SENS Systemic Environmental Solutions

WASTE TO VALUE · TIRES · COAL · MUNICIPAL WASTE

Carbon is not a dirty word.

Carbon is the foundational element of life. One proprietary low-temperature process converts end-of-life tires, coal, and municipal solid waste into industrial carbon, fuel oil, and self-generated process energy, with zero waste streams.

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THE OPPORTUNITY

Waste on one side. Carbon demand on the other.

The world produces waste it cannot absorb. More than 4 billion end-of-life tires sit in stockpiles, with roughly 1.5 billion added each year. Cities generate over 2 billion tons of municipal solid waste annually, and about a third of it is not managed safely. Coal remains the most abundant and lowest-cost source of carbon on Earth, but burning it raw burns everything in it, the pollutants along with the value.

At the same time, demand for industrial carbon keeps climbing across concrete, steel, agriculture, and energy. Conventional carbon black is made from oil and priced with it, keeping high-grade carbon scarce and costly.

TiPs technology treats all of these feedstocks as what they are: carbon carriers. It recovers the materials they already contain and sells them into markets that need them.

4B+

End-of-life tires stockpiled globally, with ~1.5 billion more added every year.

2B+

Tons of municipal solid waste generated each year, heading to 3.8 billion by 2050.

~4B

Tons of cement produced each year, a vast market for affordable bulk carbon.

190M

Tons of fertilizer applied each year. Carbon helps soil hold water and nutrients.

The gap between what these feedstocks contain and what the market pays for carbon is the opportunity.

ONE PROCESS, THREE PRODUCT FAMILIES

Carbon

From tread-grade N330 carbon black for tire manufacturing to bulk industrial carbon for concrete, steel, and agriculture.

Fuel oil & diluent

High-aromatic industrial oil and solvent with established offtake markets, from heating to refining.

Process gas

Captured during processing and used to power the plant. Closed loop, zero external fuel.

THE TECHNOLOGY

One process. Every carbon feedstock.

The Thermal-static internal Pyrophinic system (TiPs) is a sealed, low-temperature, vacuum-driven thermal mechanical selective depolymerization process. Instead of burning a feedstock, TiPs separates the carbon, hydrocarbons, water, and gas it already contains, and returns each one as a saleable product.

Feedstock

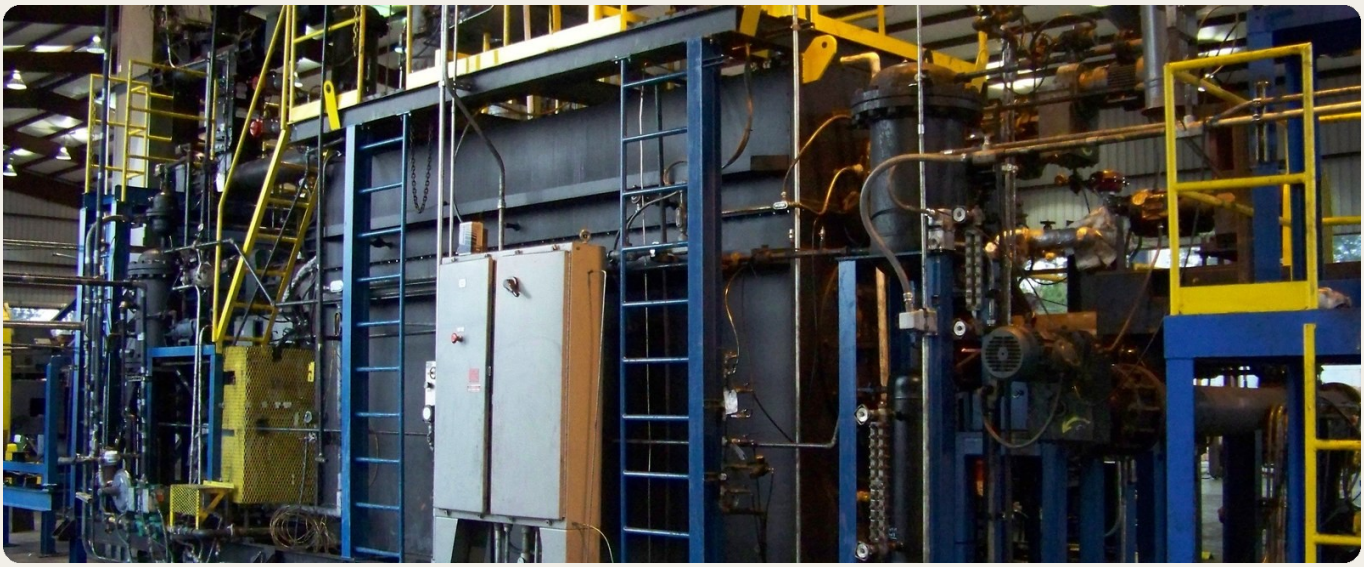
Tire crumb, crushed coal, or sorted and dried MSW

TiPs processing

Sealed low-temperature depolymerization under vacuum

Outputs

Carbon, fuel oil, and process gas. Water where the feedstock carries it



TiPs processing unit

10,000+

Hours operated at full scale across feedstocks: tires, coal, oil sands. TRL 8.

24/7

Continuous feed operation, self-powered after a one-time grid startup.

100%

Of every ton of feedstock becomes product, recovered water, or sold residue.

Zero

Waste streams. Every fraction is sold or used in the process.

THE FEEDSTOCKS

Waste in. Value out.

Each feedstock runs on the same TiPs core with feedstock-specific preparation. The products change with the chemistry of what goes in. The zero-waste principle does not.

End-of-life tires

In: crumb rubber, 0.25 to 0.75 inch

Recovered:

- N330-grade carbon black
- High-aromatic diluent
- Syngas

Coal

In: crushed run-of-mine coal

Recovered:

- Industrial carbon
- Coal-fuel-oil
- Process gas, water, mineral ash

Municipal solid waste

In: sorted and dried MSW

Recovered:

- Carbon
- Fuel oil
- Syngas, potable water, mineral residue

Also successfully tested: **oil sands and railroad ties.** The process also handles **most plastics**, and extends to additional carbon-based waste and primary feedstocks as projects demand.

Typical recoverable fractions vary by feedstock: carbon 15 to 57%, hydrocarbons 8 to 30%, water 3 to 55%, gas 5 to 18%, minerals 5 to 30%. The business case for each project is built on the assay of the actual feedstock.

One technology platform. The chemistry of the feedstock decides the product offtake mix. The process never changes.

FEEDSTOCK · END-OF-LIFE TIRES

01

Tread-grade carbon from waste tires.

TiPs converts tire crumb into materials validated against virgin equivalents. The carbon black is a direct N330 tread-grade replacement, confirmed by independent rubber testing. Most recovered carbon black never reaches that grade. TiPs carbon goes back into new tires, a closed tire-to-tire loop unique to the process.

The diluent is a 200+ constituent aromatic solvent with naturally occurring d-limonene. At Noble, Oklahoma, 88,000 tons of crumb rubber per year is secured under a long-term agreement.

> *“Rubber testing confirmed comparable cure behavior, strong tensile and elongation values, and equal or better abrasion resistance than the N330 control.”*
>
> Independent analysis, Sid Richardson Carbon Co, a division of TOKAI CARBON (Japan)

48 tons

Processed per day, per TiPs unit, on continuous feed.

88K tons

Annual crumb rubber supply secured at Noble, Oklahoma.

66%

15-year project IRR. 175% 5-year ROIC.

Zero

Waste streams. No combustion in the process.

Outputs: N330-grade carbon black (Tokai Carbon validated), high-aromatic diluent and solvent (Herty / CRC validated), and syngas that powers the unit.

FEEDSTOCK · COAL

02

From raw coal to clean carbon.

Burning raw coal burns everything in it. TiPs separates the value from the pollution before anything is burned. Carbon comes out as a solid industrial material at a modeled $0.10/lb, far below conventional carbon black. The volatile fraction is recovered as coal-fuel-oil, heavy metals are captured instead of emitted, and process gas powers the plant.

Mineral ash stays entrained in the carbon for concrete and agriculture, with cyclone separation available for higher-grade buyers.

OFFTAKE USE CASES

Industrial carbon

- Advanced concrete and insulation
- Metallurgical carbon for steel
- Soil enrichment
- Activated carbon

Coal-fuel-oil

- Industrial heating
- Marine and bunker fuel
- Refining feedstock and diluent blending

6

TiPs processors on one mine-mouth site, minimal feedstock transport.

880K

Tons of coal processed each year into carbon, fuel oil, and gas.

$0.10/lb

Modeled carbon selling price. Every step toward market pricing is upside.

57.6%

Project IRR. First revenue in Year 2, payback by end of Year 3.

Outputs: industrial carbon, 1.63M barrels of coal-fuel-oil per year, and closed-loop process gas that powers the plant.

FEEDSTOCK · COAL TO POWER

03

Clean carbon to power: a 400 MW project.

For power markets, TiPs runs in front of the boiler. Coal that would have been burned raw is processed first. The volatiles leave as exportable fuel oil, and the recovered carbon burns far cleaner. About 2.94 million tons of coal a year feed 20 TiPs reactors supporting 400 MW of clean carbon power, with multiple revenue streams from one feedstock.

Carbon credits and carbon sales are upside only. The base case is power and fuel oil.

IMPACT ON EMISSIONS

- Volatile hydrocarbons leave as fuel oil instead of burning in the boiler
- SOx and NOx drop sharply per MWh against a raw-coal baseline
- No fly ash. Bottom ash is sold into cement rather than ponded
- Heavy metals are captured in processing, not emitted from the stack
- Flue gas is left capture-ready, cutting the cost of CO2 capture where projects add it

400 MW

Of clean carbon power built on processed coal.

20

TiPs reactors processing 2.94 million tons of coal a year.

45%

Project IRR at Year 15. First revenue Year 3, payback end of Year 4.

3x

Collateralization on the investment, releasing at commercial operation.

Outputs: 400 MW of power, exportable fuel oil, recovered carbon, and bottom ash sold into cement.

FEEDSTOCK · MUNICIPAL SOLID WASTE

04

A city's waste, returned to value.

A city of one million people generates about 1.22 million tons of municipal solid waste a year, enough to feed a single six-unit TiPs facility. After sorting and drying, 880,000 tons of dry feedstock become carbon, fuel oil, and potable water. Nothing is landfilled.

Landfills are one of the largest anthropogenic methane sources. TiPs takes that material out of the ground entirely, with syngas running the dryer and the unit in a closed loop. Municipal tipping fees and carbon credits are not included in the base case.

OFFTAKE USE CASES

Carbon

- Advanced concrete
- Soil enrichment and agriculture
- Metallurgical carbon for steel

Fuel oil

- Industrial heating
- Marine and bunker fuel
- Refining and diluent blending

Water & minerals

- Potable water returned to the city
- Mineral residue to cement and aggregate

270K

Tons of carbon recovered each year for concrete, agriculture, and steel.

61M

Gallons of industrial fuel oil produced annually from the hydrocarbon fraction.

337M

Litres of potable water recovered each year and returned to the city.

56.2%

Project IRR. First revenue Year 2, payback by end of Year 3.

Modular and distributed: deployable at one landfill site or several, sized to the city.

THE PRODUCTS

Three commodity-grade revenue streams.

Every TiPs output is a commercial-grade product, not a downgraded byproduct. Carbon and fuel oil drive the economics, process gas powers the plant, and recovered water is returned as potable.

The model is built on product value, not subsidies.

Carbon

From tread-grade N330 carbon black on the tire side to bulk industrial carbon from coal and MSW, priced for material markets that need volume.

Markets & uses

- Tires, belts, and rubber goods
- Advanced concrete
- Metallurgical carbon for steel
- Soil enrichment
- Activated carbon

Fuel oil & diluent

High-aromatic oil, 85 to 95% aromatic content. On the tire side, a 200+ constituent solvent with d-limonene that outperforms xylene and toluene blends.

Markets & uses

- Industrial heating
- Marine and bunker fuel
- Refining feedstock
- Diluent blending
- Industrial solvents

Process gas

Non-condensable gas captured during processing. It powers the TiPs unit and upstream drying, so the plant feeds itself.

Markets & uses

- Powers the TiPs unit
- Runs feedstock drying
- Closed loop after startup
- Zero parasitic load
- No external fuel

Where the feedstock carries moisture, TiPs captures it and returns it as potable water rather than venting it.

THE COMPARISON

How TiPs compares.

Each feedstock has an incumbent disposal or processing route. TiPs replaces all of them with material recovery instead of destruction.

	TiPs	Pyrolysis	Mass-burn incineration	Raw coal + bolt-on CCS
Process	Sealed, low-temperature selective depolymerization under vacuum	High-temperature thermochemical cracking, 400 to 800°C	High-temperature combustion, 850 to 1,100°C	Raw coal combustion with CO2 captured afterward from flue gas
Products	Carbon, fuel oil, process gas, recovered water	Fuel oil, low-grade char, syngas	Heat and power, with fly ash and bottom ash residue	Power, plus captured CO2 at high cost
Material value	Preserved and sold into product markets	Partially destroyed, lower-value byproducts	Destroyed in combustion	Destroyed in combustion
Environmental	Zero waste streams, no combustion in the process	Energy-intensive, higher emissions	Dioxin and NOx emissions, hazardous fly ash	Regulated pollutants remain, capture cuts plant efficiency
Deployment	Modular, distributed, on-site at the feedstock	Large centralized plants	Large centralized plants	Large capture plant per facility

48 t/day

Processed per unit on tires. Coal units run larger, at 480 t/day on continuous feed.

TRL 8

Technology readiness proven across 10,000+ hours of full-scale operation.

Modular

Units are added as feedstock and demand grow. No giant central plant required.

THE ECONOMICS

Four projects, one model.

Independent revenue lines from products, not subsidies. Each project is financed against a 3x collateralized investment with the balance mobilized through the SENS and ISCM structure.

	Tires Noble, Oklahoma	Coal Clean carbon	Coal 400 MW power	MSW City of ~1M
Total project capex	$130M	$120M	$1.92B	$136M
Minimum investment	$20M	$20M	$150M	$20M
TiPs units	6	6	20	6
Annual feedstock	88K tons crumb rubber	880K tons coal	~2.94M tons coal	880K tons dry MSW
Key outputs	N330 carbon black, diluent, syngas	Carbon, 1.63M bbl fuel oil	400 MW power, fuel oil, carbon	Carbon, 61M gal fuel oil, 337M litres water
First revenue	Year 1	Year 2	Year 3	Year 2
Payback	Year 4	End of Year 3	End of Year 4	End of Year 3
Project IRR	**66% (15-yr)**	**57.6%**	**45% (15-yr)**	**56.2%**
Collateralization	3x	3x	3x	3x

Indicative figures, subject to business case validation, country profile, and feedstock profile. Carbon credits are not included in any base case. For the power project, carbon sales are upside only; the base case is power and fuel oil.

Every project is built on product value from day one. Subsidies, credits, and premiums are upside, never the case.

PARTNER WITH US

Build this in your region.

SENS delivers waste-to-value and clean carbon solutions at scale. Whether you represent a government, a municipality, a mining operator, a utility, a manufacturer, or an investment fund, we invite you to explore what TiPs can do with the feedstocks in your region.

SENS

Technology, project development, and delivery of TiPs facilities worldwide.

ISCM Foundation

20+ years of governance oversight and research integrity from Brussels.

ISCM Investments

The Foundation's dedicated fundraising and investment governance arm, mobilizing private and institutional capital.

THE TEAM

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SENS Systemic Environmental Solutions

ISCM FOUNDATION

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Systemic Environmental Solutions is an initiative of the ISCM Foundation.