

₱85,000 a month back in your pocket. *From day one.*

A Philippine PET wash-and-pelletise plant, cooling the extruder and pelletiser melt while heating the friction-wash and hot-wash tanks from one Karnot platform — one electricity bill, no diesel or LPG boiler, financed by the bank, paid out of the saving. Modelled on a bottle-to-flake/pellet line.

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WHY YOUR RECYCLING LINE PAYS FOR EVERY KILOWATT TWICE

The pelletiser throws off the heat. The wash tanks buy it back. *At the same moment.*

Every wash-and-pelletise line runs **two opposing thermal jobs at once**: the extruder melts flake at 230 °C and the melt-cooling loop must reject that heat continuously; meanwhile the friction-wash and hot-wash tanks want 60–90 °C all shift long. The same kilowatt-hour, paid for twice — once to Meralco to throw it into the cooling tower, once to the diesel man to buy it back.



Wash-water temperature IS your flake quality

Friction wash and hot-wash caustic loops must hold **60–90 °C** to lift glue, labels and oils off the PET. Most PH recyclers run an ageing **R404A melt-cooling chiller at COP ~2.8 with an F-gas phasedown clock** on the asset register. The chiller is both your throughput tool and your biggest electricity line.



The diesel/LPG boiler is optional — and nobody told you

Friction wash, hot-wash loops, flake drying: roughly **₱1.5M of diesel/LPG a year on a typical PET line**. But the heat your extruder and pelletiser give up is the same heat your wash side needs — captured at the CO₂ gas cooler, **it covers the friction-wash and hot-wash load. Top it up with iHEAT and the boiler is retired, not replaced.**

THE ARCHITECTURE · ONE MACHINE, BOTH JOBS

Cool the melt. *Bank the heat.* Heat the wash.

KARNOT PLASTIC-RECYCLING PLATFORM · PET WASH-AND-PELLETISE MODELLED · SCALES WITH THROUGHPUT

COLD SIDE · WHAT THE LINE NEEDS

Extruder · pelletiser melt cooling · die-face

Melt rejected from the extruder and pelletiser at 230 °C. **Chilled water at 8–15 °C holds the die-face and water-ring cooling steady.** Pellet water bath process cooling. All from iCOOL CO₂ at **COP 4.2 (Oak Ridge validated)** — 40% less electricity than the legacy melt-cooling chiller.



iCOOL CO₂ + iHEAT R290

The heat pulled out of the melt is delivered to the wash side. Nothing goes to the cooling tower.



HOT SIDE · WHAT THE WASH NEEDS

Friction wash · hot wash · flake drying

Hot-wash caustic tanks 60–90 °C to lift glue, labels and oils. Friction-wash water and pre-wash. Warm air for flake drying. Fed from **recovered pelletiser + extruder heat** via the CO₂ gas cooler + iHEAT R290 top-up. **Diesel/LPG: zero.**

ISTOR PCM · BOTH SIDES BUFFERED

Hot buffer banks pelletiser heat for the wash tanks. **Cold buffer carries the melt cooling through a brownout — the line keeps running through the outage.**

THE WASH-AND-PELLETISE LINE STAYS

Your extruder, pelletiser and wash tanks don't change. **We replace the utilities around them, not the line.** Commissioning across two scheduled maintenance windows.

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THE FOUR BOXES YOU ACTUALLY NEED

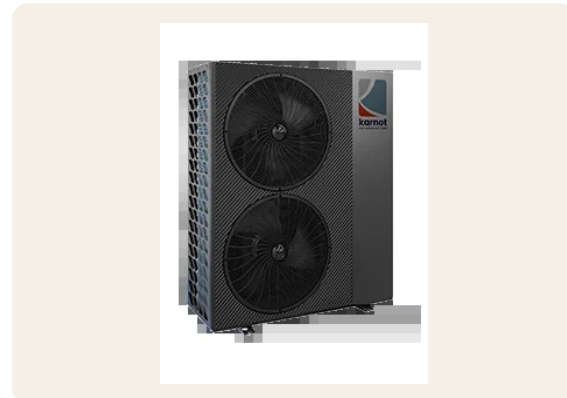
Four products. *One project. One commissioning team.*



iCOOL CO₂

Transcritical R744 · GWP 1 · food-safe A1

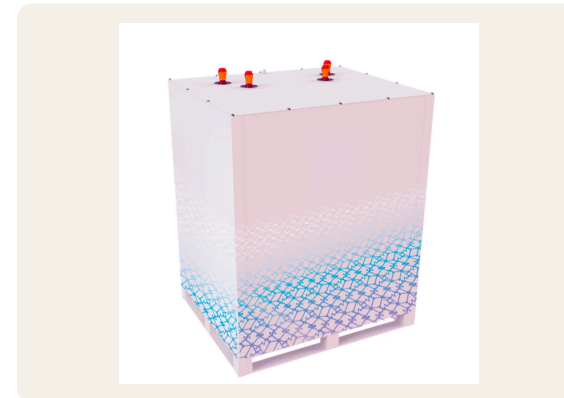
Extruder and pelletiser melt cooling, die-face and water ring. **COP 4.2** (Oak Ridge validated). Gas cooler delivers **75–90 °C hot water from the same cycle**. A1 food-safe — fit for food-grade flake.



iHEAT R290

9.5–100 kW · COP 4.0+ · 60–85 °C

Friction-wash and hot-wash duty. **Drop-in replacement for the diesel/LPG boiler.** Outdoor install, sealed 1.4 kg charge, EN 378 compliant. No flame, no flue, no boiler-room schedule.



iSTOR PCM

38 kWh · 8–12 hr backup

Thermal battery on both sides. **Hot:** pelletiser heat banked for the wash tanks. **Cold:** the melt cooling rides through a PH brownout with zero compressor load. 1,500+ charge cycles.



iSAVE + iVOLT

IPMVP M&V + zero-export solar

iSAVE meters every duty — **monthly IPMVP Option B report to your accountant and your lender.** iVOLT zero-export solar cuts the remaining grid draw 30–50%. Plant roofs are flat and big.

THE BILL · MODELLED PET WASH-AND-PELLETISE LINE

₱2.4M energy bill today. ~~₱2.4M~~ **₱0.9M after. –63%.**

ANNUAL FIGURE	TODAY · BOILER + OLD CHILLER	KARNOT PLATFORM	YOU STOP PAYING
Process heat (friction wash + hot wash + drying)	diesel/LPG hot water	0 · recovered pelletiser heat	₱1.5M/yr
Pelletiser / extruder cooling	COP 2.8 · R404A	COP 4.2 · CO ₂	₱900K/yr
Scope 1 + refrigerant exposure	~45 t CO ₂ e + GWP 3,922	GWP 1 & 3 · natural	~55 tCO₂e/yr
Total investment (VAT-inc)	(already paid)	~₱2.4M	1.6 yr payback

*Basis: PET bottle-to-flake/pellet wash-and-pelletise line. Friction wash + hot-wash caustic loops 60–90 °C, flake drying, continuous extruder and pelletiser melt cooling. We replace the utilities, not the line. Diesel/LPG ₱85/kg-equiv at 82% boiler efficiency; Meralco GP ₱14/kWh. CAPEX includes iCOOL CO₂ melt-cooling chiller, iHEAT R290, hot + cold buffers, controls, commissioning, Permits-Managed Service. **Your line might run at half this throughput or double it — the per-tonne economics hold.** Excludes iVOLT solar (further 30–50% off the remainder).*

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THE CASH FLOW · BANK-FINANCED

From day one. *Net of the loan payment.*

MONTH 1

₱ 85K

~₱125K monthly saving **minus** the green-loan payment (~₱38K). Net cash in pocket. Every month. From day one.

YEAR 1

₱ 1.0M

In your pocket while the loan is being repaid. **The kit has paid for itself in cash terms by month 19.**

YEAR 5

₱ 5.1M

Banking ~₱1.0M a year after the loan payment. **The loan clears in year 7 — then you keep all of it.**

YEAR 15

₱ 18M

Total cash retained over the 15-year asset life vs keeping the boiler and the old melt-cooling chiller.

HOW YOU PAY FOR THE KIT · YOU DON'T, THE BANK DOES

Three banks. *One BOI Income Tax Holiday.* *Karnot files everything.*

DBP

Sustainable Energy Finance Programme (SEFP)

Industrial energy-efficiency priority. Covers heat pump + refrigeration + solar. 70–80% LTV. 5–10 year terms.

~6.5–8% p.a.

LandBank

Sustainable Energy Investment Loan (SEILP)

Strong fit for regional and circular-economy recyclers already banking with LandBank. Friendly underwriting.

~7% p.a.

BPI

Sustainable Development Finance (SDF)

Fastest decisions for established processors with a BPI relationship. ESG-aligned loan book.

~1–1.5% below SME

These are **loans**, not grants. The monthly saving covers the payment **3.3x over**. Plus **BOI Pioneer Income Tax Holiday under RA 11285** — energy-efficient manufacturing qualifies. Karnot files **the loan, the BOI registration, the building permits and the monthly IPMVP M&V report your lender wants** as part of project scope.

We don't guess the saving. *We calculate your thermodynamic minimum.*

NUMBER 1 · MINIMUM HEATING

$Q_H \text{ min}$

The **absolute least boiler energy** your plant needs after maximum heat recovery. If your boiler burns more than this — and in every recycling line we have surveyed, it does — **the difference is pure waste.**

NUMBER 2 · MINIMUM COOLING

$Q_C \text{ min}$

The **absolute least chiller energy** required after recovery. Everything your melt-cooling chiller removes above this is pelletiser heat you paid to make and then **paid again to throw away.**

NUMBER 3 · THE BOTTLENECK

~35 °C

The recycling-line pinch point. Above it: heat deficit. Below it: heat surplus. **A heat pump is the only utility that moves surplus heat from below the pinch to the deficit above it.** That is why the saving is 63%, not 15%.

Hot streams are income. Cold streams are expenses. Pinch analysis is the accountant that finds the maximum internal transfer before you go to the bank (boiler) or throw money away (chiller). *Plain-English guide: karnot.com/blog/idiots-guide-utility-pinch-analysis*

Three ways to cool a recycling line. *Two of them have a clock running.*

LEGACY HFC · THE PHASEDOWN

3,922

GWP of R404A · F-gas phasedown clock

R404A / R134a melt-cooling chillers face **quota-driven service price rises every year**. The EU PFAS restriction names the HFC family explicitly. PH typically follows 6–8 years behind. **Every peso spent maintaining one is a peso spent on a dying asset.**

INDUSTRIAL AMMONIA · THE EXCLUSION ZONE

B2L

Toxic safety class · specialist compliance

NH₃ is efficient but **toxic** — **exclusion zones, specialist technicians, emergency response plans**, and an insurance loading. Sized for heavy-industrial scale, not the mid-size recyclers driving the growing PH circular-economy industry.

KARNOT NATURAL · NO CLOCK, NO ZONE

GWP 1

CO₂ (R744) + propane (R290 · GWP 3)

CO₂ is food-safe, A1 class — fit for a plant making food-grade flake. R290 sits outdoors in a sealed 1.4 kg charge under EN 378. No phasedown, no exclusion zone, no insurance loading, **nothing on the asset register with a death date.**

SEC PFRS S2 climate disclosure: ~55 tCO₂e/yr avoided, audit-grade data from iSAVE, monthly.

WHAT HAPPENS NEXT

Four steps from this deck *to a retired boiler.*

- 1 Send us three things**

Annual throughput (tonnes), 12 months of diesel/LPG + electricity bills, and your wash + pelletise schedule. That is all we need for the first model.
- 2 Level 1 Energy Survey + pinch study**

₱90K, one week of portable metering on your actual production log — **refunded in full when you proceed to install.** Output: your Q_{Hmin} , Q_{Cmin} and a sized system quote.
- 3 Bank + BOI paperwork — we file it**

DBP / LandBank / BPI green-loan application, BOI Pioneer ITH registration, building permits. You sign at the bank window, not before.
- 4 Install in 4–6 weeks • no lost output**

The wash-and-pelletise line stays. We swap the utilities around it — commissioning across two scheduled maintenance windows. Boiler retired on handover day.

GET YOUR PLANT'S NUMBERS

Send us your *annual throughput, 12 months of bills and your production schedule.*

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