

Metso

Reliable process equipment for the direct reduction of iron ore, iron sands or ilmenite

SL/RN and SL/RN Xtra





7 decades of technology and market leadership in iron ore direct reduction

The SL/RN process, developed in the 1960s by the Steel Company of Canada, Lurgi (now Metso), Republic Steel Company, and National Lead Corporation, has been significantly advanced by Metso.

Metso has supplied 65 SL/RN plants for iron ore and ilmenite, contributing to a global production capacity exceeding 10 million tons per year. Metso's expertise covers complete plant design, including ore preparation and screening, preheating, reduction, kiln firing, gas cleaning, product handling, and storage.

The merger of Metso and Outotec has further strengthened the capabilities, combining a track record of over 1,200 rotary kiln plants for various applications, including pet-coke, pebble lime, lime recovery, lithium ore processing and waste pyrolysis, along with 56 Grate

Kiln plants for iron ore pelletizing. Metso's R&D centers in Frankfurt, Germany, and York, USA, bring decades of experience to support optimal process design and equipment layout.

Metso's global presence and extensive experience enable local sourcing of major system components near installation sites, ensuring they remain close to customers throughout the service life of the equipment and systems they provide.

SL/RN process advantages

The SL/RN process, developed in the early 1960s by Metso in collaboration with three US companies, laid the foundation for numerous rotary kiln plants. This process remains the dominant technology for the direct reduction of lump ore or pellets using coal.

One of the key advantages of the SL/RN process is its ability to handle a wide range of iron-bearing materials, including pellets, lump ore, beach sand, ilmenite, and even iron ore fines with the SL/RN-Xtra variant.

Additionally, it can utilize an extensive range of reductants, such as sub-bituminous and bituminous coals, lignites, anthracite and coke breeze.

The process also boasts improved thermal efficiency, thanks to waste heat recovery systems that can be

combined with export power generation. This not only enhances energy efficiency but also helps in meeting environmental standards for emissions control.

Furthermore, the SL/RN process can increase capacity through multiple line installations and optimized material flow, making it a proven versatile and scalable solution for iron production.

Benefits

- Process know-how as one of the inventors of the SL/RN process
- Development of the SL/RN Xtra applications for fine raw materials
- R&D in the research centers in the USA and Germany
- Huge installation base
- Unique equipment know-how for rotary kilns, travelling grates, pelletizing equipment, own proprietary burner technology and other process relevant auxiliary equipment
- Many different applications

Products of SL/RN plants



DRI from lump ore



DRI from pellets

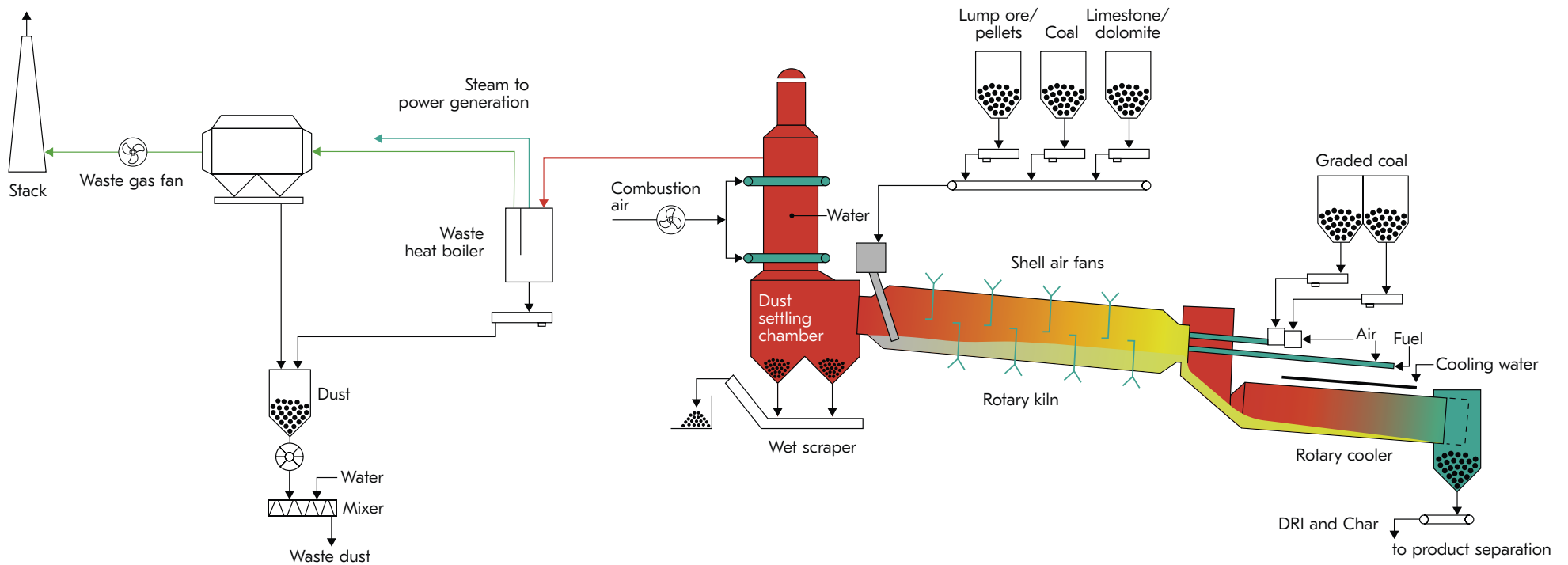


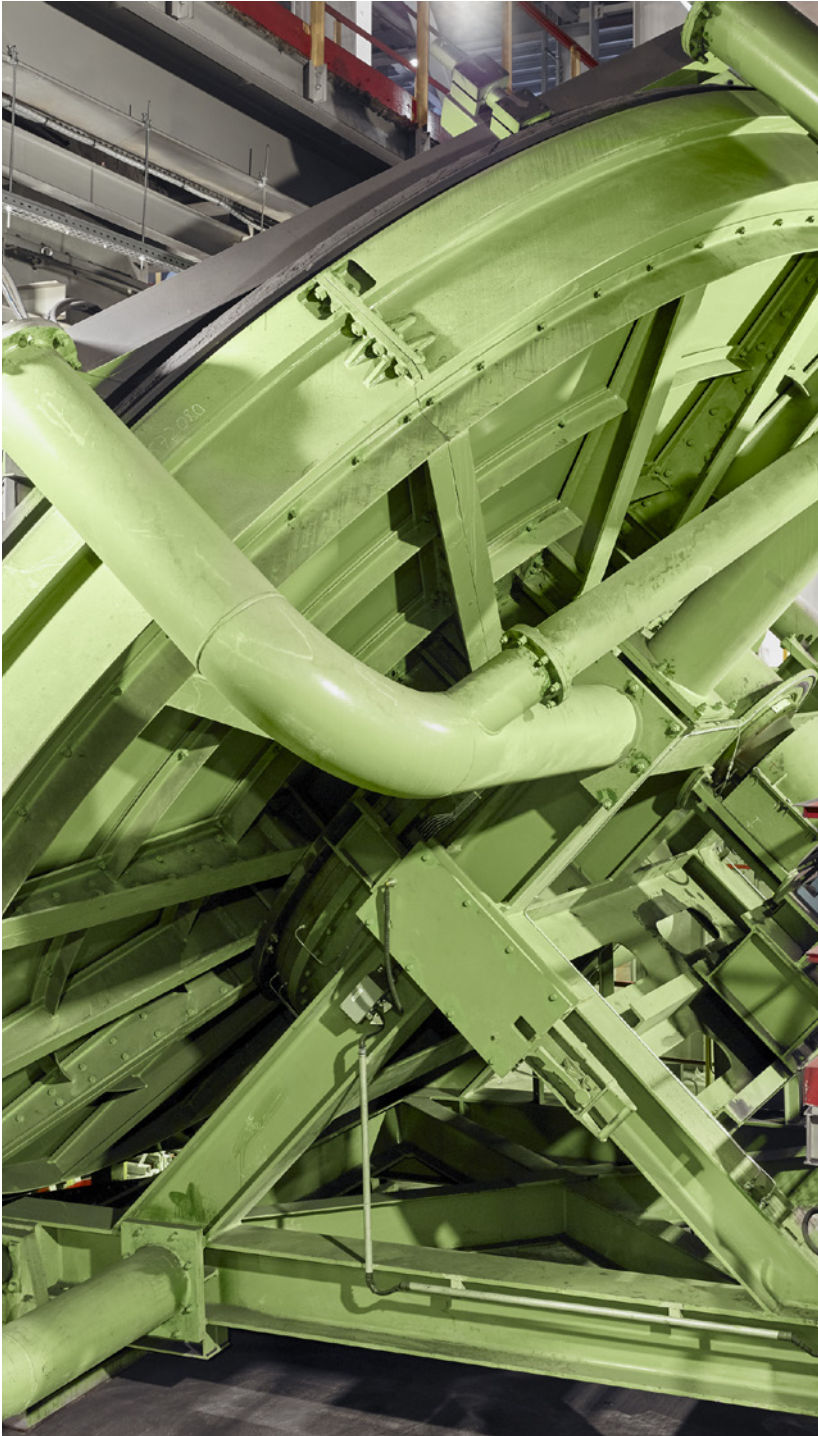
Pre-reduced iron sand

Process schematic

SL/RN

- Raw material: iron ore lumps, iron ore pellets, coal and dolomite (if required)
- Product: Direct reduced iron (DRI) as pellets or lumps
- Feed for EAF or induction furnace
- Rotary kiln and cooler are Metso proprietary equipment
- Proven SL/RN process, own test facilities in York and Frankfurt





Coal based direct reduction for fines

For over 50 years, the standard SL/RN process has been used to produce Direct Reduced Iron (DRI) from lump ores or iron ore pellets. However, the decreasing availability of high-grade lump ores has created a need for a process that can handle fine-grained ores and concentrates. The traditional SL/RN process is not suitable for treating iron ore concentrates that consist of finely ground particles with a grain size of less than 5 mm. These fine particles tend to form accretions within the kiln when metallized at temperatures above 1,000°C, which disrupts the process.

To address this issue, Metso developed the SL/RN-Xtra process, which is specifically designed to produce DRI directly from fine concentrates. This innovative process integrates pelletizing and direct reduction in a single-plant setup, significantly improving kiln throughput by up to 30%. The SL/RN-Xtra process has already been applied successfully in various contexts. For example, Lurgi (now Metso) used it for the reduction of calcined pyrite at Falconbridge in Canada and for processing steelwork residues at Nippon Kokan in Japan as early as the 1970s.

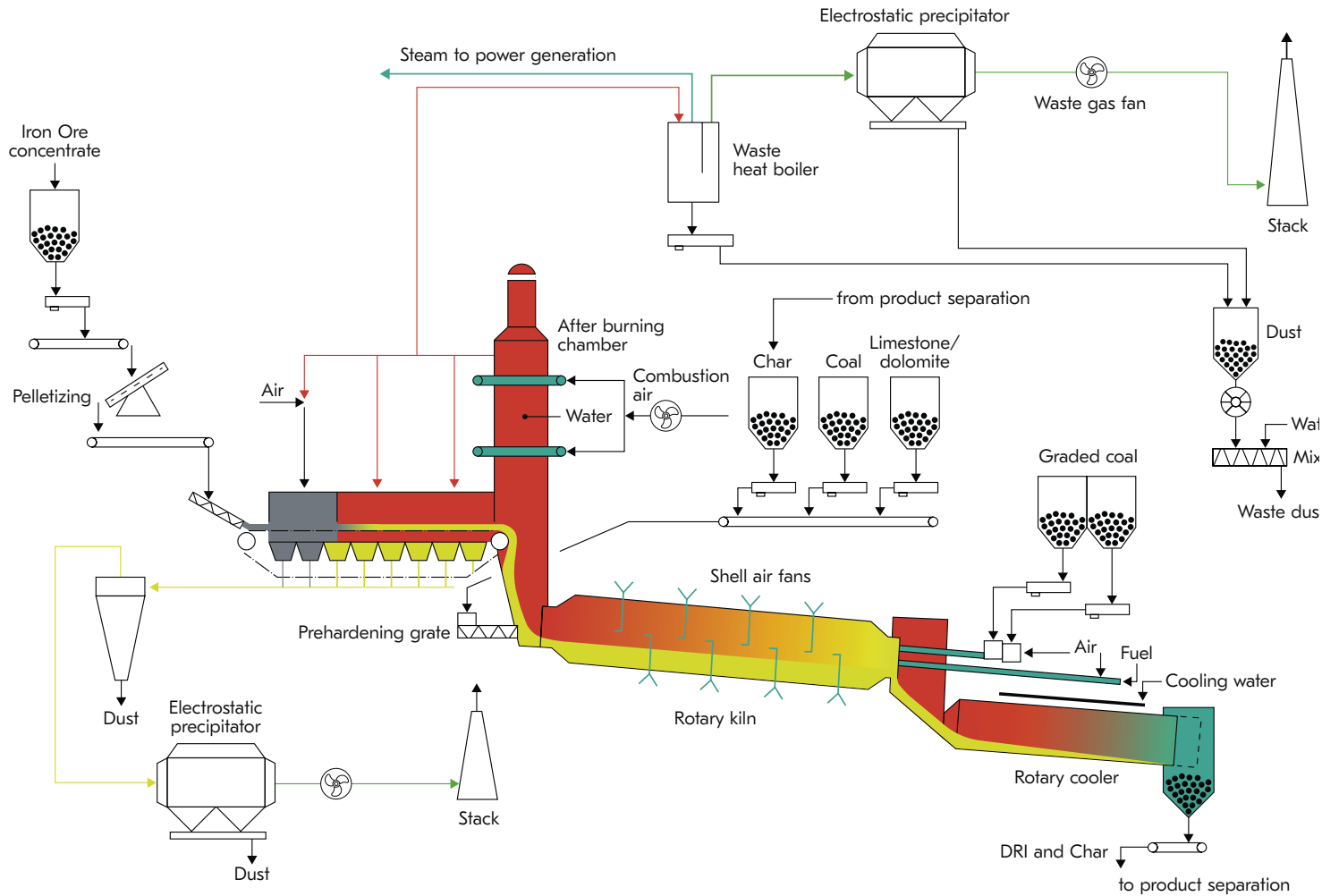
Metso proprietary equipment for SL/RN and SL/RN Xtra

The key process components are proprietary equipment of Metso and were developed over decades with the experience of numerous reference plants for direct reduction, pelletizing and other related processes. Relevant Metso proprietary equipment includes:

- Pelletizing discs or drums
- Roller screens
- Travelling grate for pre-heating
- Rotary kiln
- Rotary cooler
- Burner and combustion technology
- Holo-flite heat exchangers

Process schematic

SL/RN Xtra: DRI from pellet fines



- Raw materials: iron ore concentrates, iron bearing residues, bentonite, coal and dolomite (if required).
- Product: DRI pellets (direct reduced iron)
- Pelletizing with Metso proprietary pelletizing discs
- Pellet drying on Metso proprietary travelling grate (grate kiln process)
- Rotary kiln and cooler, both Metso proprietary equipment for proven SL/RN process

Partner over the entire lifecycle of your plant

When Metso, with its 70 years of technology leadership, provides services for spare parts, inspections and modernizations, both the client and plant operator can benefit significantly. Partnering with Metso for these services ensures high operational standards, cost savings, and enhanced performance and safety of the plant.



Reliability and quality

Metso's extensive experience ensures high-quality spare parts and services, reducing the risk of equipment failure and downtime.



Extended equipment lifespan

Proper maintenance and timely upgrades can significantly extend the lifespan of the equipment, providing better return on investment.



Up-to-date technology

Modernizations keep the plant updated with the latest technology advancements, improving operational efficiency and reducing energy consumption.



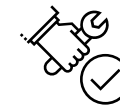
Cost efficiency

Using OEM parts and services can be more cost-effective in the long run, as they are designed to fit and function perfectly with the existing equipment, minimizing the need for frequent replacements.



Expert support

Access to Metso's technical expertise and support can help troubleshoot issues more effectively and implement best practices.



Reduced downtime

Proactive maintenance and timely replacement of parts help in minimizing unplanned downtime, ensuring smooth and continuous operations.



Enhanced performance

Regular inspections and modernizations by Metso can optimize the performance of the plant, leading to increased productivity and efficiency.

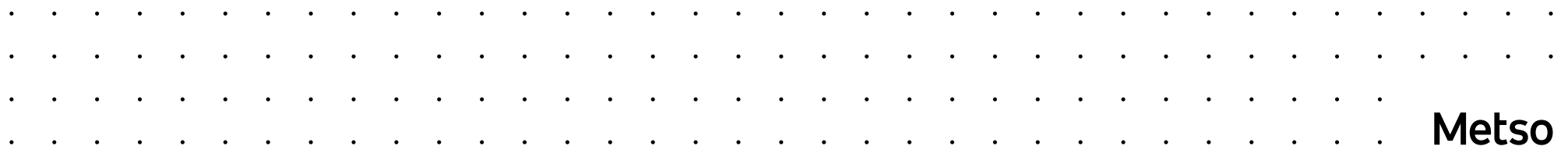


Safety

Regular inspections and maintenance ensure that the equipment operates safely, reducing the risk of accidents and ensuring compliance with safety regulations.

Metso is a frontrunner in sustainable technologies, end-to-end solutions and services for the aggregates, minerals processing and metals refining industries globally. We improve our customers' energy and water efficiency, increase their productivity, and reduce environmental risks with our product and service expertise. We are the **partner for positive change**.

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