Pelletizing Plant Conceptual Plan & Design

Land-Based Magnetite Iron Sand Pelletizing Plant
Nominal Capacity: 1,000 tpd Pellets (Matched to Upgrading Plant)
Ferro Offshore Resources Corporation — Coastal Pangasinan, Philippines

1. Project Overview

This conceptual plan is prepared for Ferro Offshore Resources Corporation. It is based on the January 2020 Primetals Technologies Initial Concept framework (originally prepared for a different proponent and location) and has been adapted and scaled to match the previously developed 1,000 tpd concentrate upgrading plant (raw magnetite iron sand feed ≈ 5,600 tpd → 1,000 tpd concentrate). The plant is sited in coastal Pangasinan. All figures are unbinding ballpark estimates subject to pot-grate testing on actual concentrate, detailed engineering, and local conditions.

- **Purpose:** Produce high-quality BF-grade pellets from magnetite concentrate for value-added sale or further processing.
- **Technology:** Circular Pelletizing Technology (CPT) preferred for compact footprint and efficiency at this scale. Combines proven travelling-grate induration with circular dip-rail cooler mechanics.
- **Location:** Coastal Pangasinan site co-located or adjacent to the upgrading plant, with suitable port access for product export or domestic shipment.
- **Power focus:** State-of-the-art efficiency due to limited local power availability. Electric consumption < 35 kWh/t pellets; heat < 150 Mcal/t.

2. Conceptual Process Flow

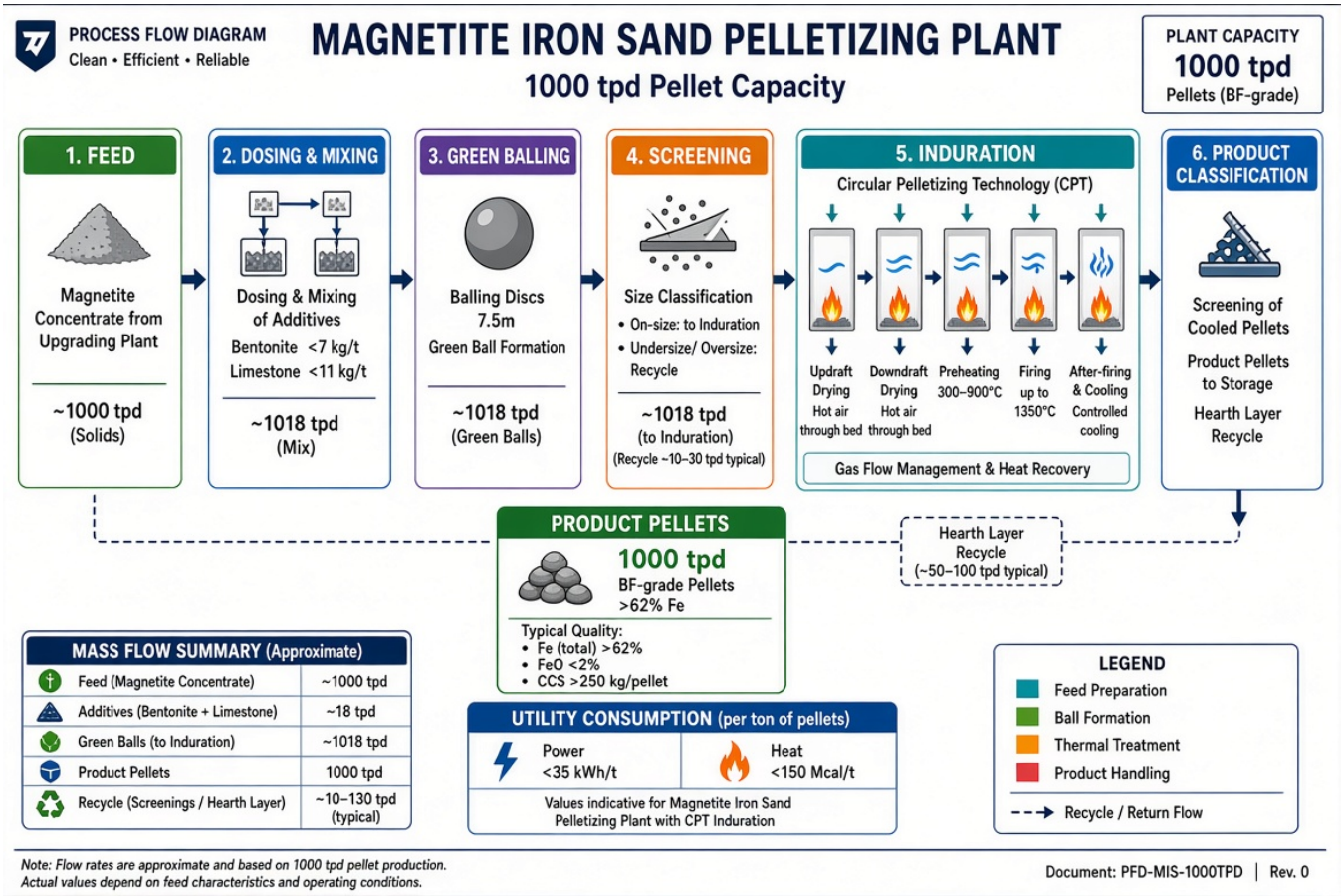


Figure 1: Process Flow Diagram — 1,000 tpd Magnetite Iron Sand Pelletizing Plant (CPT)

3. Process Description and Induration Zones

Concentrate from the upgrading plant is dosed with bentonite (< 7 kg/t) and limestone (< 11 kg/t), mixed at high intensity, and formed into green balls on 7.5 m balling discs. Screened green pellets are deposited on a hearth layer (~100 mm) plus green bed (~310 mm) and travel through the CPT circular induration furnace. Hot gases are extensively recuperated for drying and preheating, minimizing energy use. Product pellets exit at < 100 °C average.

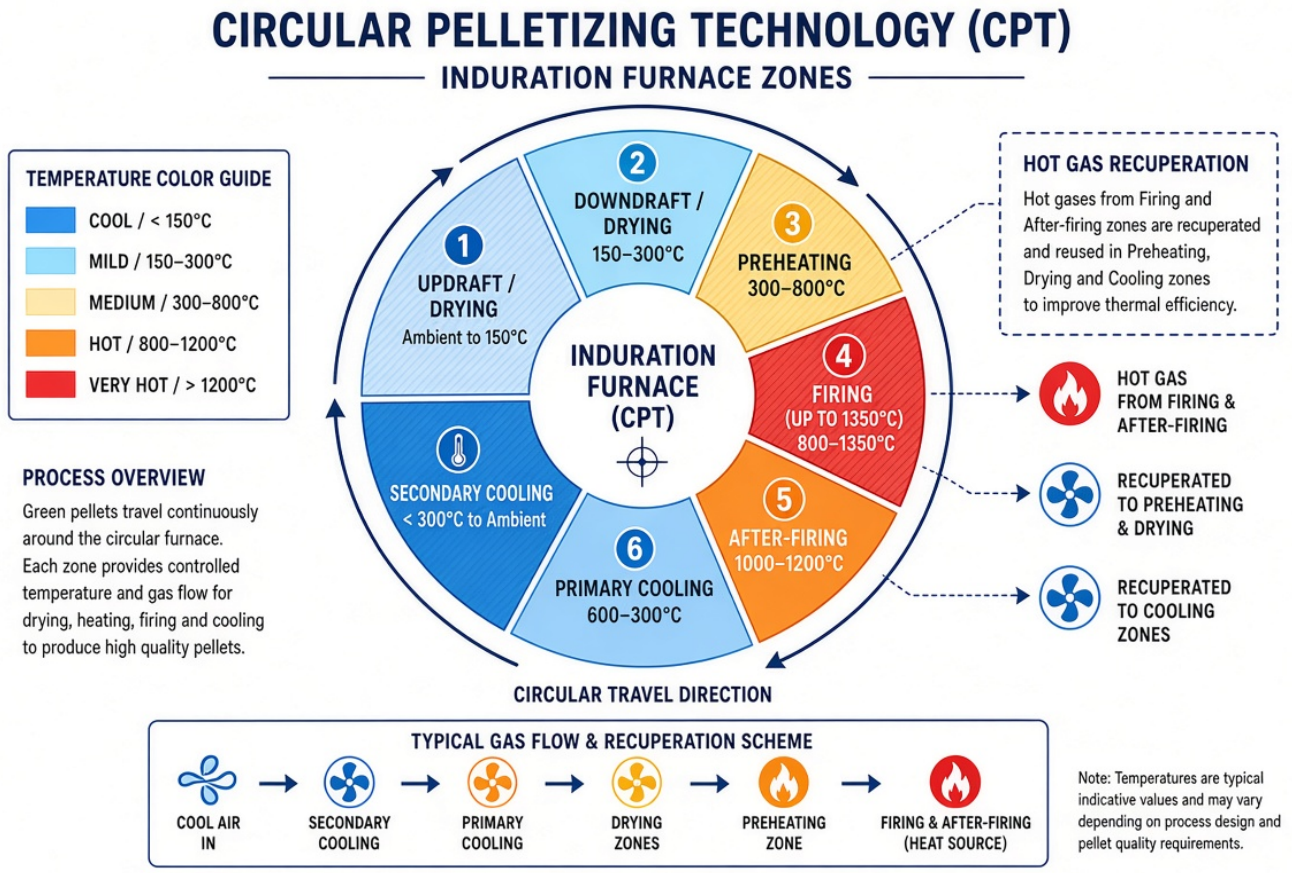


Figure 2: Circular Pelletizing Technology (CPT) — Induration Furnace Zones and Gas Recuperation

4. Approximate Mass Balance (1,000 tpd Product)

Stream	Mass Flow	Notes
Concentrate feed	~1,000 tpd	From upgrading plant, moisture < 9%
Additives (bentonite + limestone)	~15–20 tpd	< 7 + < 11 kg/t pellets
Green balls to induration	~1,015–1,020 tpd	After mixing and balling
Product pellets	1,000 tpd	BF-grade, target > 62% Fe
Internal recycles	10–15% range	Green screening + hearth layer

Target product quality (to be confirmed by pot-grate tests): size mostly 5–16 mm, CCS > 2,500 N/pellet, TI > 92%, AI < 5%, reducibility > 70%, swelling ≤ 15%.

5. Site Layout Concept

The pellet plant is conceived as a compact coastal facility in Pangasinan, integrated with the upgrading plant via short conveyor. Core process blocks occupy a reduced footprint relative to a conventional straight-grate plant of similar capacity. Peripheral areas (stockpiles, utilities, buildings) are additional and site-specific.

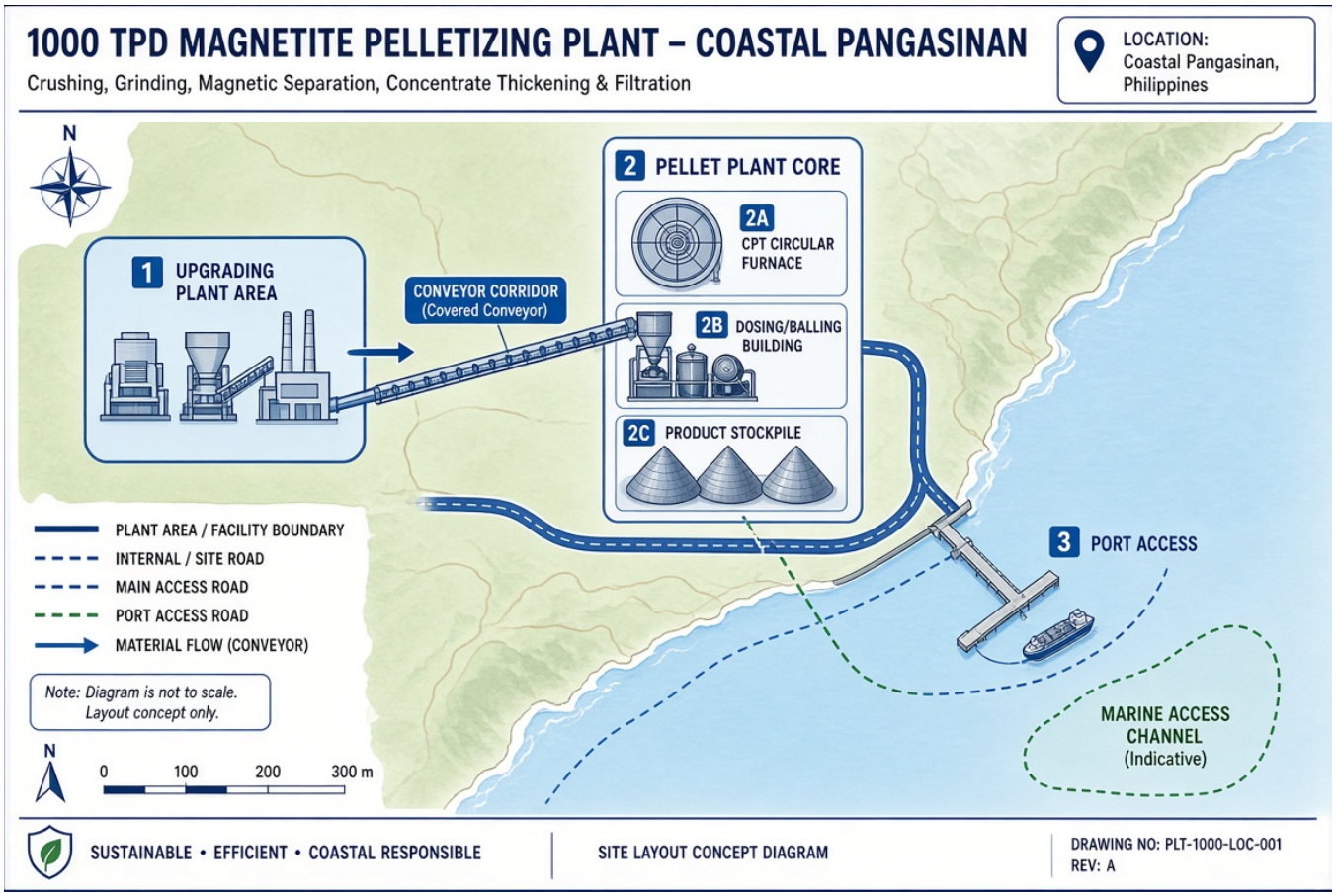


Figure 3: Conceptual Site Layout — Upgrading Plant + Pellet Plant + Port Access, Coastal Pangasinan (not to scale)

6. Key Equipment Groups (Battery Limits)

- Pre-process: concentrate & additive bins/dosing, high-intensity mixer, 7.5 m balling discs, green-pellet screening and transport.
- Induration (CPT): circular furnace, hearth/side layer systems, burners, wind boxes, fans, ESPs, pallet cars, gas recuperation ducts.
- Product handling: classification screens, hearth-layer recycle, product stockpile conveyors.
- Dedusting, utilities (process/cooling/fire water, compressed air, fuel system), electrical MCC/UPS, Level 1/2 automation (Siemens-style).

7. Utilities and Power (Indicative)

- Electric energy: < 35 kWh/t pellets (~1.5 MW average process load for 1,000 tpd; higher installed capacity).
- Heat energy: < 150 Mcal/t pellets (flexible fuel: natural gas, oil, or other).
- Water: < 0.2 m³/t pellets process + cooling and firefighting systems.
- Availability: ~91.5% / ~8,000 h/year typical (burner system operating).

8. Economic Indicators (Ballpark, Unbinding)

Derived from the Primetals Initial Concept framework (originally sized around 1.5 Mtpa CPT) and scaled conceptually for a 1,000 tpd plant for Ferro Offshore Resources Corporation. Figures are indicative only and exclude final site-specific costs in Pangasinan.

Item	Indication	Basis / Notes
Process plant CAPEX	~25–45 MUSD	Scaled from ~60 MUSD for 1.5 Mtpa CPT; local content varies
Infrastructure / BOP adder	+30–50%	Roads, buildings, storage, utilities (ex-power plant)
Conversion OPEX	~15–20 USD/t	Energy + additives + labor + maintenance (ex-concentrate)
Pellet premium vs concentrate	~40 USD/t long-term	Long-term indication for low-grade BF pellets
Project schedule	28–32 months	Typical from contract to hot commissioning

9. Integration, Phasing and Next Steps

- Direct feed from upgrading plant concentrate filter/stockpile via short conveyor. Shared laboratory, maintenance, and port facilities reduce overall cost.
- Designed so additional capacity (or a larger CPT/SG module) can be added if upgrading output expands beyond 1,000 tpd.
- Critical next steps: pot-grate tests on actual Ferro Offshore magnetite concentrate; refined process simulation and consumption figures; detailed layout and infrastructure study for the Pangasinan site; fuel/power strategy; refined CAPEX/OPEX; permitting.

This conceptual design provides a practical, power-efficient first-phase pelletizing plant for Ferro Offshore Resources Corporation in coastal Pangasinan, consistent with the Primetals technology framework and matched to the 1,000 tpd upgrading plant concept. All estimates are preliminary and non-binding.