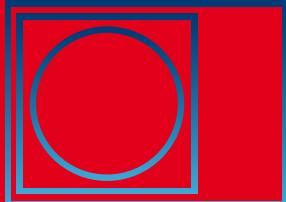


TM



ERW Tube Mills & Tube Finishing Lines

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ERW Tube Mills

FIMI TUBE MILLS PHILOSOPHY

The production philosophy for our Tube Mills can be stated as follows: to design and manufacture machines without compromises in order to guarantee maximum reliability to the Customer, continuity of production, consistently high quality of tubes, short time and low cost of toolings and maintenance.

FIMI designers are facing every day challenges in order to keep their machines to the top level in technology, maintainability and reliability. Every project is verified in every detail in order to give the customer the best result.

The flexibility, the experience of the designers and the wide know-how reached in all the areas related to industrial machineries permit FIMI to offer a complete portfolio of production lines and accessories machines for the complete process of tube mills.

Time by time, the experience in tube mills has grown passing from small sizes and thicknesses up to the top range of tubes production.

The quality of the tubes produced has also increased from construction to oil and gas including also machinery for the profiling, finishing and testing of the tubes. This brought the know-how also in machinery types like end-facing, hydrostatic-test, NDT island (online and offline) and automatic packing.

The technology in profiling process has been increased including cage forming for the linear profiling of the tube substituting some of the standard passages giving more flexibility and productivity to our tube mills.

Two pillars are on the base of this sector:

- » **The tube mills have to guarantee the best quality in the products giving also the best performances during the production** (in terms of speed reached) **and in maintenance / set-up phase** (in terms of easiness in maintainability and quick change solution for the set up operations).
- » The experience reached is also giving FIMI the possibility to offer the **optimal solution needed by the customer guiding also him and letting him grow in tube mills world. The possibility to offer all the machines needed for a complete factory is one of the most important characteristics of FIMI.**
- » The market is asking more and more attention on the time necessary for the set up. For this reason, **FIMI has developed different proposal to give the best solution** combining the quickness and the automatization that the customer is looking for.
- » To reach the best performances, the line also needs the best cutting technology. For this reason, **a lot of research has been dedicated to flying cut-off systems.** The control in speed and the precision in cutting **guarantee the best performances in terms of cycle time and blade life.**

ERW TUBE MILL

- » For high quality tube mills, FIMI proposes also single motorization on each shaft of the roll forming section. This permits an extreme control of the speed and the torque on each shaft and the possibility to adjust the ratio between upper and lower speed in order to avoid slidings on the surfaces of the metal strip, also after the grinding usually done on the rollers that changes their nominal diameters changing consequently the quality of the product.
- » One other important aspect is the time lost in production for the rolls changing when the production switches from one size to an other.

To solve this problem, on its Tube Mills, FIMI proposes quick change systems that permits to reduce the time necessary. One possibility is to remove the complete shaft with bearings and sliding blocks from the top of the passage. In this way, preparing offline the rolls already mounted on the shaft, the change is quicker and more efficient.

Another better and quicker method is to remove completely the passage (upper and lower shaft mounted on the shoulders) replacing it with one identical group prepared offline. This can be done also on Tube Mills that have automatic regulation on the passages through mechanical clutches that permit to have the motors fixed removing quickly the plates with everything mounted on it.

Fully automatic machines can also be proposed in order to minimize the intervention of the operator with mechanical adjustments, using motors for all the regulations.

For the break down phase, a flexible system that permits to change quickly the production size without changing the rollers is the cage forming where a linear forming system permits to adjust the position of the rollers adapting to all the diameters that the machine can produce.

This permits also to reduce the total number of forming rollers needed for each tube size, decreasing the cost of the toolings for each production size.

All these aspects are possible thanks to the great experience and know how got on the automation side.



These kind of outstanding performances are achieved by the application of new forming philosophy based on the experience made in the years on different type of tube mills.

Depending on the production range, FIMI Tube Mills can be composed in different ways in order to adapt better the requests of the customer and the quality obtained.

- » The maintaining of the tension between one passage to the next one on the forming section is one of the key aspects for a good tube quality. This is obtained optimizing the motorization on each shaft depending from the range of OD and WT requested to the line.
- » Highly advanced electronics continuously keep under control the motor torque in order to uniform the stress on the material. The high flexibility of the system permits the operators to adjust all the parameters in the way they prefer in order to increase the quality.



The attention to the production side, obtained by the presence in the factories among these years, **is shown in the high attention on the set up and maintainability of the lines.**

This takes evidence in the systems for the **quick change of the rolls or of the passages complete with rolls, shafts and shoulders** and in the development of **flexible groups such as the cage forming** that **guarantee an automatic positioning of the universal rolls when changing the production size.**

ERW TUBE MILLS / TUBE FINISHING LINES

Thanks to the know-how obtained over the years, **Fimi is able to project, manufacture and install turnkey plants for the production of pipes in the range from 13 mm up to 508 mm API outside diameter**, according to customer's specifications based on production speed and wall thickness.

In addition to the complete lines, **Fimi is able to offer individual parts for replacement or integration in existing production lines**: decoilers, coil opening units, automatic strip joint benches, straightening machines, horizontal spiral accumulators.

- » ERW TUBE MILLS
- » ERW TUBE MILLS API
- » STRIP JOINT BENCHES
- » STRIP ACCUMULATORS
- » MILLING CUT-OFF UNITS



▲ Complete Electro-Welded Tube Mill API



◀ Strip Joint Benches



◀ Strip Accumulators



◀ Milling Cut-Off Units

Erw Tube Mills

TM10

TM10 is a Tube Mill able to produce from 127,0 up to 273,0 mm with optimal performances and quality.

It is composed of both standard cages and linear cages and the cutting system is FIMI standard Double Blade flying Cut-Off.

This permits high flexibility and high speed up to 60 m/min.

- » Linear Cage Forming
- » Quick Change Tooling System
- » Internal Scarfing System
- » Eddy Current System

- » Tube Diameter 127,0 ÷ 273,0 mm
- » Wall Thickness 3,0 ÷ 8,0 mm
- » Tube Length 6,0 ÷ 12,0 m
- » Working Speed 0 ÷ 60 m/min



▲ Forming Unit + Welding unit



▲ Charge Coil Car + Un-coiler + Opening Group



▲ 4 Rolls Welding Head + Internal Scarfer + Double External Scarfer



▲ Break Down



▲ Sizing + Eddy Current System + Squaring Unit



▲ ERW Tube Mill **TM8 API** - O.D. Ø 90,0 ÷ 219,1 x 3,0 ÷ 8,0 mm



▲ Break Down + Linea Cage Forming



▲ Sizing + Eddy Current System + Squaring Unit

TM8 API

Derived from the **TM10**, the **TM8** was born for the **API** production.

- » Tube Diameter 90,0 ÷ 219,0 mm
- » Wall Thickness 3,0 ÷ 8,0 mm
- » Tube Length 6,0 ÷ 12,0 m
- » Working Speed 0 ÷ 60 m/min

To the flexibility and to the high performances of the **TM10**, all the necessary groups have been added to satisfy the API standard requests:

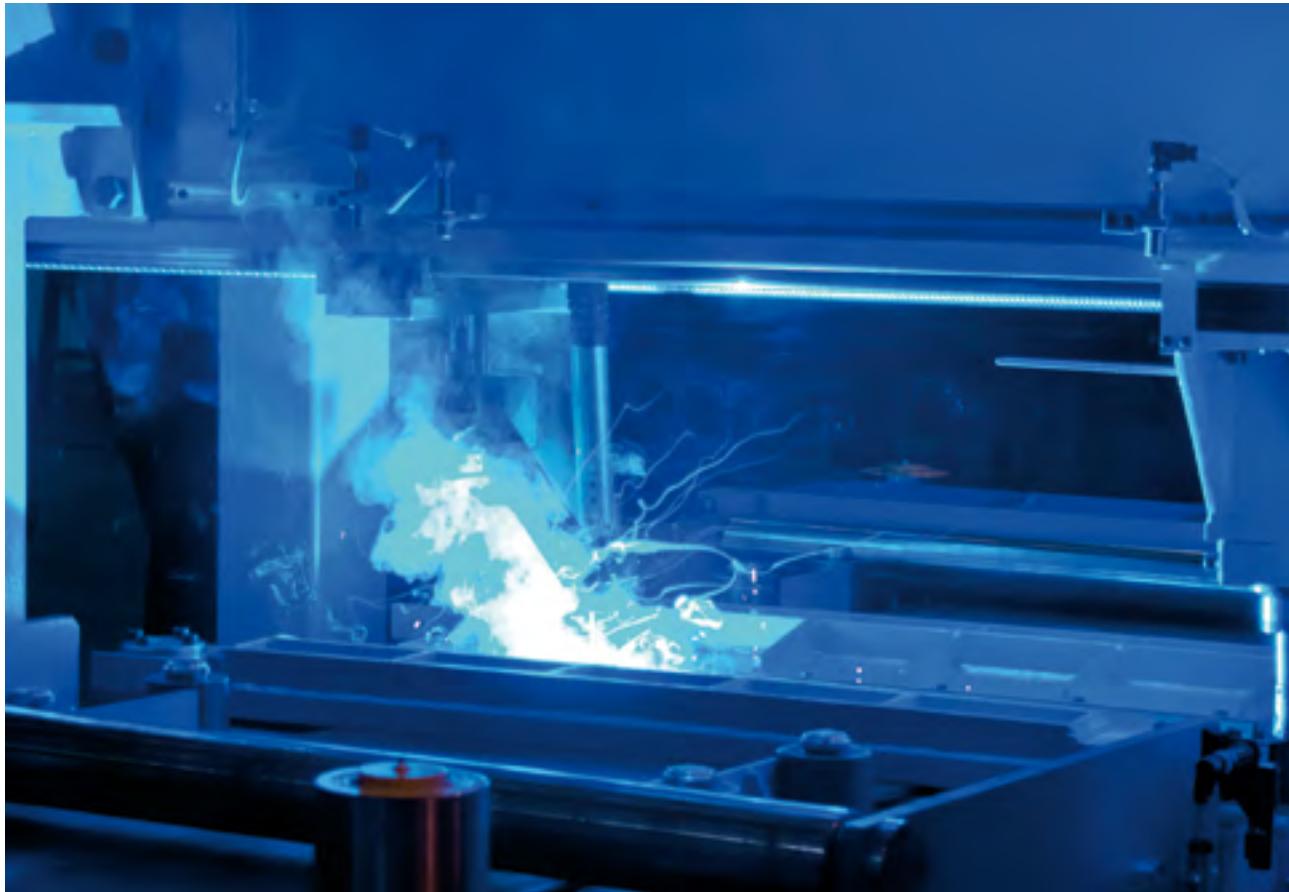
- » Seam annealing after the welding
- » End facing
- » NDT tests
- » Hydrostatic tests

Strip Joint Benches

A complete working unit for the welding of strip head coming from the uncoiler with the strip tail coming from the horizontal spiral accumulator.

This system permits to continue the production without feeding the line for the first time for every coils used.

Together with the accumulator, it permits to change coil and joint it with the already working strip maintaining constant the speed of the tube mill.



▲ Full Automatic Strip Joint Bench **SBJ10**

Composed by:

- » Entry Guiding Adjustable System
- » Pinch System for the head of the strip
- » Welding Torch
- » Milling System for welding seam
- » Pinch System for the tail of the strip
- » Exit Guiding Adjustable System



◀ Strip Joint Bench **SBJ10**

- » Strip Width 436 ÷ 800 mm
- » Wall Thickness 3,0 ÷ 8,0 mm

- » Full automatic
- » Diagonal cut



◀ Strip Joint Bench **SBJ2.5**

- » Strip Width 90 ÷ 260 mm
- » Wall Thickness 1,5 ÷ 4,0 mm

- » Semi automatic
- » Diagonal Cut

The entry system has a clamping device for the head of the incoming strip, assembled on a slide with a forward motion system, controlled by hydraulic motor through a screw.

This allows the strip positioning very close to the shear blade, while a centering device with vertical axis rolls provides the correct alignment for right cut at 5° degrees angle.

A powerful hydraulic shear with a double circular blade, allows the cut of the head and the tail of the strip to be welded.

The double support for welding torch is placed on a transversal sliding system controlled by a servomotor through a screw and this machine is equipped with welder CO₂ and one torch.

Once the operator has confirmed all the positions with the correct sequence of operations, the automatic welding cycle of the strip can start. This machine is equipped with a milling carriage that can mill the welding seam.

All functions are performed by the operator through the push buttons on a control board.



▲ MIG Welder



▲ Milling carriage for mill welding line

Strip Accumulators

The possibility to unwind the material at a higher speed in order to have the time to joint coil to coil is given by the accumulator.

Composed by:

- » Strip launching rollers
- » External rollers for spirals entry
- » Internal body with rollers
- » Horizontal rollers to guide the strip spirals
- » Motors
- » Electrical / Electronically



▲ Horizontal Spiral Accumulator **HA16** - Strip Width 365 ÷ 1.300 x 3,6 ÷ 12,5 mm

- » Synchronized functioning: the entry speed and the outlet speed are the same of the speed line.
- » Stop of the line for the welding of the tail/head. In this phase the tube line goes on working using the strip stocking.
- » When the welding process has finished, the machine accumulates again quickly the quantity of strip used during the welding phase.
- » When the defined strip quantity is reached, the machine is automatically synchronized with the speed of the tube line.



▲ Pinch-roll



▲ Angled Rollers

The entry end strip deviators with hydraulic and driven pinch rolls guide the strip from the horizontal exit of the strip joint bench to the vertical pinch roll of the accumulator.

The horizontal spiral accumulator is filled by the pinch roll driven by the A.C. motor and with pneumatic cylinders that give the pressure to guarantee the friction with the strip.

The drive system for the rollers table is composed by a series of motors with one gearbox for each one. The motors are controlled by a frequency variable system. The strip exits from the center of the accumulator and is again angled horizontally by a series of deviators up to the profile.



▲ Horizontal Spiral Accumulator **HA10**



▲ Horizontal Spiral Accumulator **HA2.5**

» Strip Width	400 ÷ 800 mm
» Wall Thickness	3,0 ÷ 8,0 mm

» Strip Width	90 ÷ 260 mm
» Wall Thickness	1,5 ÷ 4,0 mm

Milling Cut-Off Units

FIMI's flying cut-offs are real machine tools **completely designed, assembled, tested and put into service** as a result of **perfect understanding** of technological cycle, **Customers' needs** and also due to **feedback constantly received** from our numerous Customers all over the word, for whom we have been supplying and installing **electro-welded tube lines**.



▲ Double Blade Shear Flying Cut-Off **DB10** - O.D. Ø 73 ÷ 273 x 3,0 ÷ 8,0 mm

With different suggested solutions coming from the field of machine use, the production philosophy for our cut-off machines remains the same and can be stated as follows:

designing and manufacture machines without compromises in order to guarantee **maximum reliability** to the Customer, **continuity** of production, **consistent high quality** of cut, **short time and low cost** of toolings and maintenance.



▲ Four Blades Shear - Orbital Cut-off



▲ Double Blade Shear



▲ Single Blade Shear

Thanks to the know-how obtained over the years, Fimi **project, manufacture and install** milling cut-off units able to **cut pipes in the range from 13 mm up to 610 mm API outside diameter, according to customer's specifications** based on production speed and wall thickness.

- » FOUR BLADES SHEAR - ORBITAL FLYING CUT-OFF
- » DOUBLE BLADE SHEAR - STATIONARY CUT-OFF
- » DOUBLE BLADE SHEAR - FLYING CUT-OFF
- » SINGLE BLADE SHEAR - FLYING CUT-OFF



▲ Milling Cut-Off Clamp & Blade

To guarantee the best control during the cutting process, **SIEMENS SINAMICS** drives are used on our flying cut-off, and the control logic of the board is managed by a **SIMOTION PLC** with Profinet cabling.

The software is developed on 2 levels: the first, PLC, made by tool "SIMOTION Scout" while the second, the supervisor's touch screen, made with the new development environment **Siemens Simatic TIA Wincc**.

The operator's interface graphic pages will be designed to allow operators a rapid takeover of the machine after the start up. Interactive diagnostics allow the operator to immediately identify the cause of any operational stop or anomaly of the system.

The alarm/failure signals follow their logical sequence, avoiding irregular indications and the operator will be quick in helping solving functional problems, the alarms will also be saved in data base for diagnostics and maintenance.

Pages with trend graphs of the main parameters measured by the machine will be immediately available and data based.

Milling Cut-Off Units

Orbital Flying Cut-Off FB24

The orbital flying cut-off **FB24** is the result of **an innovative project** that have brought us the solution of the head with 4 blades in order to **ensure cutting times adequate to the line speed on large diameters** (over 219,0 mm) and the possibility to work with 2 blades on the smaller sizes.

» Tube Diameter	168,0 ÷ 610,0 mm	» Tube Length	6,0 ÷ 14,0 m
» Wall Thickness	4,0 ÷ 20,0 mm	» Working Speed	0 ÷ 35,0 m/min



◀ Orbital Flying Cut-Off **FB24**



▲ **FB24** Blades & Drives



▲ **FB24** Clamps

- » Use of reduced diameter TCT blades with a high rigidity and low vibrations.
- » Very strong construction for a precise and vibration-free cut.
- » Possibility to continue the production even in case of blade breakdowns, using two coaxial blades.
- » Great simplification, reduction and unification of the components which allows to minimize the needs for technical assistance and stock of spare parts.
- » System of universal clamps used to cover all the profiles to be cut and their correspondent dimensions, with minimal setup time and number of clamps.



▲ Double Blade Flying Cut-Off **DB10**



▲ Double Blade Stationary Cut-Off **DB10S**

Double Blade Shear DB10 - Flying or stationary cut-off

Flying cut-off with a controlled movement along the orthogonal axis for the range of diameters 73,0 up to 273,0 mm and their derivatives. It is a result of the evolution of a basic project, with already very high performances.

» Tube Diameter	73,0 ÷ 273,0 mm
» Wall Thickness	3,0 ÷ 12,0 mm
» Tube Length	6,0 ÷ 14,0 m
» Working Speed	0 ÷ 50 m/min

- » Cutting heads mounted on two columns with brushless motors on the X and Y axes, independently controlled, that optimize cutting paths. This allows to cut any type of profile (round, square, rectangle, irregular shapes) optimizing the penetration of the blade in the material to guarantee the best cutting process and the longest life of the blades.
- » Clamps arrangement extremely close to the cutting area to ensure a closure of the tube which minimizes deformations and vibrations;
- » Blade AC motors with vector control to ensure the optimum torque under any conditions, able to cut from the more common to high-resistance steel grades with HSS blades or with TCT inserts. Top class cutting times, thanks to the possibility to use the blades to the top of their performances.
- » The flying carriage moves on linear guides and sliding blocks, driven by a pinion / rack rectified and a brushless motor dimensioned to guarantee high levels of torque in order to accelerate the carriage in each cycle for an unlimited time without overheating.
- » A user friendly control software, that allows to optimize the parameters and the cutting paths for each measure; it is also able to collect all useful working data.



▲ **DB10 Blades**



▲ **DB10 Control Pulpit**



▲ **DB10S Universal Clamps**

Milling Cut-Off Units

Double Blade Flying Cut-Off DB8

Flying cut-off with a controlled movement along the orthogonal axis for the range of diameters 76,0 up to 219,0 mm and their derivatives. It is a result of the evolution of a basic project, with already very high performances.



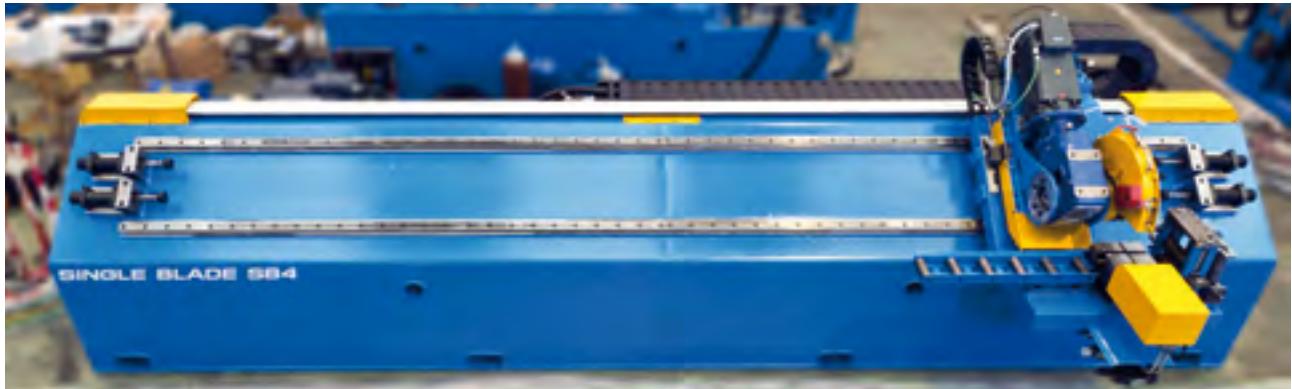
▲ O.D. Ø 219,1 x 8 mm Tubes



▲ O.D. Ø 219,1 x 8 mm Tubes

- » **Extreme flexibility** - the wide range of sizes and sections that can be cut always with the best parameters requested by the blades (also) for this machine either HSS or TCT).
- » **High-quality of cut** and a long blades' service life.
- » **Unique cutting line in the world** can follow unequal pathways.

» Tube Diameter	76,1 ÷ 219,1 mm
» Wall Thickness	2,0 ÷ 8,0 mm
» Tube Length	6,0 ÷ 12,0 m
» Working Speed	0 ÷ 140 m/min



▲ Single Blade Flying Cut-Off **SB4**

Single Blade Flying Cut-Off SB4

Single blade cut-off for tubes with diameters from 18,0 up to 127,0 mm and all the quadrangular profiles that can be obtained from this measure.

- » Possibility to adjust feed per tooth, cutting speed and milling speed in a wide range in order to optimize the working conditions for both HSS and TCT blades.
- » Reduced time for clamps/blades replacement.
- » Minimum necessity of maintenance and easy chips evacuation and cleaning.
- » Low operating costs.



◀ **SB4** Cutting group



◀ Specific cut application

» Tube Diameter	18,0 ÷ 127,0 mm
» Wall Thickness	1,0 ÷ 6,0 mm
» Tube Length	3,0 ÷ 10,0 m
» Working Speed	0 ÷ 130 m/min

ERW TUBE MILLS / TUBE FINISHING LINES



▲ End Facing & Chamfering Unit



▲ Hydrostatic Test Unit

Tube Finishing Lines

FIMI TUBE FINISHING LINES PHILOSOPHY

In the last years, the importance of the finishing machines has increased in order to have a better quality and a more valuable production.

FIMI has developed proper lines in order to satisfy this requests.

Finishing lines are fundamental to obtain certified products such as API or OCTG production. All the necessary phases such as end-finishing, hydrostatic testing and NDT controls can be managed by FIMI that can supply the correct machine for the correct requests.

All this products can be fitted both online or offline depending from the production capacity, layout restrictions or customer desires. The main scopes are flexibility and quality as for the rest of the FIMI machines.

ERW TUBE MILLS / TUBE FINISHING LINES

Upon completion of its tube lines or supplied individually as implementation of existing plants, Fimi is able to offer end-facing and chamfering machines, hydrostatic tests for the pipe pressure testing (diameters from 12,7 to 406 mm. and lengths from 4 to 13 meters up to 500 MPA) and Threading/Drilling Units.

The tools for the various diameters have been designed to guarantee rapid re-setting of the machine and to ensure high productivity levels for the line. The processing phases are totally automated and easily integrated with the pipe lines and the automatic packing lines produced by Fimi.

- » END FACING & CHAMFERING UNITS
- » HYDROSTATIC TEST UNIT
- » THREADING/DRILLING UNITS
- » AUTOMATIC PACKING SYSTEMS
- » HANDLING UNITS



▲ Tube Finishing Plant for O.D. tubes 73 ÷ 219,1 x 3,0 ÷ 8,0 mm



◀ End Facing & Chamfering Units



◀ Hydrostatic Test Units



◀ Threading/Drilling Units



◀ Automatic Packing Systems

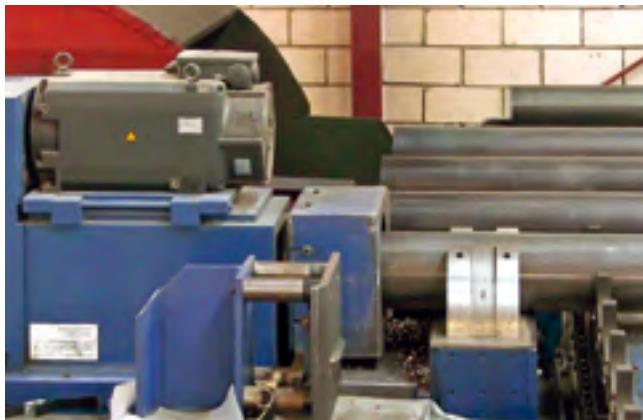


◀ Handling Units

End Facing & Chamfering Units

End Facing EF8

The end facing line consist of a single couple of head able to finish the tubes with a frontal, external and internal chamfering for tubes from 73 to 219,1 mm OD.



◀ EF8 Head & Vices

- » Tube Diameter 73,0 ÷ 219,1 mm
- » Wall Thickness 3,0 ÷ 8,0 mm
- » Tube Length 6,0 ÷ 13,5 m

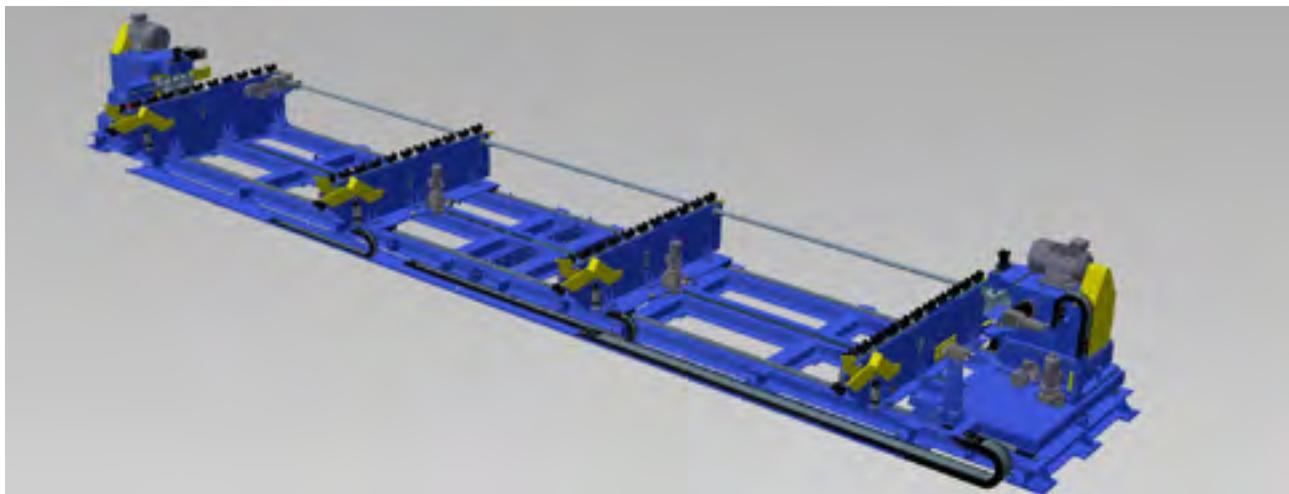


◀ EF8 Blowhole station

- » Round tubes from 73 up to 219 mm O.D. with thicknesses limited only if the customer pretends also internal beveling.
- » Tubes length from 3 up to 12 m all under automatic control.
- » Speed up to 120 m/min (with tubes long 6 m, 6 seconds to process 2 tubes).



◀ EF8 Beveling Head



▲ End Facing & Chamfering ***EF4 Double***

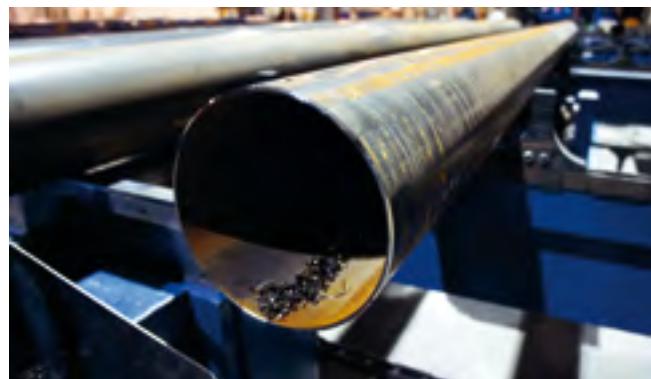
End Facing ***EF4 Double***

End-facing are generally beveling one side of the tube per time and one tube per time. From the experience done with this standard way to bevel the tube ends, FIMI has improved this machine in order to be **able to work 2 tubes per time using 2 parallel heads** that are beveling the 2 tubes at the same time.

This permits to have almost **the double of the time to bevel the tubes**. This is very important when the tube mill is really performing and the risk is that the bottleneck could be the time to complete the beveling of each tube.



▲ ***EF4 Double Beveling Head***



▲ ***Tubes Beveled***

- » Round tubes from 30 up to 114 mm O.D. with thicknesses limited only if the customer pretends also internal beveling.
- » Tubes length from 3 up to 12 m all under automatic control.
- » Speed up to 120 m/min (with tubes long 6 m, 6 seconds to process 2 tubes).
- » 4 chain conveyors in order to support the tubes with all the ranges.
- » 2 parallel beveling head with the possibility to mount external, internal and frontal inserts to finish the surface as desired.
- » Brushless motors to adjust automatically the axis of the beveling heads depending from the tube diameter.

Hydrostatic Test Units



▲ Hydrostatic Test Unit **HT8**

Hydrotest HT8 Double Head

This machine can test two tubes at the same time up to 250 bar and up to a diameter of 219,1 mm; for larger diameters, it is possible to test the tubes at lower pressure.

- » Nr. 2 tube with diameter 219,1 mm at the maximum test pressure of 250 bar.
- » Head changing time reduced with a simple and quick cassette system.



◀ **HT8 Control Pulpit**



◀ **HT8 Walking Beam Transfer**

- | | |
|------------------|-----------------|
| » Tube Diameter | 73,0 ÷ 219,1 mm |
| » Wall Thickness | 3,0 ÷ 8,0 mm |
| » Tube Length | 6,0 ÷ 13,5 m |
| » Max Pressure | 250 bar |

Hydrotest HT4 Triple Head

This machine can test three tubes at the same time up to 250 bar and up to a diameter of 114 mm; for larger diameters, it is possible to test the tubes at lower pressure.



◀ Hydrotest HT4 Triple Head

» Tube Diameter 48,3 ÷ 114,3 mm
 » Wall Thickness 1,0 ÷ 6,0 mm

» Tube Length 6,0 ÷ 13,0 m
 » Max Pressure 250 bar



▲ HT4 Heads



▲ HT4 Clamps

- » Optimized cycle testing 3 tubes per time in order to increase the productivity.
- » Very strong construction to support pressure up to 250 bar on 114 mm O.D. tubes.
- » Possibility to test tubes from 6 to 13 m length.
- » Quick change head in order to change quickly from one tool to an other.

Automatic Packing Systems

FIMI tube's packers are completely smart and allows the formation of **square, rectangular and hexagonal packages**. Thanks to an accurate construction, **they are able to stack** square, rectangular, beveled round and hydro-tested tubes **directly in line with the Tube Mill**, avoiding intermediate stoppages.

Automatic stackers, magnetic or traditional system, starting from 12,7 up to 323,0 mm length from 3 m up to 13 m. Stackers **automatically form, weight and drain** the bundles of pipes ready to be packed using manual or automated strapping systems.

The lines are studied for the packing of round, square and rectangular pipes forming packaging with dimensions and footprint **specified by Customer and requested by the factory layout**.

The bundles can be in fact unloaded to the front or the side according to the layout requirements.



▲ Automatic Packing Magnetic System **AP8** - O.D. 114,3 ÷ 219,1 x 4,0 ÷ 8,0 mm



▲ Magnetic System



▲ Tube AP loading



▲ Automatic Stacker **AS4** - O.D. 25,4 ÷ 127,0 x 2,0 ÷ 6,0 mm



◀ Automatic Packing **AP6** - O.D. 60,0 ÷ 168,3 x 2,0 ÷ 6,0 mm



◀ Automatic Stacker **AS2.5** - O.D. 33,0 ÷ 88,0 x 1,0 ÷ 3,0 mm

Handling Units

Handling systems for tubes designed to connect the various stations of the plant.

Composed by:

- » Horizontal strip guide entry
- » Vertical strip guide in entry
- » Outlet strip guide
- » Motors



▲ Handling Unit



▲ Handling Unit **H16** - O.D. 89,0 ÷ 406,0 x 8,0 ÷ 25,0 mm





▲ Handling Unit **H20** - O.D. 168,0 ÷ 508,0 x 12,0 ÷ 60,0 mm



▲ Conveyors



METAL STRIPS | SHEETS CUTTING LINES | TUBE MILLS

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