

# UTILIZATION OF MILL SCALE IN FERROCHROME PRODUCTION

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VARGÖN Alloys AB

CoreX

# Vargön Alloys AB – Swedens only ferrochrome producer









**1874:** The company was founded

**1912:** Installation of the first ferroalloy furnace (SiMn)

**1957:** The first energy recovery system became operational

**1972:** Inauguration of the world's largest smelting furnace for ferroalloys

**1987:** Management buy-out (MBO) by four managers

**2008:** Vargön Alloys AB was acquired by Yildirim Group of Companies

**2025:** CoreX Holding established

CoreX

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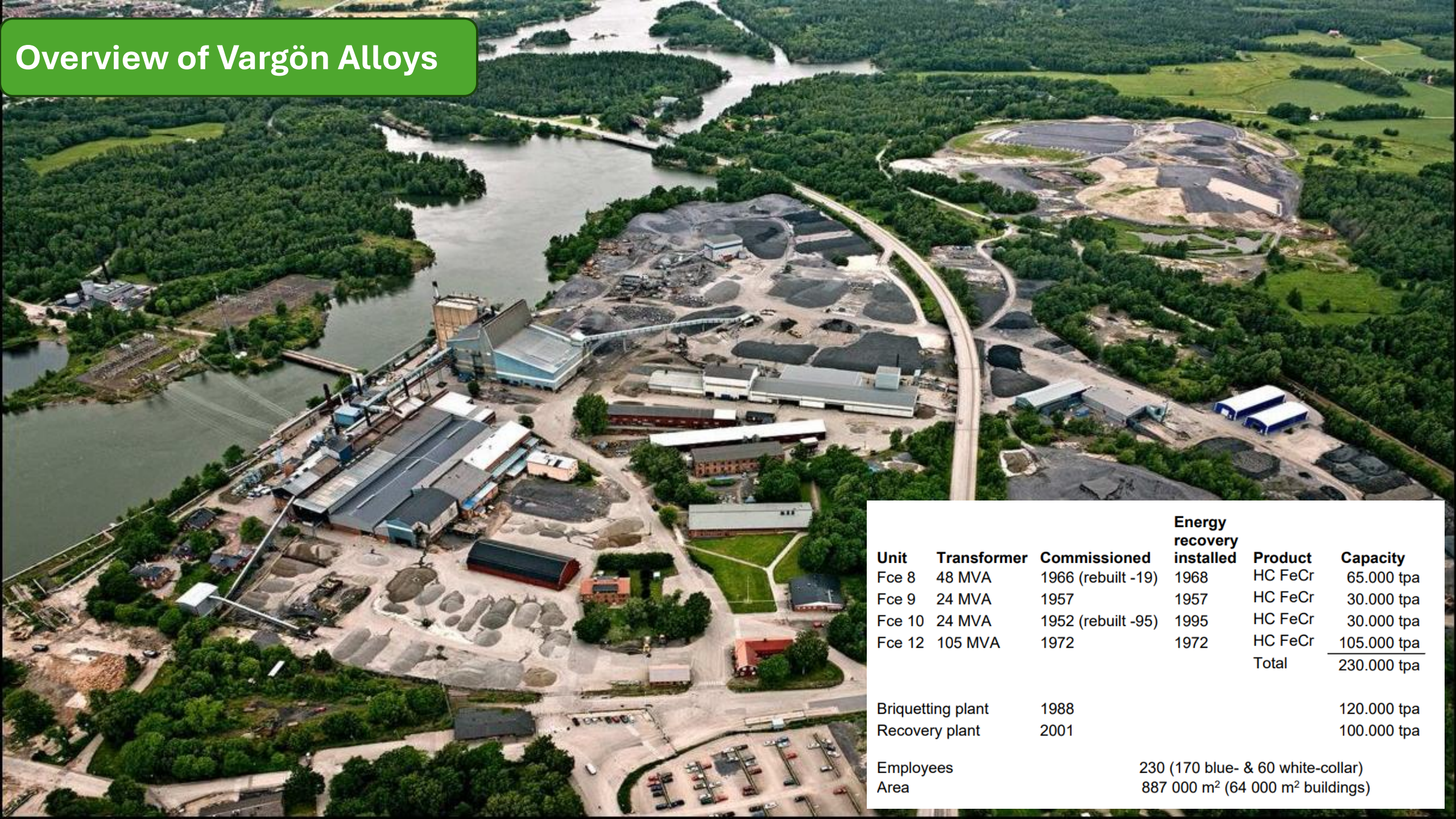
# Overview of Vargön Alloys



| Unit | Transformer | Commissioned | Energy recovery installed | Product | Capacity |
|---|---|---|---|---|---|
| Fce 8 | 48 MVA | 1966 (rebuilt -19) | 1968 | HC FeCr | 65.000 tpa |
| Fce 9 | 24 MVA | 1957 | 1957 | HC FeCr | 30.000 tpa |
| Fce 10 | 24 MVA | 1952 (rebuilt -95) | 1995 | HC FeCr | 30.000 tpa |
| Fce 12 | 105 MVA | 1972 | 1972 | HC FeCr | 105.000 tpa |
| | | | | Total | 230.000 tpa |
| Briquetting plant | | 1988 | | | 120.000 tpa |
| Recovery plant | | 2001 | | | 100.000 tpa |
| Employees | | | 230 (170 blue- & 60 white-collar) | | |
| Area | | | 887 000 m$^2$ (64 000 m$^2$ buildings) | | |

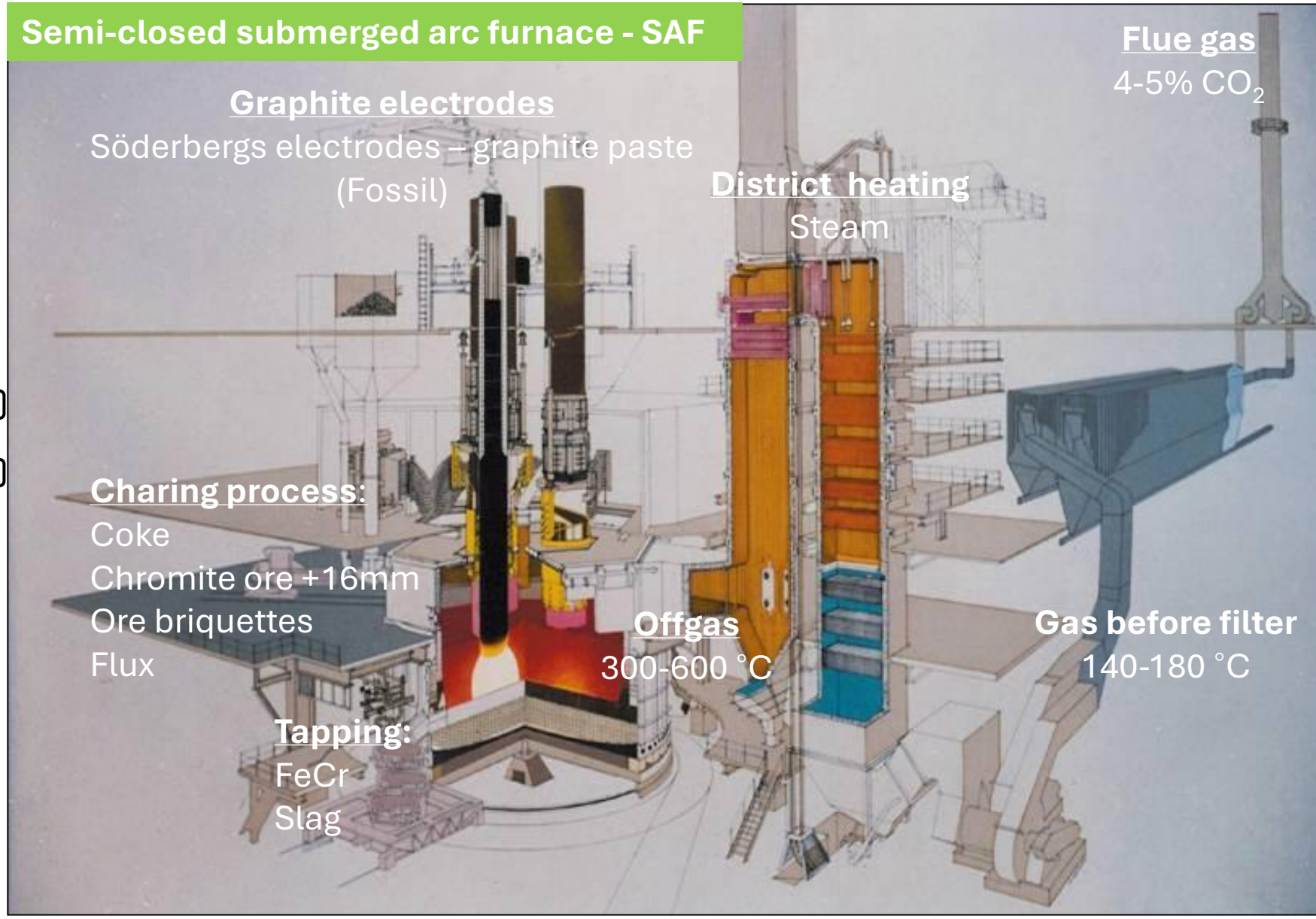
# FeCr - production

Ferrochrome, shortened FeCr, is a ferroalloy consisting of 50-70% Cr.

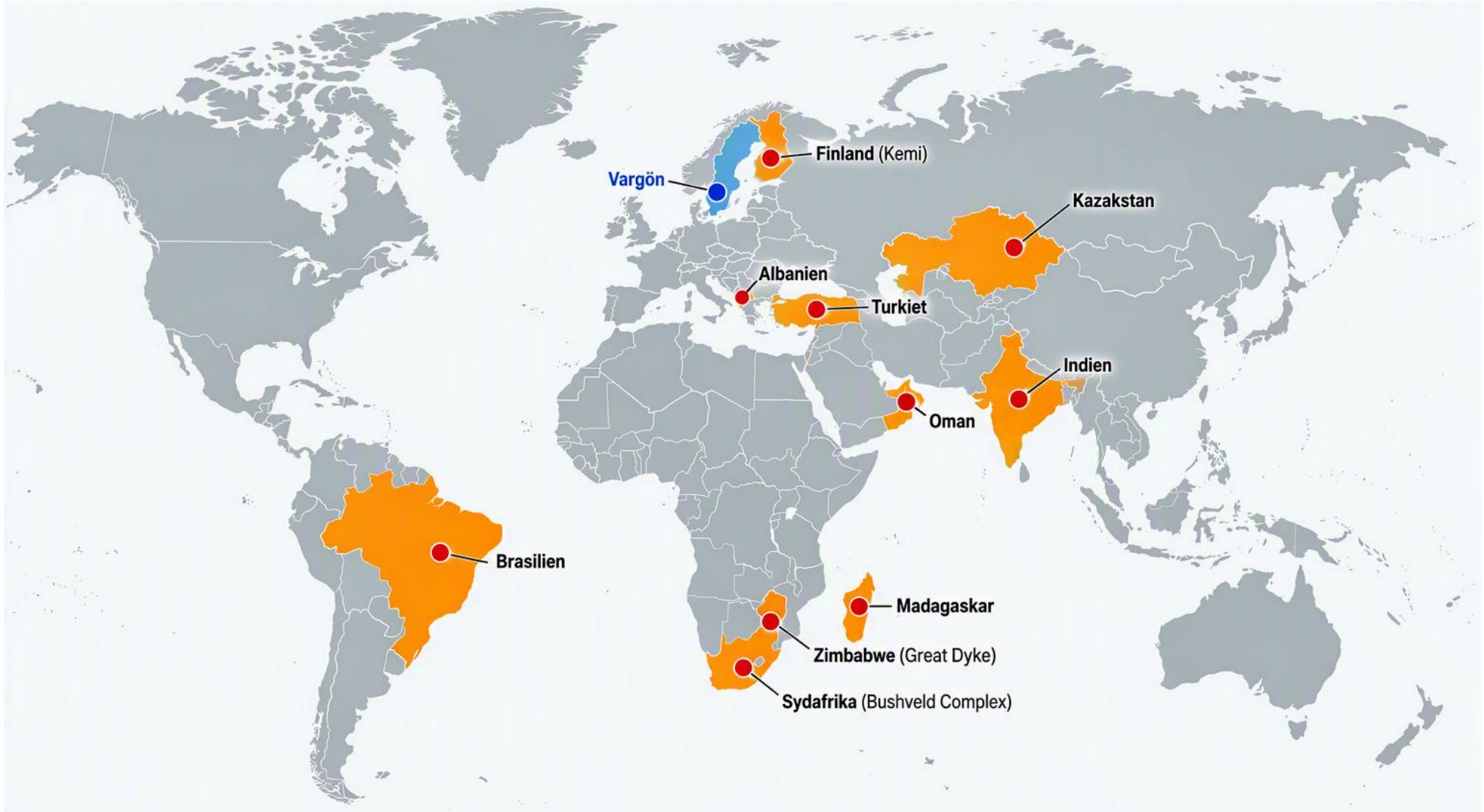
- Low carbon = 0,01 – 0,5%
- Medium carbon = 0,5 – 4%
- High carbon = 4 – 9% C

**Raw material**:

- **Chromite ore, abt 350,000 tpa**
  - 40-48 Cr2O3, & 2.8-3.0 Cr/Fe ratio
- **Reductants, abt 65,000 tpa**
  - **Coke with P <0,010%**
- **Flux, abt 20,000 tpa**
  - From our own quarry or Swedish origin
  - Quartz, Lime, etc
- **Electricity (Nuclear), abt 560,000 MWh**
  - 100% green electricity



# Chromite deposit worldwide, and why mill scale



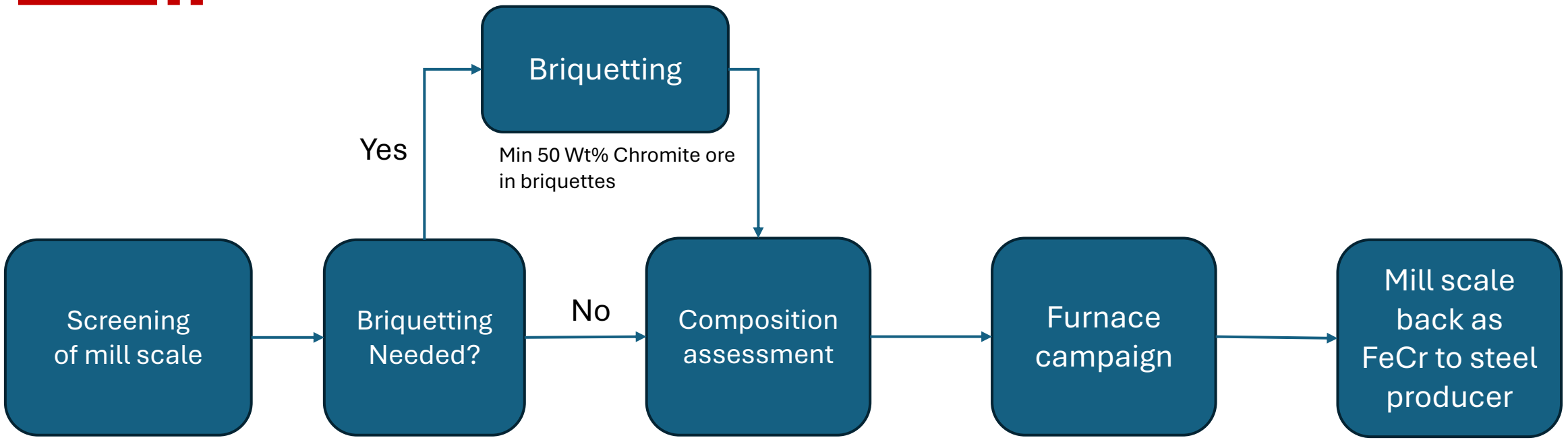
# Demand of Cr




- EU HC FeCr demand: 0.9-1.2 Mt/year
- Approximately 50% of the EU's HC FeCr demand is supplied by production within the EU, while the remaining 50% must be imported
  - South Africa, Albania, Kazakhstan, Turkey
- Stainless steel production in Europe: 6 million tonnes
- Annual amount of high alloyed mill scale generated in Sweden: ~ 8000 tonnes

https://jernkontoret.se/globalassets/publicerat/handbocker/jernkontoret_handbok-for-restprodukter-2...

# Vargöns mill scale procedure



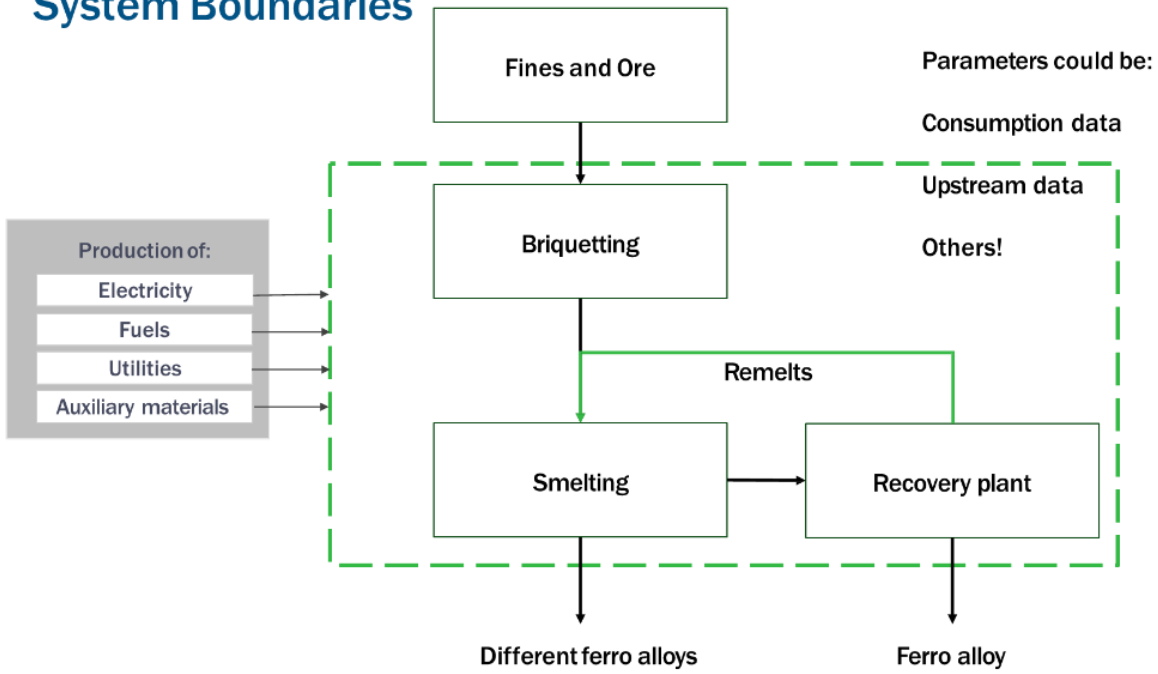

- Particle size distribution
- Cr content (Cr/Fe ratio)
- Chemical compositions

- Charge rate of mill scale
- Alloy composition
- Min Cr in alloy: 52%

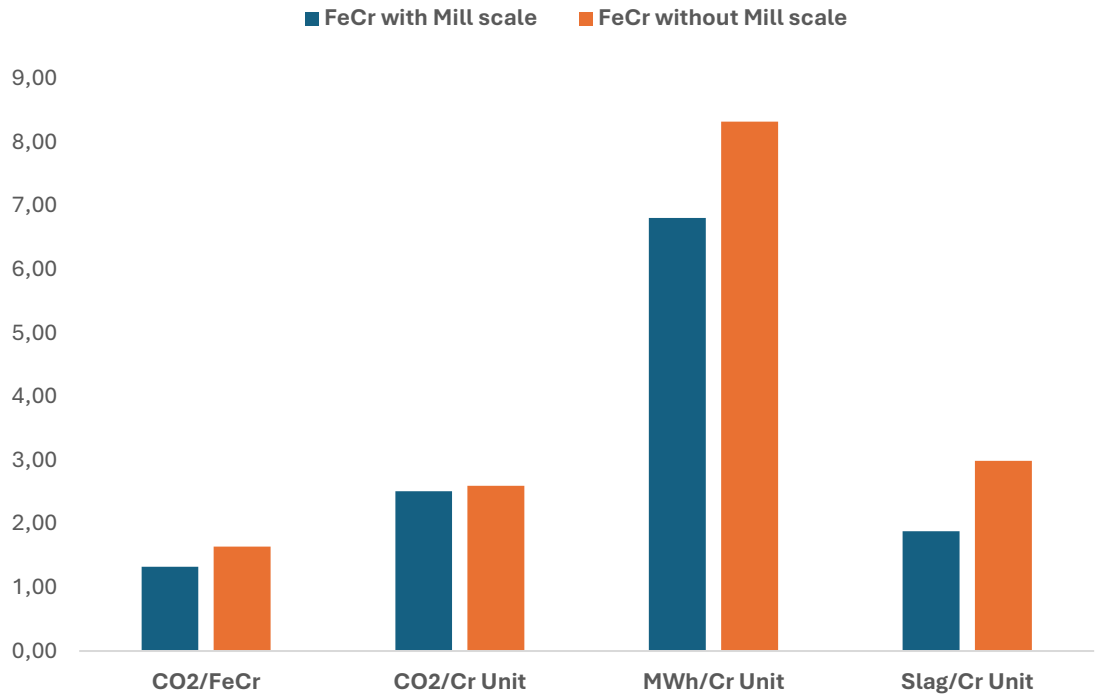
- Recovery of Cr and other alloying elements (Mo, Ni etc.)

# Environmental impact

## System Boundaries




Scope 1 comparison between two FeCr products with similar chemical composition (Si%, C%)



# Why utilize mill scale in FeCr production

- **Reduced slag generation and lower energy consumption** per tonne of FeCr produced.
- **Increased chromium recovery and resource efficiency**
- **Lower $CO_2$ footprint (Scope 3)** by reducing the demand for primary chromite ore per tonne of alloy produced.
- **Flexible alloy production**, depending on:
  - Cr/Fe ratio of the mill scale
  - Chromium content of the mill scale
- **Recovery and recirculation of critical alloying elements** such as Ni and Mo, reducing the need for virgin raw materials.
- **Reduced environmental impact of nickel recovery**, as conventional ferronickel production generates significant volumes of slag.
- **Supports circular material flows** and contributes to a more sustainable and resource-efficient stainless steel value chain.

# Questions?

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