A Part of SSAB

Circular economy in steel industry

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2017-10-06 Oulu

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Circular economy in steel industry

1. SSAB Merox
2. Briquettes
3. Scrap

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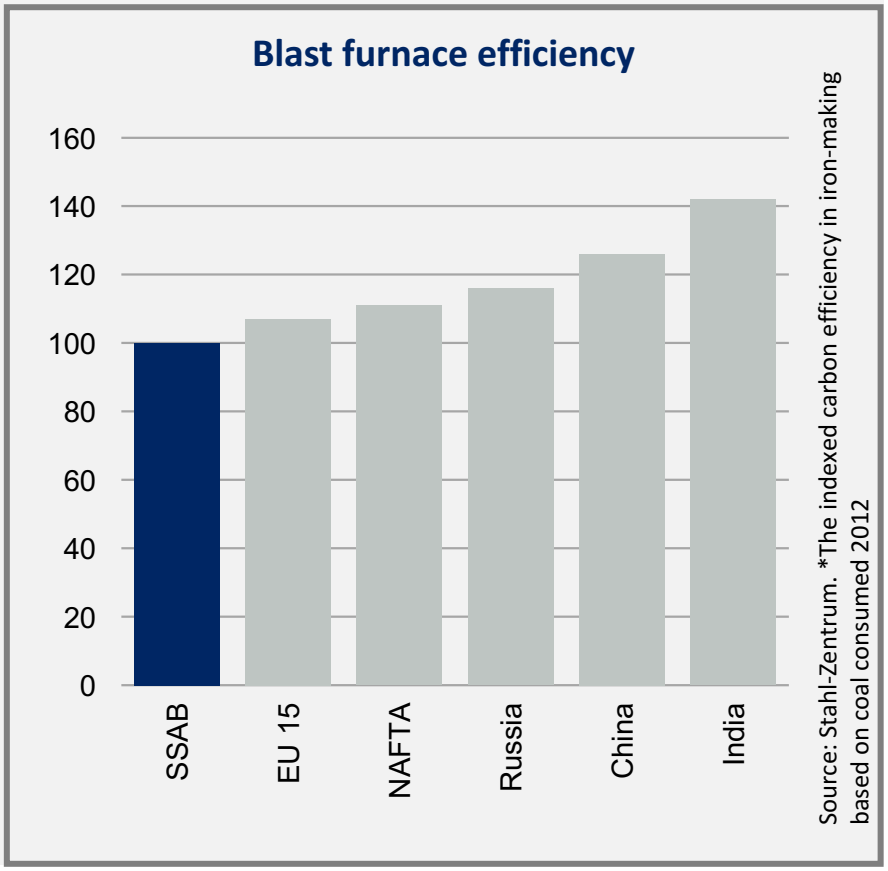
Sustainable operations - Reducing CO_2 emissions

At the end of 2019 SSAB will have achieved a lasting reduction of 200,000 tonnes in CO_2 emissions

- Equal to 2.1% of SSAB total CO_2 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 CO_2 efficiency - 7% better than the European average



Sustainable operations - Reducing amount of purchased energy

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

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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

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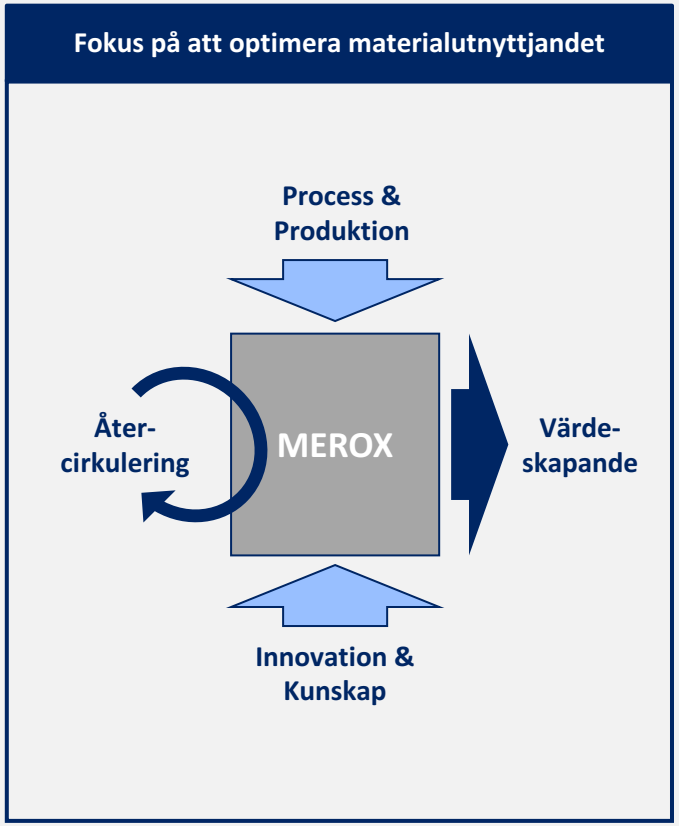
Merox in short

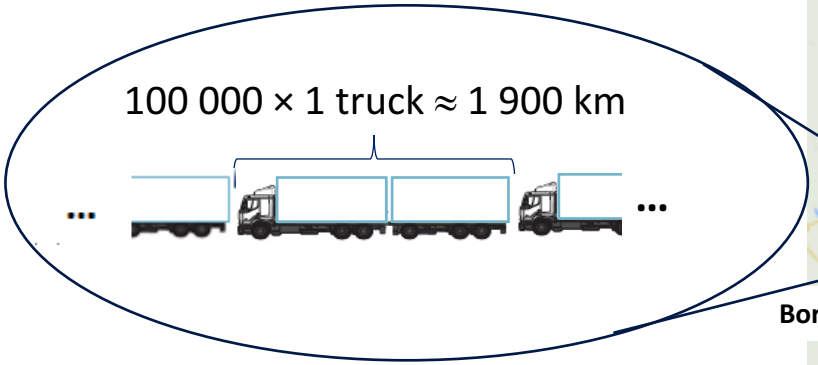
- Merox is a business within SSAB, with a mission to optimize the value of SSAB's by-products and reduce waste
- Prioritized areas:
  - Recirculation of material to SSAB production
  - Processing and selling products externally
  - Managing waste which cannot be re-circulated or processed into new products
- 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



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Value In Use (VIU)

- VIU > market price → USE
- VIU < market price → SELL

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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)

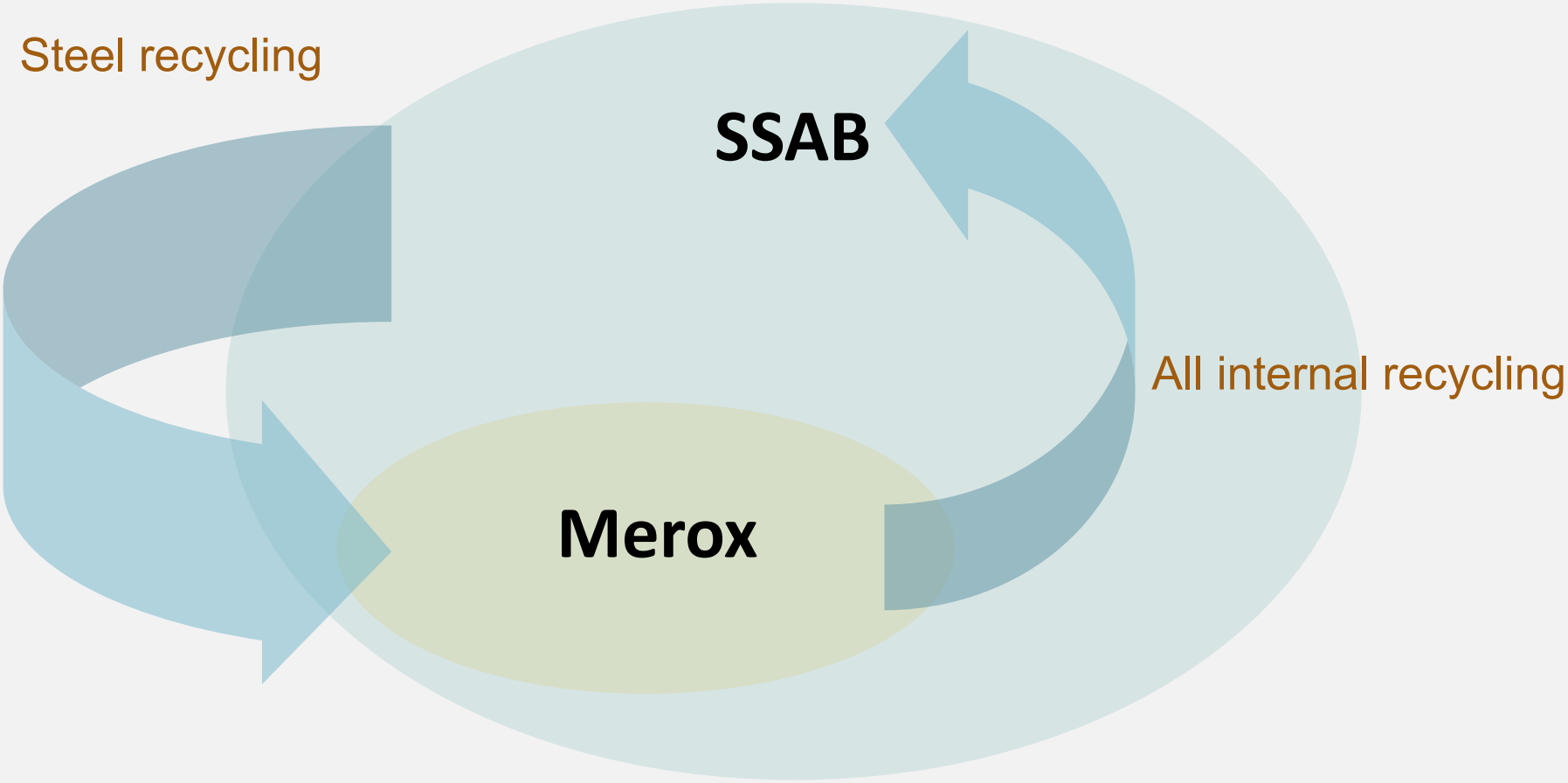
- **Steel works services**
  - Landfill services (management and long term planning)
  - Waste management services (non-process waste such as paper, oils, etc.)
  - Used equipment services (taking care of discarded equipment)
  - Utilizing materials (develop the best usage for by-products and waste)

- **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



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Recycling in overall level

Outside
→ Inside

Internally

Inside →
Outside

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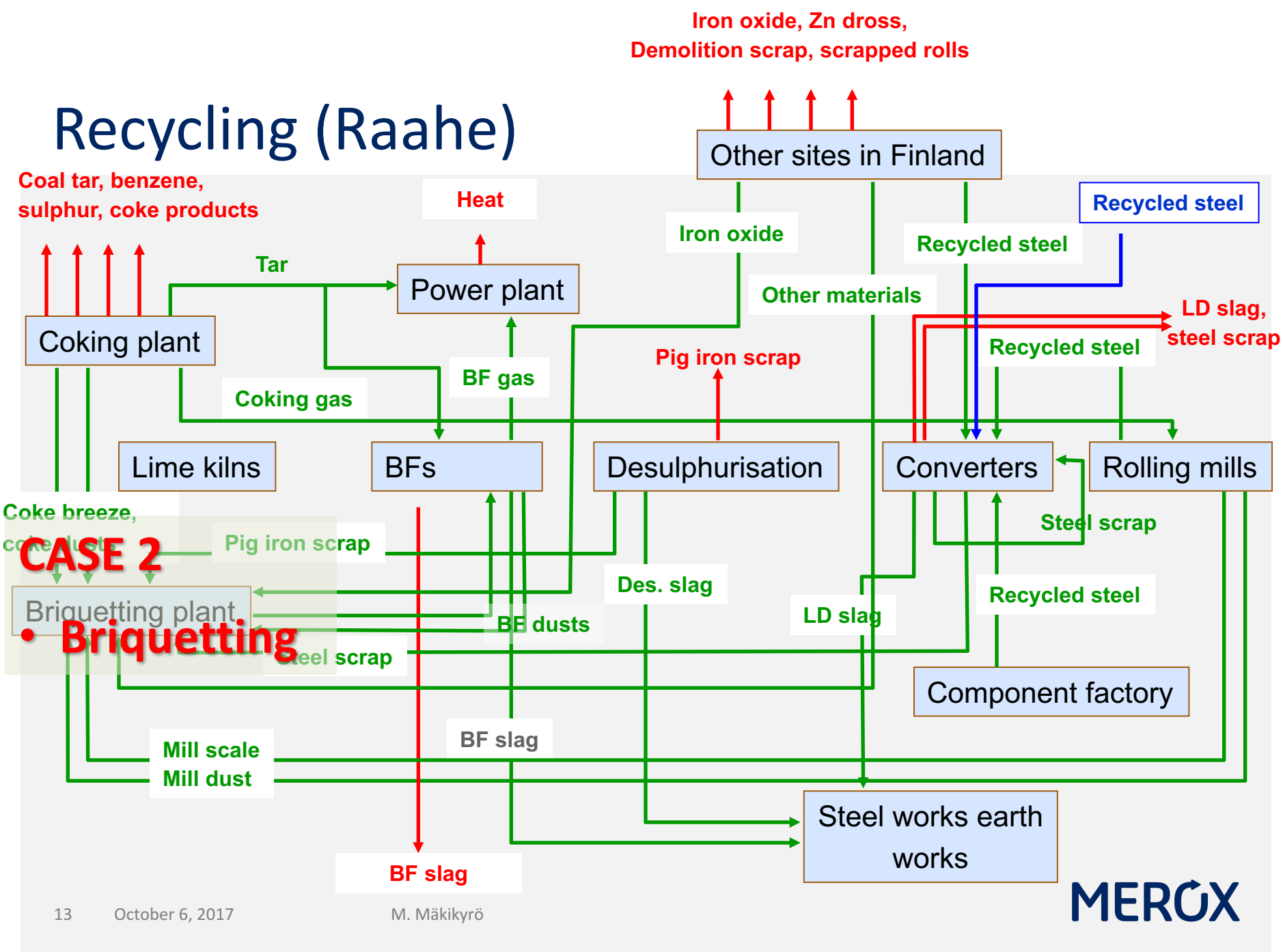
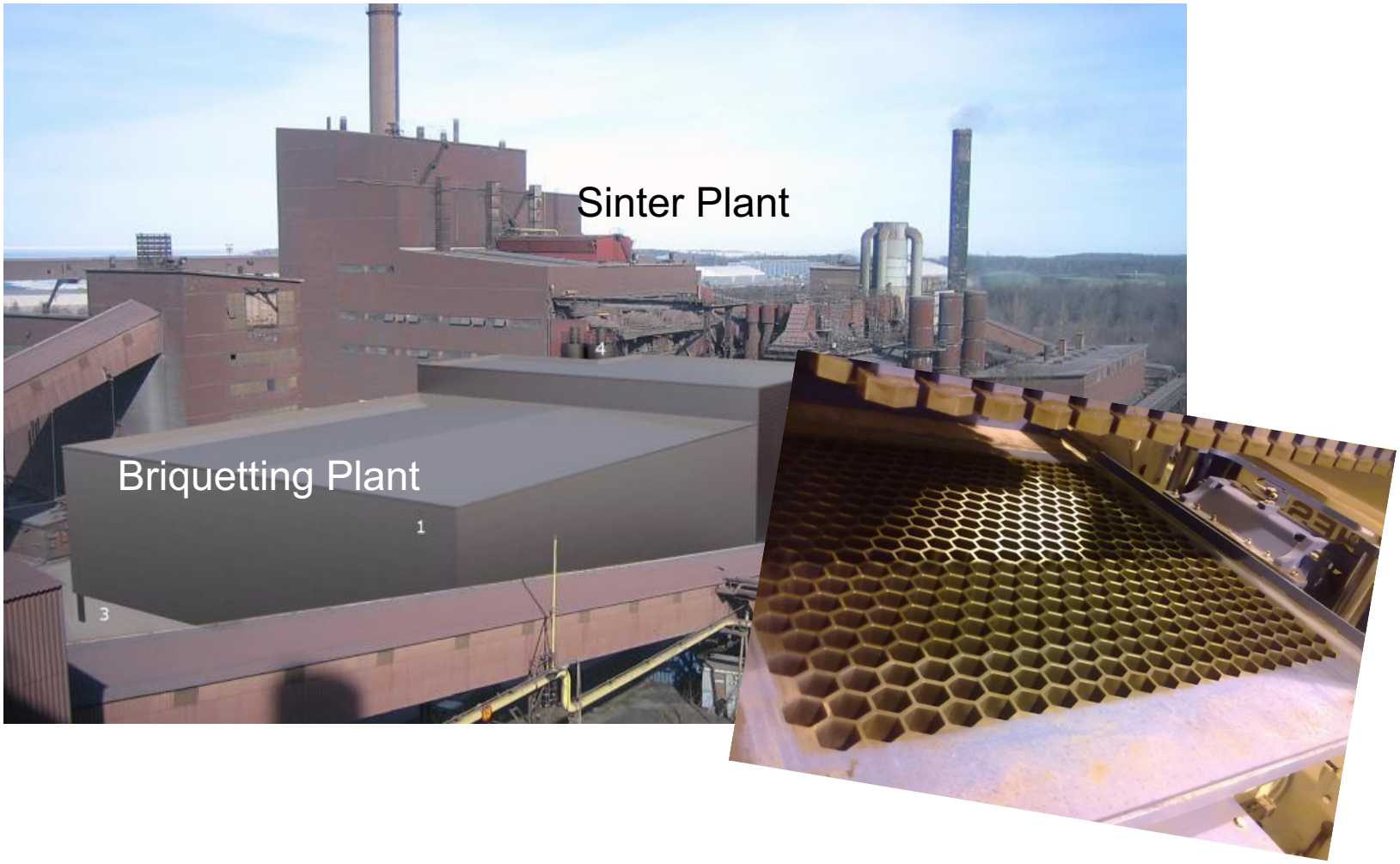
Recycling (Raahe)



Shutdown of Sintering plant in Dec 2011
Startup Briquetting plant in March 2012



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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 Briguette
- after 28 hours
- after a month

Strenght in BF shaft

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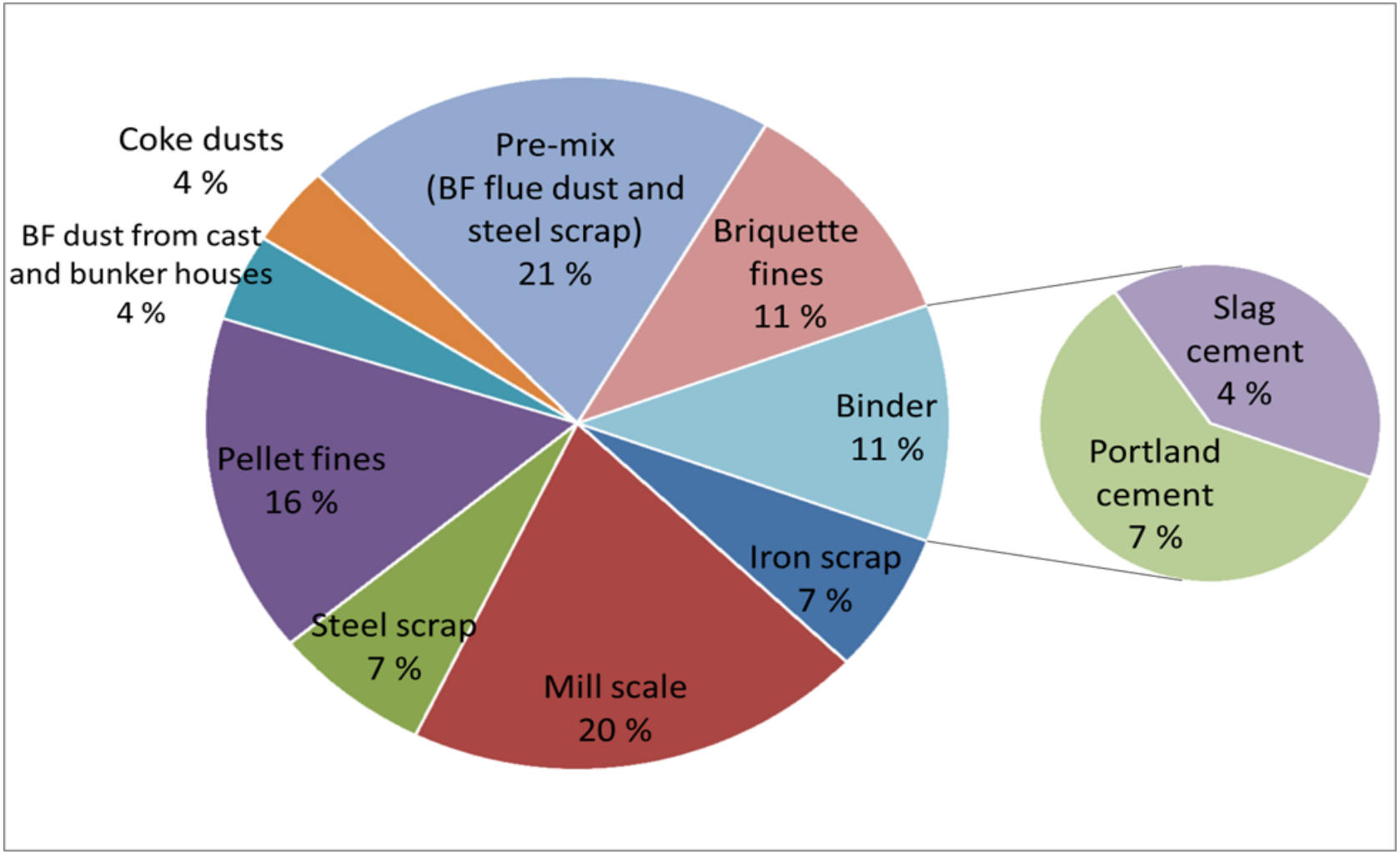
The raw materials of cold bonded briquettes



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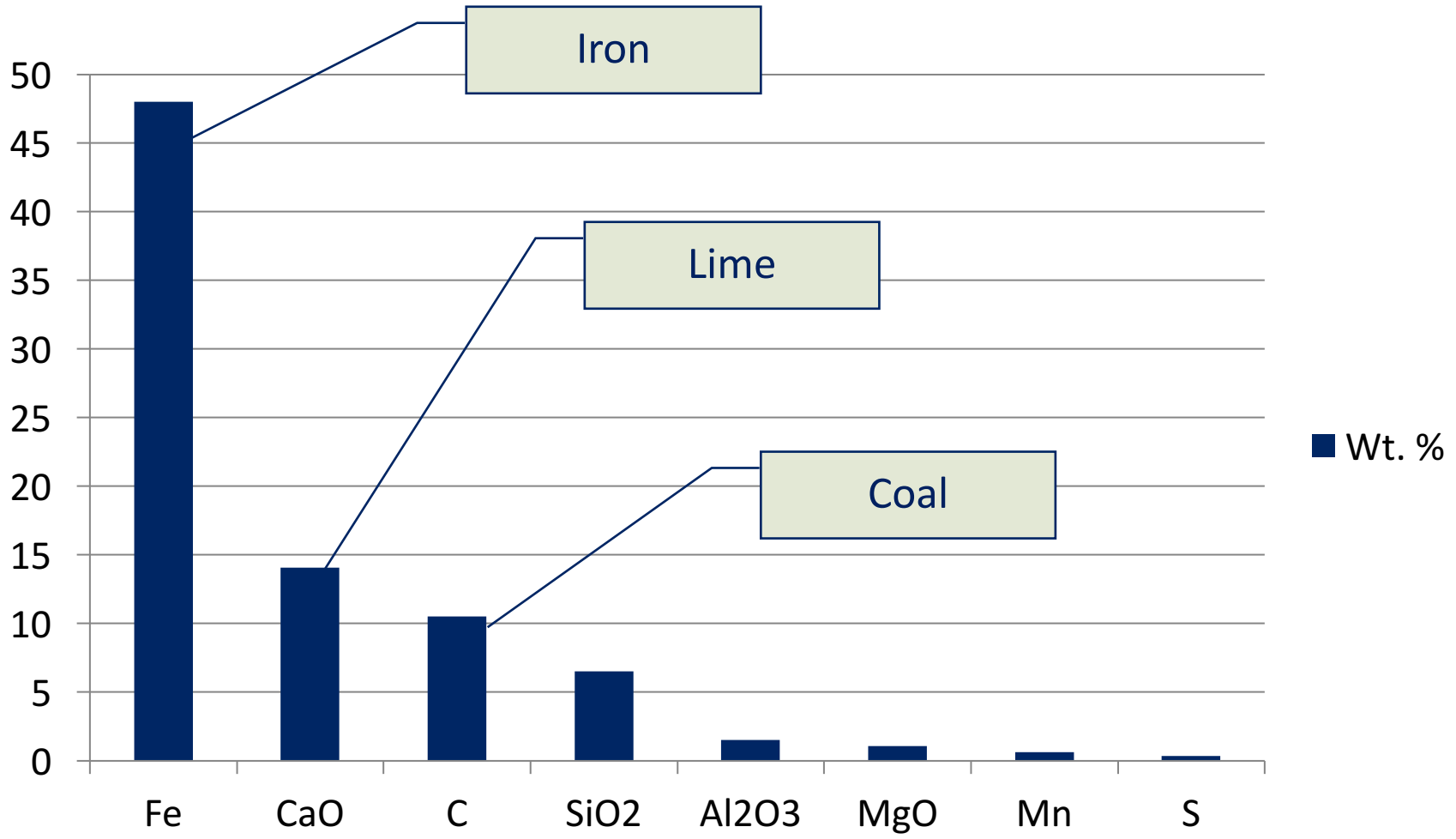
The main component of briquettes



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VIU: Briquettes to BFs

Fe	Fe i Briquette	% Fe
	C content	%
	Metallic Fe of total Fe	%
	Value Fe	SEK/tn
	Saved coal/coke due to Metallic Fe	t C/t Fe
	Saved coal/coke	kg/t Briquette
	Saved coal/coke	SEK/t Briquette
	Intrinsic value Fe /tn briquette	SEK/tn
CaO	CaO in Briquette	% CaO
	Value CaO/t Briquette	SEK/t
	Saved coal/coke due to CaO instead of $CACO_3$	kg/t Briquette
	Saved coal/coke	SEK/t Briquette
	Intrinsic value CaO /tn briquette	SEK/tn
Manganese	Analysis	% Mn
	Value Mn	SEK/t
CO_2	Saved coal/coke	kg/t Briquettes
	Saved cost for less CO_2 emission	SEK/t
Landfill	Cost for landfill	SEK/t
	Cost avoidance for cost of landfill	SEK/t

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Ways of recycling

CASE 3

- **Scrap**

Outside → Inside

Internally

Inside → Outside

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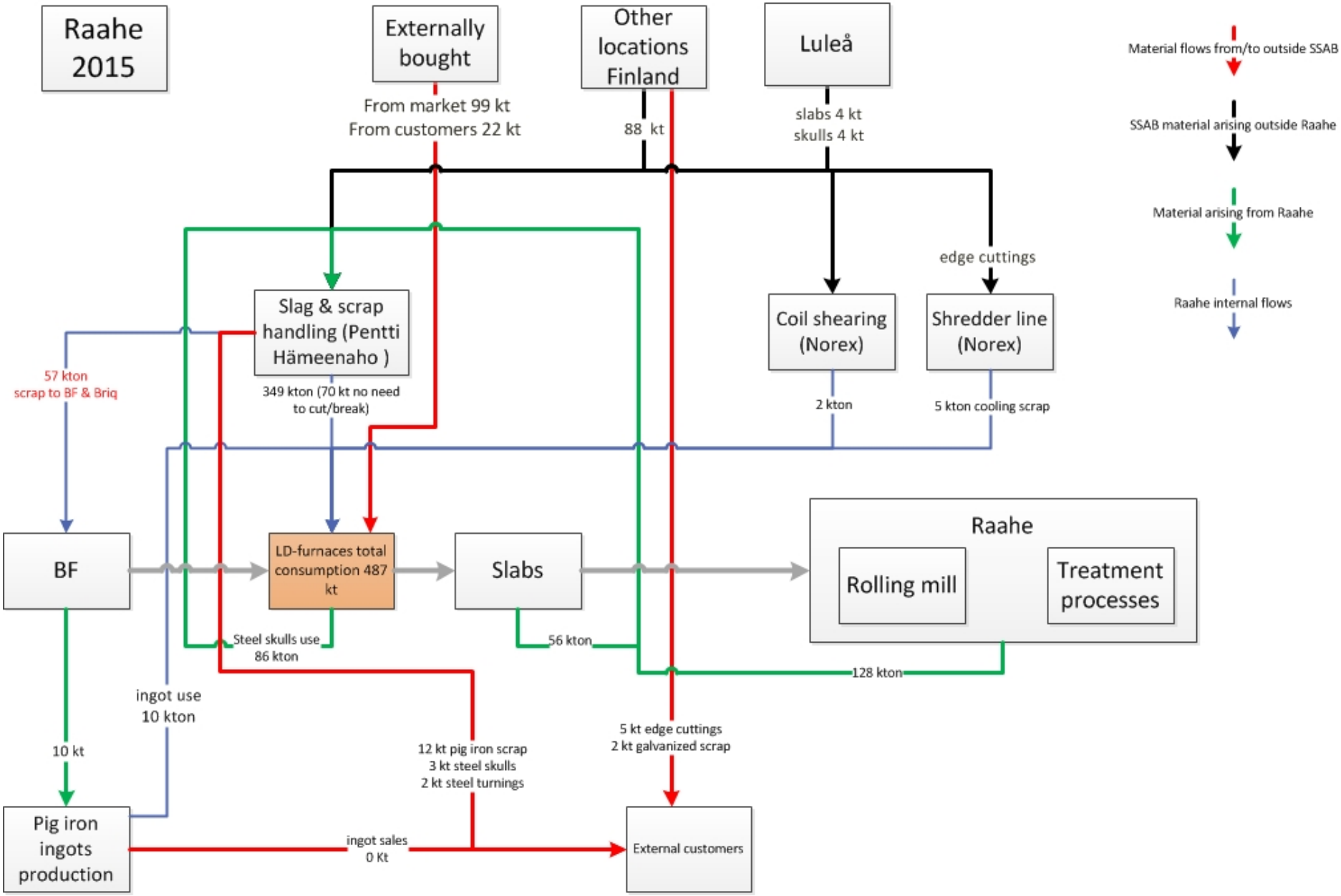
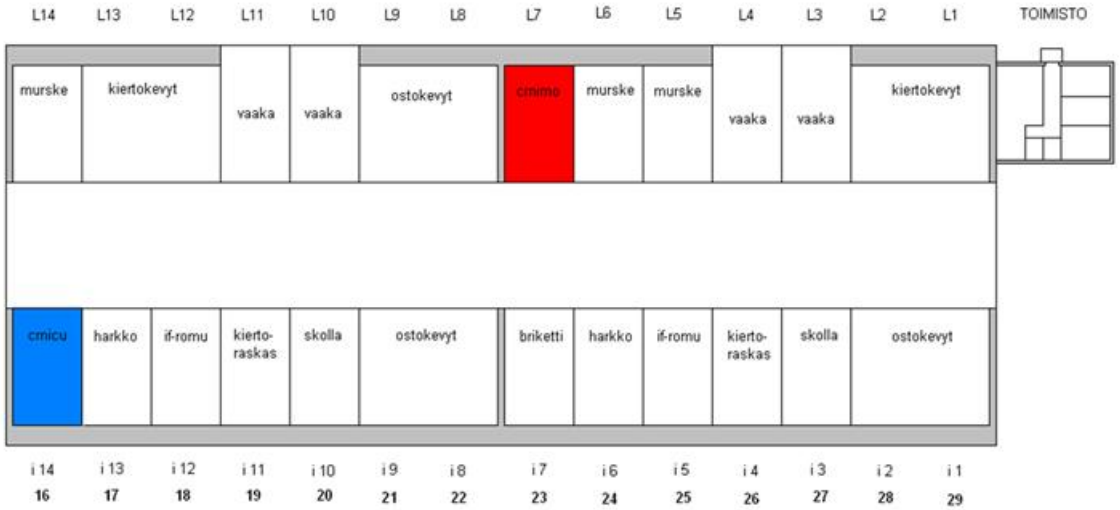
Raahe scrap flows



Scrap terminal



Slag derived scrap

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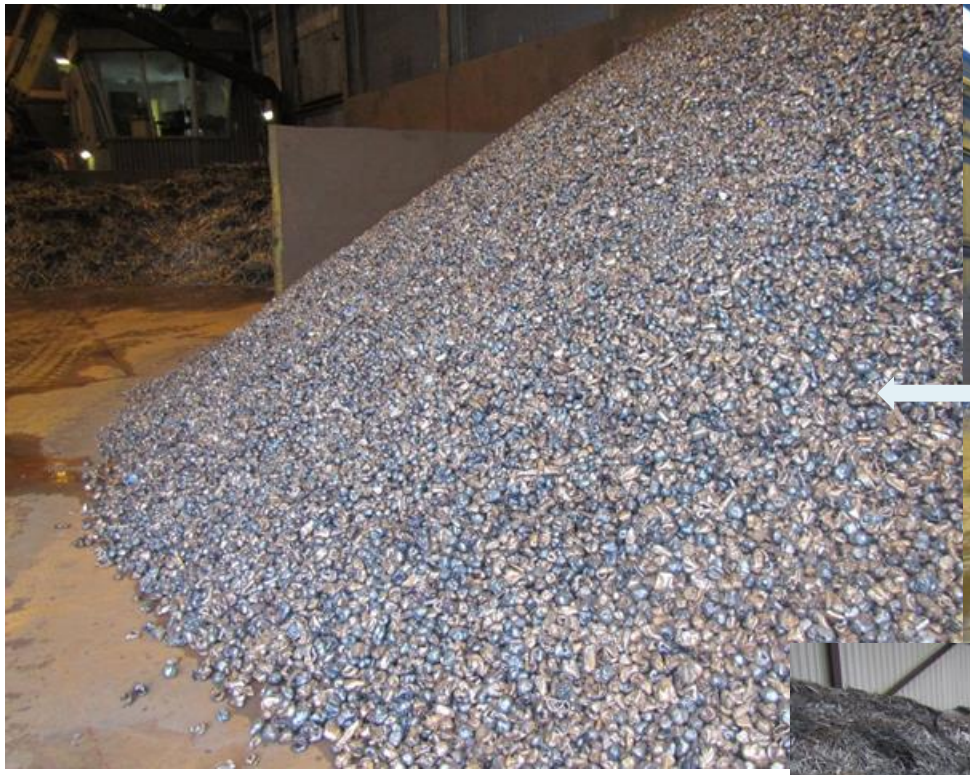
Edge cuttings → cooling scrap



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Home scrap

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External scrap

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VIU: Slag scrap to converters

	Parameter	Unit
Market value purchased scrap	Replacement purchased scrap	EUR/tn
Value loss due to internal handling (slag scrap)	Quality	EUR/tn
	Yield	EUR/tn
	Production cost	EUR/tn
	Transportation	EUR/tn
Total value	Total value of own slag scrap EUR/tn	EUR/tn
Used amounts	Used amount of own scrap	tn/month
Total value	Total value EUR/month	EUR/month

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Something to think…

SHOULD WE FOCUS MORE ON

DECREASING CIRCULAR ECONOMY?

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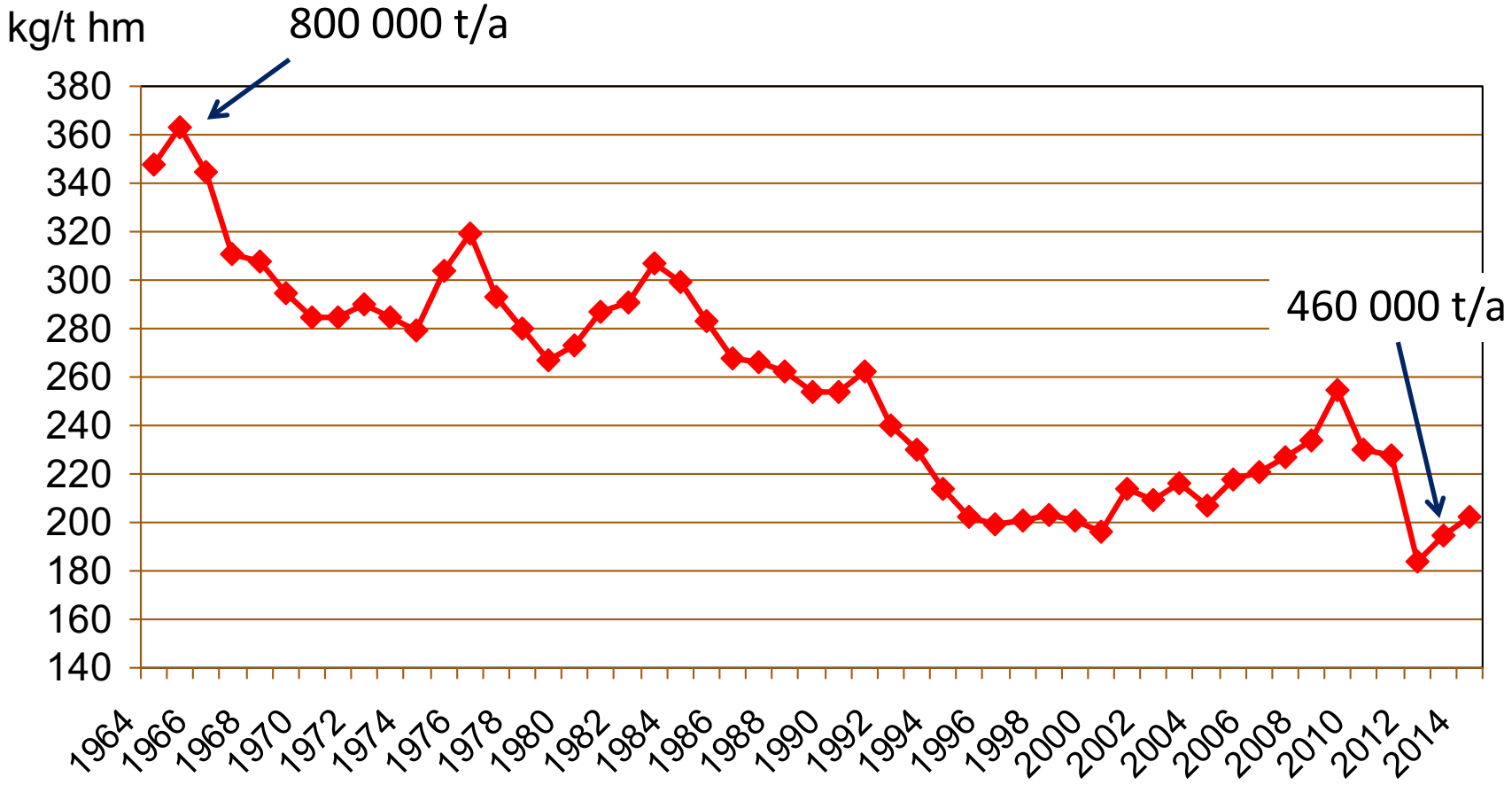
Slag volume in SSAB Raahe BFs, 1964 – 2014



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Thank You!

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