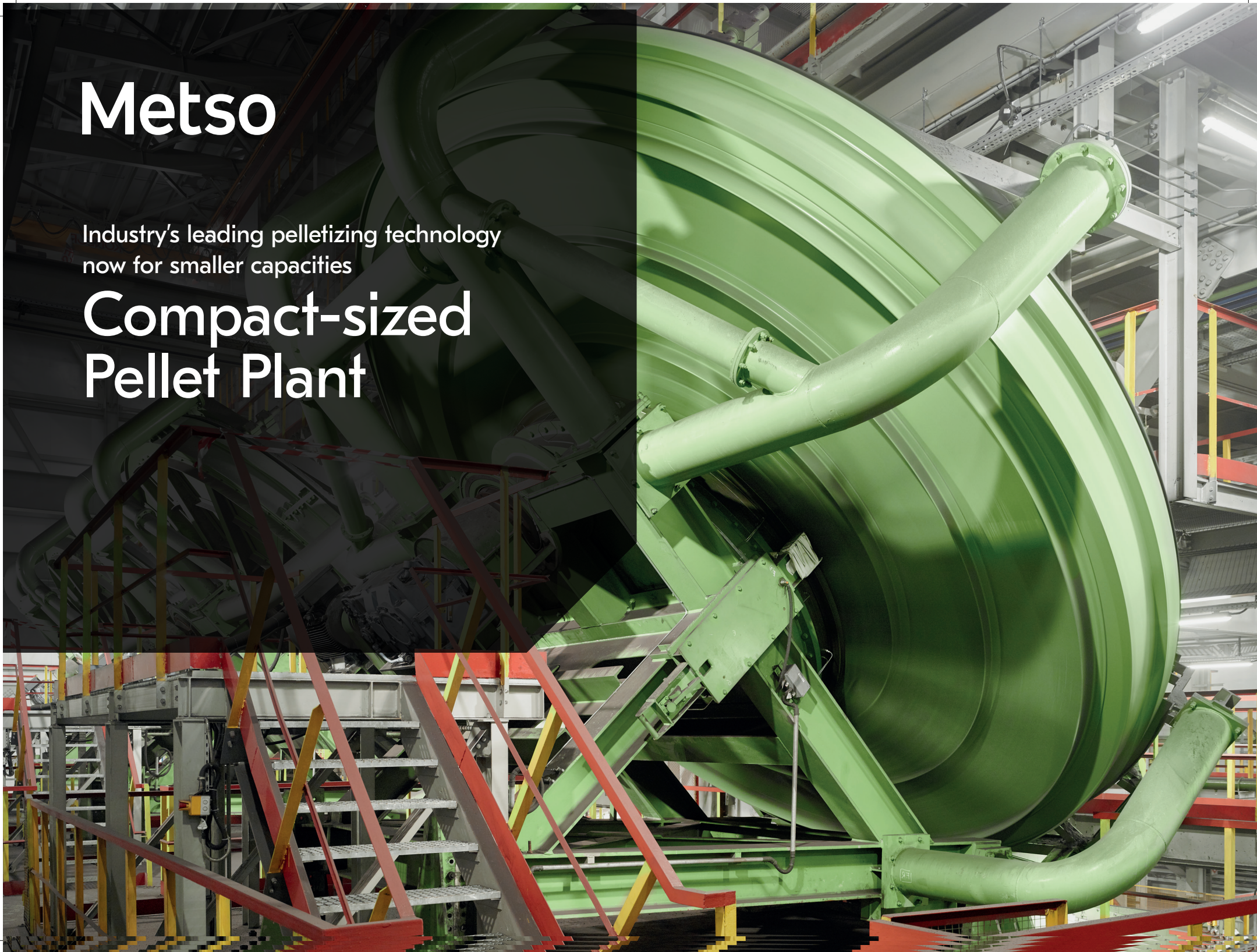


Metso

Industry's leading pelletizing technology
now for smaller capacities

Compact-sized Pellet Plant





Paramount pelletizing technology now also for smaller capacities

From the very beginning of pelletizing technology, Metso has been leading the development through its predecessors and is the undisputed market and technology leader. The company has designed and delivered more than 120 traveling grate pelletizing plants across the globe and continues to rule the marketplace.

In the early days of the pelletizing technology, pellet plants were small-sized. The first pellet plants had an indurating machine width of 2.5-3 meters and annual capacities in the range of 1 million tons of pellets.

The development of the product in the later decades was based on two targets: to respond to the growing demand of the market for pellets and to reduce the specific investment and operational costs. Since then, the plant sizes grew to 4 m width with a 816 m² reaction area. The largest capacity reached is more than 9 million tons per year in a single furnace.

Expanding the value chain

In recent years, there has been an increasing demand in the market for plants with smaller capacities. This would allow mining companies to expand their value chain and support decentralized steel-making concepts like mini mills. To answer this demand, Metso designed Compact-sized Pellet Plant. Metso plants have also proven their longevity.

Compact-sized Pellet Plant

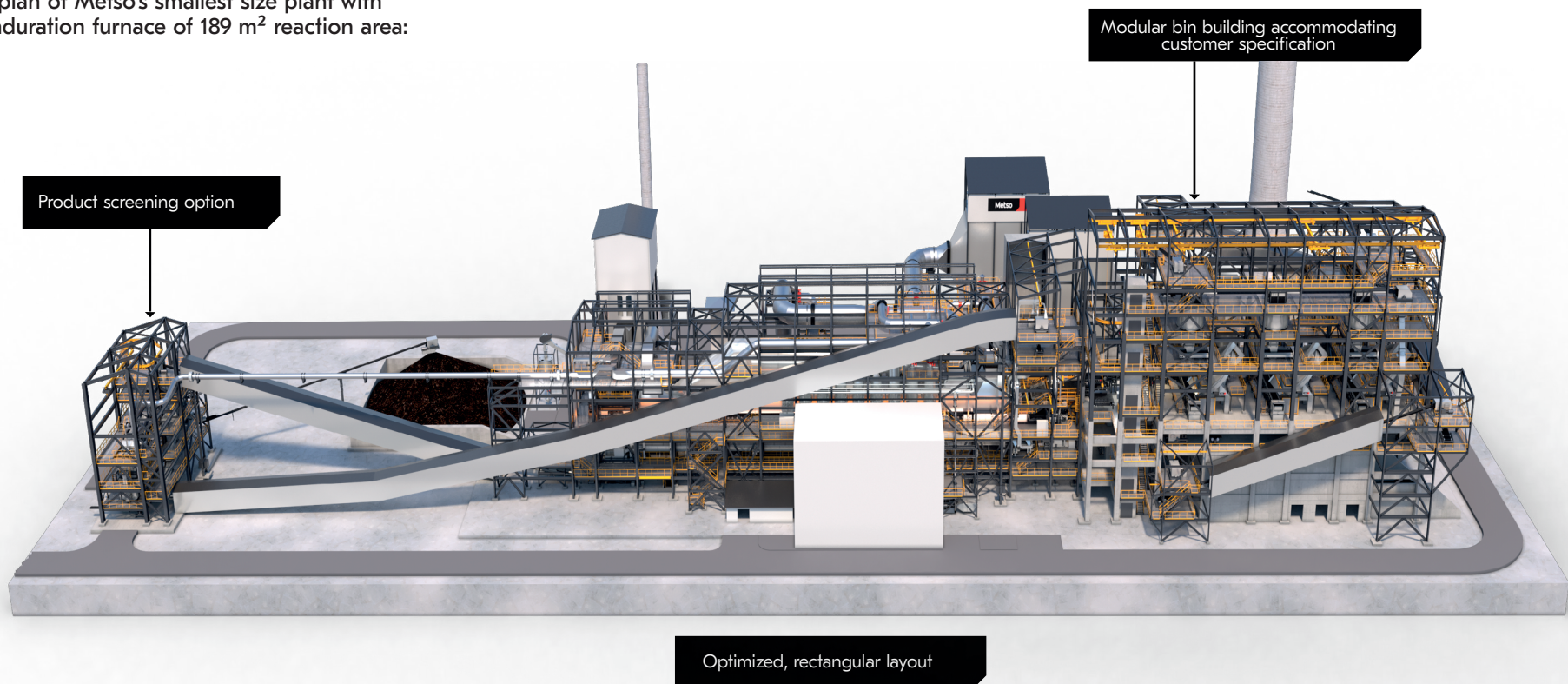
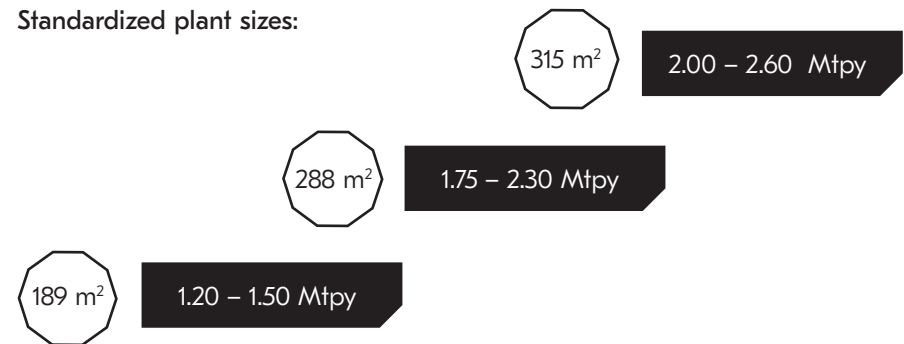
Market-leading traveling grate technology now offered for small capacities.

The design of the Compact-sized Pellet Plant is based on a 3 meters wide indurating machine, built on the state-of-the-art design of Metso's larger product range. The compact-sized plant offers the same high performance and premium product quality as the larger size plants.

The new plant design is cost efficient with optimized delivery time, thanks to the high standardization in design and project execution. At the same time, the design provides the required flexibility in order to cater to typical customer demands.

Plot plan of Metso's smallest size plant with an induration furnace of 189 m² reaction area:

Standardized plant sizes:



The process

High quality pellets with excellent physical and metallurgical properties ensuring low investment and operating costs, as well as optimized energy consumption and low emissions.

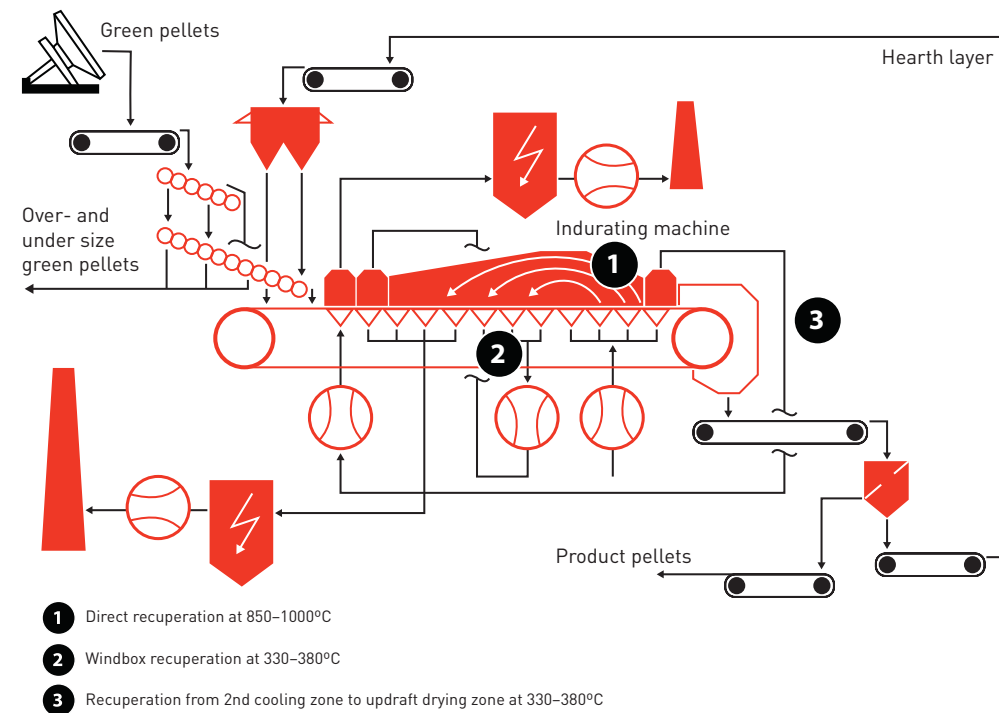
The Metso traveling grate pelletizing process consists of four steps:

1. Raw material preparation and mixing
2. Green pelletizing
3. Pellet hardening (indurating)
4. Hearth layer and product screening

In the mixing step, the iron ore concentrate is mixed with additives and water is added to adjust the raw mix moisture content. Low amounts of binding agents are used to provide sufficient stability to the green pellets in the later process steps. Fluxes, such as limestone, olivine, and dolomite are influencing the necessary physical and metallurgical properties of the final product pellets.

The green pelletizing step is where the pellets are formed using pelletizing discs, which benefit from the self-classifying effect of rim discharge. Pellet size can be precisely adjusted by varying the disc inclination, circumferential speed, and feed or water addition rates.

In the induration area, the green pellets are first distributed evenly across the traveling grate and then hardened in a furnace, where they pass through the updraft drying, downdraft drying, preheating, firing, after-firing, and cooling zones. The unique updraft and downdraft drying sequence significantly reduces fuel consumption. The homogenous pellet charge on the grate reduces the pressure drop within the furnace, which further reduces energy consumption and enables even heat treatment, resulting in high quality pellets.

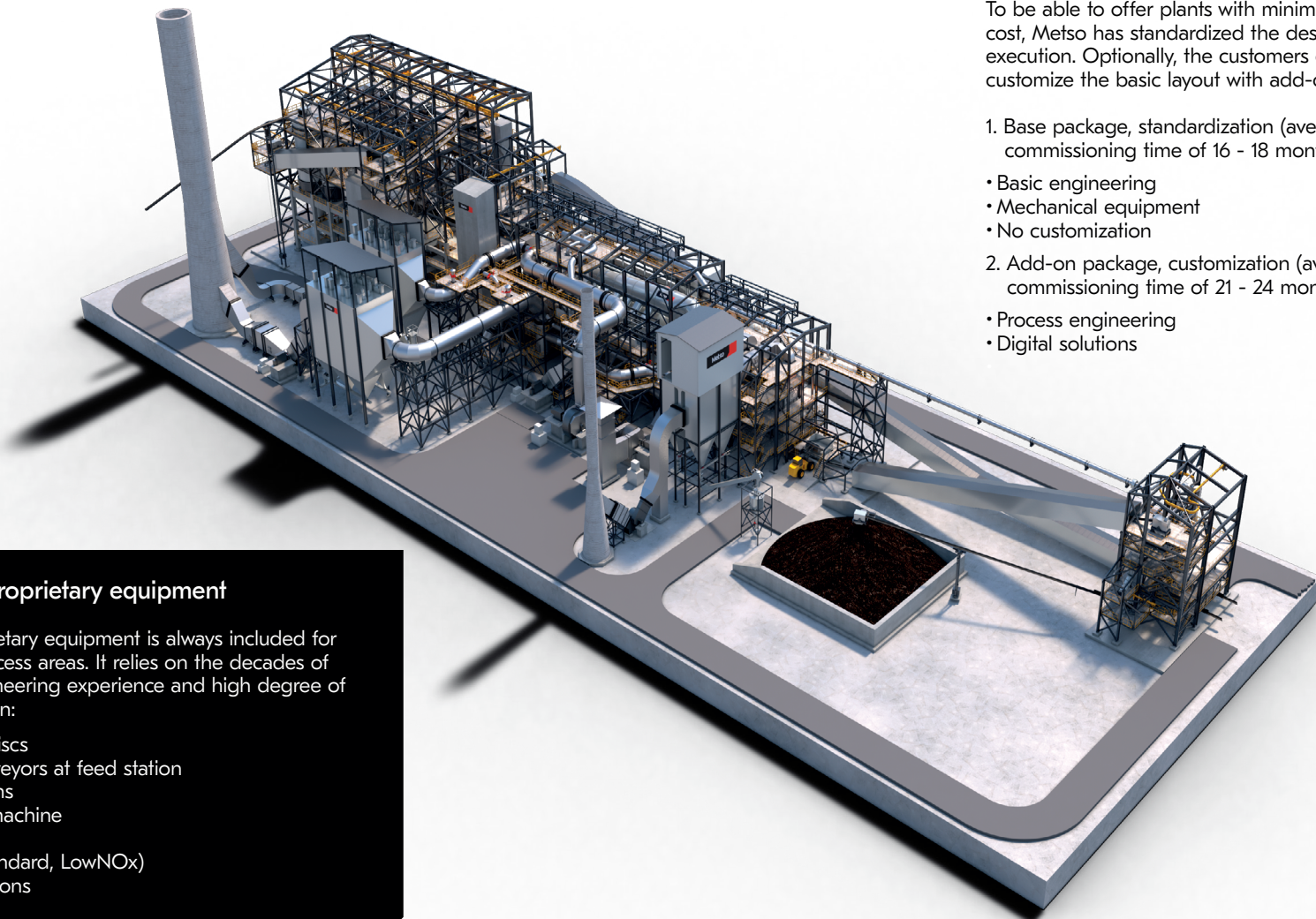


Compact-sized Pellet Plant benefits:

- Highly standardized engineering
- Optimized plant layout
- Modular and flexible configuration
- Minimized CAPEX and OPEX
- Short delivery times (16-24 months, depending on chosen package)

Full value chain

Metso offers the full value chain for the Compact-sized Pellet Plant. Customers can benefit from the most efficient and modern plant designs, lower CAPEX and OPEX, short delivery times as well as using the industry's highest quality and safety standards.



To be able to offer plants with minimum investment cost, Metso has standardized the design and project execution. Optionally, the customers can choose to customize the basic layout with add-on packages:

1. Base package, standardization (average commissioning time of 16 - 18 months)
 - Basic engineering
 - Mechanical equipment
 - No customization
2. Add-on package, customization (average commissioning time of 21 - 24 months)
 - Process engineering
 - Digital solutions

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
- Burners (Standard, LowNOx)
- Digital solutions

Digital solutions as add-on for Compact-sized Pellet Plant

As a market leader for pelletizing plants, Metso is committed to shaping the future of pelletizing. Proven digital solutions are helping Metso's customers worldwide to excel in productivity, energy-efficiency and availability.

Optimus™ process advisor and optimizer

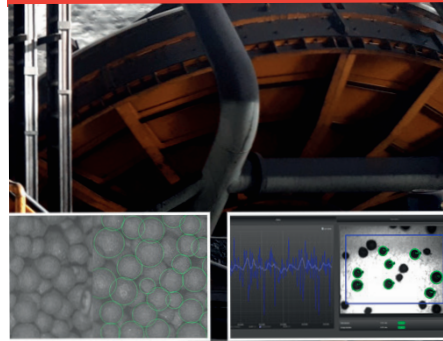


Metso's advanced control system **Optimus™** has been proven cost-and-time-effective for continuously improving plant performance and energy consumption.

Metso has more than 10 systems in operation with proven results:

- Up to 5% production increase
- Up to 9% energy decrease
- Up to 40% decrease in quality standard deviation.

VisioPellet™ green pellet size control system



VisioPellet™ is a real-time expert level process assistant that optimizes green pellet size distribution and feed rate.

More than 20 systems in operation with proven results:

- 3.6% improvement in target size
- 16.4% reduction in target size standard deviation.

Pallet car condition monitoring



To provide accurate, real-time information about the pallet condition during operation and thus clear criteria for service intervals, Metso has developed its condition monitoring system. The system consists of a **Pallet Car Identification System** via optical cameras or RFID, a **Sag Monitoring** for the pallet bodies with contactless sensors and further sensors to detect missing grate bars or wheels.

Virtual training and remote support







With cloud accessible dynamic, interactive and realistic **training solutions**, operators can learn about plant behavior, how to react in emergency situations and the consequences of their actions in a safe environment.

Pairing with Optimus™ or remote monitoring is possible. Support is available through the Metso Support Center.

Services at a glance

Metso provides expert services for the key process areas in iron ore beneficiation and pelletizing plant.

 Inspections & alignment	 Spare parts supply
Regular and standardized inspections provide a sound picture of assets' condition and the basis for optimized maintenance and plant reliability.	The most important thing required for the equipment's optimization, performance, reliability, uptime, safety and maintenance costs is the reliable original parts that fit and function perfectly.
 Upgrades & modernizations	 Digital solutions
As production goals evolve, so should the equipment. Metso's process, plant and equipment know-how work together to result in improved profitability, uptime and safety.	Data transfer and automatization of processes allows customers to make informed decisions that help improve availability, reliability, and performance with end-to-end operational visibility backed up by expert support.



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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