Outokumpu and circular economy in practice

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The world needs sustainable solutions to tackle climate change

Global megatrends

- Economic and population growth
- Mobility and urbanization
- Climate change and limited resources

Stainless steel – at center of circular economy
Stainless steel is sustainable: 100% recyclable, efficient and long lasting

- 100% recyclable
- Corrosion resistant
- Heat resistant
- High strength
- Hygienic
- Aesthetic
- Cost efficient

- Oil & gas, petrochemical
- Chemical and pharmaceutical
- Automotive
- Aerospace & marine transport
- Catering and household goods
- Architecture and building
- Medicine and medical engineering
Outokumpu has a solid presence in key regions

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- Nyby
- Kemi
- Tornio*
- Calvert
- San Luis Potosí
- Richburg
- Avesta*
- Fagersta
- Degerfors
- Sheffield
- Terneuzen
- Krefeld*
- Dillenburg
- Dahlerbrück
- Helsinki
- Terneuzen
- Kemi
- Nyby
- Helsinki
- Headquarters in Helsinki, Finland

Legend:
- Integrated melt shop, hot and cold rolling
- Other mills
- Mine
- Service centers
- Headquarters in Helsinki, Finland
- R&D centers
Chromium makes steel stainless

85% of global Chromium ore reserves are located in South Africa and Zimbabwe

Source: Critical minerals and metals for the EU.
Kemi mine and Tornio Operations

- Integrated ferrochrome and stainless steel production chain in Kemi-Tornio area.
  - World class chrome deposit in EU
  - Integrated, world class efficiency
  - Low carbon electricity

- Capacities:
  - Ferrochrome 530,000 tons annually
  - Stainless steel production 1,400,000 tons annually

- Impact of direct and indirect employment:
  - > 10 000 jobs in Finland
Kemi Mine – The only chromium mine in the EU

• Ferrochromium (FeCr) is the most important alloy for stainless steel
• Mines are needed – recycling of metals is not enough

The biggest underground mine in Finland. Annual ore handling capacity is 2.7 million tons.

Products are delivered to Tornio FeCr-plant which feeds stainless steel mill

Ferrochromium (FeCr) is the most important alloy for stainless steel
Mines are needed – recycling of metals is not enough
Outokumpu Tornio works - the biggest material recycler in Europe

Integrated ferrochrome and steel production

Using low carbon electricity

Integrations: energy efficiency and low emissions

Ferrochrome with the lowest carbon footprint
Our stainless steel contains the highest proportion of recycled content on the market
Stainless steel from China & Indonesia has up-to five times higher carbon footprint vs. Outokumpu

Drivers for high carbon footprint of China & Indonesia stainless steel

1. Low utilization of recycled material
2. Low nickel content ore and high emissions from blast furnaces
3. Use of coal as main electricity source

CO₂ emissions of stainless steel producers

Outokumpu* | Global average** | China & Indonesia***
---|---|---
0 | 4 | 8
1 | 6 | 8
2 | 8 | 8

*) Source: Outokumpu January 2020
**) Average of ISSF study 2018 and China & Indonesia
***) Outokumpu estimates for China and Indonesia
By-products create sustainability in society

- Without slag there is no metal products
  - Slag formers needed (natural limestone, quartzite)
  - Slag = Mineral product
- Outokumpu slag products are sold mainly to construction purposes
- Annual use of Tornio FeCr slag in road and basement construction saves 1,000,000 tonnes of virgin materials and 350,000 t CO2 emissions
Environmental and economical benefits of slag products in roads

In road construction the use of slag products means ~35% less total material (~200 truck loads less per road kilometre!)

Sand/aggregate construction

1. Tarmac
2. Rock aggregate
3. Sand
4. Crushed FeCr slag aggregate

FeCr slag construction

1. Tarmac
2. Base layer
3. Sub-base layer
4. Tarmac
5. Granulated FeCr slag
Zero Waste slag smelter – the next generation in circular economy?

- Completely new method of maximising the yield from slag and other by-product streams
- EIA process ongoing
- No investment decision done
- Reduces the need of virgin raw materials

Draft of a corresponding smelter. (Material of technology provider)
Material flows of Zero Waste Slag Smelter

- **Molten slag**
  - 1,070,000 t/a

- **Solid slag**
  - 100,000 t/a

- **Reductant**
  - 70,000 t/a

- **Waste and other by-materials**
  - 145,000 t/a

- **Electricity**
  - 685 GWh/a

- **Offgas**
  - 989 MNm³/a

- **Dust**
  - ~10,000 t/a

**Slag products**
- ~1,065,000 t/a

**New metal product**
- ~240,000 t/a

**Benefits:** Improved metal recovery & new metal product for recycling from waste and side-materials - and deleting waste flows
We are committed to reach carbon neutrality by 2050 – in-line with EU Green Deal targets

We’re on track with the target of reducing our carbon footprint by 20% by 2023\(^1\)

We’re committed to reach carbon neutrality by 2050

1) Reduction of Outokumpu CO2 footprint to 1.5 tons / tons of steel by 2023 vs baseline 2014-16 average of CO2 footprint of 1.86 (CO2 tons / ton of steel)
Thank you!

Stay tuned and follow us on

www.outokumpu.com