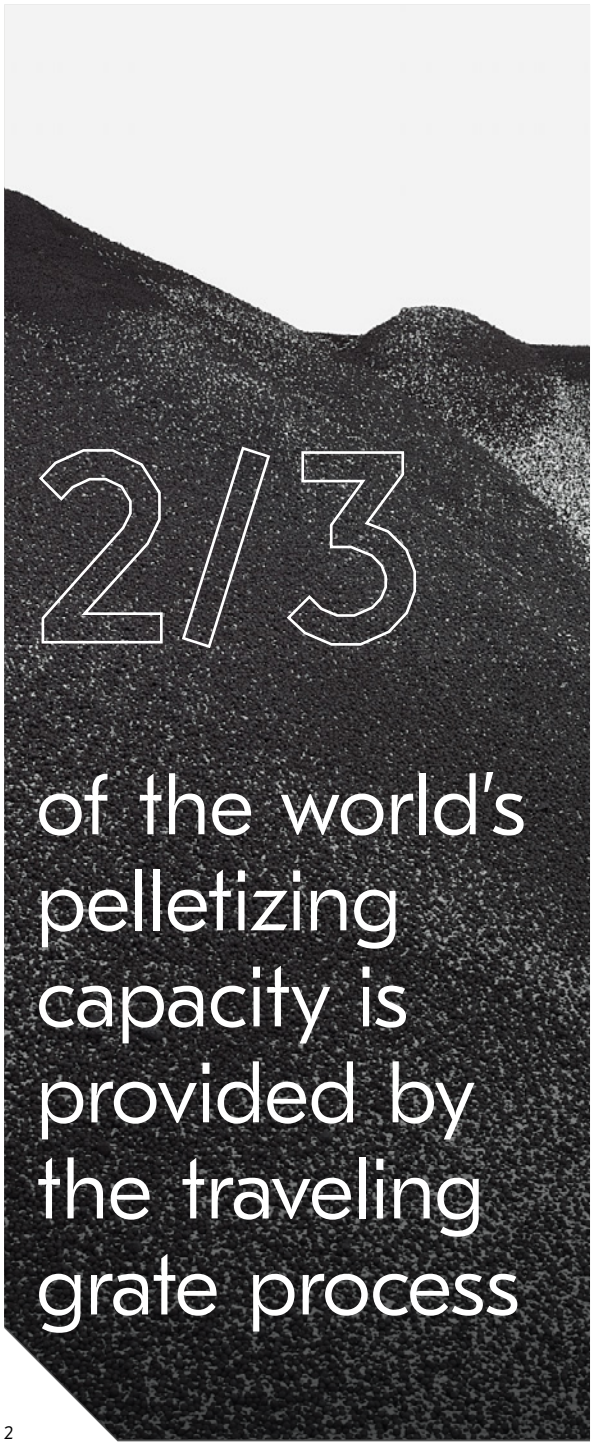
Metso

NextGen Pelletizing™

A visionary concept to build the carbon-neutral and fully autonomous pellet plants of the future





Iron ore pelletizing is crucial for the "green" future

Metso Traveling Grate Pelletizing

The traveling grate indurating process is responsible for two-thirds of the world's installed pelletizing capacity. Metso offers the industry's leading induration technology for iron ore pellet processing, which is based on over 60 years of experience and world-class R&D. This process produces pellets with excellent physical and metallurgical properties for a wide range of plant capacities up to >9 Mtpa. It ensures high performance and quality, low investment and operating costs, as well as reduced energy consumption and emissions. Since 1961, Metso has delivered more than 75 plants all over the world for a wide range of ore types. This is a testament to our market leadership and proven expertise throughout the years.

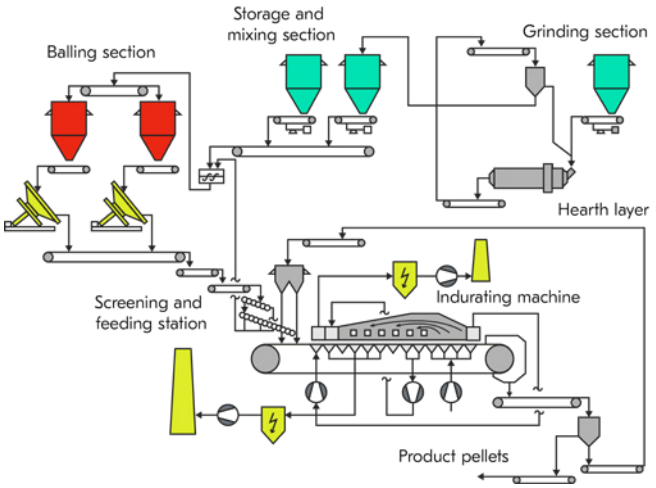
Evolving to changing needs

Carbon-neutral steelmaking and reduced greenhouse gas emissions are at the forefront of conversation in the steel industry today. Evidently, the transition to carbon-neutral steelmaking cannot be achieved without pelletizing with the availability of DR-grade iron ore pellets especially playing a crucial role. While productivity, energy efficiency and emission levels of the plants have been significantly improved during the past 60 decades, the global challenge of climate change requires more drastic modernizations in design and operations in order to reduce the carbon footprint of these plants. Because of this, we have evolved our existing processes and developed the next generation of pelletizing plants to become carbon neutral and fully autonomous.

Benefits

- Optimal plant performance and lowest TCO (Total Cost of Ownership)
- Produces pellets with excellent metallurgical and physical properties for both the blast furnace and the direct reduction route
- Highest process flexibility allows adapting to changing feed materials and product qualities
- Advanced combustion technology and burner design improve fuel efficiency, reduces emissions and enable use of alternative fuels such as Hydrogen
- Optimized heat recovery for the highest energy

Technologically advanced pelletizing process



Raw material preparation and mixing
For optimum raw material preparation, Metso utilizes a century of experience and reliable equipment, namely all types of grinding mills, filtration or regrinding with HPGR. The importance of the mixing is often underestimated for product quality and plant performance. We can select the best-suited equipment and can offer our patented MixGuard system for online measurement of the mixing performance.

Green pelletizing
Metso plants are normally using pelletizing discs in bigger plants, followed by roller screens. The green pellet quality and size distribution is paramount for the gas permeability of the pellet bed in the furnace and thus for product quality, energy consumption and process stability. Our proven online VisioPellet system controls the pellet quality and adjusting disc inclination, rotation speed, feed rate or water addition.

Induration furnace
The even and smooth feeding of the sensitive green pellets to the furnace is done with our proprietary reciprocating head and wide belt conveyor and our roller screens with the option for bi-layer operation.

The traveling grate can be considered as the core of our plants, and is distinguished by unique mechanical performance, longevity and maintainability. Our main focus is on the energy efficiency, which is why we are continuously improving the different integral heat recovery systems in the furnace.

Another focus is on the combustion technology to reduce fuel consumption and emissions, particularly NOx, and to use alternative fuels such as hydrogen or available process gases. The overall performance of the induration process is supported by our digital online process optimizer, Optimus™.

Premium quality pellets

Optimized energy consumption and low emissions

Low investment and operating costs

In-house proprietary equipment
Metso proprietary equipment is always included for the main process areas.

It relies on the decades of process engineering experience and high degree of modularization:

- Pelletizing discs
- Special conveyors at feed station
- Roller screens
- Indurating machine
- Pallet Cars
- Digital Solutions
- Burners (Standard, LowNOx)

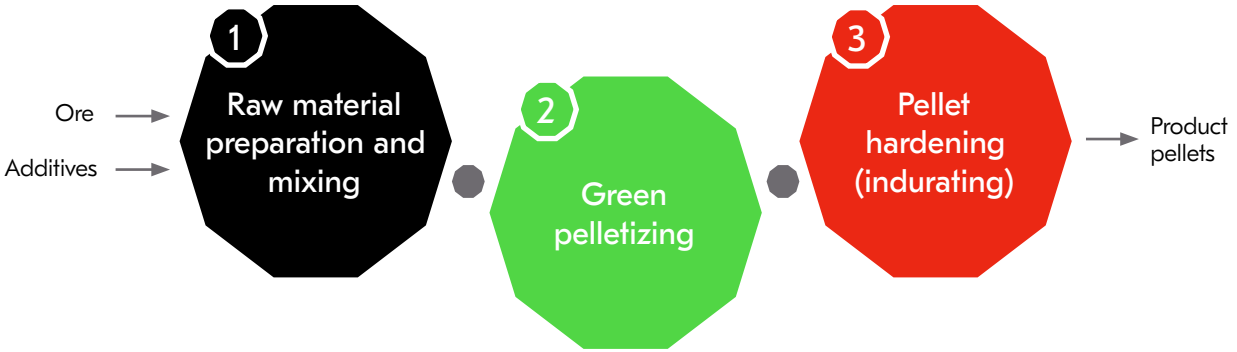
NextGen Pelletizing:

Carbon-neutral pellets production

Reducing the carbon footprint of pelletizing is extremely important in order to achieve the globally agreed targets. This shift towards a direct reduced iron (DRI) production requires more highly beneficiated ores, as well as higher quality pellets, than the traditional blast furnace (BF) route. Because of this, Metso is continuously developing for the next generation of pellet plants, which adheres to our aspiration to be carbon neutral and fully autonomous.

To enable the carbon-neutral production of DR-grade pellets, the sources of CO_2 must be effectively eliminated. Removing solid fuel from the raw mix for hematites requires finding the "green" substituents, reducing the overall energy consumption and the use of alternative fuels. This leads to development and engineering of optimized recuperation concepts, alternative indurating hood arrangements and novel burners, for example, LowNOx hydrogen combustion.





Leveraging digital solutions to build fully autonomous, modular, flexible and sustainable pellet plants

The importance of advanced process control

The increasing quality demands of DR-grade pellets require more stable operations in a narrower operating window and thus, higher level process control where the need for human intervention is minimized. Here, advanced process control (APC) is of paramount importance. The already available Metso Optimus process advisor controls the processes in the induration furnace by means of pressure, temperature, and fan-speed control.

To enable holistic optimization of the performance of the pelletizing process, all relevant factors for energy efficiency, plant production, and pellet quality throughout the entire process need to be taken into account. The main factors are the concentrate quality, the quality of the mixing step and the green pelletizing, the bed distribution on the pallet car, and the induration process in the furnace.

The final aim is to control the entire process based on online measurement of the quality (strength and metallurgical composition) of the burned pellets.

Energy reduction
by up to 5-10%

Emissions reduction
Up to 80-90% CO2, NOx

Improved product homogeneity & quality
supporting transition to green steel



Solutions to meet current demands
Smaller capacity plants allow mining companies to expand their value chain and support decentralized steel-making concepts such as mini-mills.

Metso Compact-sized Pellet Plant answers this need with a design based on a 3-meter wide indurating machine. It offers the same high performance and premium product quality as the larger size plants.

High level of standardization ensures optimized capital and operating costs, as well as the shortest production time. At the same time, the modular plant design allows flexibility for customization and future upgrades.

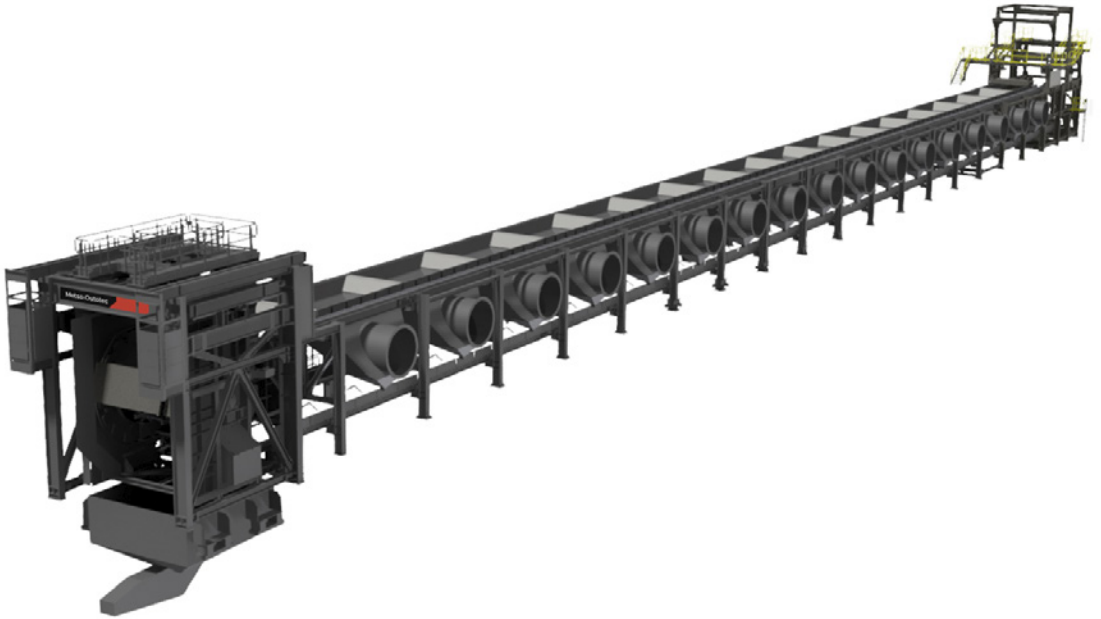
Standardized base package
(average commissioning time of 16-18 months)

- Basic engineering
- Mechanical equipment
  1. Pelletizing discs
  2. Special conveyors at feed station
  3. Roller screens
  4. Indurating machine
  5. Pallet cars
  6. Burners (Standard, LowNOx)
- No customization

Optional add-on packages
(average commissioning time of 21-24 months)

- Process engineering
- Digital solutions

An economical offering even for smaller-sized pellet plants



Standard plant sizes

Indurating area	Plant capacity
189 m^2	1.20 – 1.50 Mtpy
288 m^2	1.75 – 2.30 Mtpy
315 m2	2.00 – 2.60 Mtpy

Get to know more about our Compact-sized pellet plant

World-class R&D support

Innovations that optimize investments as well as operating costs

Our innovations focus on improving plant performance and reliability, while reducing capital investment and lifetime operating costs. For this, we are continuously developing and improving the process set-up, the mechanical design and the automation of our technology.

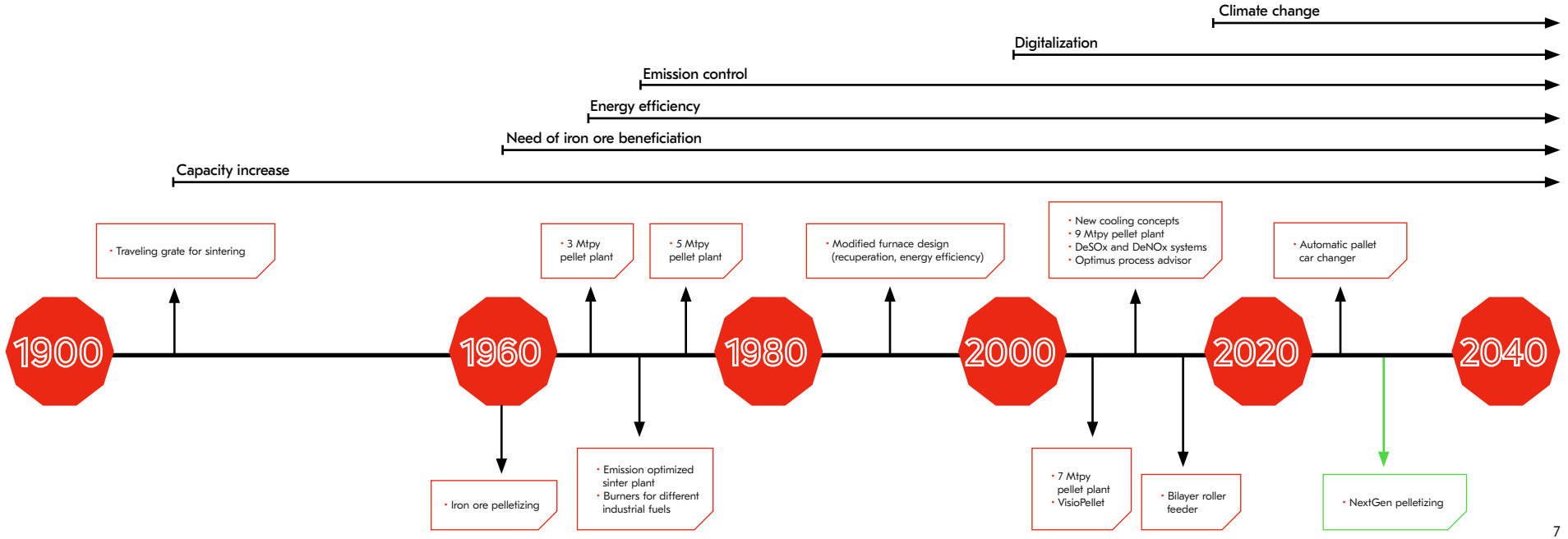
Since the 1960, we have conducted our own R&D centers research and testing with a wide range of raw materials and process parameters, for both blast furnace and direct reduction pellets. Our pot-grate rig with movable pots is one of the only ones in the world, and is simulating the complete pelletizing process very close to the set-up of an industrial plant.

The key objective for our test work for customer projects is to optimize product quality, productivity and energy consumption. For this, our R&D Center can perform pelletizing tests in conjunction with beneficiation testing. The results are forming a proven and reliable basis for our plant configuration and design, as well as for performance guarantees for both greenfield projects and plant modernizations.

Proven technology leadership spanning over decades

- Developed game changing processes that became state-of-the-art
- Kept them over decades in status of best available technologies (BAT)
- Continuous development to respond to the challenges of the industry and the society ahead of time

Main focus now:
Support the efforts of the global steel industry to replace fossil fuels and cut CO_2 emissions.



Metso is a frontrunner in providing sustainable technologies, end-to-end solutions and services for the aggregates, minerals processing and metals refining industries globally. By helping our customers increase their productivity, improve their energy and water efficiency and environmental performance with our process and product expertise, we are the **partner for positive change.**

Metso

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