CHEMICAL IP — BIOACRYLAMIDE MANUFACTURING TRAILER

OWN OR LEASE YO

ACRYLIC MONOMER SUPPLY C

Stop buying. Start producing.
Make your own acrylamide, on your own site, in a trailer.

CHEMIP SUPPLIES THE ENZYME. YOU OWN THE CAPACITY.



Every acrylamide option today is a bad one.

The mid-size polymer maker is squeezed between captive giants, tariff walls, and $40M+ greenfield fantasies.

NO LEVERAGE. STRUCTURAL SUPPLY RISK.

Captive supply

Merchant giants (SNF / BASF/Kemira) price for their polymer margins, not yours. Volume commitments, zero process control.

MARGIN CAPTURE UPSTREAM → YOU

Tariff exposure

Chinese imports >$2,000/t landed. Section 301 + forced-labor duties, quality variance, audit risk.

DUTY STACK = $2K+ LANDED COST

Build your own?

Traditional biocatalytic plant: $40–80M, years to build, fermentation expertise required. Not viable below 50 kt/yr.

CAPEX + TIME + BIOLOGY

Result

You are buying acrylamide at a polymer premium with zero leverage and permanent supply concentration risk. No path to vertical integration at your scale.

Merchant supply is broken.

The math doesn't work for you. You're buying at a polymer premium, not a monomer cost.

$1,650

Merchant pricing

$1,650/t for 50% solution. Priced for their downstream, not your P&L. Volume commitments required.

ZERO PROCESS CONTROL

$2,000+

Chinese route

Low headline, $2,000+ landed after duties. Quality variance + forced-labor audit risk.

DUTY STACK + RISK

$40-80M

Build route

Traditional plant: $40-80M CapEx, 3-4 year timeline, fermentation expertise required.

ONLY VIABLE >50 KT/Y

You are buying acrylamide at a polymer premium.

Mid-size makers absorb merchant margin, tariff inflation, and supply concentration without leverage. ChemIP breaks that.

MARKET REALITY

No leverage

Structural risk retained by buyer

THE ANSWER

A trailer. Not a plant.

Enzymatic acrylamide, delivered and commissioned in weeks.
Frozen design. Same at every site. Service model scales.

01 Biocatalytic conversion

Nitrile hydratase cartridges turn acrylonitrile + water into acrylamide at ambient T & P. No copper, no heat.

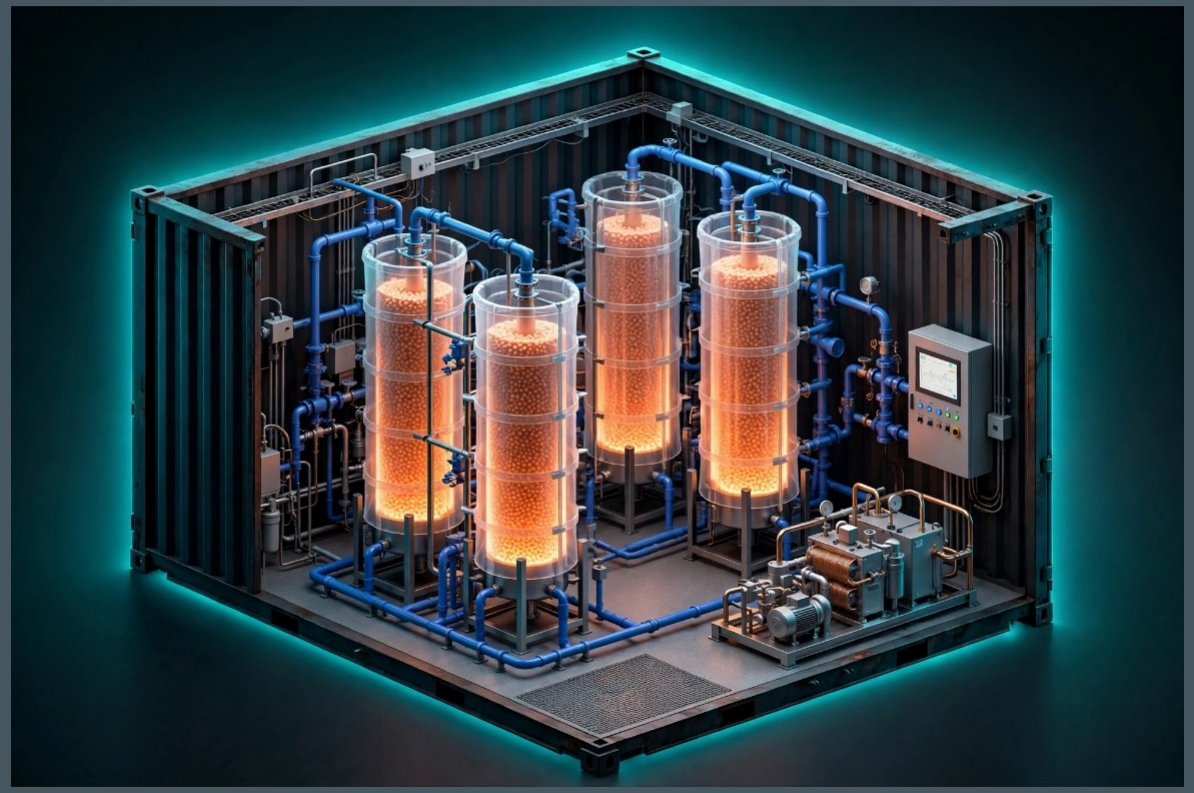
02 Containerized module

Packed beds, membrane shell and concentration train fit in a single 53ft shipping trailer / ISO container.

03 Cartridge swap model

When activity drops, bed is pulled and replaced. Zero downtime. ChemIP supplies cartridges.

FROZEN LAYOUT — IDENTICAL AT EVERY CUSTOMER SITE



4 PACKED BEDS | 3+1

MEMBRANE • COOLING

THE CHEMISTRY — AMBIENT CATALYSIS

One enzyme, one step, no heat.

ACRYLONITRILE + WATER

$CH_2=CH–C\equiv N + H_2O$

Feed — ACN + water

NITRILE HYDRATASE

15–30 min | ambient T&P

ACRYLAMIDE — ON-SPEC

$CH_2=CH–C(O)NH_2$

50% solution direct to polymerization

CONDITIONS

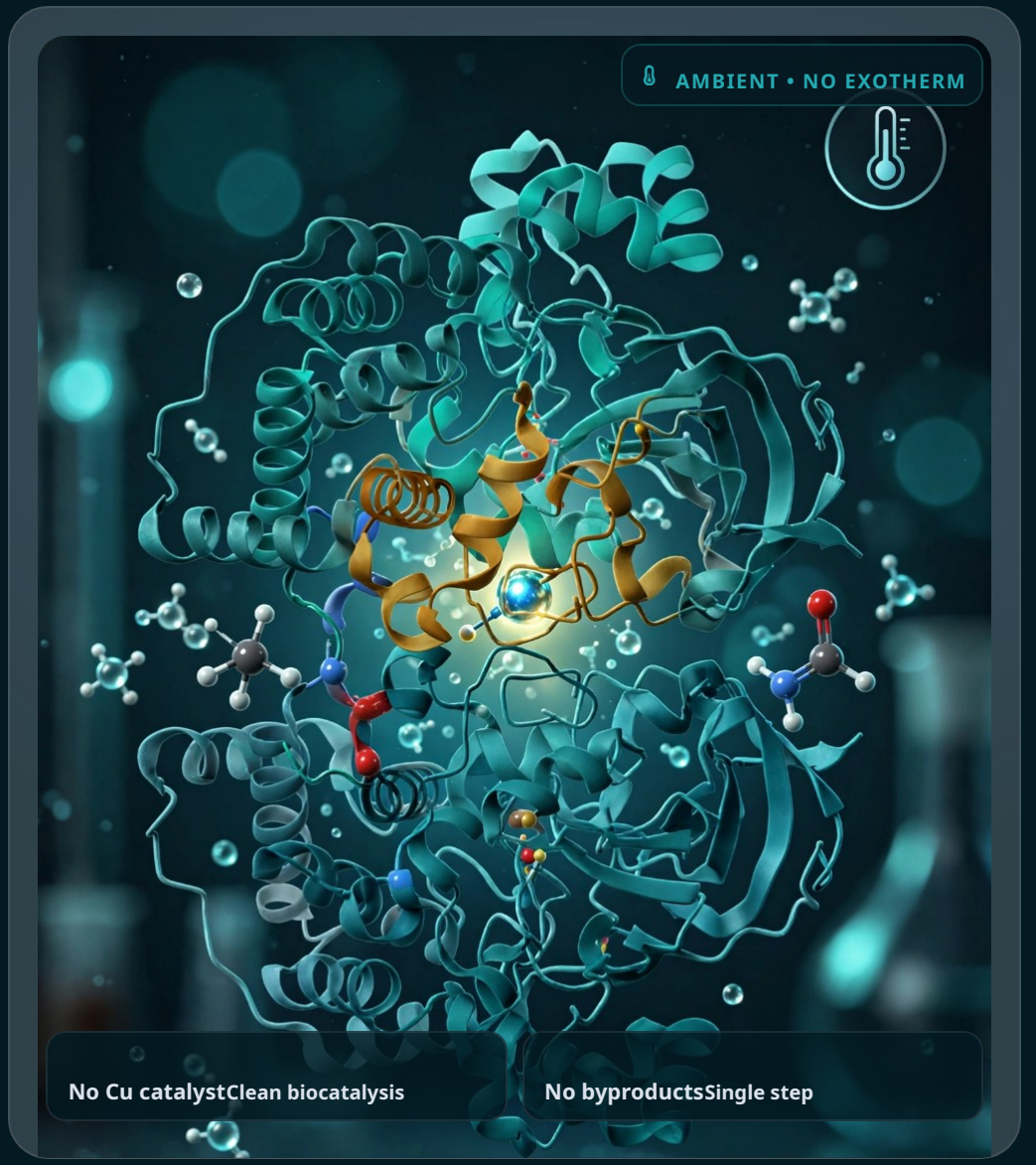
Ambient T&P. No copper, no high heat, no byproducts. Eliminates pressure hazard.

CARTRIDGE

Immobilized beads. Pre-loaded, activity-trended, swappable in hours.

PURITY

Polymer-grade. 40–50% solution on-spec for your line. >99% conversion.

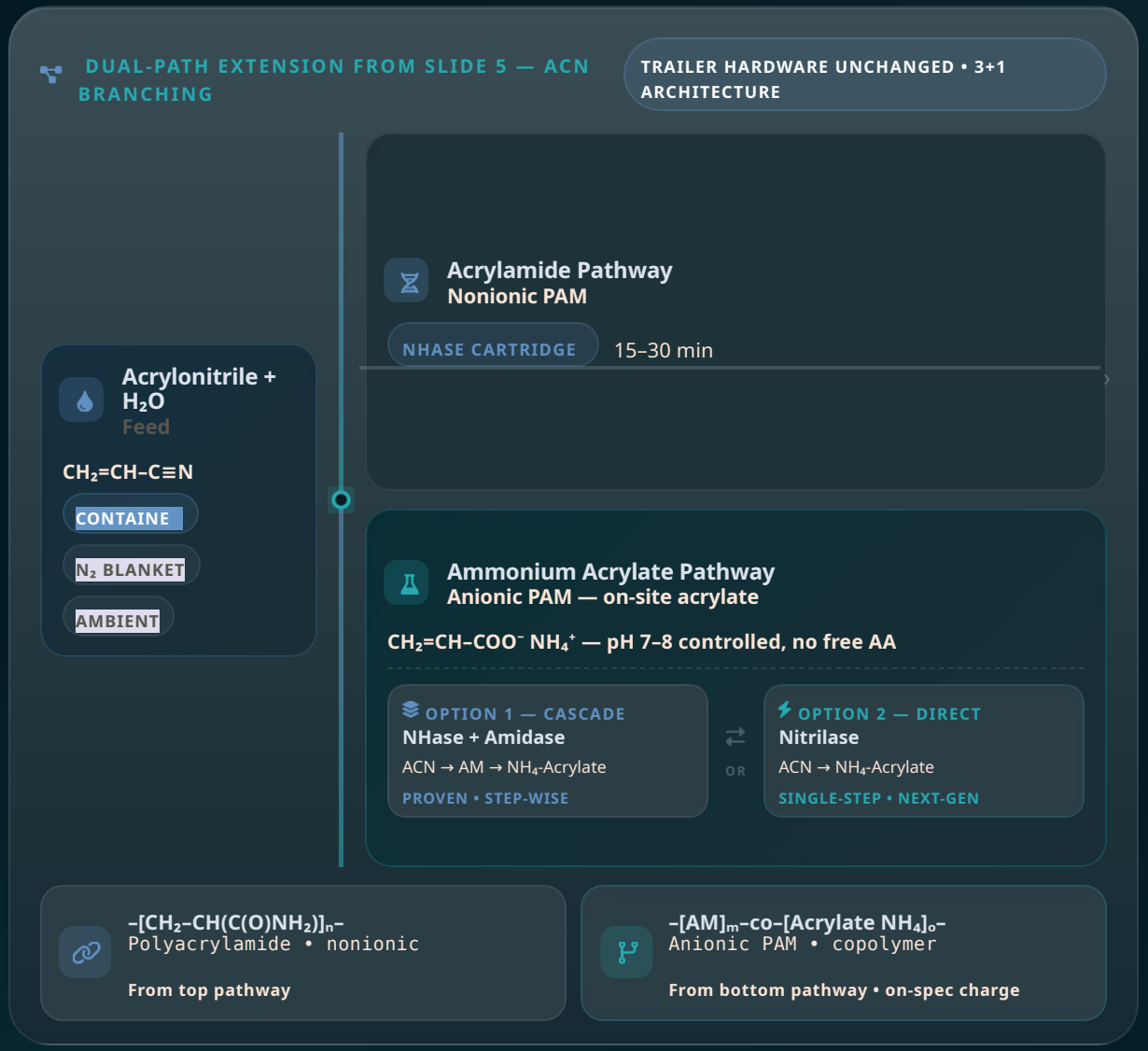


CHEMIP ADD-ON: DIRECT BIOPATHWAY TO AMMONIUM ACRYLATE FOR ANIONIC PAMS

Yes, we can.

...FOR THOSE WHO CHECKED THAT BOX

Same trailer. Second cartridge type. Eliminate petrochemical acrylic acid — make ammonium acrylate on-site for anionic PAM copolymerization, pH-controlled as salt, no free acid handling.



Eliminate merchant acrylic acid

No buying, storing, or handling petrochemical AA. Make ammonium acrylate on demand for copolymerization. Cut price volatility & freight.

DE-RISKED SUPPLY

Same trailer, second cartridge type

Identical 53ft skid, 4-bed 3+1. 4th bed becomes polishing / secondary conversion bed for full NH_4-acrylate conversion.

✓ FROZEN DESIGN • ZERO REDESIGN

pH-controlled to ammonium salt

Operated at pH 7–8 to NH_4^+ salt, avoids free acrylic acid handling, exotherm, and polymerization hazard. Direct to anionic PAM line.

SAFE HANDLING • POLYMER-GRADE

Leverages 3+1 — zero downtime anionic

Activity-trended swap, same quick-disconnects. ChemIP supplies both NHase and Nitrilase/Amidase cartridges under same service model.

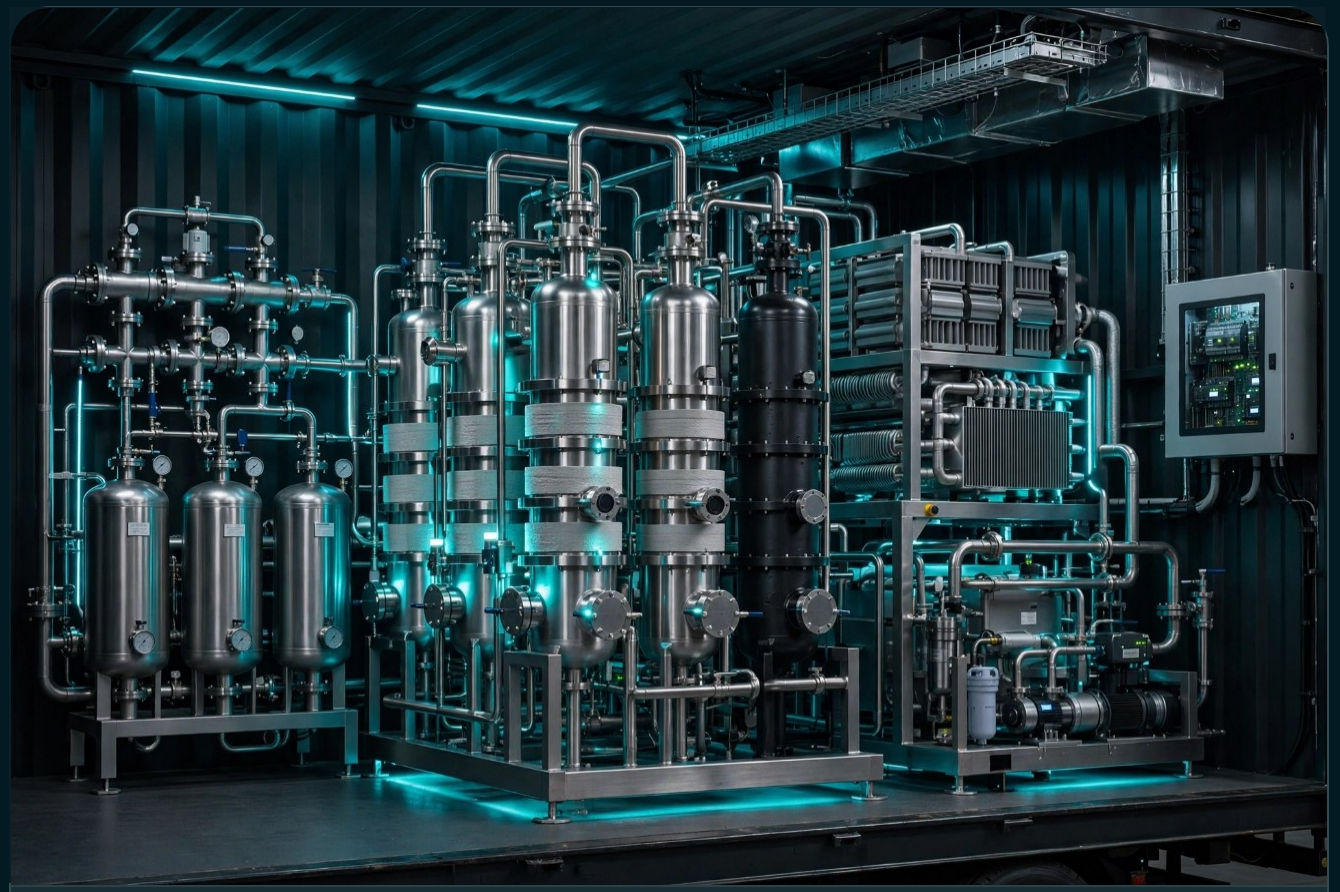
SWAP IN HOURS • SAME PLC + TELEMETRY

PREMIUM ADD-ON

For those who checked "anionic PAM" — you own that too.

Inside the trailer — a complete plant in one container.

53FT ISO — FEED TO 50% AM — 3+1 REDUNDANCY — UNMANNED CAPABLE



Feed — ACN + water

Temperature-controlled header, safety interlocks, N2 blanket. ACN containment standard. Ambient operation eliminates high-P/T hazards.

Packed-bed bioreactors (4 beds)

Three run, one always free for cartridge exchange. No downtime. >99% conversion in 15–30 min. Immobilized beads retained.

3+1 REDUNDANCY → ZERO-DOWNTIME SWAP

Membrane + cooling

Retains enzyme, staged cooling prevents exotherm. AM exits at target strength, cooled.

Controls — DCS-ready, remote

Activity trending algorithm, auto-isolation valves, temp/pressure interlocks, remote telemetry. 40–50% AM on-spec.

CONCENTRATION → 40–50% • UNMANNED OPERATION

How it runs. Continuous packed-bed.

Ambient temperature & pressure hydration. No copper, no heat, no byproducts. Three beds run, one always free for cartridge exchange — zero downtime.

01 — FEED

ACN + water in

Acrylonitrile + water enter at controlled temperature. Safety interlocks, N2 padded header.

Ambient T & P

02 — CONVERSION

Hydration

Immobilized nitrile hydratase → acrylamide in 15–30 min. Staged cooling prevents exotherm.

>99% CONVERSION

03 — SEPARATION

Membrane retention

Membrane shell retains enzyme. AM exits at target strength, cooled to storage.

50% SOLUTION DIRECT

04 — SWAP

Activity-triggered exchange

Auto-isolation, quick disconnects. Swap takes hours, not days. Predictive algorithm.

3+1 N CONFIG, ZERO DT

CONTINUOUS LOOP • UNMANNED

PLC with activity trending • Remote telemetry • DCS-ready • ACN containment standard

Process flow & control architecture

ENGINEERED FOR UNMANNED OPERATION • FROZEN DESIGN • DCS-READY

BLOCK FLOW

ACN Tank → Feed Pump → Heat Exchanger → **Packed Bed x4 [3+1]** → Membrane Retention → Cooler → Concentration → **Product Tank 50%**

Control

PLC with activity trending algorithm, auto-isolation valves, temp/pressure interlocks, remote telemetry.

Safety

Ambient T&P eliminates high-pressure hazards. ACN containment to standard, nitrogen blanketing.

Utilities

Power, water, cooling water, ACN, N_2 only. Single 53ft trailer / ISO container footprint.

P&ID — SIMPLIFIED



MODE	SWAP TIME	MONITORING
Continuous packed-bed	Hours, not days	Remote 24/7 telemetry

Economics at US merchant — Riceboro, GA
$1,650/t 50% basis

$39.6M Rev
12 KT PURE / 24 KT AS 50% • MEDIUM CAPEX

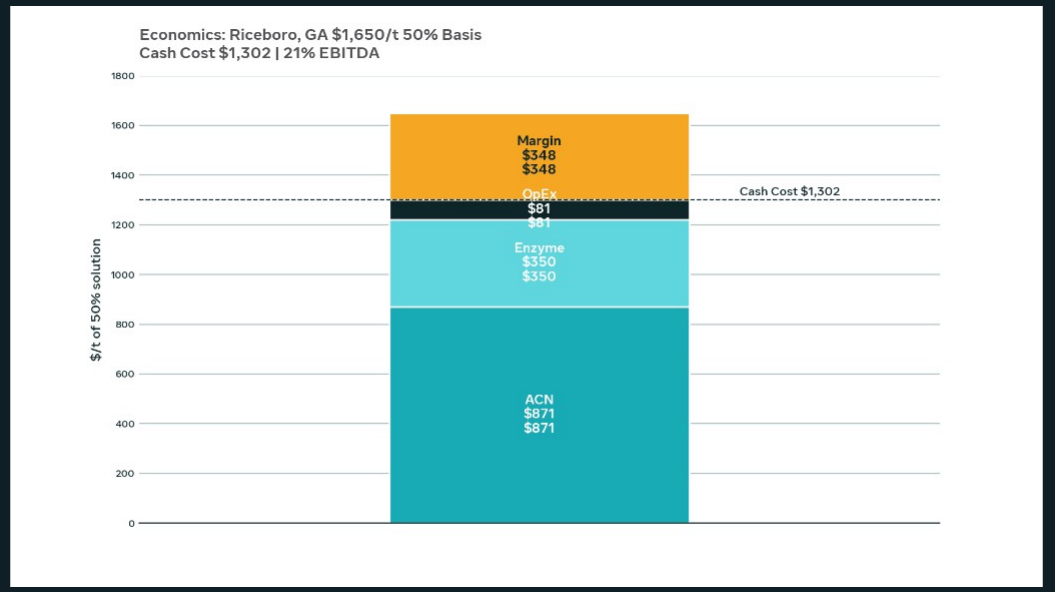
CASH COST $1,302 / T 50% — 21% EBITDA MARGIN

- **Acrylonitrile** — $871/t • 53% cost
- **Enzyme cartridge** — $350/t • service
- **Fixed OpEx 3 shifts** — $81/t • low fixed

CASH COST	MARGIN @ $1,650
$1,302/t	$348/t • 21%
79% of merchant price	EBITDA margin

ANNUAL REVENUE	ANNUAL EBITDA	CASH-ON-CASH	FEEDSTOCK
$39.6M	$8.4M	93%	53% ACN
24 kt 50% sold @ $1,650	12 kt pure basis	Medium CapEx case	Largest cost driver

STACK — PRICE TO MARGIN



CAPITAL — MEDIUM CASE • STANDALONE MODULE • FROZEN LAYOUT

$9.0M fully installed. Not $40–80M.

A complete acrylamide plant in a single trailer. Structure, process, utilities, controls, FAT and commissioning — order to product in 22 weeks.

TOTAL INSTALLED CAP

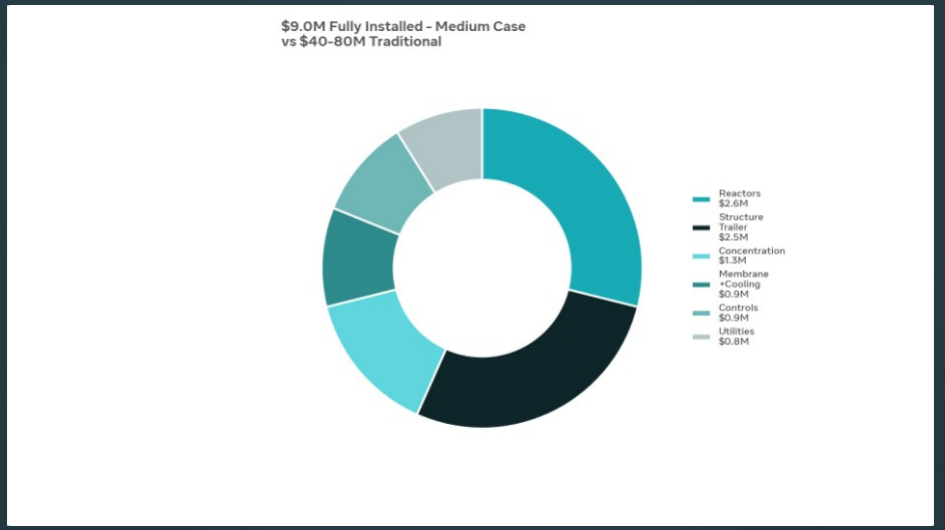
$9.0M

↓ 89% less than traditional greenfield

CAPEX BREAKDOWN

	USD
Packed-bed bioreactors (4 beds)	$2.6M
Structure, trailer, assembly, engineering	$2.5M
Downstream concentration	$1.3M
Membrane shell + staged cooling	$0.9M
Controls & automation	$0.9M
Utilities package	$0.8M
TOTAL MEDIUM CASE	**$9.0M**

COST COMPOSITION



CHEMIP TRAILER

$9.0M

Standalone, DCS-ready

TRADITIONAL PLANT

$40–80M

Greenfield + bio team

Trailer vs traditional plant
a fraction of the capital, time and scale.

FROZEN CONTAINERIZED DESIGN • 44-WEEK ORDER-TO-PRODUCT • NO FERMENTATION ON YOUR SITE

ChemIP Trailer
12 KT/YR PER TRAILER • 53FT ISO

$9.0M

Installed capital
$9.0M fully installed standalone module
Up to 89% less

Order to first product
~22 weeks — fabrication, FAT, delivery, commissioning
Years → Weeks

Viable scale
12 kt/yr per trailer. Start with 1, add trains
1 = economic

Footprint + expertise
Trailer pad, no greenfield. No fermentation on site.
Plug-in plant



Traditional biocatalytic plant
GREENFIELD • 50+ KT MINIMUM

$40-80M

$40–80M CapEx
Custom engineered, civil works, fermentation suites
—

2–4 years to product
Permitting, EPC, start-up, validation
Long risk

50+ kt/yr minimum
Not viable for mid-size polymer maker de-risking
Overscale

Full bioprocess team
Fermentation expertise required on site — your headcount
Complex

SERVICE MODEL — ENZYME IN, CAPACITY OUT



Hours, not days Ready-to-run

Predictive swap Activity trend

ChemIP enzyme cartridges.

You own the capacity. We supply the bed. No fermentation on your site — biology stays at ChemIP.

Replaceable, pre-loaded

Immobilized beads drop into reactor. Forklift swap, quick disconnects, shipped ready-to-run.

Activity monitoring

Conversion trending triggers replacement before yield drops. PLC + remote telemetry.

Multi-year supply contract

Pricing scales with volume. Guaranteed availability, swap logistics included.

No bio team on site

Enzyme production is our problem. Your site stays chemical, not biological.

Performance guarantee • Learnings propagate across fleet • Continuous improvement

DEPLOYMENT TIMELINE — FROZEN LAYOUT

Order to first product in under six months.

22 wks
DESIGN FREEZE TO ON-SPEC PRODUCT

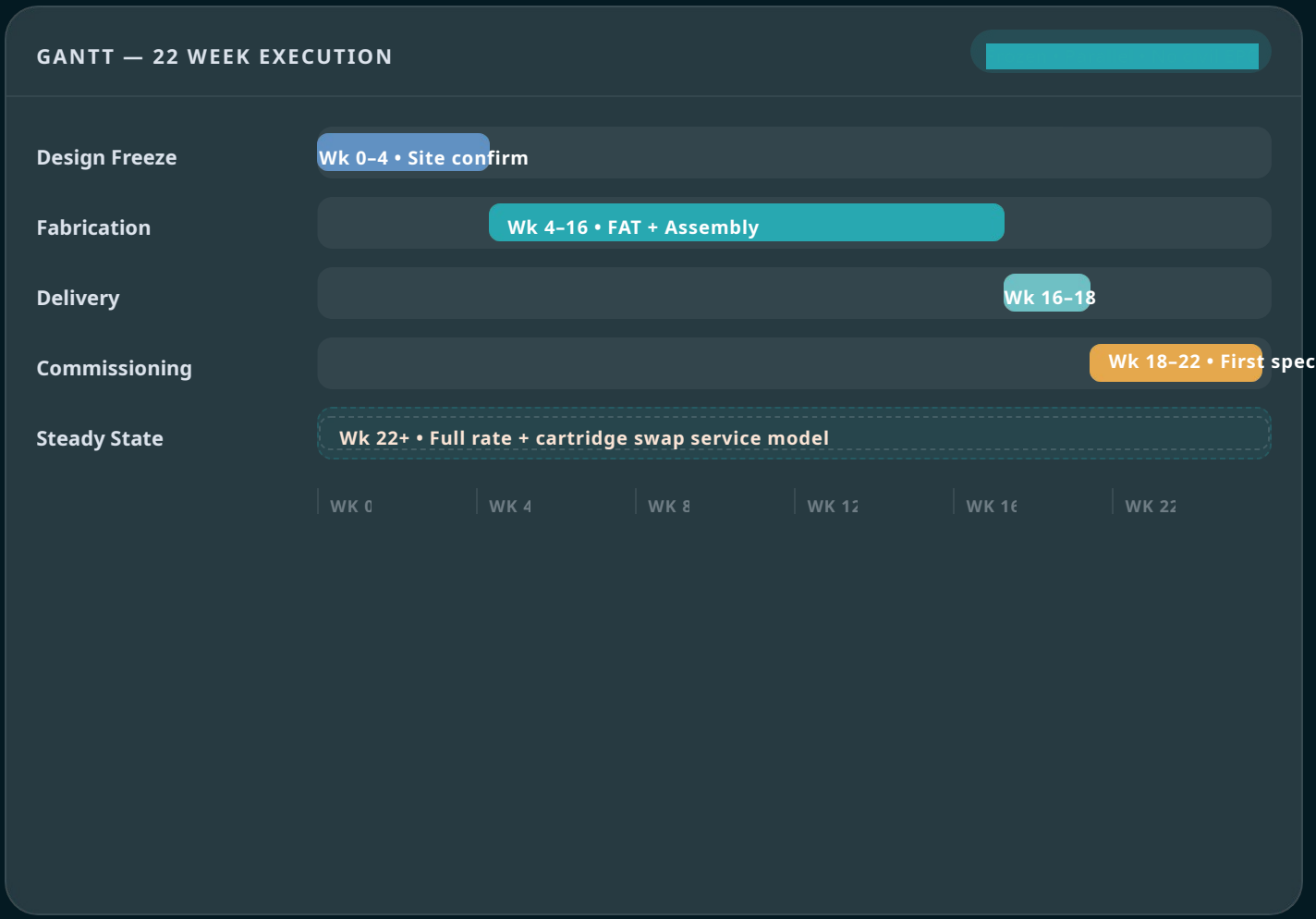
01 — Design freeze — WK 0–4
Frozen layout, site utilities confirmed, foundation spec, ACN storage tie-in.

02 — Fabrication — WK 4–16
Skid assembly, FAT, trailer mounting, pre-commissioning. Activity-tested cartridges staged.

03 — Delivery — WK 16–18
Truck to site, crane set, utility tie-in: power, water, cooling water, ACN, N_2.

04 — Commissioning — WK 18–22
Enzyme load, ramp, first on-spec 50% AM, operator training, remote link.

05 — Steady state — WK 22+
Full rate 12 kt/yr pure, cartridge supply ongoing, remote monitoring 24/7.



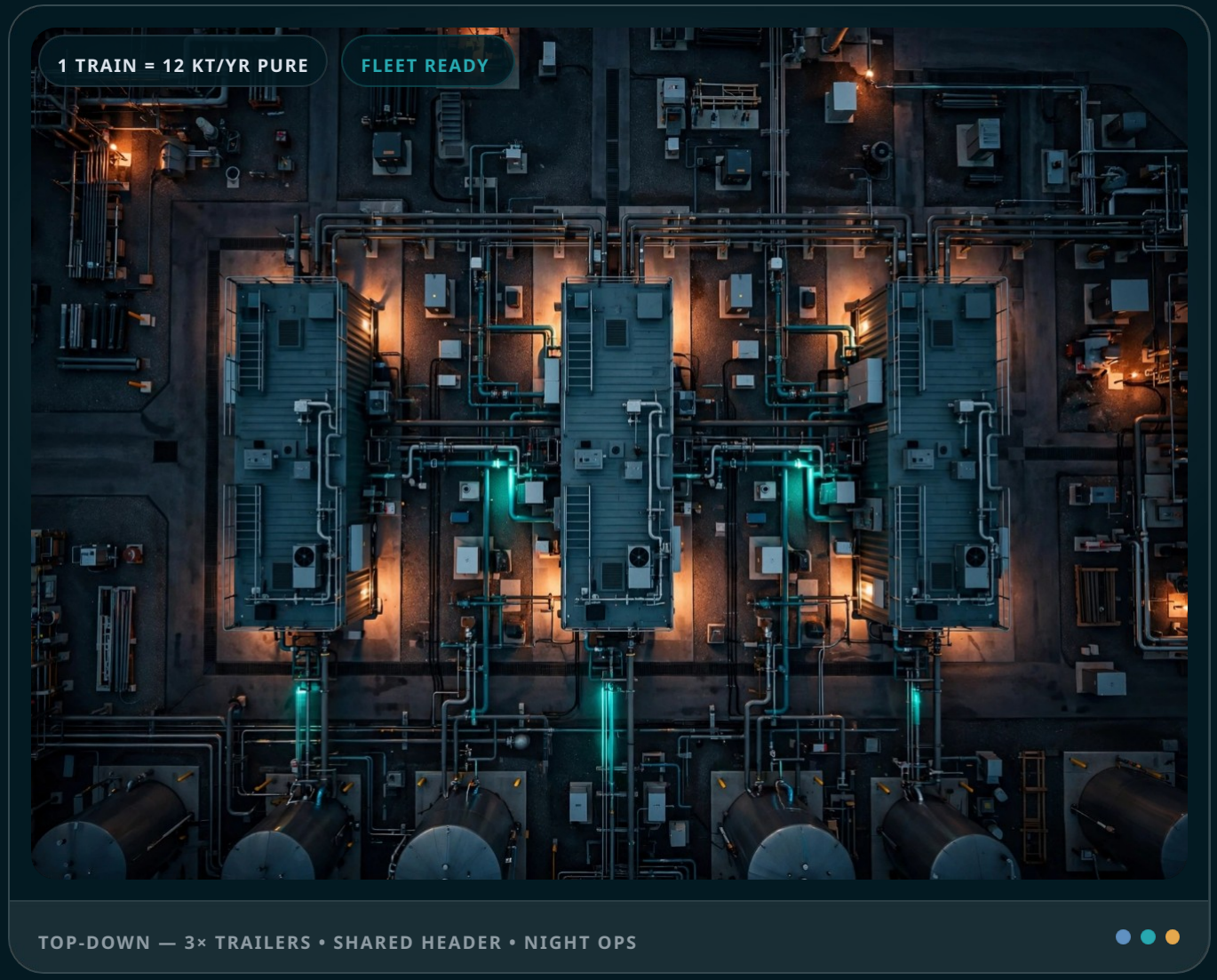
22 weeks Order to product

Trailer pad No greenfield

Training incl. Operator + remote

Modular scale.
Start with one. Add trains.

FROZEN DESIGN — SHARED UTILITIES — N+1 AVAILABILITY
LEARNINGS PROPAGATE ACROSS FLEET



12 kt/yr — single trailer

Pure capacity that fits one polymer line. Ideal for de-risking. $9.0M installed, 22 weeks order-to-product.

Pure: 12 kt/yr | 50% soln: 24 kt/yr

24 kt/yr — two trailers

Shared utilities, redundancy across trains, N+1 availability. No re-engineering. Second train adds incremental CapEx only.

Shared feed & utils | Zero downtime

Multi-site fleet

Same frozen design at every customer site. Service model scales — cartridges, monitoring, swap logistics propagate.

Frozen layout | Centralized biology

+ **Future:** Add third train for 36 kt/yr without re-engineering. Standard pad, same tie-ins, performance contract continues.

Own the molecule.
Outsource the biology.

THE BUSINESS MODEL & WHY CHEMIP — PARTNERSHIP, NOT PROCUREMENT

Vertical integration is leverage. Proven nitrile hydratase, containerized execution, performance contract — not a science project.

YOU OWN

Capacity, control, timing.

- **Site + trailer + production** — your asset, your pad
- **Process control + quality + timing** — on-spec 40–50% for your line
- **No volume commitment** to SNF / BASF merchant

STRATEGIC INDEPENDENCE

WE SUPPLY

The biology, as a service.

- **Enzyme cartridges** — pre-loaded, ready-to-run
- **Activity guarantee + remote monitoring** + swap logistics
- **Continuous improvement** — fleet learnings propagate

ZERO FERMENTATION ON YOUR SITE

WHY NOW

Tariffs up. Supply tighter.

- Section 301 + forced-labor duties push landed Chinese >$2k/t
- Merchant concentrating — polymer margins squeezed

DE-RISKED

Proven, frozen, contracted.

- **Industry standard** nitrile hydratase — decades of use
- **Frozen container design** + performance contract

OWN THE STRATEGIC MOLECULE

OWN YOUR ACRYLAMIDE.

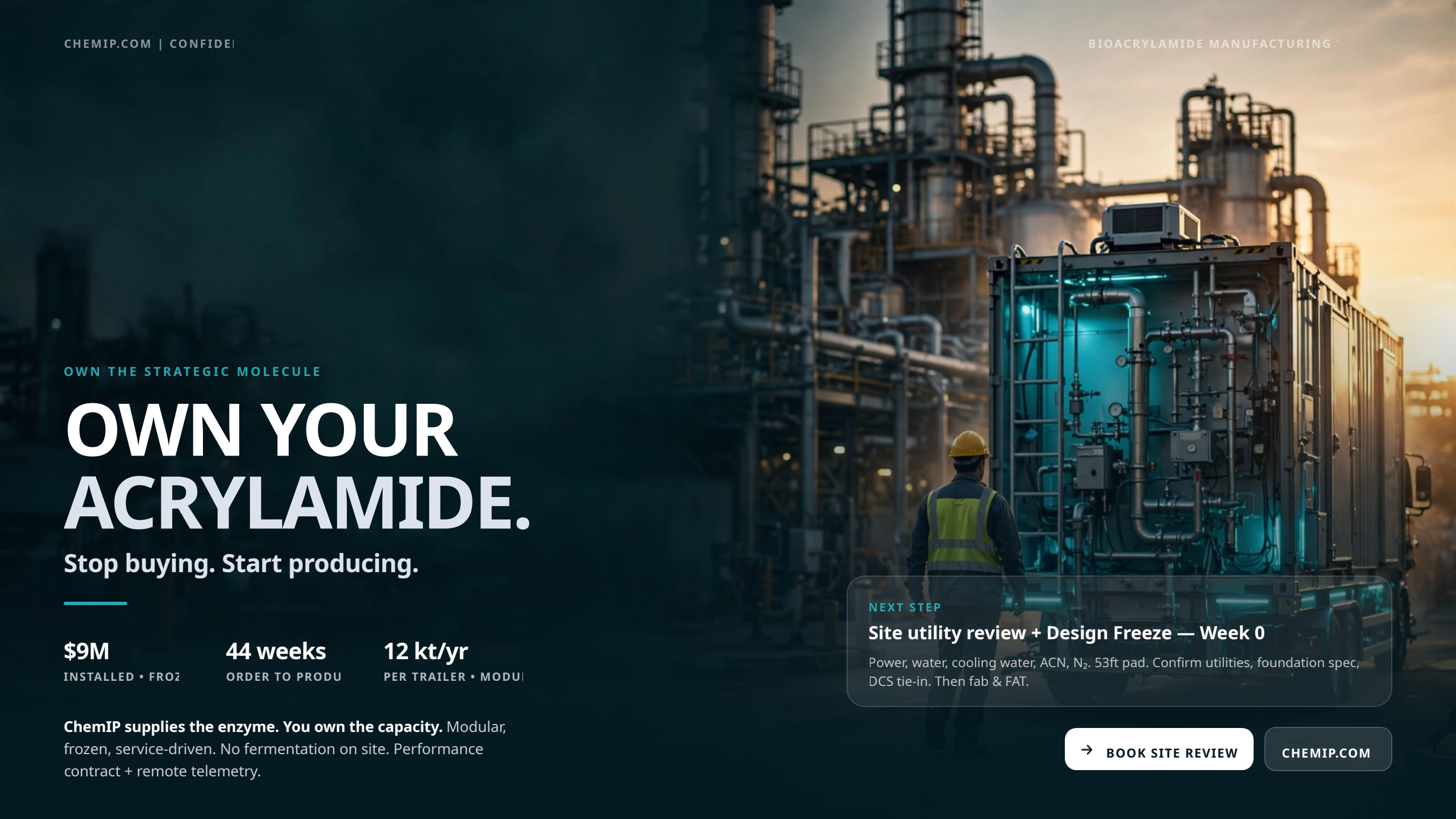
Stop buying. Start producing.

$9M
INSTALLED • FROZ

44 weeks
ORDER TO PRODU

12 kt/yr
PER TRAILER • MODU

ChemIP supplies the enzyme. You own the capacity. Modular, frozen, service-driven. No fermentation on site. Performance contract + remote telemetry.



NEXT STEP

Site utility review + Design Freeze — Week 0

Power, water, cooling water, ACN, N_2. 53ft pad. Confirm utilities, foundation spec, DCS tie-in. Then fab & FAT.

→ BOOK SITE REVIEW

CHEMIP.COM