Circular economy in steel industry

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Circular economy in steel industry

1. SSAB Merox
2. Briquettes
3. Scrap
Sustainable operations - Reducing CO₂ emissions

At the end of 2019 SSAB will have achieved a lasting reduction of 200,000 tonnes in CO₂ emissions

- Equal to 2.1% of SSAB total CO₂ emissions
- Corresponds roughly to 100,000 cars driving 15,000 km each
- Reduction efforts focused on production
  - 90% of total is generated from the ore-based iron and steel making (coke and coal)
- Today, SSAB uses nearly the minimum amount of carbon raw materials possible with current technology

SSAB is one of the best in the world in iron making CO₂ efficiency - 7% better than the European average

Blast furnace efficiency

At the end of 2019 SSAB will have achieved a lasting reduction of 300 GWh (both electricity and fuel) in purchased energy

► Equals to approx. 3.5% of SSAB's total amount of purchased energy

► Target level corresponds roughly to the energy used by 15,000 households for electricity, hot water and heat during one year.
Sustainable operations - Utilization of residuals

At the end of 2019 SSAB will have achieved a lasting improvements in residual utilization by 30,000 45,000 tonnes

► Achieved through improved internal recirculation and external sales of by-products

► This reduction corresponds to:
  - 12% of the total amount of material currently sent to landfill
  - Roughly to a normal football field filled with 3 meter of material

CASE 1

• Merox – optimizing the value of SSAB’s by-products and reducing waste in the Nordics

• 4 million ton of residuals handled annually
Merox in short

- Merox is a business within SSAB, with a mission to optimize the value of SSAB’s by-products and reduce waste.

- Prioritized areas:
  - Recirculation of material to SSAB production
  - Processing and selling products externally
  - Managing waste which cannot be re-circulated or processed into new products

- Production in six locations in Sweden and Finland.

- The number of employees in Merox about 70 and about 200 people work through various contractors within Merox business.

- Sales in Merox responsibility area 1 500 MSEK

Merox handle yearly about 4 million ton of residuals: In average 52% recirculated (mostly as raw material to SSAB steel production), 33% sold externally, 9% storage and 6% landfill.
4 000 000 t/a

Route
Oxelösund-Borlänge-Luleå-
Raahe-Hämeenlinna ≈ 1 900 km

100 000 × 1 truck ≈ 1 900 km
Value In Use (VIU)

- VIU > market price → USE
- VIU < market price → SELL
Market segments - internal

- **Raw material for SSAB steel production**
  - Slag recirculation (LD and ladle slag for BFs)
  - Scrap (scrap from slag and recycled steel)
  - Internal raw materials (briquettes, tundish covering powder)

- **Steel works services**
  - Landfill services (management and long term planning)
  - Waste management services (non-process waste such as paper, oils, etc.)
  - Used equipment services (taking care of discarded equipment)
  - Utilizing materials (develop the best usage for by-products and waste)

- **SSAB sustainability support**
  - REACH management and coordination
  - Environmental expertise consulting
Market segments – external

► Earthworks & road construction
  – Granulated and air cooled blast furnace slag
  – Ground Granulated Blast furnace Slag (GGBS)
  – Mixture of converter slag and granulated blast furnace slag

► Agriculture
  – Granulated blast furnace slag
  – Ladle slag
  – Mixture of calcite and granulated blast furnace slag
  – Mixture of calcite and desulphurization slag
  – Air cooled blast furnace slag

► Industrial sales - raw materials
  – Scrap
  – Coke products
  – Coking plant by-products
  – Blast furnace slag
  – Iron oxide
  – Zink dross
  – Copper
Recycling in SSAB/Merox level

Steel recycling

SSAB

All internal recycling

Merox
Recycling in overall level

Outside → Inside

Internally

Inside → Outside
Recycling (Raahe)

CASE 2
• Briquetting

Coal tar, benzene, sulphur, coke products

Coking plant

Briquetting plant

Power plant

Lime kilns

BFs

Desulphurisation

Convertisers

Rolling mills

Other sites in Finland

Recycled steel

LD slag, steel scrap

Iron oxide, Zn dross, Demolition scrap, scrapped rolls

Heat

Iron oxide

Other materials

Recycled steel

Steel works earth works

Coke breeze, coke dusts

Mill scale
Mill dust

BF dusts

Des. slag

LD slag

Pig iron scrap

BF gas

Coking gas

Pig iron scrap

BF slag

BF slag

Recycled steel

Steel scrap

Recycled steel

Recycled steel

Recycled steel

Recycled steel

Recycled steel

Recycled steel

Recycled steel

Recycled steel
Shutdown of Sintering plant in Dec 2011
Startup Briquetting plant in March 2012
Quality Factors of Briquettes

- Raw materials
  - grain size distribution
  - properties
  - composition

- Mixer & Machine
  - Mixing times
  - Press force and vibration frequency etc.

- Cement
  - quality
  - amount

- Moisture
  - setting of concrete
  - compaction

- Strength of Briquette
  - after 28 hours
  - after a month
  - Strength in BF shaft
The raw materials of cold bonded briquettes

- Coke dusts: 4%
- BF dust from cast and bunker houses: 4%
- Pellet fines: 16%
- Steel scrap: 7%
- Mill scale: 20%
- Pre-mix (BF flue dust and steel scrap): 21%
- Briquette fines: 11%
- Binder: 11%
- Iron scrap: 7%
- Slag cement: 4%
- Portland cement: 7%
The main component of briquettes

Iron
Lime
Coal

Wt. %

Fe, CaO, C, SiO2, Al2O3, MgO, Mn, S
Ways of recycling

CASE 3

- Scrap

Outside → Inside

Internally

Inside → Outside
# Scrap terminal

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October 6, 2017
M. Mäkikyrö
Slag derived scrap

Steel scrap 30-150 mm for converters

Pig iron scrap for BFs

Pig iron scrap for sales
Edge cuttings ➔ cooling scrap
Home scrap
External scrap
Something to think...

SHOULD WE FOCUS MORE ON DECREASING CIRCULAR ECONOMY?
Slag volume in SSAB Raahe BFs, 1964 – 2014

kg/t hm

800 000 t/a

460 000 t/a
Thank You!

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