

# Integrated stainless steel production in Tornio

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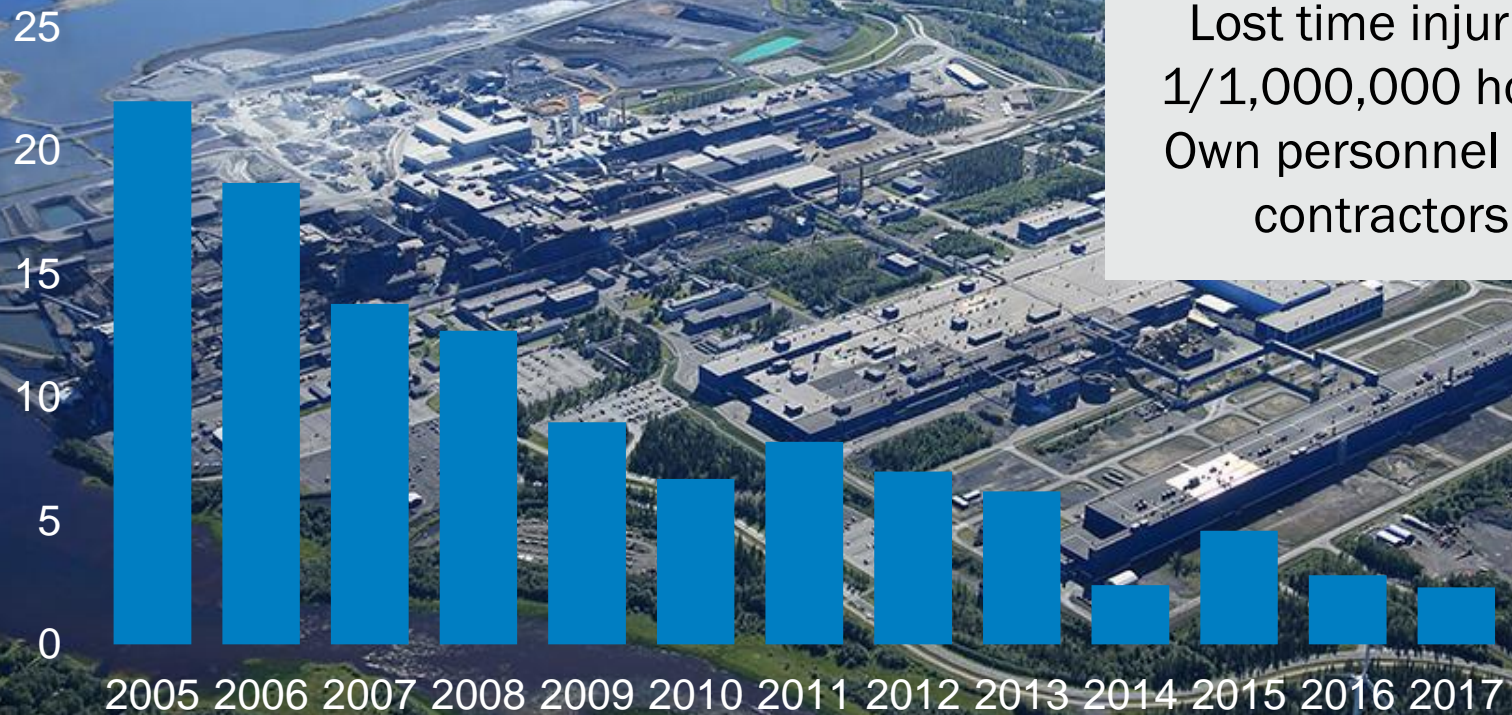




Welcome to the most integrated  
stainless steel mill in the world



# Safety is our number one priority in all operations



**Tornio Operations**  
Lost time injuries  
1/1,000,000 hours  
Own personnel and  
contractors



# The plant area and employment

- Tornio Site covers an area of 600 hectares
- > 56 hectares covered with buildings.
- 50 kilometers of roads and 10 kilometers of pedestrian and bicycle routes in the plant area
- 2,100 employees
- 300 contractors
- 7,000 people employed indirectly



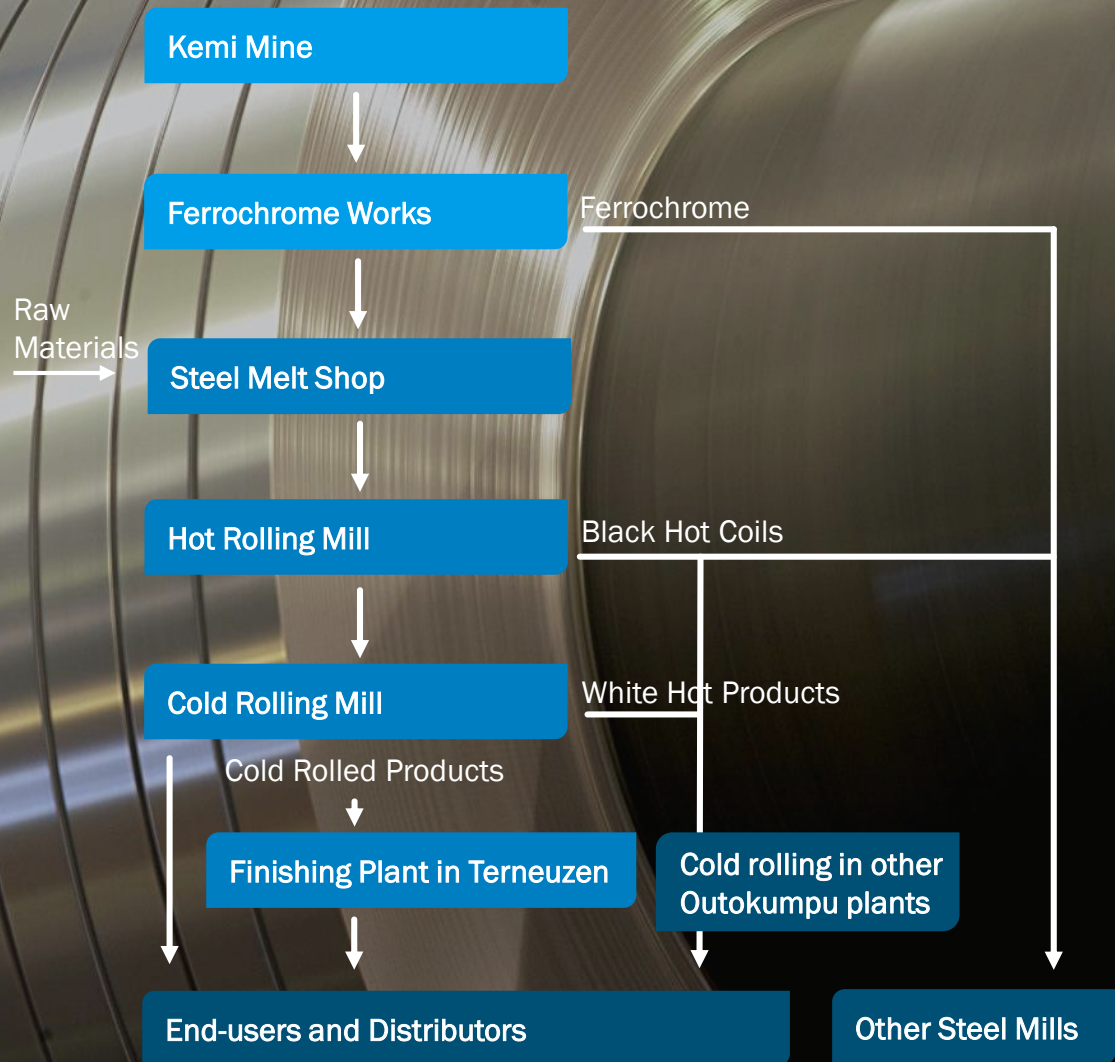


# Integrated production

■ FeCr Production

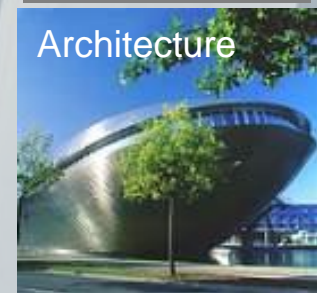
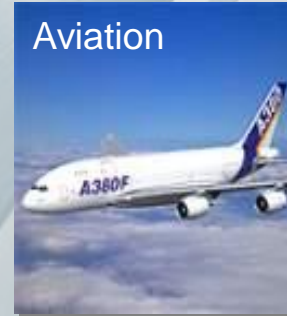
■ Stainless Production

- 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 CO<sub>2</sub> emissions
- Short processing time and lower logistic costs
- Cost savings from full downstream integration into finished products



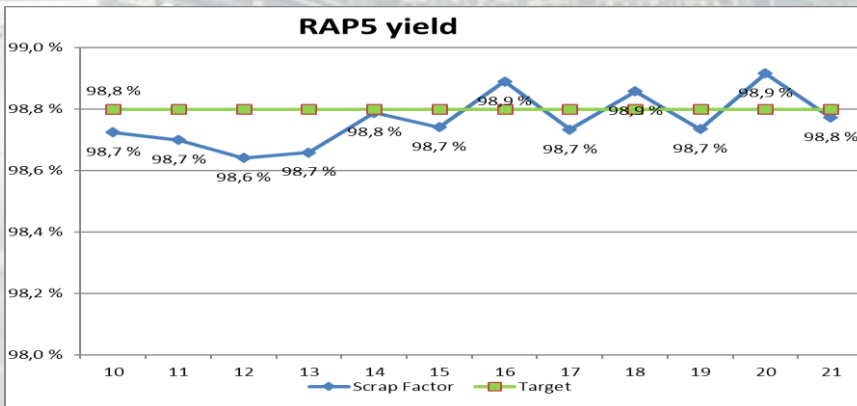
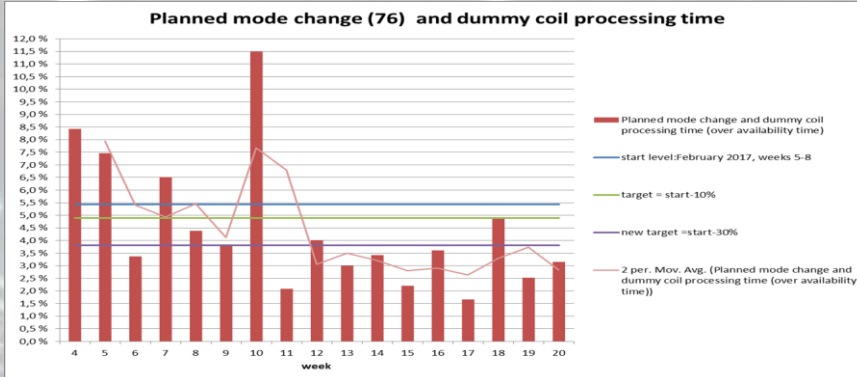
# Example products from Tornio

- Direct from Tornio
- Via our plants in Germany
  - Krefeld
  - Dillenburg





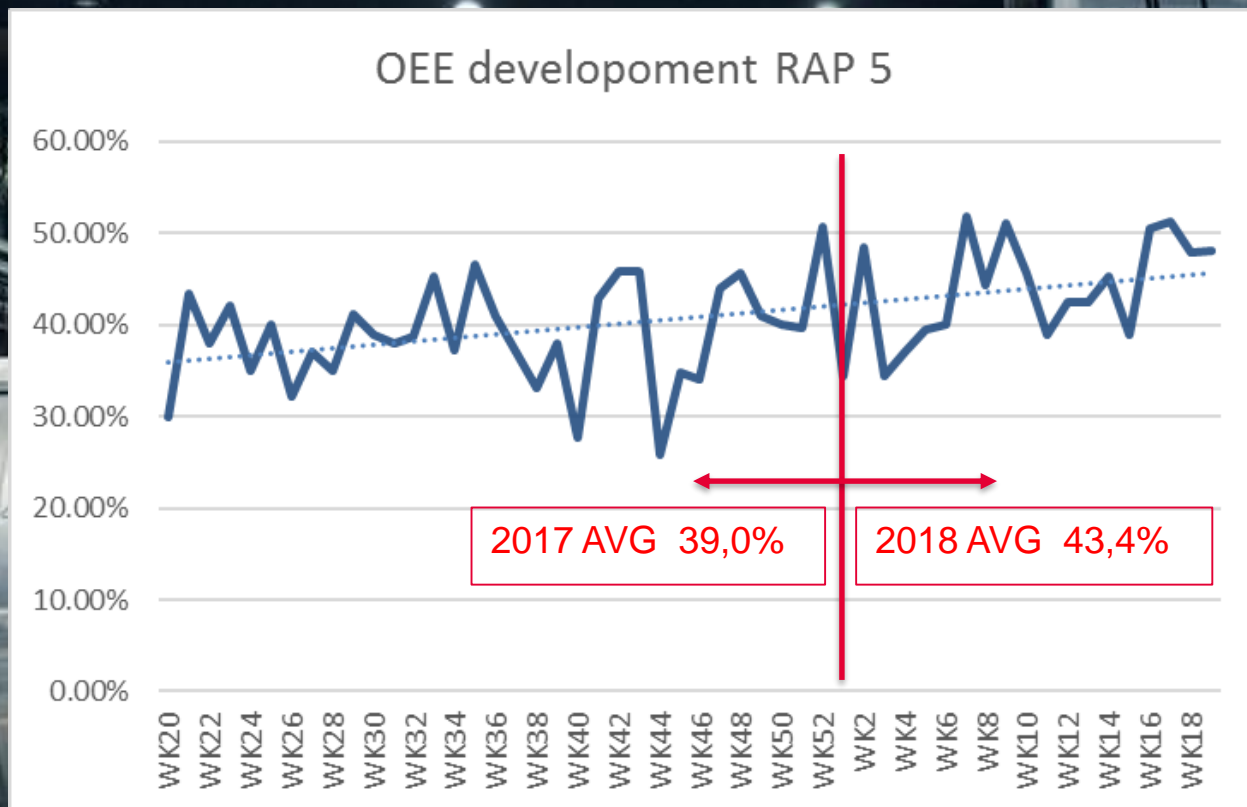
# OEE improvement of RAP5 with CI initiatives



- **Example 1: Reduction of set-up times**
- Problem: Value adding production time is lost when changing from one steel grade to another
- Optimal sequencing defined together with SCM to minimize the non-productive time consumed for set-up between different steel grades.
- Result: Set-up times reduced by 30% over 16 week period. Effect on OEE +1.6%
  
- **Example 2: Yield improvement**
- Problem: To ensure product quality, certain amount of material scrapped from beginning and end of each coil before processing thus creating yield loss
- Optimal process parameters and ways of working defined to minimize scrapping from head and tail of a coil without compromising quality
- Result: Improvement of yield by 0.11%, without compromising quality

# RAP5 - Weekly OEE has improved on average 11% from 2017

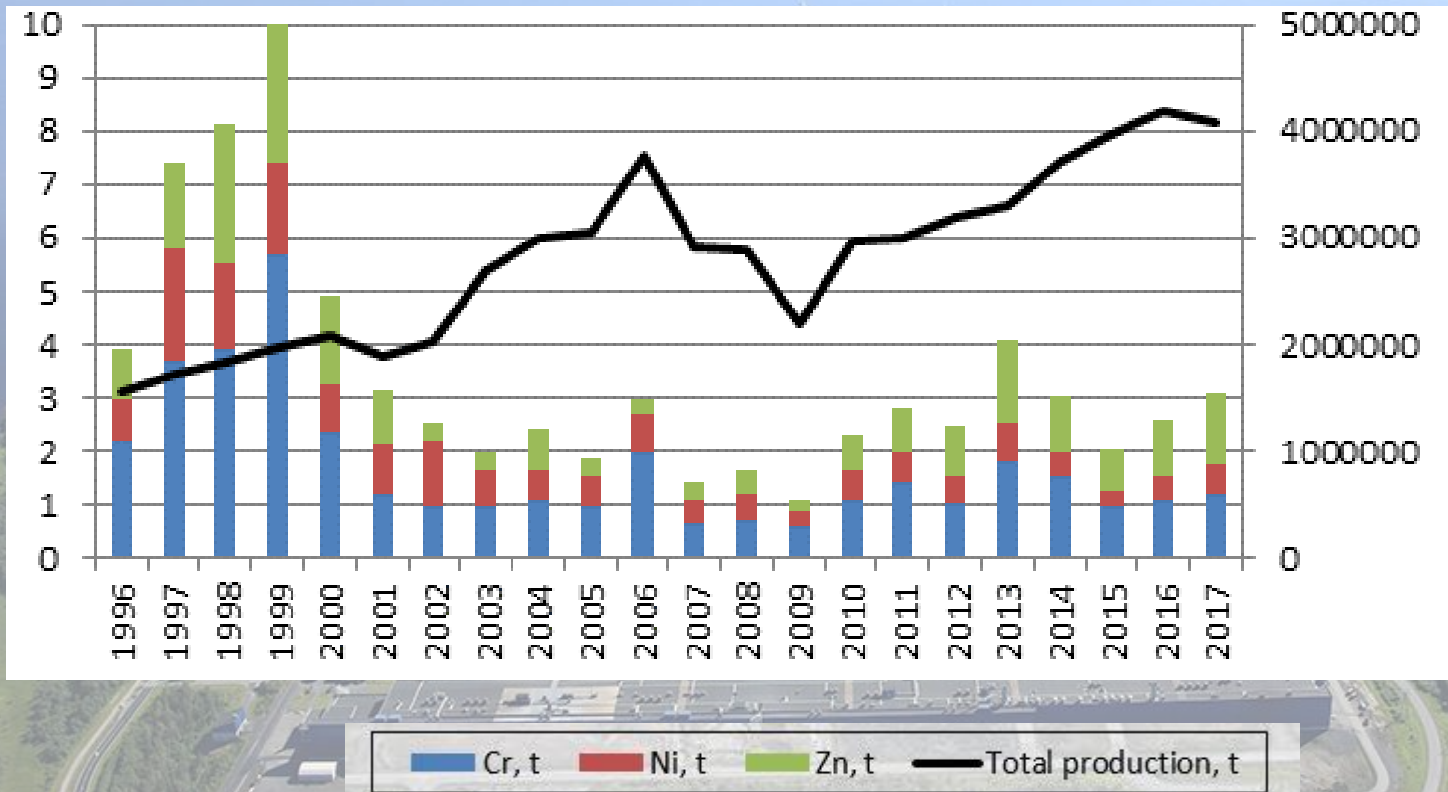
(OEE = Overall Equipment Effectiveness)





# Reducing emissions while increasing production

Wastewater discharges: Cr, Ni and Zn



**In 2017:**

- Discharges of chromium 3.3 kg/d, permit limit value 5 kg/d
- Discharges of nickel 1.6 kg/d, permit limit value 4 kg/d
- Discharges of zinc 3.3 kg/d, permit limit value 4 kg/d



# One of the world's most significant recyclers

## Material Balance of stainless steel production 2017

### Materials in

Recycled carbon steel 0.35 Mt  
Recycled stainless steel 0.9 Mt  
FeCr-, Ni-, Mo-, Ti, Si-, alloys 0.5 Mt

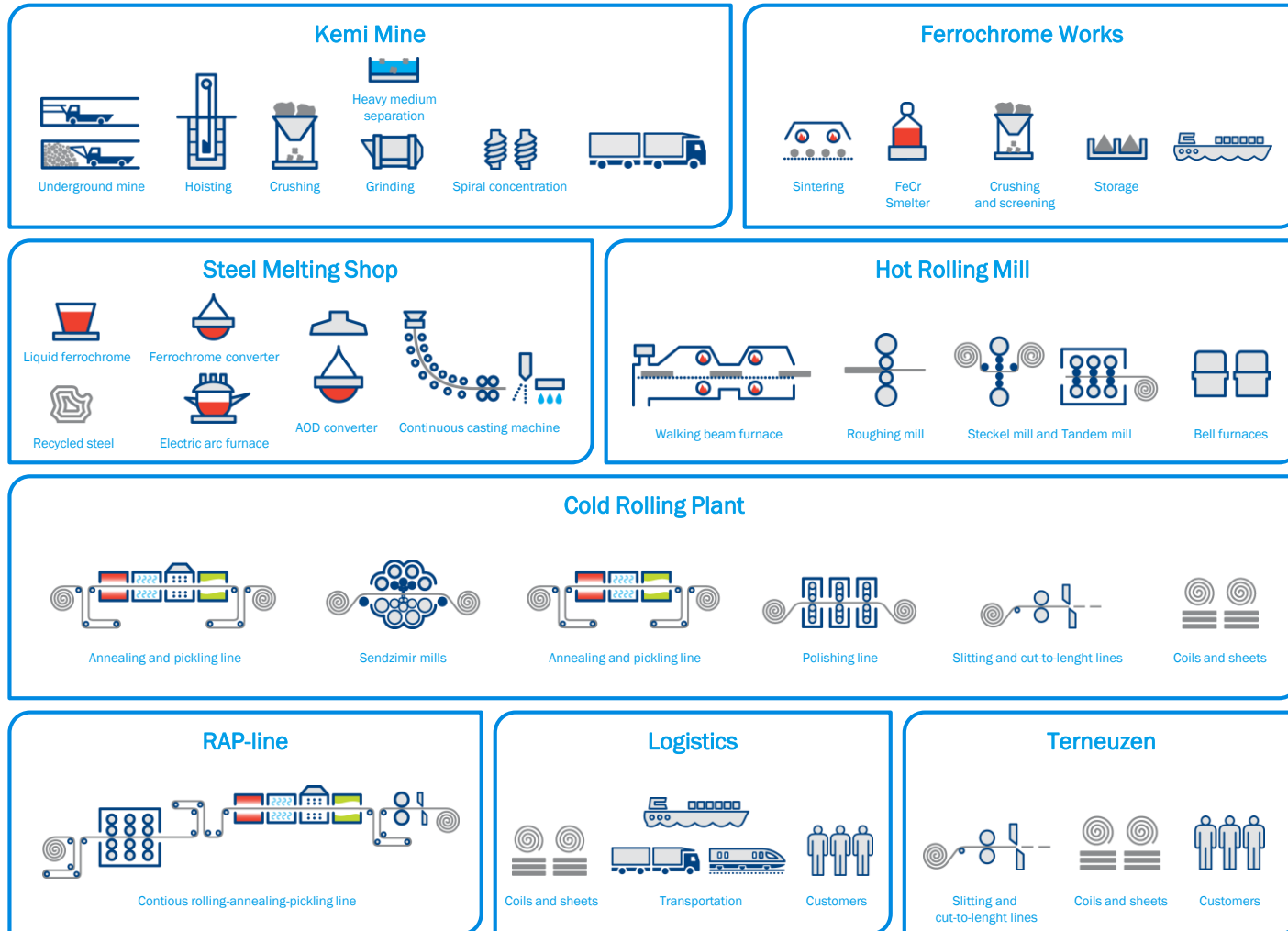
### Materials out

White hot rolled products 0.2 Mt  
Cold rolled products 0.7 Mt  
Mineral products 0.2 Mt  
Waste landfilled and utilized 0.1 Mt

Recycled and  
recovered metals  
0.2 Mt



# From chrome ore to stainless steel





# Thank you!