

Investor visit, 7th October 2015
Hannu Hautala, SVP - Business Line Tornio

This is Outokumpu Tornio Site



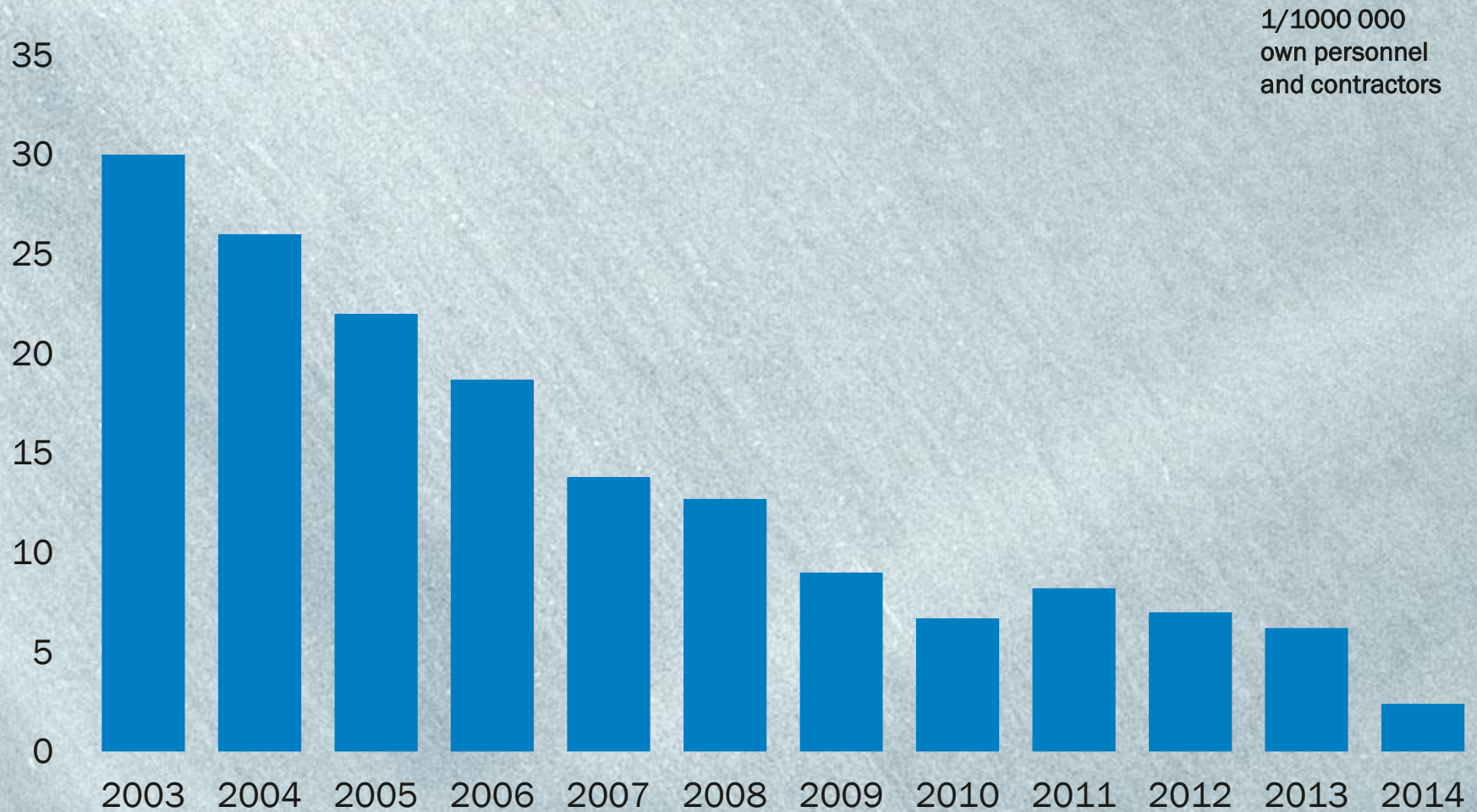
Home
again
safely.

outokumpu
spirit

We believe that all
accidents are preventable.

Our target is zero accidents.

Approaching our target—zero accidents



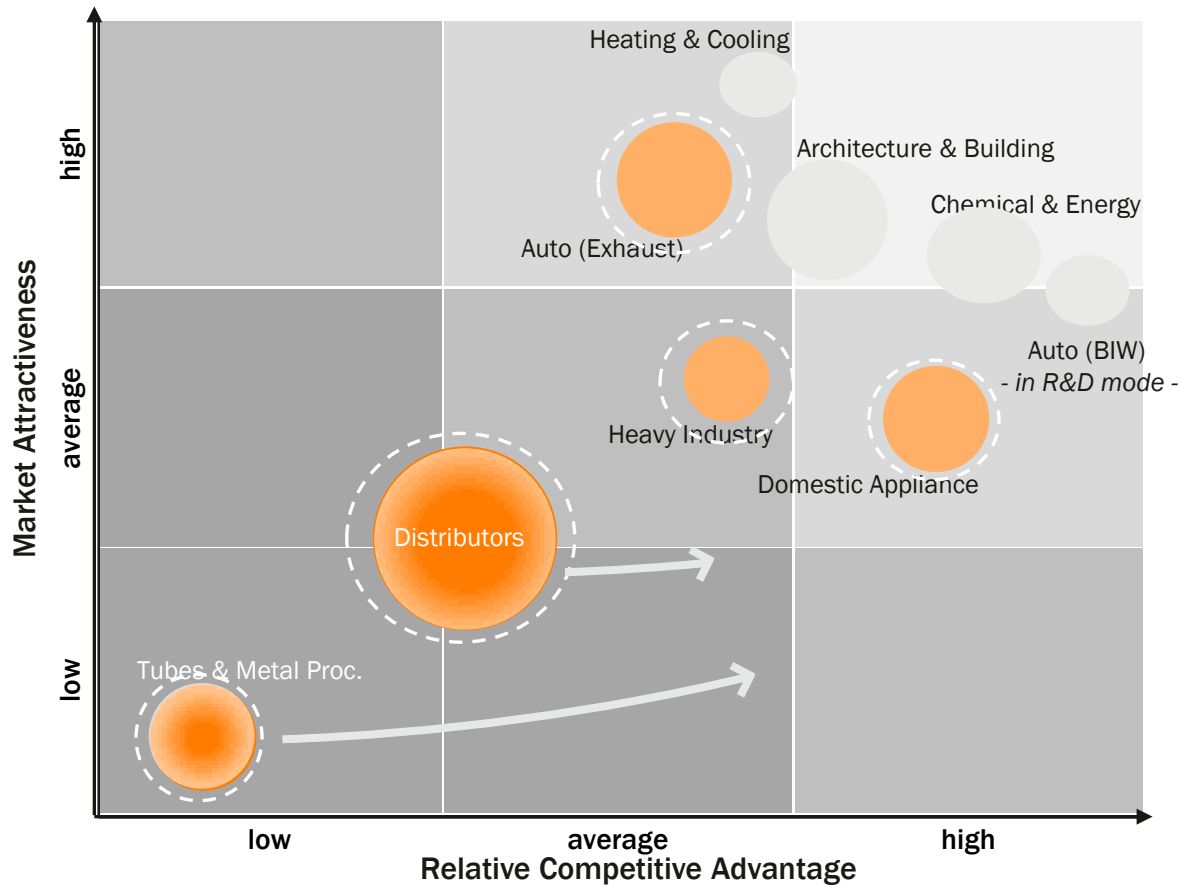


From chrome ore to coil and plate...



...to cutlery and bridges
-endless possibilities

Key customer segments for Tornio



Auto (Exhaust System)




Contract (1-2yr.)
Business

Heavy Industry



Project Business

Domestic Appliance



Contract (1yr.)
Business

Distributors



Spot Business

Tubes & Metal Process.



Spot Business

The most integrated stainless steel plant in the world

Steps of steel

Tornio site and Kemi Mine

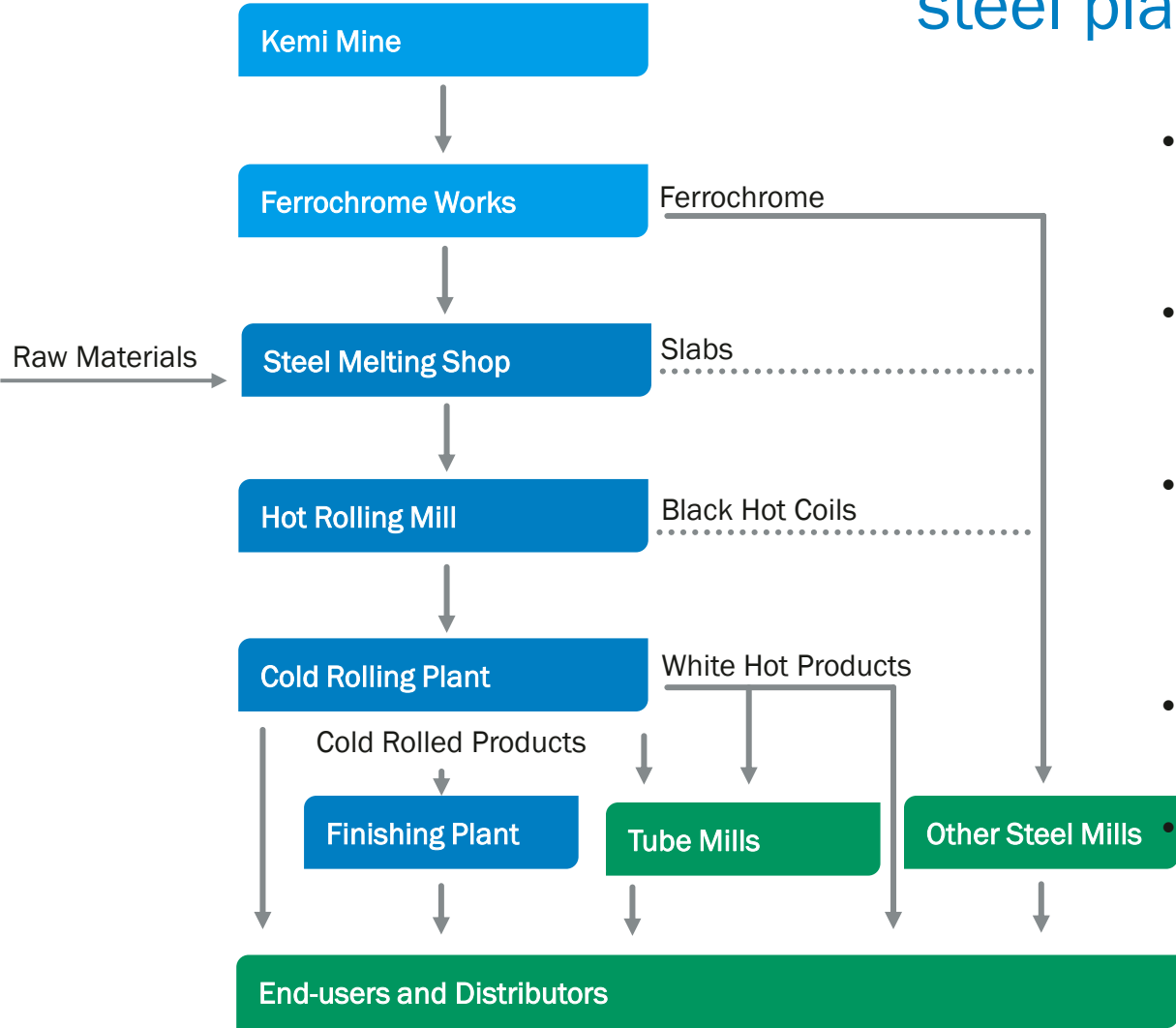
- 1950** Chrome ore deposit discovered in Kemi in 1959
- 1960** Kemi Mine and ferrochrome production begins in 1968 with a capacity of 28 000 tpa
- 1970** Stainless steel production starts in 1976 with a capacity of 50 000 tpa
- 1980** Kemi Mine expanded as the second FeCr smelting furnace begins operations in 1985
Hot Rolling Mill starts in 1988
- 1990** Finishing Plant in the Netherlands opens in 1993
In 1995 ferrochrome converter begins operations, energy savings can be achieved by using smelted ferrochrome in the process
Expansion of Cold Rolling Plant in 1997, capacity now exceeds 400 000 tpa
- 2000** In 2004 steel production expansion project finalised, stainless steel production capacity now 1,2 million tpa
Kemi Mine production moves underground in 2003, open pit exhausted in 2005
- 2010** The capacity of ferrochrome production doubled in 2013, total capacity 530 tpa FeCr.

The plant area and employment

- The plant area of Tornio Site covers an area of 600 hectares.
- More than 56 hectares of the plant area is covered with buildings.
- Inside the plant area, there are 50 kilometers of roads and 10 kilometers of pedestrian and bicycle routes.
- We have 2150 employees in the integrated production chain of Kemi Mine and Tornio Site. In addition, the indirect employment within the whole region is estimated to be 8000 people.
- Some 300 employees of our contractors work at the plant area on a daily basis.

The most integrated stainless steel plant in the world

■ FeCr Production ■ Stainless Production



- Ferrochrome production onsite with molten Ferrochrome charged directly
- No need to crush or reheat, saving energy and minimizing transportation costs
- Ability to use carbon monoxide from own processing to replace propane as energy source saves costs and CO₂ emissions
- Short processing time and lower logistic costs
- Cost savings from full downstream integration into finished products

One of the world's most significant recyclers

MATERIALS IN

Recycled carbon steel	0,2 Mt
Recycled stainless steel	0,8 Mt
FeCr-, Ni-, Mo-,Ti-,Si-, Mn-alloys	0,3 Mt

MATERIALS OUT

White hot rolled products	0,2 Mt
Cold rolled products	0,6 Mt
Mineral products	0,3 Mt
Waste landfilled and utilized	0,1 Mt



Recycled & recovered metals 0,1 Mt

Our products

- **Black coils**
 - Thickness range 2.5–12 mm, width range 1000–1600 mm.
- **White hot rolled coils, strips, sheets and plates**
 - Finishes 1/1D, 2E. Thickness range 2.5–8 mm (1/1D), 1.8–4 mm (2E), width max. 1600 mm.
- **Cold rolled coils, strips, sheets and plates**
 - Finishes 2B, 2D, 3N, 4N, DB. Thickness range 0.4–6.35 mm, width range 35–1600 mm.
- **Ferrochrome product offering**
 - 10–40 mm, 10–80 mm (Cr content 52–54%)
 - 0–10 mm fines (Cr content 50– 52%)
- **Slag products**
 - OKTO-eriste (FeCr slag granules), OKTO-murske (FeCr slag aggregates), OKTOa-murske (Stainless steel slag aggregates), OKTO-kevytkivi (Stainless steel slag light mineral aggregates) and OKTO-filleri (Stainless steel slag filler products).



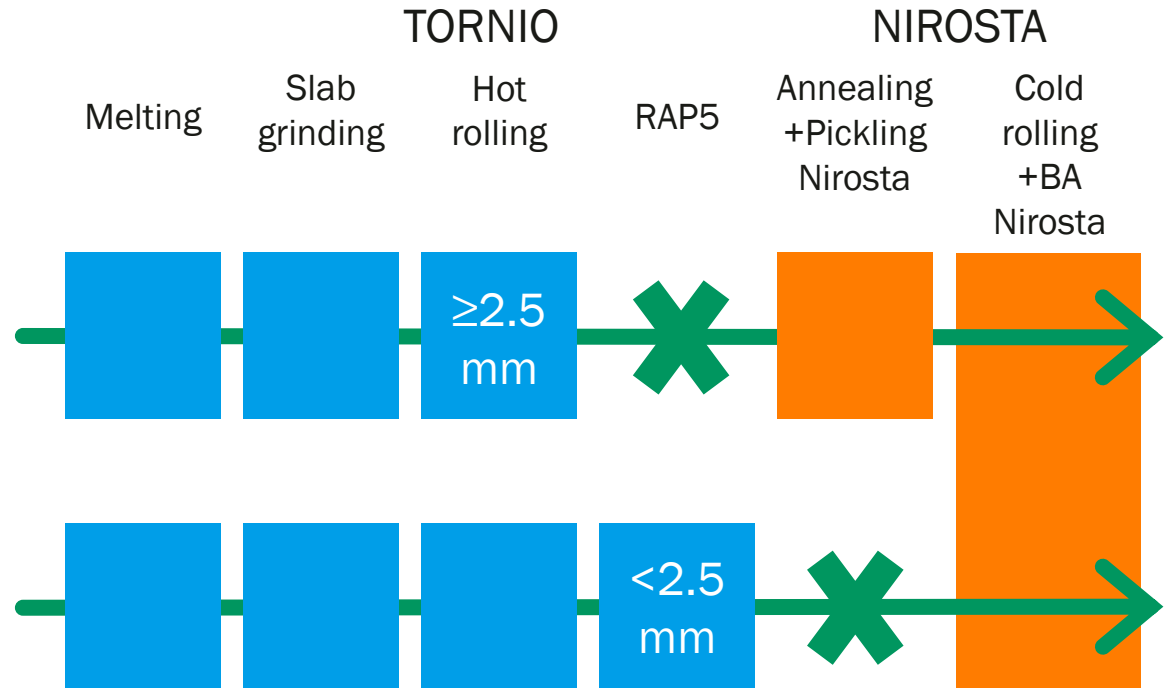
Case: Continuous production optimization between Tornio and Nirosta

Able to choose optimal production chain*

1. From hot rolling to Nirosta for annealing and pickling

2. RAP5 reduces the thickness

- Straight to Nirosta cold rolling.
- Thinner end thickness without extra processing



Example from Chain 1: "Hot rolled 2,5 mm"

82% Reduction at Cold Rolling

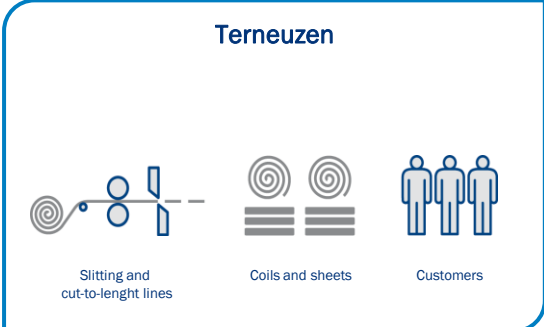
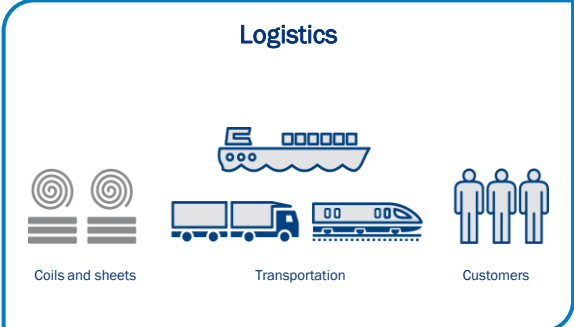
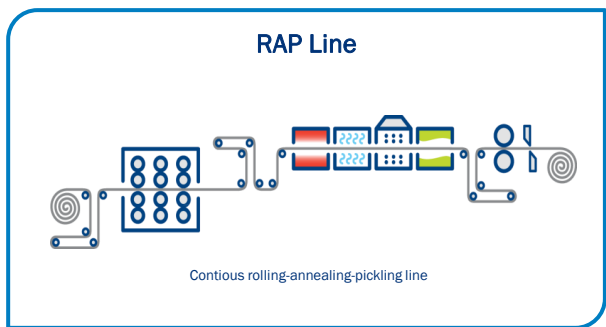
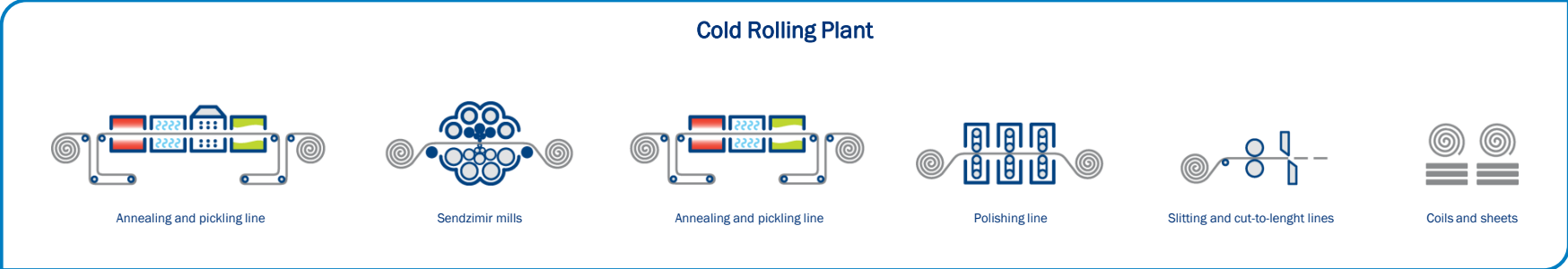
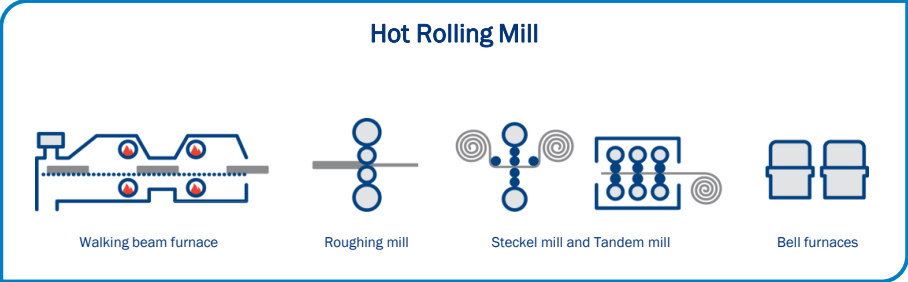
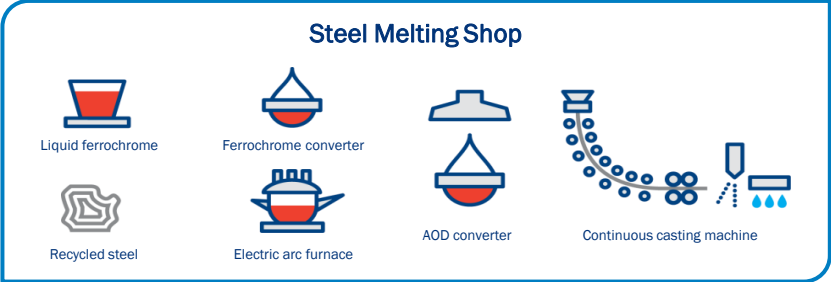
=> $18\% \times 2,5 \text{ mm} = 0,45 \text{ mm}$

Example from Chain 2: "RAP5 => 2,0 mm"

82% Reduction at Cold Rolling

=> $18\% \times 2,0 \text{ mm} = 0,36 \text{ mm}$ i.e. -25%

Tornio: From raw materials to stainless steel sheets/plates and coils/strips



Instructions for Visitors



You have to be accompanied by your host



Personal protective equipment must be used at all times



Always follow the instructions of your host



Photographing is not allowed



Smoking is allowed only in special areas

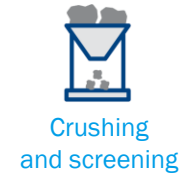


We operate a recording video surveillance system on the premises

**In case of emergency, please call
+358 16 452 300**

Appendix

Ferrochrome Works – safe supply and stable quality

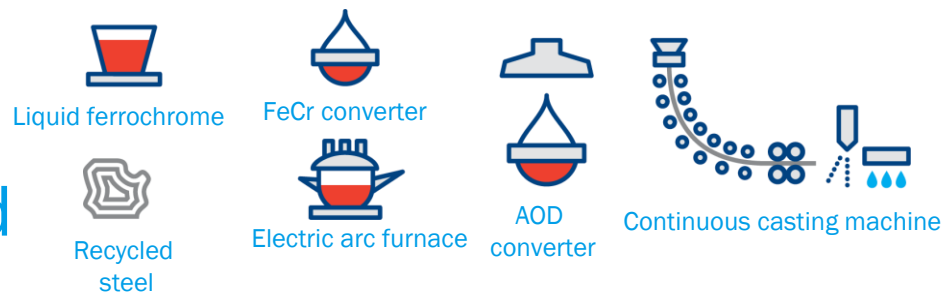


- Fine concentrate from the Kemi mine is mixed with Bentonite and Coke dust and fed into the Pelletizing drum to produce pellets.
- The pellets are fed into the sintering furnace.
- A dosing system charges the smelter with Chromite Pellets, Quartzite, Coke and Lumpy Concentrate.
- After smelting in the furnace the ferrochrome smelt is tapped into a ladle and the slag by-product removed.
- The molten ferrochrome transfers by rail to the adjacent Steel Melting Shop.



❖ Three ferrochrome smelting furnaces with the capacity of 500 - 530 ktpa

Steel Melting Shop – where the grade is produced

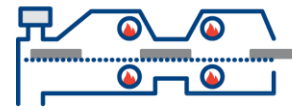


- At the Steel Melting Shop, the molten ferrochrome is poured into a ferrochrome converter where silicon and some of the carbon is removed.
- An electric-arc furnace is charged with recycled steel and other raw materials – such as nickel, molybdenum, ferrochrome and coke.
- Once the charge has melted and the slag is removed, the melt is mixed with ferrochrome melt and transferred to the AOD converter.
- In the AOD Converter, the alloying is made to create the specified stainless steel grade.
- The melt is then transferred to the ladle treatment where final adjustments are made before casting.
- The melt is transferred to a continuous casting machine where the steel is cooled and cut into slabs of stainless steel.
- The slabs are then transferred to the Hot Rolling Mill.



- ❖ Slab length 14 m, thickness 167–185 mm, width 1000–1620 mm, weight 16–26 tons
- ❖ Available capacity is 1.45 million tpa

Hot Rolling Mill – turning slabs into black coils



Walking beam furnace



Roughing mill



Steckel mill and
Tandem mill



Bell furnaces

- The slabs are transferred to a walking beam furnace in which the temperature of the steel is raised to more than 1200 degrees Celsius.
- The slab is then rolled backwards and forwards a number of times through a roughing mill reducing its thickness and increasing its length and transforming it into a transfer bar.
- Passing the transfer bar through the Steckel and Tandem mill further reduces its thickness.
- It is then coiled and moved to a cooling pool.
- After cooling most coils continue to cold rolling plant or are sold as black coils.



❖ Coil thickness 2.5–12.7 mm, width 1000–1600 mm

❖ Capacity is 1.45 million tpa

Cold Rolling Plant – producing finished sheet and coil



Annealing and pickling line



Sendzimir mills



Annealing and pickling line



Polishing line



Slitting and cut-to-length lines



Coils and sheets

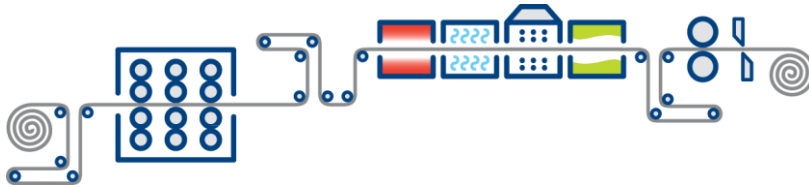
- In the Cold Rolling Plant, coils are uncoiled and passed along an annealing and pickling line which recovers the mechanical properties of the steel, removes the black scale and changes the steel surface to silver-grey.
- The coil is then rolled to its desired thickness, which can involve it being reduced by over 80%.
- In order to recover mechanical properties, the cold rolled steel is annealed and pickled again.
- At the slitting and cut to length lines the stainless steel coil is finished to the required dimensions either as coils or as individual sheets.



❖ Capacity is 0.9 million tpa

- 750 000 tpa cold rolled products
- 150 000 tpa white hot band

RAP line – an integrated line with rolling, annealing and pickling



- A continuous Rolling Annealing and Pickling line known as a RAP line occupies a three-floor building next to the Cold Rolling Plant.
- Stainless steel strip passes through the RAP line twice.
- On the first pass black hot rolled coil undergoes annealing and pickling and emerges as white hot band.
- During the second pass, the material is cold rolled and its thickness is further reduced.
- The final product is stainless steel cold rolled coil.



Port of Tornio – an integral part of logistics

- The Port of Tornio is operated by Outokumpu Shipping
- Exporting products into the markets and importing raw materials to Tornio Works
- The icebreakers keep the sea lane open during winter



❖ Total traffic more than 2,5 Mt in 2013

Finishing Plant in the Netherlands – link to markets and logistic hub

- Finishing Plant with slitting and cut to length facilities
- Non-stop vessel connection between Terneuzen and Tornio
- Collecting point for Northbound Raw Materials and Consumables
- Excellent Water – Road – Rail connections



❖ Capacity 475 000 tpa of cold rolled and hot rolled products