

15 ADVANCED MANUFACTURING · PRECISION PROCESS COOLING

₱50,000 a month back in your pocket. *From day one.*

For Philippine precision metal-fabrication and laser-cutting shops. The same machine that **cools your fibre lasers, CNC spindles and weld stations to ±1 °C** heats your **parts-wash and facility hot water** — one electricity bill, no flame on site, financed by the bank, paid for out of the saving. The heat your chiller dumps IS the heat your wash bay is paying to make — and iSAVE shaves the laser's power spike off your demand charge.

MODELLED PHILIPPINE PRECISION METAL-FABRICATION SHOP · LASER + CNC + WELD COOLING + PARTS-WASH

₱50K

In your pocket every month

Saving minus the green-loan payment · from day one

2.0 yr

Cash payback

~₱2.0M install vs ~₱1.0M/yr saving · -56% energy bill

Peak

Demand charge shaved

iSAVE trims the laser + weld spike off your Meralco demand · Measure → Shave → Prove · no flame on site

You pay nothing up front. *The bank does.*

DBP, LandBank and BPI all run **green-loan programmes** built for exactly this CAPEX — **~6.5–8% p.a., 5–10 year terms, 70–80% LTV**. The monthly saving (~₱83K) is larger than the monthly loan payment (~₱32K). **Cash flow goes UP from day one**. Karnot files the loan application, the BOI paperwork and the building permits as part of project scope. Most precision-manufacturing installs qualify for **BOI Pioneer status and Income Tax Holiday under RA 11285**.

— WHY YOUR SHOP PAYS FOR EVERY KILOWATT TWICE

The chiller dumps heat the wash bay buys back. *And the laser's spike inflates your demand charge.*

A precision shop is a **cooling-led plant**. Fibre-laser resonators, CNC spindles and weld stations must be held to **±1 °C** or the cut wanders and the optics drift — so the process chillers run all shift, every shift. Today an ageing R404A chiller does that at **COP ~2.8** and throws every kilowatt of reject heat over the roof — then your parts-wash and DHW pay the electric heater to make that same heat back. **The same kilowatt-hour, paid for twice.** Worse, the laser and weld loads switch hard — those spikes set your Meralco **demand charge**. A heat pump moves the heat across instead; iSAVE shaves the spike.



Process cooling IS your tolerance — and the old chiller is the weak link

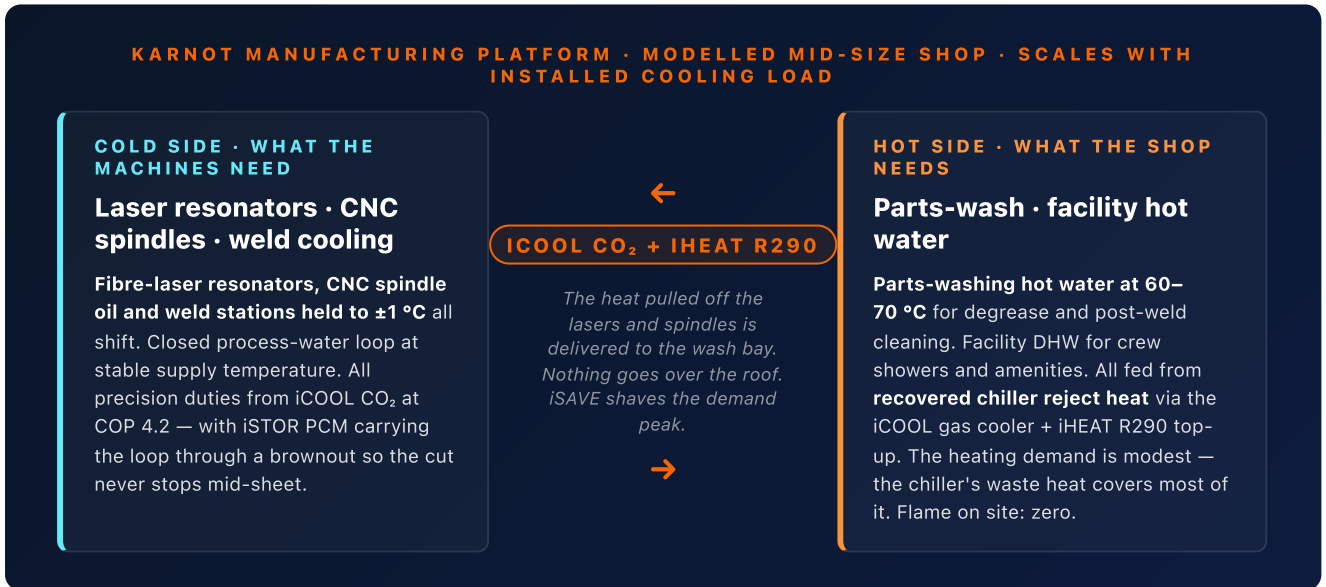
Laser resonators, CNC spindle oil and weld cooling must hold within **±1 °C** or kerf width, focus and bead quality drift. Most PH shops run an ageing **R404A chiller at COP ~2.8 with a phasedown clock on the asset register**. Karnot iCOOL CO₂ holds the same precision duty at **COP 4.2 (Oak Ridge validated)** — 40% less electricity for the cold side, and the heat it removes is the heat your wash bay needs.



The laser + weld spike is your biggest controllable cost — and it's shaveable

Fibre lasers and weld sets switch in hard bursts. On a Meralco tariff your bill is **energy plus a demand charge set by your worst 15-minute peak** — roughly ₱380K/yr of that is the spike. iSAVE meters the load, then **shaves the peak with stored cooling and buffered draw** — Measure → Shave → Prove. The kit never trips your demand band. No flame, no flue, no plant-room schedule.

— ONE MACHINE · COOL, RECOVER, SHAVE · ONE ELECTRICITY BILL



— THE FOUR BOXES · ONE PROJECT

<p>iCOOL CO₂</p> <p>Transcritical R744 · GWP 1 · TRL 9</p> <p>Precision process cooling for lasers, CNC spindles and weld stations — held to ±1 °C. COP 4.2 at -5 °C (Oak Ridge validated). Gas cooler delivers 60–90 °C hot water from the same cycle. A1, non-flammable, non-toxic.</p>	<p>iHEAT R290</p> <p>9.5–100 kW · COP 4.0+</p> <p>Parts-wash and facility hot-water duty. 60–85 °C delivery at PH ambient. Outdoor install, 1.4 kg sealed charge, EN 378 compliant. Tops up the recovered chiller heat — no flame, no flue.</p>	<p>iSTOR PCM</p> <p>38 kWh · 8–12 hr backup</p> <p>Thermal battery on both sides: cold buffer holds the process loop through a brownout so the cut survives; hot buffer banks recovered heat for the wash bay. Also stores cooling that iSAVE draws on to flatten the demand peak.</p>	<p>iSAVE + iVOLT</p> <p>M&V + peak-demand shaving</p> <p>iSAVE meters every duty — IPMVP Option B M&V report monthly and shaves the laser + weld spike off your demand charge. iVOLT zero-export solar on the shop roof cuts the remaining grid draw 30–50%.</p>
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— WHAT YOU PAY TODAY · WHAT YOU PAY AFTER

A precision shop. *A real number off every machine-hour.*

ANNUAL FIGURE · PRECISION METAL-FAB SHOP	TODAY	KARNOT PLATFORM	YOU STOP PAYING
Process cooling (laser + CNC + weld chillers)	COP 2.8 · R404A	COP 4.2 · CO ₂ GWP 1	₱620K/yr
Parts-wash + facility hot water	electric / direct	heat pump + recovered chiller heat	₱280K/yr
Peak demand charge (spiky laser/weld load)	un-managed	iSAVE peak-shaving	₱380K/yr
Total energy bill	~₱1.8M/yr	~₱0.8M/yr	-56% / ~₱1.0M
Refrigerant exposure	R404A GWP 3,922	CO ₂ GWP 1 + R290 GWP 3	~40 tCO₂e/yr
Total investment (VAT-inc)	(already paid)	~₱2.0M	2.0 yr cash payback

*Basis: Philippine precision metal-fabrication shop · fibre lasers + CNC + welding. Process chillers held to ±1 °C for laser, CNC and weld duty; recovered chiller reject heat fed into parts-wash + facility DHW; iSAVE peak-demand shaving on the spiky laser/weld load. Meralco GP ₱14/kWh plus a demand charge set by the worst 15-minute peak. CAPEX includes iCOOL CO₂ precision chiller, iHEAT R290, iSAVE controller, hot + cold buffers, commissioning and Permits-Managed Service. **Your shop scales with installed cooling load — bigger laser fleet multiplies up, a single cell divides down — the per-machine-hour economics hold.** Excludes iVOLT solar, which cuts the remaining ₱0.8M a further 30–50%.*

— THE CASH FLOW · PLAIN AND DULL

<p>MONTH 1</p> <p>₱50K</p> <p>~₱83K monthly saving minus the green-loan payment (~₱32K). Net cash in pocket. Every month. From day one.</p>	<p>YEAR 1</p> <p>₱0.6M</p> <p>In your pocket while the loan is being repaid. The kit has paid for itself in cash terms by year 2.</p>	<p>YEAR 5</p> <p>₱3.0M</p> <p>Loan paid off in year 7. Until then you bank ~₱0.6M a year after the loan payment.</p>	<p>YEAR 15</p> <p>₱11M</p> <p>Total cash retained over the 15-year asset life vs keeping the old process chiller and the un-managed peak.</p>
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THE ENGINEERING BEHIND THE NUMBER · PINCH ANALYSIS + DEMAND SHAVING

We don't guess the saving. *We calculate your shop's thermodynamic minimum — and your peak.*

Pinch analysis maps every hot stream (the chiller reject heat that must leave) against every cold stream (the parts-wash and DHW that must heat) and computes **Q_Hmin** and **Q_Cmin** — **the absolute minimum heating and cooling your shop needs** after maximum heat recovery. Everything above that is waste, and **a heat pump is the only utility that moves the chiller's surplus heat across to the wash bay**. Then iSAVE adds the second lever: it meters the laser + weld load and **shaves the demand peak** with stored cooling — so you stop paying for a 15-minute spike all month. Read the plain-English guide: karnot.com/blog/idiots-guide-utility-pinch-analysis — or commission a Level 1 Energy Survey (₱90K, refunded on install) and we run the study on your actual machine log.

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

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

Philippine green-loan programmes *built for manufacturing CAPEX*

DBP · SEFP

Sustainable Energy Finance Programme

Industrial energy-efficiency priority.
70–80% LTV · 5–10 yr · ~6.5–8% p.a.

LANDBANK · SEILP

Sustainable Energy Investment Loan

Strong fit for regional and export-zone fabricators already banking with LandBank · ~7% p.a.

BPI · SDF

Sustainable Development Finance

Fastest decisions for established producers · ~1–1.5% below standard SME rate

These are **loans**, not grants. The monthly saving covers the payment 2.6x 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 to see** as part of project scope.

WHY NATURAL REFRIGERANTS · THE PROCESS-CHILLER DECISION

CO₂ and propane. *No HFC clock. No ammonia zone.*

Legacy process refrigeration is either R404A / R134a (GWP up to 3,922, F-gas phasedown, rising service prices) or industrial ammonia (toxic, exclusion zones, specialist compliance) — neither sized for a precision shop. Karnot iCOOL runs on CO₂ — GWP 1, A1 safety class, non-flammable — holding the resonators and spindles to ±1 °C. iHEAT runs on R290 outdoors with a sealed 1.4 kg charge under EN 378. Nothing on the asset register has a phasedown date, an exclusion zone, or an insurance loading. SEC PFRS S2 climate disclosure: ~40 tCO₂e/yr avoided, audit-grade data from iSAVE.

“ We build with these machines — fibre lasers and CNC are on our own shop floor — so we know exactly two things: their chillers waste energy, and their power spikes cost money. The cut has to hold ±1 °C, so the chiller runs all shift dumping heat over the roof while the wash bay pays the electric heater to make that same heat back. And the laser switches hard enough to set your whole demand charge. One Karnot platform fixes both: iCOOL cools the cut at COP 4.2, recovers the reject heat into the wash water, and iSAVE shaves the peak off your Meralco bill. We cool them too. ₱2.0M installed, ₱1.0M back every year, the bank finances it against the saving. The maths is not subtle. ”

Stuart Cox · Founder & CEO · Karnot Energy Solutions Inc.