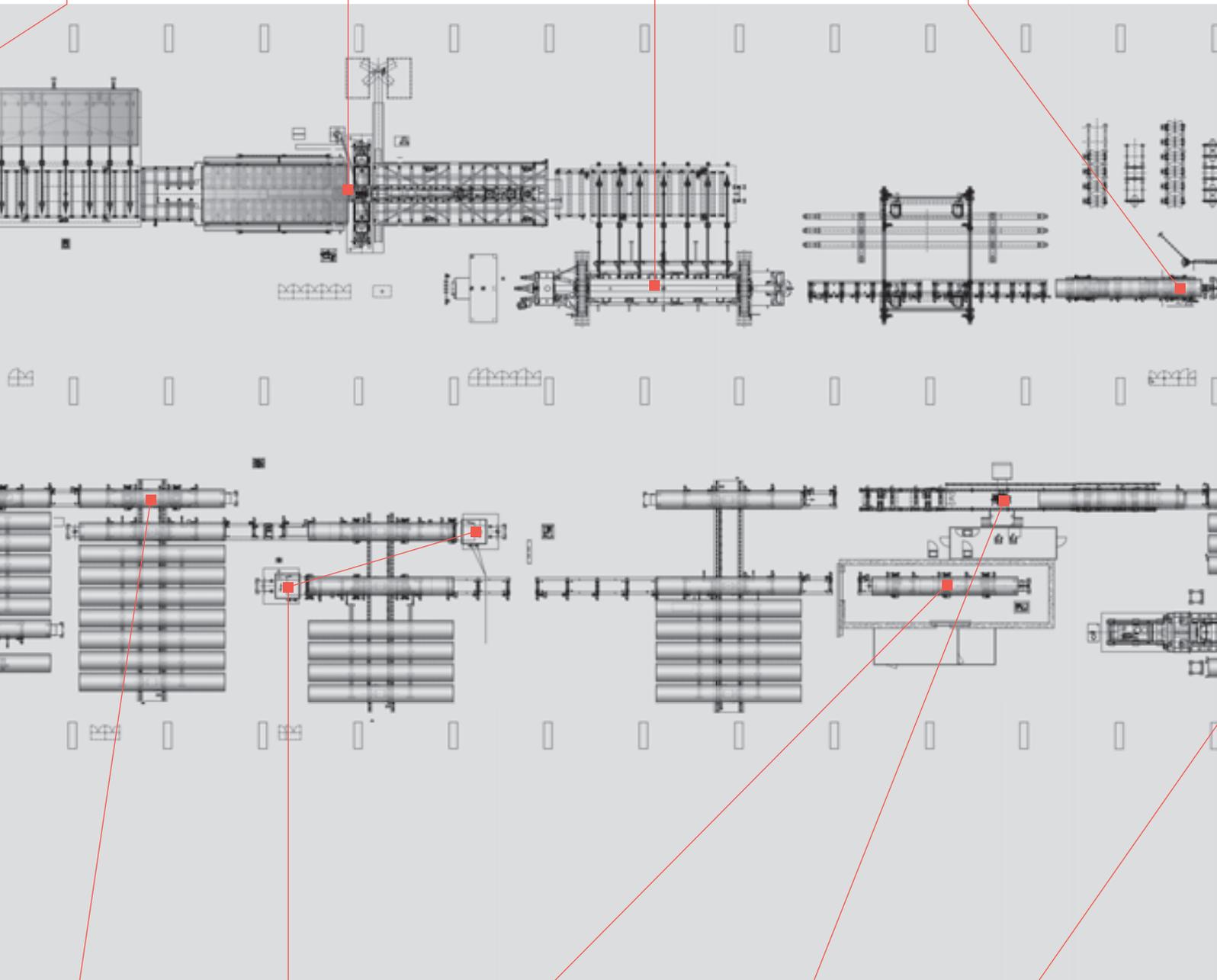
Edge preparation



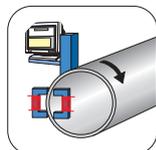
Roll bending



Post bending



Weighing and measuring



Magnetic particle inspection



X-ray testing

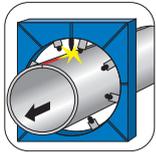


Ultrasonic testing



Hydro testing

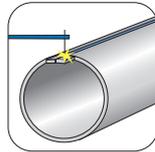
Root welding



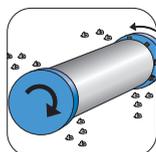
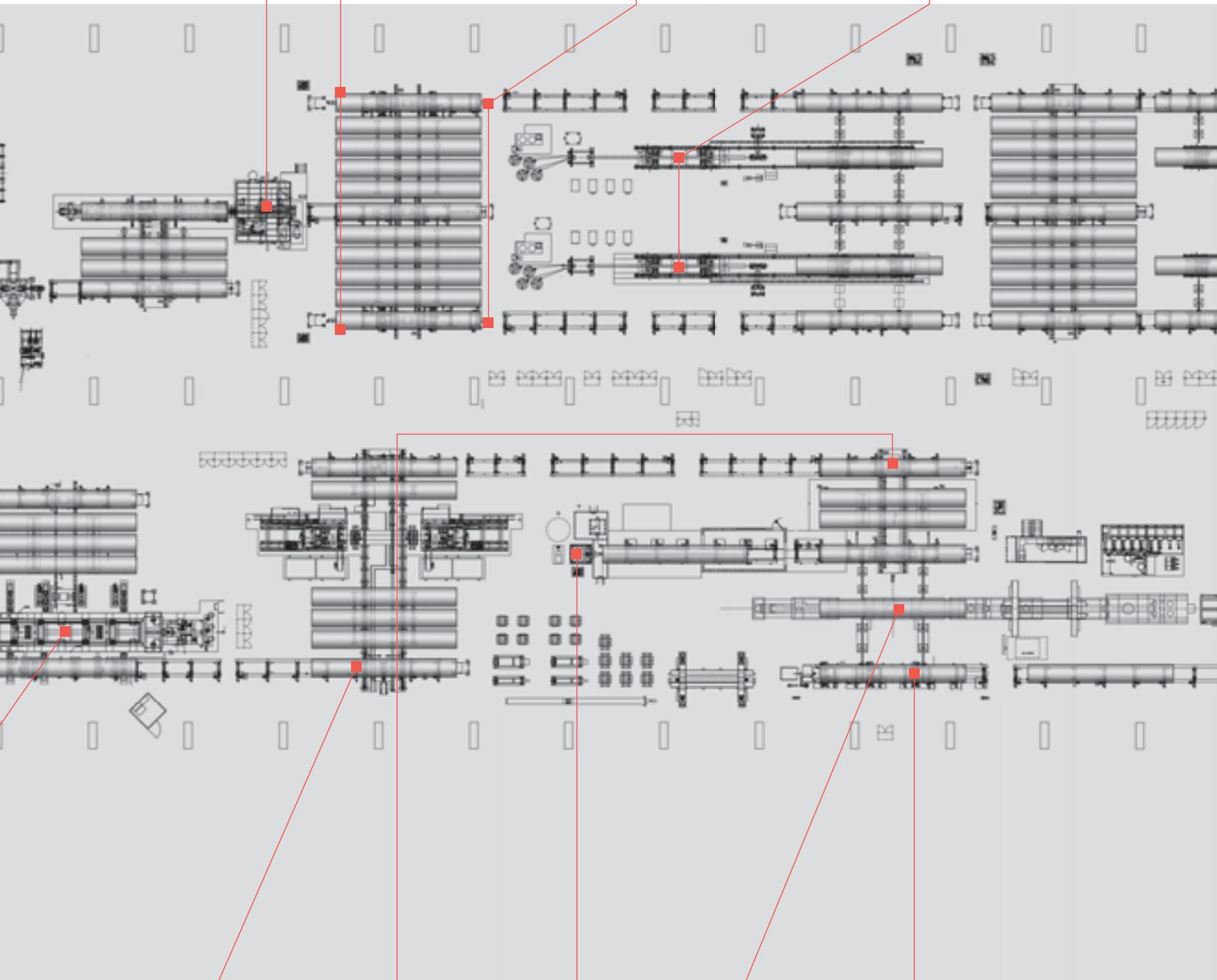
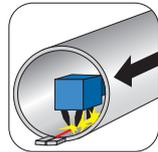
Visual inspection



Weld-on taps



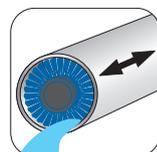
Internal welding



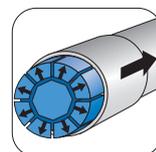
End bevelling



Specimen taking



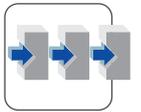
Post-washing



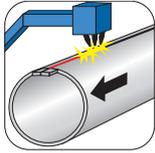
Expanding



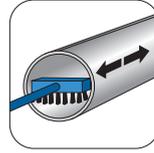
Pre-washing



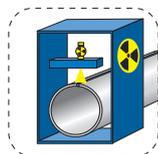
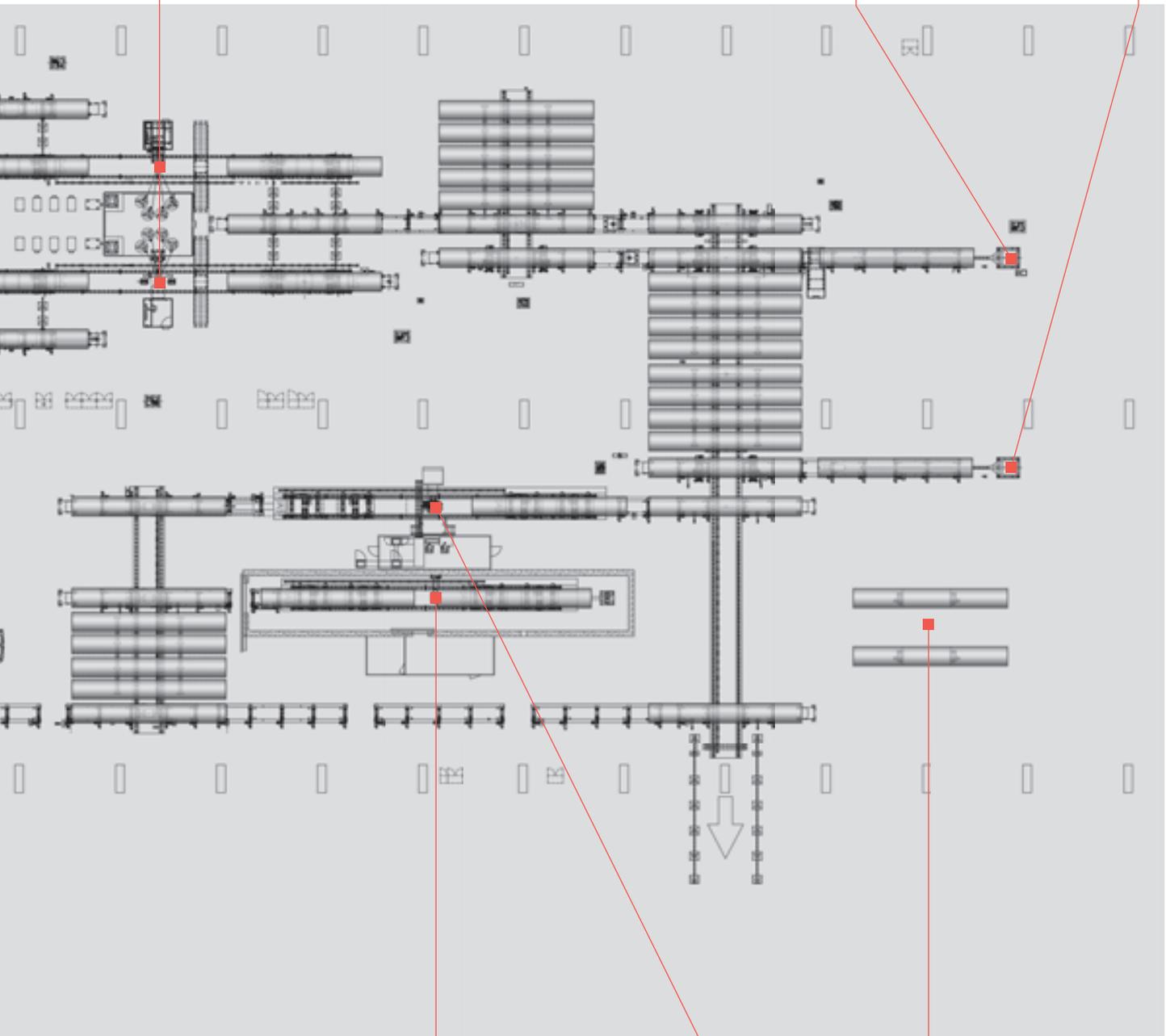
External welding



Pipe cleaning



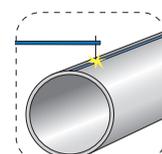
Visual inspection



X-ray testing



Ultrasonic testing



Weld repair



The pipe mill process

A number of interacting operations are part of the overall pipe mill process. Three main process categories can be defined:

1. Production
2. Quality control
3. Pipe transport

1. Production

Production machines are the key factor to the quality of the pipes which need to be produced.

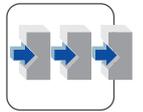
All parameters, which must conform to the relevant standards, are set here. Based on their physical requirements and the factors which influence the process, there are three production steps which have a main influence on the pipe quality:

- Forming pipes
- Welding pipes
- Expanding pipes

As a general contractor for turnkey pipe mill solutions, HAEUSLER offers all key machines as in-house products. Therefore all critical sections of the HAEUSLER pipe mill process are produced from one source.

These key machines can also be used for the modernization of existing pipe mills.

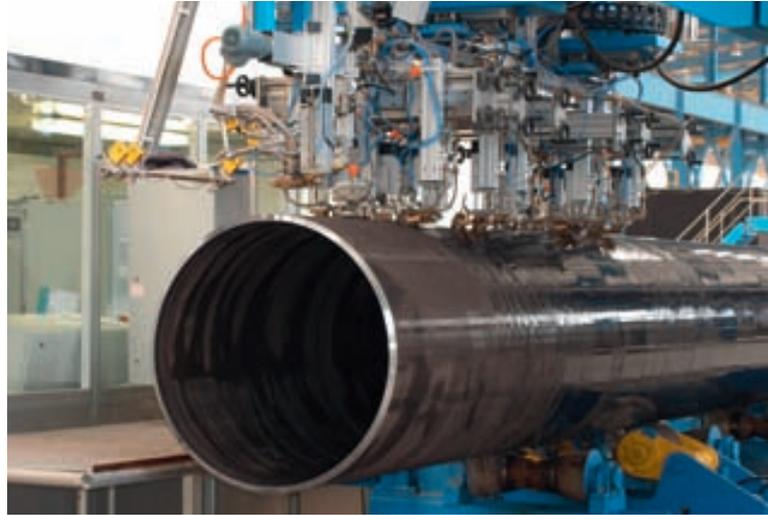




2. Quality control

The inspection stations include all process steps, in which the pipe is inspected as required by the different international standards.

- X-ray
- Ultrasonic
- Magnetic particle inspection
- Hydro testing
- Visual inspections



3. Pipe transport

Pipe transport within the plant is essential for the efficiency and flexibility of a pipe mill since it forms the link between the various individual steps.



Forming of pipes

In a HAEUSLER pipe mill, forming is carried out in two steps: Roll bending of the plates into cylindrical shells and the following post-bending of the remaining straight ends. This quick and efficient forming process ensures top quality and short cycle times.

Roll bending with the HAEUSLER 3-roll bending machine RMS

After the milled plate is automatically fed and aligned in the machine, the CNC-controlled roll bending sequence starts. In two to three forming steps the plate is formed into a cylindrical shell. During pipe conveying the next plate can be loaded.

Only HAEUSLER RMS offer the unique option to produce pipes in two different processes:

- Forming with a pre-stressed top roll
- Forming with supported top roll – a HAEUSLER innovation!



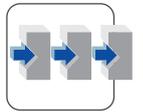
RMS

- High output
- Insensitive to material variances
- Stress homogeneity through continuous forming process

Forming with a pre-stressed top roll

The conventional way of rounding large pipes in a diameter range of 20 to 64" is to use a pre-stressed top roll in combination with a variable bottom roll distance. This guarantees optimum utilization of the installed bending

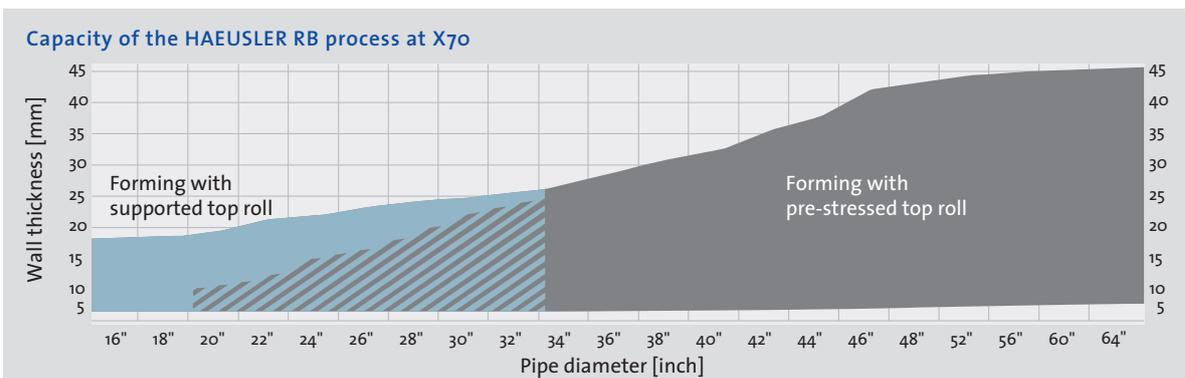
power while maintaining a consistent pipe quality. The complete diameter range of the plant can be covered using two to three top rolls which can be quickly changed.



Forming with supported top roll – a HAEUSLER innovation!

As a result of the further development of the RMS, HAEUSLER added the supported top roll which opens up an extended wall thickness range for pipes diameters from 16 to 32”.

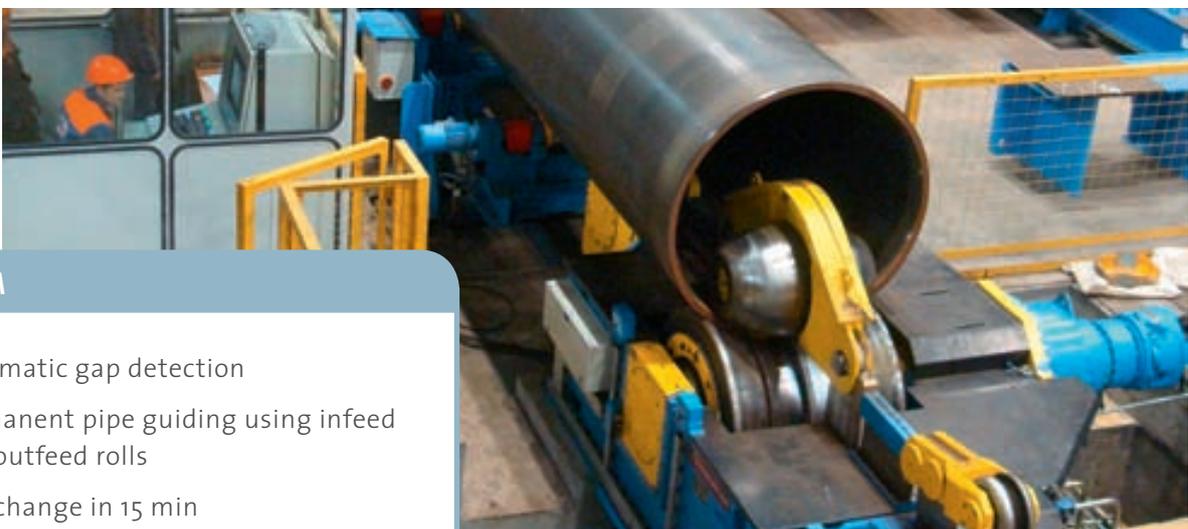
This new feature combines the advantages of roll bending with capacities previously reserved press forming processes.



Post bending on the HAEUSLER NABM

Using the efficient post bending machine NABM, the remaining straight ends are

rounded by using forming rolls. The post bended pipe is ready for welding.



NABM

- Automatic gap detection
- Permanent pipe guiding using infeed and outfeed rolls
- Tool change in 15 min

Welding of pipes

The welding of the pipes is one of the most demanding production steps within the pipe mill. It is done in three steps:

1. Continuous root welding (GMAW)
2. Internal submerged arc welding (SAW)
3. External submerged arc welding (SAW)

Continuous root welding with the HAEUSLER CRWM

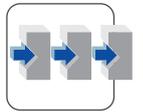
The open pipe will be fed through a hydraulically controlled cage for proper alignment of the edges and continuous root welding. To weld the pipe without offset and with homogeneous seam are the main quality criteria within this process. Additional to the pipe assembling, the root weld serves as backing for the following internal welding.

Simultaneous closing, transporting and seam tracking of the pipe as well as controlling the welding parameters are run by an easy-to-use CNC system. The integrated digital weld control and laser tracking systems ensure high and reproducible pipe quality.

CRWM

- No tool change necessary, therefore very quick production changeover
- Constant grounding over the full pipe length for an homogenous seam
- Laser system for offset control and seam tracking guarantees high quality standards
- Integrated exhaust filter unit





Internal and external welding

Both internal and external welding is carried out by stationary multi-wire submerged arc welding, while the pipe is transported on a carriage.

For internal welding, the multiple wire welding head is mounted at the end of a self-supporting boom in which the supply for wires and flux are integrated.

For external welding, these components are fitted onto a gantry with a height adjustable operator platform.

The speed of the pipe carriages is precisely controlled to match the welding parameters.

The flux supply and recovery system, as well as the electrical grounding system, are integral parts of all HAEUSLER welding stations.

Depending on the required output, two or more internal and external welding stations are integrated into the production line.



Multi-wire SAW

- One pass multi-wire submerged arc welding with up to 5 wires
- Digital weld control enables online monitoring of the welding quality as well as recording of production parameters
- Automatic seam tracking for very high quality requirements
- Rail guided transport carriages with turning rolls for safe and quick pipe manipulation



Quality through full body pipe expanding

Expanding is the final forming step in the production of pipes – it defines the final shape of the pipe in order to meet the required standards.

Full Body Pipe Expander CMR

During expanding, the pre-washed pipe is fed over a tool which radially expands the pipe step by step.

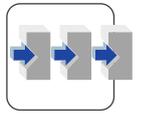
The tool is fitted onto a boom and contains radially expanding segments which are pushed by a hydraulically actuated cone. This process expands the pipe to achieve the required tolerances for out-of-roundness and straightness.

HAEUSLER offers the complete equipment including pre-washing, pipe expanding, expander tools, post-washing and water treatment.

Expander CMR

- Patented pipe guiding system for high quality pipes
- Innovative head design to maximize life time
- Individual lubrication lines for every head segment for extended life time and reduced oil consumption
- Easy to control and fast production change over





In use around the world

HAEUSLER is an export-oriented company. Our machines and equipment are already in operation on all continents and in more than 70 countries in total. Shown below is a summary of HAEUSLER's reference list.



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PLATE BENDING



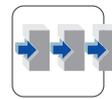
PROFILE BENDING



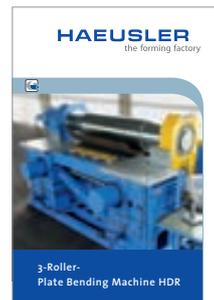
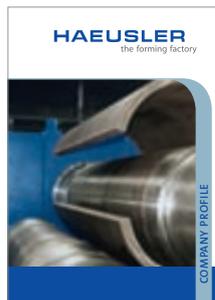
SPECIAL FORMING



ASSEMBLING EQUIPMENT



PRODUCTION LINES



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