1. TUBE PRODUCT PORTFOLIO

2. DCT REFERENCES

3. DANIELI UNIQUE SUPPLIER AND FULL-COMPREHENSIVE PARTNER

4. DANIELI PRODUCTS - SEAMLESS HOT ROLLING LINE

5. DANIELI PRODUCTS - WELDED TUBE LINE

6. DANIELI PRODUCTS - FINISHING LINES

7. TECHNOLOGICAL PACKAGES

8. DANIELI AUTOMATION
SUPPLIES COVER THE ENTIRE RANGE OF PIPE-MAKING EQUIPMENT

| SEAMLESS PIPE MILLS UP TO OD 28” | FINISHING LINES, HEAT TREATMENT LINES, SINGLE EQUIPMENT | ERW LONGITUDINAL PIPE MILLS UP TO OD 26” | LSAW LONGITUDINAL PIPE MILLS UP TO OD 64” | HSAW PIPE MILLS UP TO OD 120” |
Since 2004, birth year of DCT, as a result of innovative technology and big efforts, 19 contracts for seamless pipe plants and finishing lines are already under execution and/or under operation activity. Further developments and improvements in the process and equipment design are in progress looking for the next future.
<table>
<thead>
<tr>
<th>DANIELI TUBE PLANTS</th>
<th>DANIELI UNIQUE SUPPLIER AND FULL-COMPREHENSIVE PARTNER</th>
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</table>

**KSP**

300 ktpy  
OD 60 – 273 mm

- Hot rolling line  
  (RMM 2-rolls technology)
- Finishing lines  
  > N.1 Upsetting line  
  > N.2 Heat treatment lines  
  > N.2 Quality ass. lines  
    (EMI+UT)  
  > N.1 Quality ass. line  
    (UT full body)  
  > N.1 Swaging line  
  > N.1 Finishing line (Cas-Tub)  
  > N.1 Finishing line (Casing)  
  > N.1 Finishing line (LP)  
  > N.1 Coupling shop

**JESCO**

400 ktpy  
OD 139.7 – 406.4 mm

- Hot rolling line  
  (FQM™ 3-rolls technology)
- Finishing lines  
  > N.1 Heat treatment line  
  > N.2 Quality ass. lines  
    (EMI+UT)  
  > N.1 Quality ass. line  
    (UT full body)  
  > N.1 Swaging line  
  > N.2 Finishing lines  
    (Casing - LP)  
  > N.1 Finishing line (LP)  
  > N.1 Coupling shop

**NEW PROJECT**

453.9 ktpy  
OD 73 – 280 mm

- Hot rolling line  
  (FQM™ 3-rolls technology)
- Finishing lines  
  > N.1 Upsetting line  
  > N.2 Heat treatment lines  
  > N.3 Quality ass. lines  
    (EMI+UT)  
  > N.2 Finishing lines  
    (Tubing/Casing)  
  > N.1 Finishing lines (LP)
**HOT ROLLING LINE IN-HOUSE TECHNOLOGY AND KNOW-HOW**

<table>
<thead>
<tr>
<th>Process</th>
<th>Vendor</th>
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<tr>
<td>Billet cutting</td>
<td>Danieli Centro Tube</td>
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<tr>
<td>Billet heating</td>
<td>Danieli Centro Combustion</td>
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<td>Billet punching</td>
<td>Danieli Centro Tube</td>
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<td>Billet piercing</td>
<td>Danieli Centro Tube</td>
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<tr>
<td>Shell elongating</td>
<td>Danieli Centro Tube</td>
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<tr>
<td>Tube reheating</td>
<td>Danieli Centro Combustion     / Danieli Automation</td>
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<tr>
<td>Tube sizing / stretching</td>
<td>Friedrich Kocks GMBH</td>
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<tr>
<td>Tube cutting</td>
<td>Danieli Centro Tube</td>
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<tr>
<td>Plant automation</td>
<td>Danieli Automation</td>
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</table>
HRL MAIN EQUIPMENT HIGHLIGHTS
FQM™ FINE QUALITY MILL - TECHNOLOGY EVOLUTION

RMM
Up to 2004

FQM™ ACO
From 2005

FQM™ LCO
From 2008

FQM™ LCO ESR+
From 2013
The **FQM™ 3-ROLLS TYPE**

The Danieli FQM "Fine Quality Mill" is a Retained Mandrel Mill Process
The FQM mainly consists of one set of 4 to 7 rolling units, each one equipped with three rolls individually driven.

The tube is rolled passing through each stand while the cylindrical mandrel moves at a constant controlled speed during the whole rolling phase.
At the end of FQM rolling, the mandrel returns rapidly through the mill back in the starting position, while the tube is extracted from the mandrel by means of a extracting mill located in-line with the FQM.
THE MAIN TECHNOLOGICAL IMPROVEMENTS OF THE FQM PROCESS ARE:

High quality products and saving in material cost
  > Close wall thickness tolerances
  > Good diameter tolerances
  > Very high pipe surface smoothness
  > Optimal yield (better shape of tube ends)

Saving in operational cost
  > Significant reduction in tooling cost and consumption
  > Reduction in mandrel inventory and tooling change frequency

Earnings in efficiency, flexibility and versatility
  > High efficiency of the process
  > Internal and external defects minimized
  > Reduced tooling change over time
  > Increased flexibility (small lots)
  > Steels with critical hot workability can be rolled
  > Pipes with thin wall thickness (higher D/T ratios) can be rolled
FQM LCO (Lateral Change Over)
FQM LCO ESR+ (Lateral Change Over - Easy Stiker Removal)
In case of sticker: access phisically, without constraints, to operate in the sticker area
HOT BILLET CENTERING - HBC

> To punch the front and tail of the billet before piercer process
> To guide the plug during piercing operation starting
> To guide the plug during the final billet break through
**MAX. Pipe OD 120”**

- Conventional production process
- Two-step production process:
  - 1<sup>st</sup> step: Tack-welding at high speed
  - 2<sup>nd</sup> step: Final welding by SAW final welding stands Submerged-Arc final welding stands for simultaneous inside and outside welding
- Finishing floor
- Manufacture of spiral-welded pipes: API 5L - ISO 3183 - AWWA
MAX. Pipe OD 26”

HF Tube and Pipe Welding Plants for the production of:
> Line pipes, OCTG for gas, oil, water, according to API
> Thick-walled precision pipes and tubes for the automotive industry
> Hollow sections for structural applications
> Finishing floor
MAX. Pipe OD 64"

> Co-operation with Graebener for LSAW plant technology
> Forming press in conventional and C-frame design
> Production of large diameter and heavy wall thickness steel pipes, stainless steel pipes and poles
> Finishing floor
<table>
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<tr>
<th>FINISHING LINES IN-HOUSE TECHNOLOGY AND KNOW-HOW</th>
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<td>Tube heat treatment (heating and quenching systems)</td>
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<td>Tube upsetting</td>
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<td>Tube straightening</td>
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<td>Tube hydrotesting</td>
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<td>Tube chamfering</td>
<td>Danieli tubolar equipment</td>
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<td>Tube and coupling threading</td>
<td>Danieli tubolar equipment</td>
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<td>Coupling screw-on</td>
<td>Danieli tubolar equipment</td>
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<td>Cold pilger mill</td>
<td>Danieli tubolar equipment</td>
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<td>Automatic tube protectors application</td>
<td>Danieli Automation</td>
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<tr>
<td>Tube marking and code reading automatic system (tube-by-tube tracking)</td>
<td>Danieli Automation</td>
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<tr>
<td>Plant automation</td>
<td>Danieli Automation</td>
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</table>
SEAMLESS API 5CT FINISHING LINE

WELDED API 5L FINISHING LINE

LONGITUDINAL WELDING LINE

Internal Tube Flushing Station
Tube Bevelling Area
Tube Hydrotesting Area
Tube NDT Inspection and repairing Area
Tube Marking, and Coating Area
Danieli hydroteester

- Single and double configuration
- Pressures up to 1,500 bar
- High productivity (>300 tubes/h)
- Complete automatized solution
- Quick size change-over system
Danieli coupling threading machine

- Single and double configuration
- Center drive machine with double turret
- Wide dimensional range
- Maximum flexibility in the connection profile
- Small lots, high productivity
- Fast and easy product change
- Automatic loading and unloading
- Wide product mix (API - GOST - PREMIUM)

Dual tool turret configuration for maximum productivity and simultaneous machining of the two coupling ends

Extremely rigid cast iron machine bed

Headstock designed for a high cutting speed in the complete od range with a proper selection of spindle motor and spindle bearings
Danieli bevelling machine

- High flexibility (fast and easy product change)
- High productivity (> 300 bevel/hr)
- Rigid and precise clamping system
- Automatically operated
Danieli cold pilger mill

> "Quarto" design fixed-frame and movable cassette with working and backup rolls for difficult-to-roll materials, from standard austenitic stainless steel to nickel-based alloy and titanium

> "Duo" design two-roll movable stand for ductile materials: copper, brass, aluminum

> “Lever” design with two, three or four rolls and lever-type synchronization design, for ultra thin wall precision pipes

Danieli cold pilger mill

> WT ranging from 0.12 to 30 mm
> OD ranging from 4 to 450 mm
Adaptive (wall) Thickness Control
ATC

optimize the wall thickness distribution in the cross section and along the length of the tube at the outlet of extracting mill.

Benefits

> Better wall thickness quality
> Eccentricity’s improvement
> Reduced wear on mandrel
> Improving of the mandrel’s life

Data measured from IMS gauge at extractor outlet
Correction from the ATC model
Wall thickness at next tube after the application of the correction by the hydraulic capsules
Controlled Mandrel Cooling
CMC

To reach a constant temperature along the entire length of the working part of the mandrel

Benefits
> Uniform temperature means uniform lubrication coating
> Uniform lubrication coating means improved life of mandrel and tube quality
> Improved life of mandrel means save money

Hydraulic Capsule and Motor Drive functions - HCMD

> Adaptive Leading Speed - ALS:
> Impact Settling Compensation - ISC:
> Mill Modulus Compensation and Adaptive Mill Modulus Compensation - MMC & AMMC:
> Adaptive Force Balancing - AFB:
> Mill Zeroing Calibration - MZC:
> Front and Tail Tapering - FTT:
> Extractor Dynamic Control - EDC:

Benefits
> Improved tube quality
> Reduced and uniform tooling wear
> Increased plant yield

Piercer II section with in line plugbar changing

Use two (or more) plugs and bars alternatively during the shell production, without any stop of the production

Benefits
> Improved plug life
> Reduces downtimes
> More consistent shell quality

Other functions/systems applied on the piercing mill II section exit side:

> Plug bar pre-rotation
> Plug internal cooling;
> Improved plug life
> In-Line Plug bar extraction
Danieli Automation

> Complete in-house automation and electrics systems
> Q-Drive
> Diameter measuring units
> Robots for tube applications
> Induction heating systems
> I-Stand - 3D simulation platform