



## Waste plastics to petroleum fuels

Ventana Ecogreen Inc.

830, Andromeda Lane  
Foster City, CA 94404

R&D Centre  
KK-16, HSIDC Estate  
Kalka, Haryana, India  
[www.ventanacleantech.com](http://www.ventanacleantech.com)





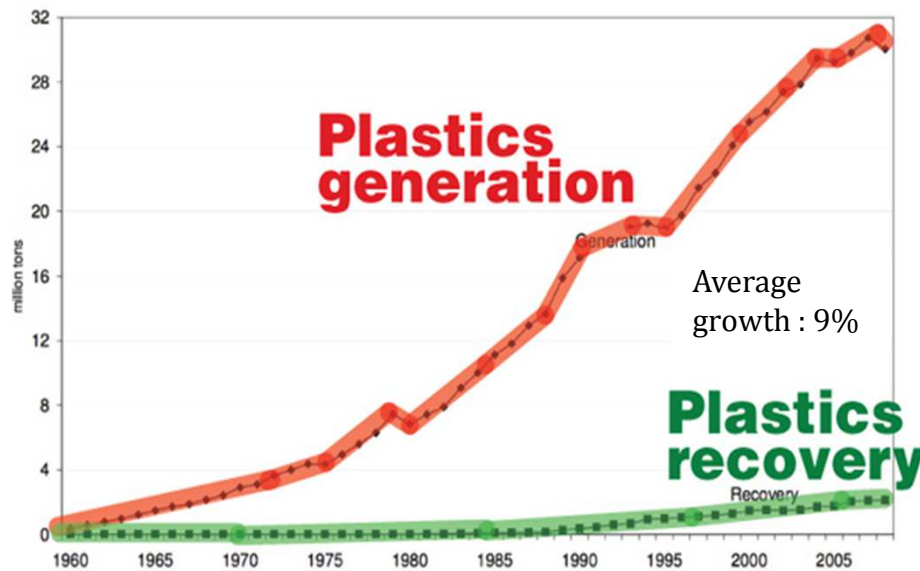
patent-pending  
thermal depolymerization  
technology for converting  
waste plastics  
to diesel and gasoline blendstocks

# Waste plastic recycling – global landscape



Every piece of plastic ever manufactured continues to be in existence today \*

More plastic has been manufactured in last 15 years than the entire last century



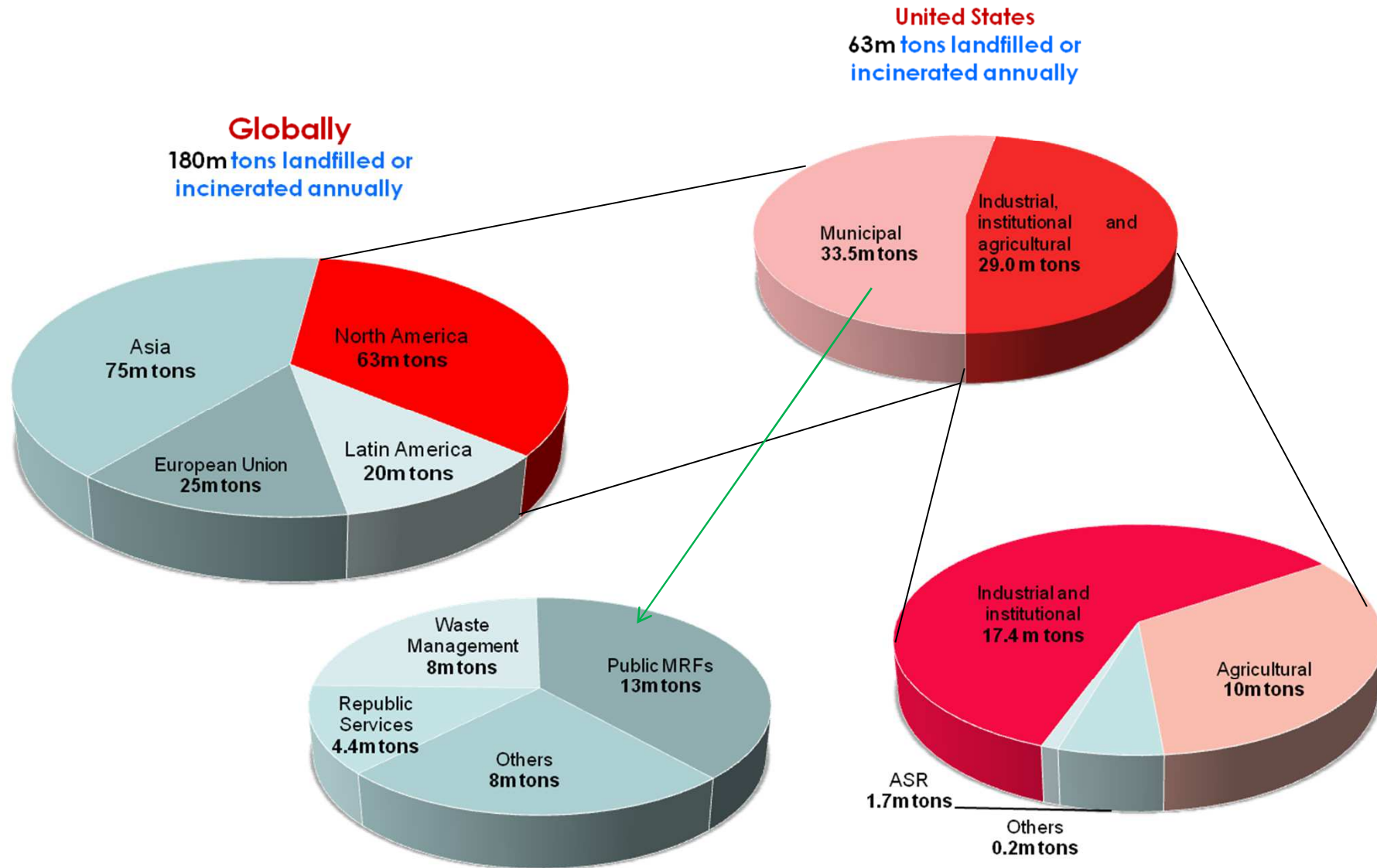
\*Except a very small % which has been incinerated

Plastics: global production  
300 million tons



Plastics: landfilled per annum  
180 million tons (60%)

# Waste plastic recycling – global landscape





# Waste Plastic Recycling- Indian Scenario



“We are sitting on plastic time bomb”.....Supreme Court to CPCB in April 2013.



CPCB Report to SC...2013

5.6 Million Tons of Waste Plastic per annum

Delhi .....689.5 TPD

Chennai.....429.5 TPD

Kolkata.....425.7 TPD

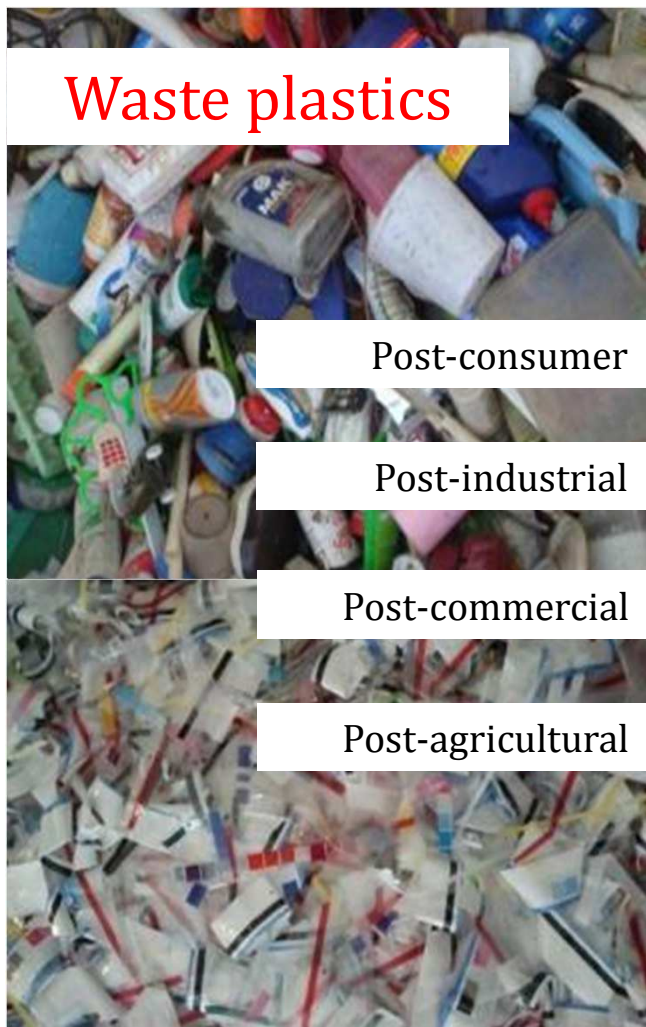
Mumbai... .. 408.3 TPD

~ 60% is recycled

## Ventana's technology



### Waste plastics



Post-consumer

Post-industrial

Post-commercial

Post-agricultural

Anaerobic Thermal  
De polymerization

### HyFuel™ distillates



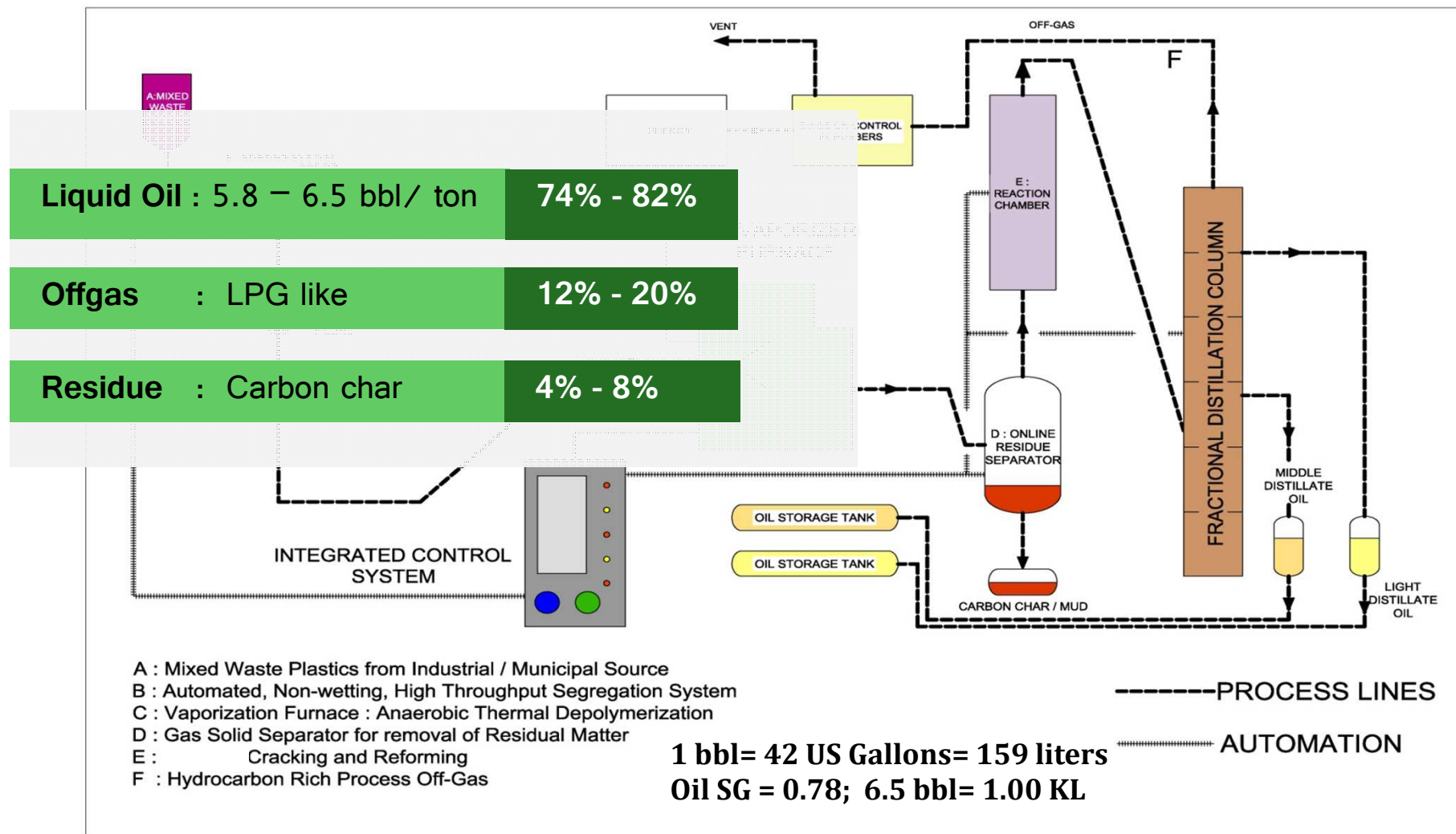
## Corporate Summary

Entity	Privately held Delaware Class C	R&D centre India [estd 2010]
Status	4 <sup>th</sup> generation demo plant commissioned	Over 400 trials conducted across 4+ years
Process Type	Fully-continuous	Lower capEx and opEx
Intellectual Property	8 patents filed in EU, US, India (5 unique)	IP relates to enablement of continuous process



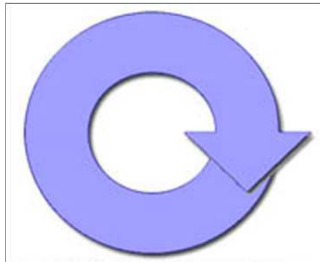


# Technology overview

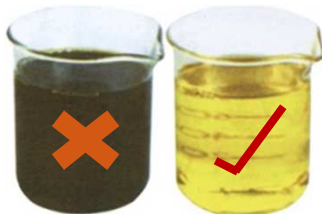




# Technology Strengths



Continuous  
(non batch) process



Direct generation of  
**diesel and gasoline**  
**blendstocks**  
(not synCrude)



Decentralized plants.  
Area requirement ~1.5 acres



**Product flexibility**  
ability to generate  
diesel / gasoline  
blendstocks, waxes,  
grease base stock



Energy Payback Ratio  
(with offgas recycling)

**16 X+**

50 TPD plant can generate  
(@39% eff)

**7.0 MW-hr**  
electricity

# Material Preparation



## Pre-processing line

Accepts contaminated, dirty plastics 'as-is'



Performs resin sorting, metal remover and size reduction



Does not deploy washing or thermal methods



No effluents are generated

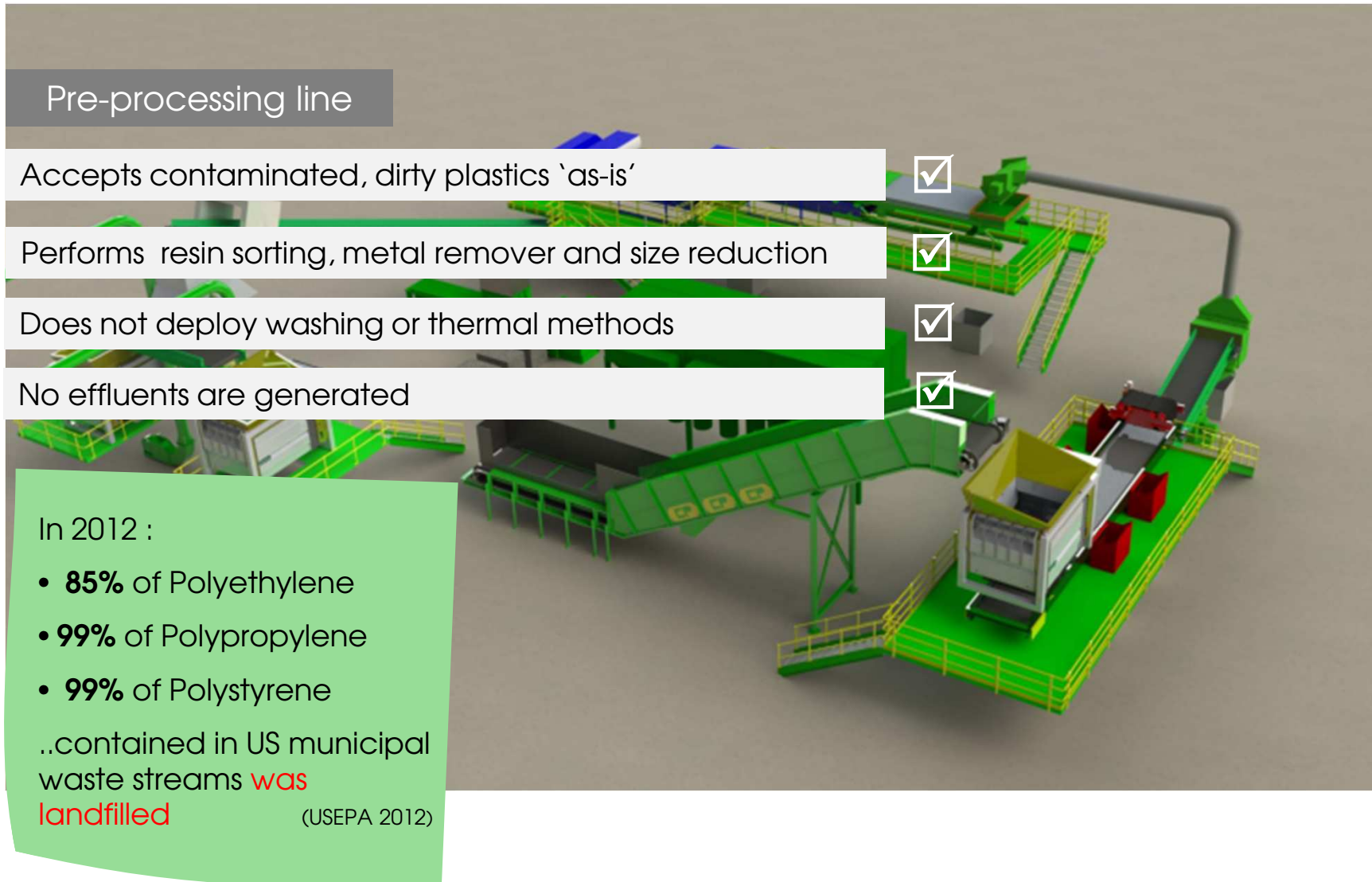


In 2012 :

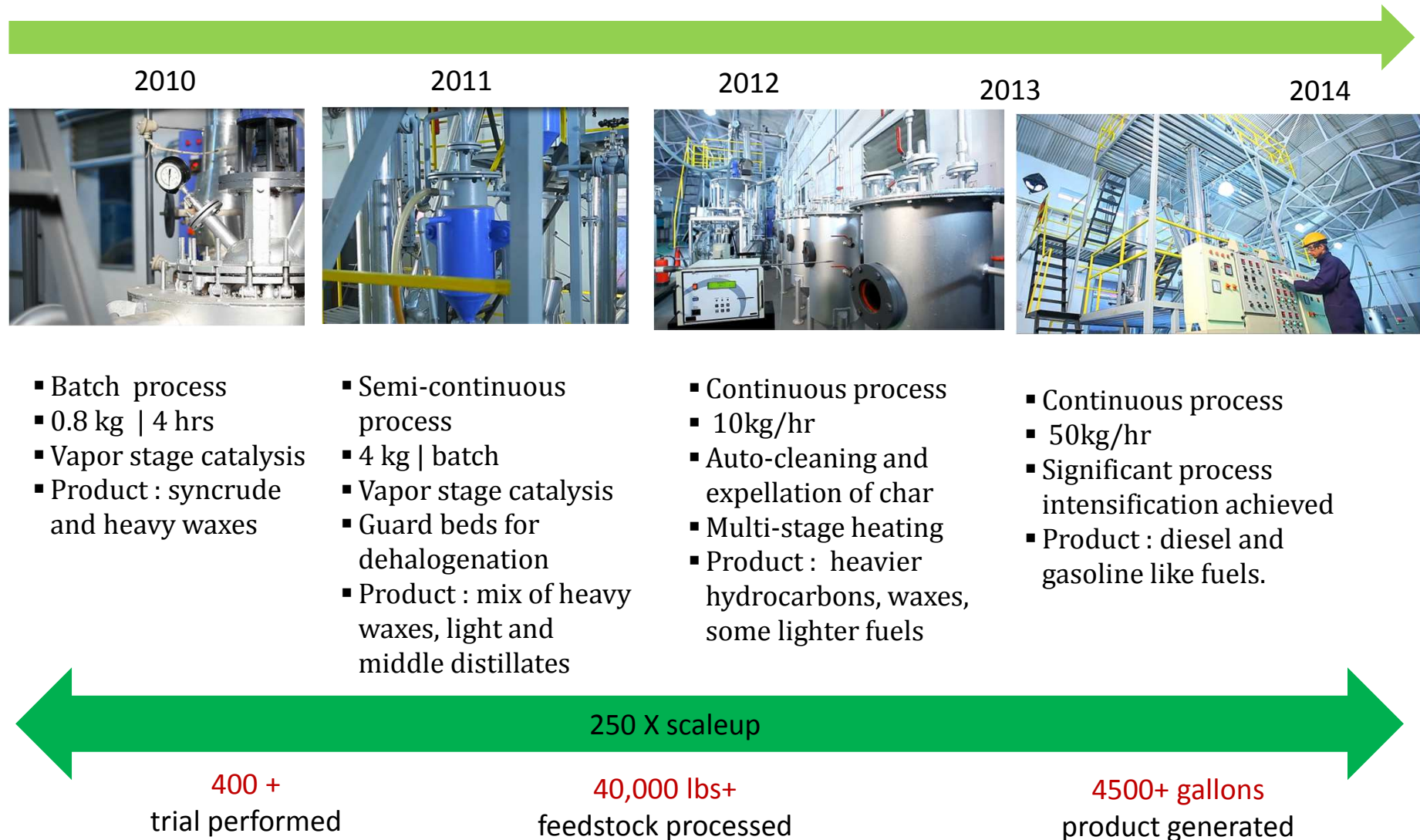
- **85%** of Polyethylene
- **99%** of Polypropylene
- **99%** of Polystyrene

..contained in US municipal waste streams **was**  
**landfilled**

(USEPA 2012)



## Development overview

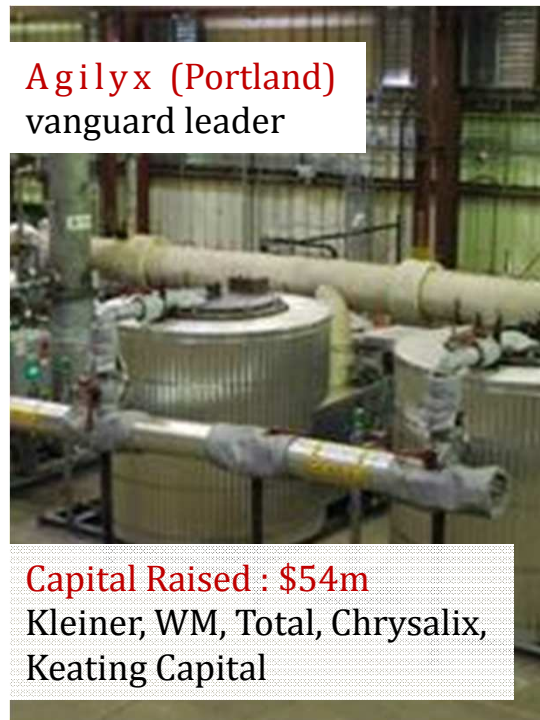


## Competition

	Process Type	Fuel Generated
Commercial	<p><b>cynar</b> PLASTICS TO FUEL</p> <p>Batch 20 TPD plants in operation in UK and Spain (retail =\$175/barrel)</p>	Diesel, kerosene, naptha
Commercialization	<p><b>agilyx</b></p> <p>Serial batch   continuous</p> <p><b>Plastic2Oil</b></p> <p>Process under development</p>	Synthetic crude  Diesel, #6 (heavy) oil
Demonstration	<p><b>VENTANA</b></p> <p>Continuous</p> <p><b>VADXX</b> PLASTIC TO ENERGY</p> <p>Continuous</p> <p><b>RES POLYFLOW</b> RENEWABLE ENERGY SOLUTIONS</p> <p>Process under development</p>	Diesel, naptha  Diesel, naptha, heavies

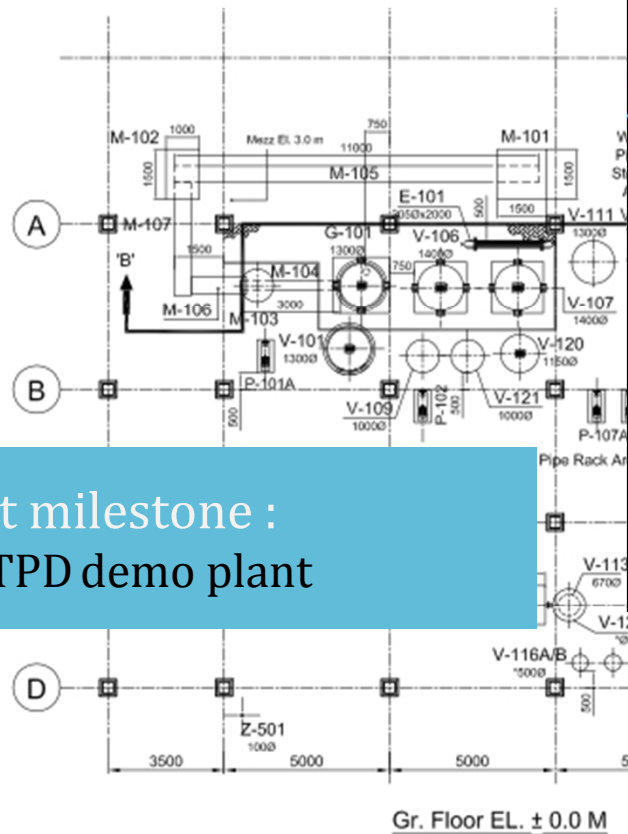


# Competitive Edge

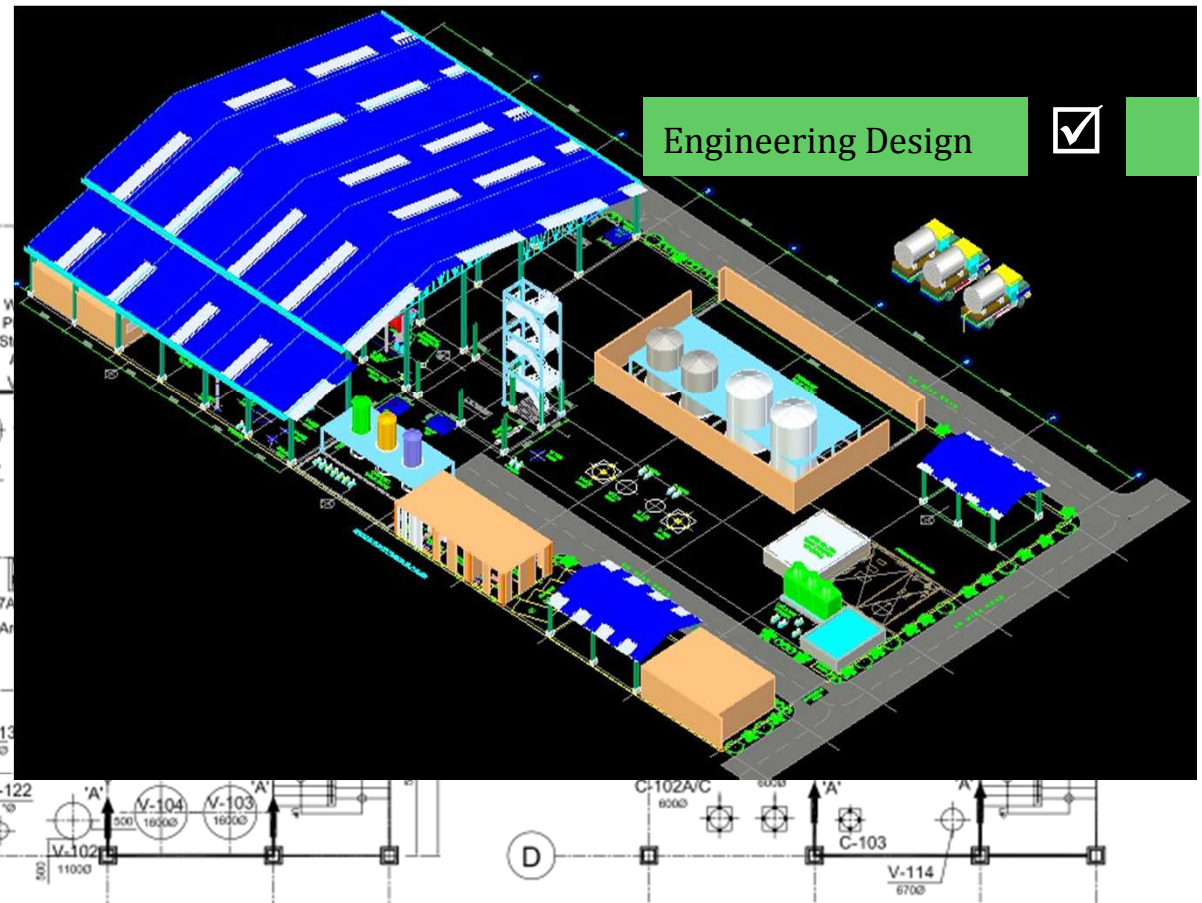


	Agilyx	Vadxx	Ventana
Product	Synthetic Crude	Naphtha and diesel blendstocks, 35% waxes	Naphtha and diesel blendstocks
Process	Batch mode (Gen 6 continuous)	Continuous	Continuous
Yield	6 barrel/ton	~5 barrel/ton	6 barrel/ton

# Road-to-market



Next milestone :  
25 TPD demo plant



# Road-to-market



## LETTER of INTENT

Ventana Cleantech Inc. (www.ventanacleantech.com) intends to establish a 50 TPD plastic to oil conversion

## Feedstock LoI

Highland Park, Michigan



### a. Resin acceptability:

Waste plastic resins acceptable for Ventana's process are low-grade polyethylene, polypropylene, and polystyrene which have a negative, nil or nominal economic value. The material may be in film or rigid form.

The technology may accept waste plastic, which consist of a commingled mix of above mentioned resins, and where the material may be coated with some residual dirt, food material, grit or glues.

### b. Non-acceptable resins:

The following plastic resins are NOT compatible with Ventana's technology:

- #1 PET
- #3 PVC or any halogenated resin, chlorinated polyethylene, chlorobutyl.
- Any thermoset or cross-linked polymers
- Any polyesters
- Any fluoropolymers, teflon or fluoroelastomers
- Nitrile rubber, nylon, hydrogenated nitrile rubber
- Engineering resins - PC, HIPS, ABS, PMMA etc.
- Any hazardous material.

### c. Pre-processing of waste plastics

Recycle Revolution shall be responsible for financing, establishing and operating a pre-processing line which shall segregate desirable resins (as provided by 1 a. above), remove other contamination and size-reduce the incoming waste plastics to the requirements of the technology.

The material delivered to Ventana shall be of proper make-up in terms of chemical composition, purity of stream, and size of particle, and shall comply with spec as given below. The pre-processed material delivered to Ventana:

- Shall comprise of only the following resins - #4 LDPE/LLDPE, #5 PP, #6 PS and (any) #2 HDPE.
- Shall be shredded to ~1".
- Shall be free from metal, foil, soda can scrap and be in free flowing and extrudable form.



March 5<sup>th</sup>, 2013

Martin N. Underwood  
Chief Operating Officer  
Indigo Energy Partners

Mr. Dan Maheu  
Principal  
Simply Energy Management, LLC  
121 Random Drive  
Hamilton, OH 45013

RE: Project Badger RFP

Dear Mr. Maheu:

Thank you for the opportunity to respond to your RFP regarding Project Badger. We are very interested in making the fuel to be produced as well as formulating an off-take agreement that will be mutually beneficial to all involved.

Below, please find my responses to the questions posed in the RFP:

#### • Product

- Indigo understands the plant will initially have only tanker truck loading capability. capability will not be necessary to move the volume(s) contemplated in the RFP.

## Fuel Offtake LoI

Indigo Energy (headquarters : Atlanta)



Sincerely,

Martin N. Underwood, Jr.  
Chief Operating Officer

## Team Ventana




Ventana's team is highly experienced with technology development, waste recycling and manufacturing industries.

Team members have over 200 years of combined experience with :

- Chemical
- Petroleum
- Mechanical
- Industrial
- Electrical
- Waste Recycling



- Ventana is incubated and supported by Milestone - India's leading automotive component manufacturing company.
- Milestone has 8 manufacturing plants in North India and employs over 1000 people.

	<b>Amit Tandon</b> Founder   CEO	Author of 5 patents in plastic-to-oil space – over 7 years experience with the sector.
	<b>Jonathan Michael</b> CFO (Consulting)	CFO expert with hardware companies in energy technology sectors. Ex CFO Solexel, Sonim, Solyndra and IXI.
	<b>Dr. Ram Iyer</b> Vice President: Engineering	Top-management executive, stalwart chemical engineer - over 30 years of experience with design, development, scaleup and commercialization of complex chemical plant and refinery units.







## Team Ventana

Ventana's team is highly experienced with technology development, waste recycling and manufacturing industries.

Team members have over 200 years of combined experience with :

- Chemical
- Petroleum
- Mechanical
- Industrial
- Electrical
- Waste Recycling






	<b>Eugene Jones</b> Director: Business Development	Serial entrepreneur. Over 30 years of experience with waste management and recycling in senior CxO level positions. Leads Ventana's business development initiatives in a consulting role.
	<b>Larry Buckle</b> Director: Supply Chain	Inventor and senior executive having 30 years of experience with engineering, development, operation and management of solid waste processing systems. Spearheads Ventana's supply chain efforts in a consulting role .
	<b>Biresh Thakur</b> Senior Engineering Manager	Accomplished executive with over 30 years of experience with industrial manufacturing and equipment design.
	<b>Rakesh Dutta</b> Engineering manager	Hands-on technocrat with over 35 years of experience with mechanical and electrical industry spanning energy, oil and polymers.

## Team Ventana



Ventana's efforts are additionally supported by an array of technical staff - including plant operators, welders, fitters, electricians and draftsmen.

The company also has a 24 hour in-house machining and fabrication shop giving it rapid turnaround time on process improvements.

	<b>Siddharth Mohan</b> Senior Process Engineer	<ul style="list-style-type: none"><li>• Chemical engineer overseeing Ventana's R&amp;D. Priorly with National Biofuel Energy Lab</li></ul>
	<b>Ankit Goyal</b> Process Engineer	Chemical engineer overseeing engineering design and operation of pilot plant.
	<b>Dr. Edward Beardsworth</b> Strategic Advisor	<ul style="list-style-type: none"><li>• Strategic advisor, physicist and cleantech specialist.</li><li>• Ex- Director at The Hub Lab and Jane Capital Partners.</li></ul>

# Macrotrends | Headwinds

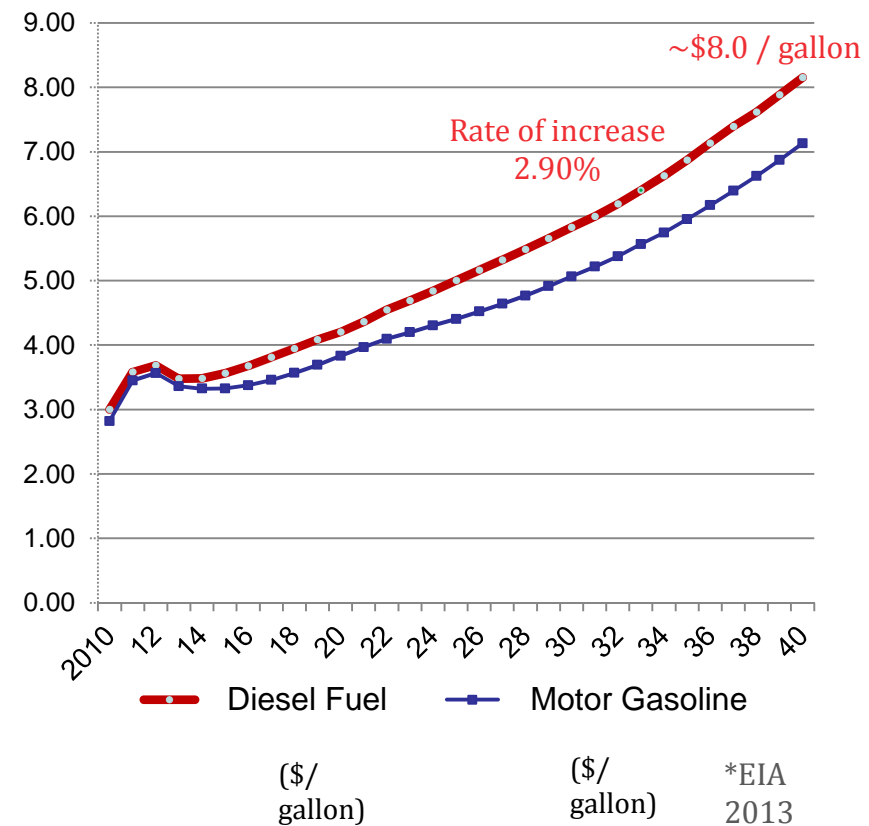


## Energy Prices \$/MMBtu\* - 2012

Fuel Type	\$/ MMBtu
Ethanol 85	\$ 35.1
Gasoline	\$ 30.4
Electricity	\$ 28.8
Distillate Fuel Oil	\$ 28.4
Propane	\$ 23.2
Jet Fuel	\$ 23.0
Residual Fuel Oil	\$ 20.4
Ventana's plastic-to-oil (cost of production)	\$ 10.9
Metallurgical Coal	\$ 7.3
Natural Gas	\$ 5.4

\*EIA 2012

## EIA : Distillate Price Forecast (2015-40 )



## Macrotrends | Headwinds

NEWS

International Recycling Group ... is looking to build a 1000 TPD plant to convert low-grade plastics to coal substitute fuel pellets for use in blast furnaces in steel production.

Resource Recycling (Oct 13)

Biffa (UK) has closed its 20,000 tons a year low-grade plastic recycling facility after finding an unacceptably high level of contamination in rigid plastic pots, tubs and trays sourced from MRFs.

letsrecycle.com (June 2013)

Under China's operation Green Fence ... more than 800,000 tons of recyclables or scrap have been rejected and Chinese customs officials have suspended the import licenses of 247 companies.

### Market price :

Coal : \$ 75 / ton of plastic

HyFuel: \$ 690 / ton of plastic

### Differentiator :

Ventana's technology accepts contaminated, dirty waste plastic



## Macrotrends | Headwinds

### US total market in numbers

Waste plastics

**62,000,000 tons pa**

No of plastic to fuel  
facilities (50 TPD)

**2000+**

Fuel generated

**8.5 bn gallons pa**

Sufficient to fuel **12.0m cars**

Revenue **\$23.0 bn pa**

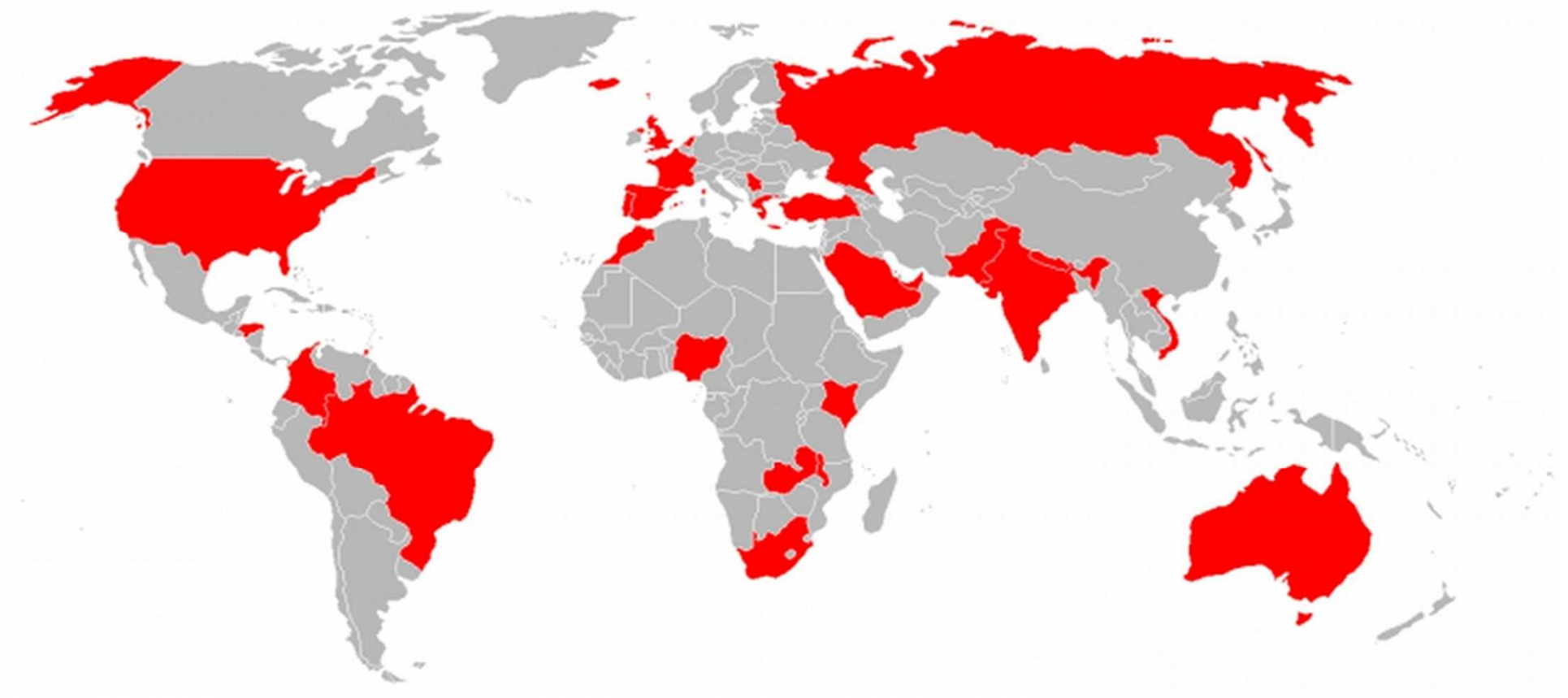
No of jobs created

**50,000+**

Landfill charges avoided

**\$2.0 bn pa**

# Macrotrends | Headwinds



100 + inbound inquiries  
35 countries

A photograph of a modern, single-story building with a bright yellow facade and a white roof. The building features large windows and a glass entrance. A sign on the roof displays the Ventana Cleantech logo, which consists of a green leaf-like icon and the text 'VENTANA CLEANTECH'. The building is surrounded by greenery, including trees and potted plants along the sidewalk. The sky is blue with some clouds.

## Contact

Amit Tandon, CEO  
amit.tandon@ventanacleantech.com  
Tel : +1-650-918-4590  
[www.ventanacleantech.com](http://www.ventanacleantech.com)

830, Andromeda Lane  
Foster City, CA 94404

**R&D Centre**  
KK-16, HSIDC Estate,  
Kalka, Haryana. India 13302  
Dr. Ram Iyer, VP (Engineering)  
ram.iyer@ventanacleantech.com

Ventana's R&D centre (India)