

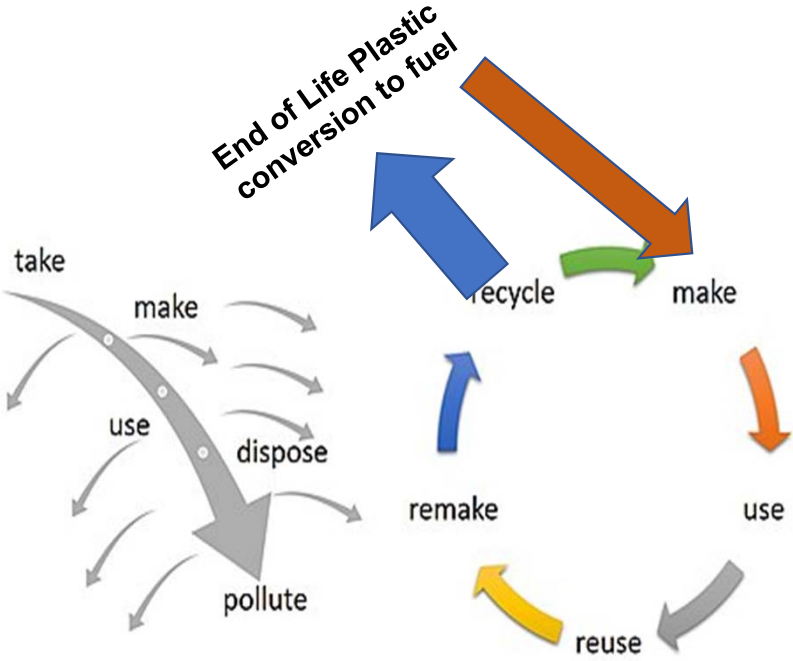
ICPE – PWL

**POLYCRACK – TOOL FOR PLASTICS
WASTE MANAGEMENT & RECYCLING
For
A Circular Economy**

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POLYCRACK WORLDWIDE LIMITED**

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Polycrack – Tool for Circular Economy



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Reforming co - mingled & contaminated waste plastics into Fuel



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The problem

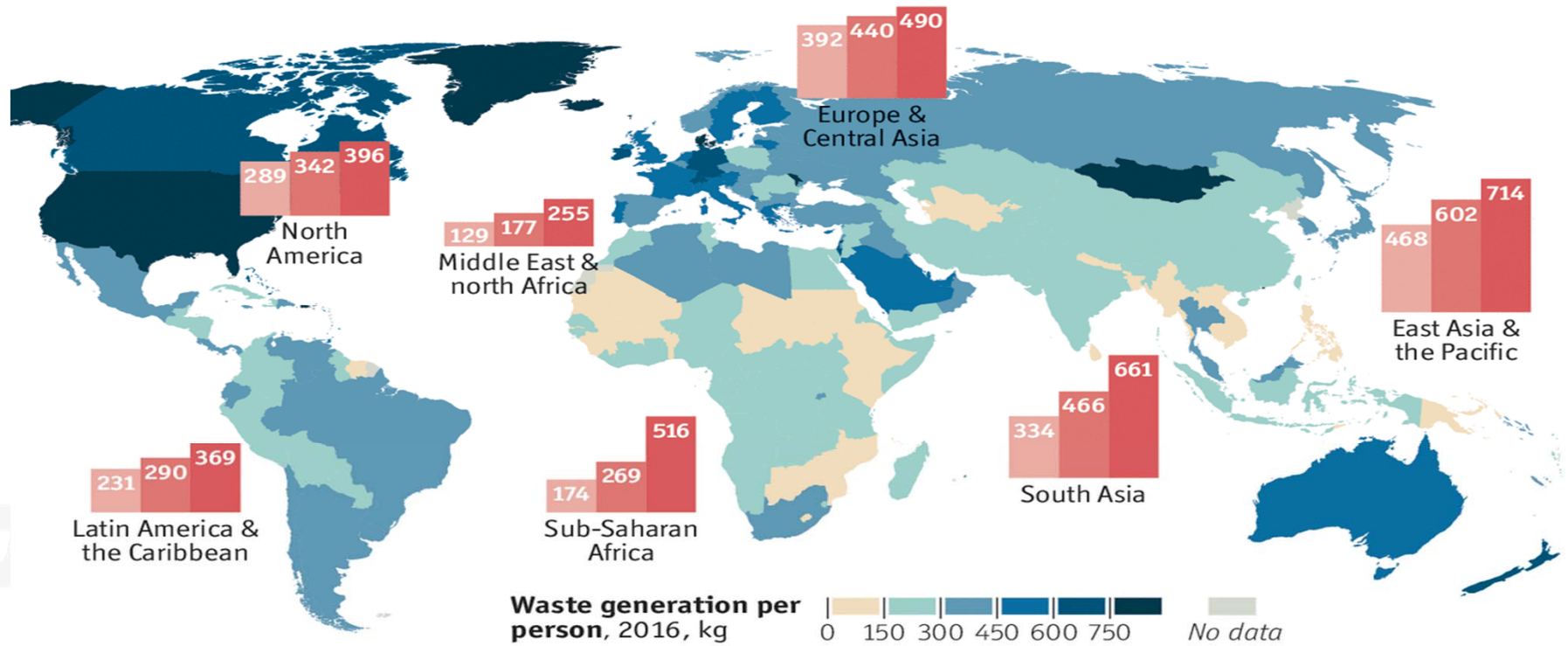
Throwaway world

Regional waste generation, tonnes m

2016

2030 forecast

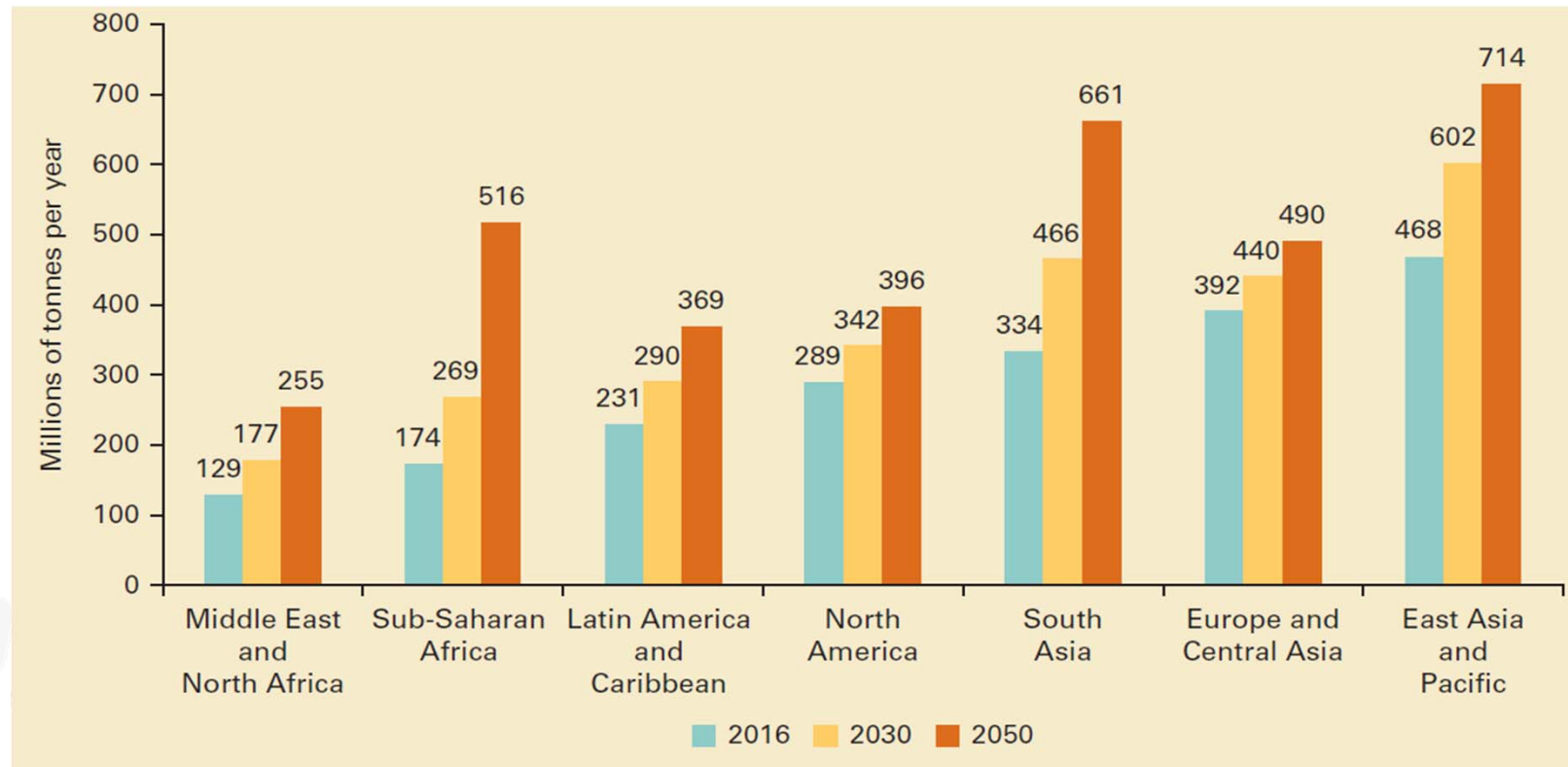
2050 forecast



Source: World Bank

The Economist

Projected generation of Municipal Solid Waste worldwide from 2016 to 2050 (millions of tonnes)



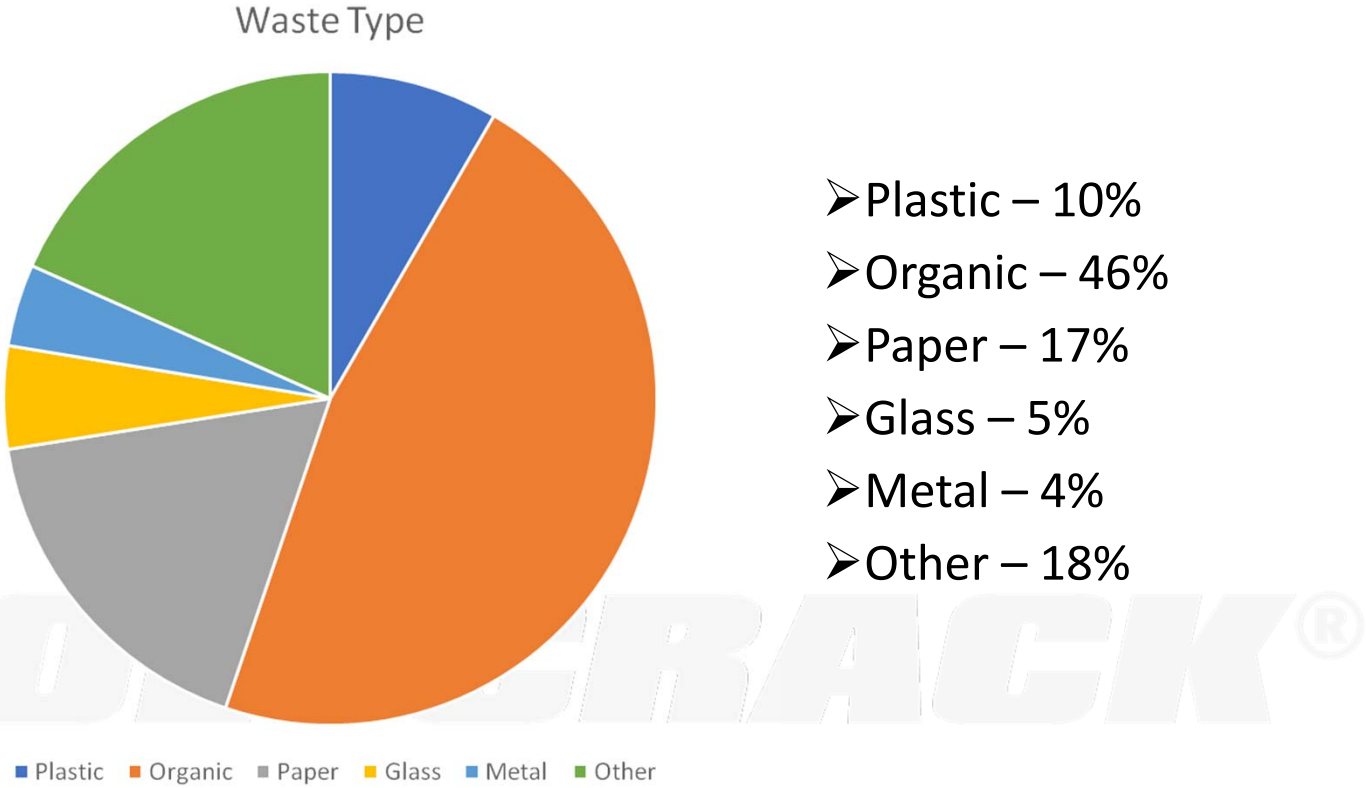
In Numbers - Global

- 1.3 billion tonnes of MSW generated globally per annum
- Projected to rise to 2.2 billion by 2025
- Under current trends, could increase by a further 70% by 2050
- MSW collection rates vary from 41% to 98%
- 55% of MSW globally is either disposed of in open dumps or landfill
- 50% (and growing) of global population live in cities; increased waste, less space for landfill, more environmental concerns and restrictions
- On average, 10% of MSW is plastic (8-12% range)
- Estimated 12 trillion tonnes of plastic in landfills and / or the environment by 2050
- Up to 500 years for plastic to decompose in landfills
- 300 million tonnes of plastic waste generated annually
- Of this, 10 million tonnes per year ends up in our oceans

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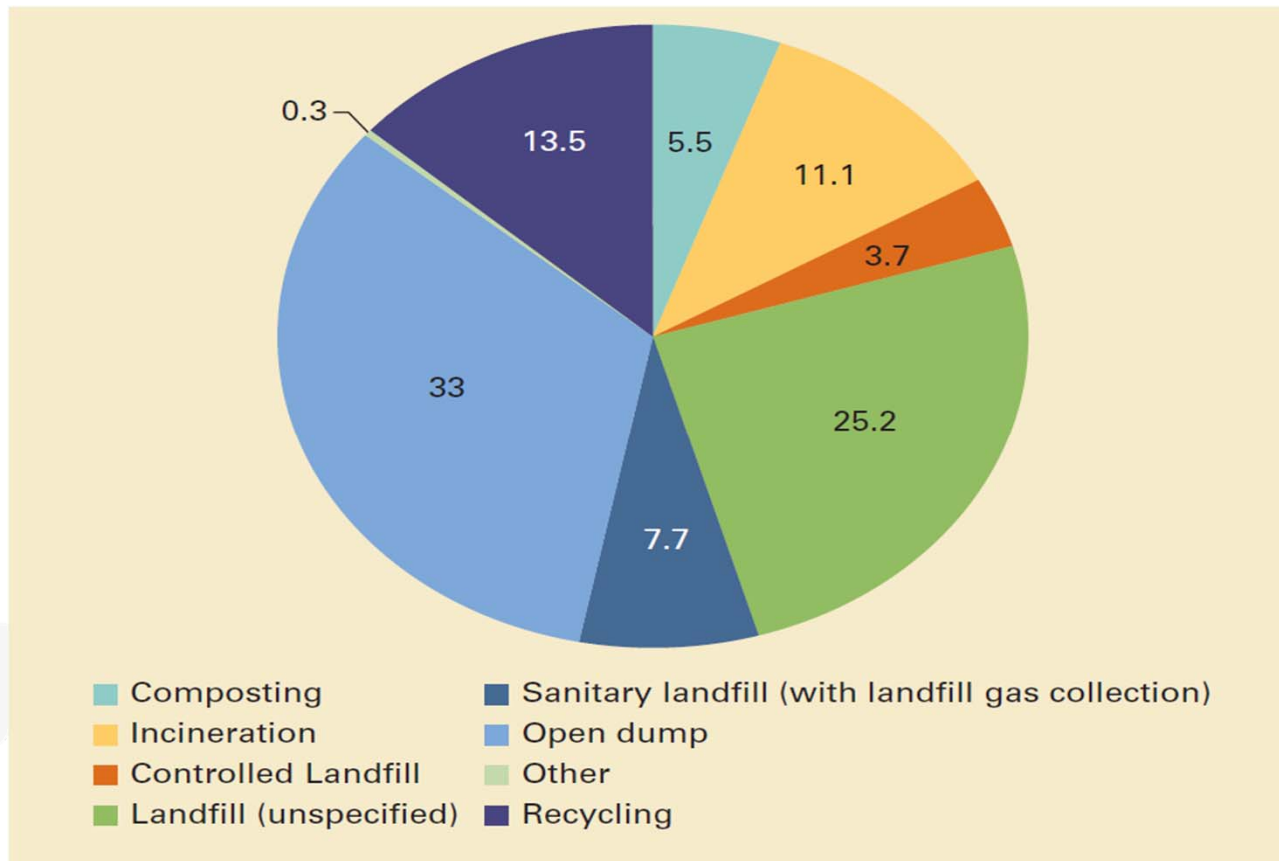
Composition of MSW – Global Averages



- Plastic – 10%
- Organic – 46%
- Paper – 17%
- Glass – 5%
- Metal – 4%
- Other – 18%

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Distribution of municipal solid waste treatment and disposal worldwide in 2016, by method



Problems associated with current methods of MSW disposal

- Zero landfill targets
- Existing landfills contaminated and land unusable
- Greenhouse Gas emissions
- Cost and environmental damage caused by transportation
- Waste not processed as created
- Potential health hazards and spread of disease
- Small percentage only recycled / reformed into valuable outputs
- High cost of many current methods
- Require pre-sorting of waste and not moisture tolerant
- No uniform waste strategies
- Waste accumulating and ending up in our oceans, on our beaches and in our countryside



Global Market Size

\$560 Billion

- Global Waste Management

\$139 Billion

- Global Plastic Waste Management



The Solution

Polycrack

Process today, leave nothing for tomorrow

The world's first patented heterogeneous catalytic process for reforming of co – mingled plastic & rubber waste into hydrocarbon liquid fuels, gas, carbon & water, without the need of segregation or drying, on the same day as generated.

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Solution

Polycrack is able to process the following, without segregation, thereby saving time and money



Plastic Waste



Organic Waste



Vehicle Tyres



Vehicle Plastic Waste



MSW



Electronic Waste



Sludge



Fats, Oil and Grease

Technology Recognition and Awards

Technology Assessed / Recognised



Commercialization supported



Key Awards

Lockheed-Martin Innovation

DST-FICCI Award winner

Best Innovation Gold Medal 2007

Nominated for Tech-Museum Awards 2008

Frost & Sullivan – Global Innovation and Leadership Award -2011

IGCW-2011 – Best Green Chemistry Innovation Award

Patents

USA - Granted

South Africa - Granted

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What is Polycrack?

World's first patented heterogeneous catalytic process for reforming of contaminated and co – mingled waste containing hydrogen and carbon into hydrocarbon liquid fuels, hydrocarbon gas, carbon & water, without the need of segregation or drying, on the same day as generated.

- Waste Plastics
- Rubber Tyres
- Municipal Solid Waste
- Petroleum Industry Refining Waste
- Packaging
- E-Waste
- Agro Plastics
- Organic Waste
- Fats & Grease
- Frac Sludge

Polycrack Process /
Heterogeneous Catalytic
Conversion

- Light Diesel Oil
- Carbon
- Natural Gas
- Water

Process Today – Leave nothing for tomorrow!

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Polycrack - Feedstocks

- Ocean plastics – co – mingled with other sea waste
- Beach plastics – contaminated with sand and salt water
- Multi layer plastics – packaging plastics with residue, contamination and moisture
- MSW Plastics – contaminated with organic and other waste
- Mix plastics – co – mingled various types of plastics without segregation
- Plastics with metal
- Plastics with glass
- E – waste plastics
- Automobile plastics
- Rubber in any form – Tires (braided/ non – Braided)
- Remaining RDF post conversion of organic waste
- Tolerance of PET up to 10%
- Tolerance of PVC – up to 5%

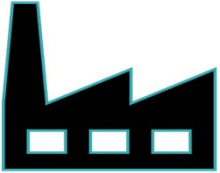
*Excess contamination of any type may require pre processing/ washing like removing inert/ sand etc.

Why use Polycrack?

- Pre-segregation can be avoided.
- Drying of plastics and rubber with contamination not required.
- Process the solid waste on the same day as it generates. Leave nothing for tomorrow.
- Plant uses the energy it generates making it self sustainable with minimal external power requirement. Thereby saving money on electricity.
- Plant requires minimal land. Approximately 1 acre per 50 TPD plant. Thereby releasing the burden of land requirement.
- Polycrack can also be used for mining old landfills and recover land for public use.
- Environmentally friendly process.
- Requires minimum water
- Modular system that can be upgraded based on waste generation.
- Most effective in decentralised waste management.
- Entire unit is enclosed hence does not generate dust or smoke pollution.
- Automated system requires minimum manpower
- Economic cost of operation
- Helps in achieving “ZERO WASTE AT LANDFILL”
- Polycrack - Smart solution for a Smart City!

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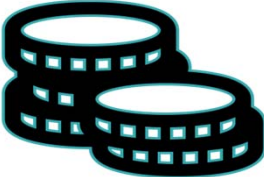
Polycrack Benefits



Distributed network of small modular units



Waste diverted from landfill



Reduce waste disposal costs



Reduce transportation costs



Produce low-sulfur diesel fuel at competitive price



Reduce Environmental Impact

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Environmental Benefits

- Non-Polluting
- No Dioxins and Furans
- Low PM count
- Low Nitrogen Oxide & Sulphur Oxide emissions
- Low Toxic Metals
- All readings & emissions below permissible limits worldwide
- Environmentally Friendly



Polycrack System Benefits

- No pre-segregation of waste required
- High tolerance to moisture – no pre-drying
- Modular system – can match plant size to waste volumes
- Plant uses energy generated – minimal external power requirement
- Can process waste where generated and when created – limit haulage costs
- Can be used to mine old landfill sites – reclaim land for use
- Can extract oil from shale
- Easy to use – minimal manpower requirement

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Solves waste problems in a cost-effective way with a revenue generating model

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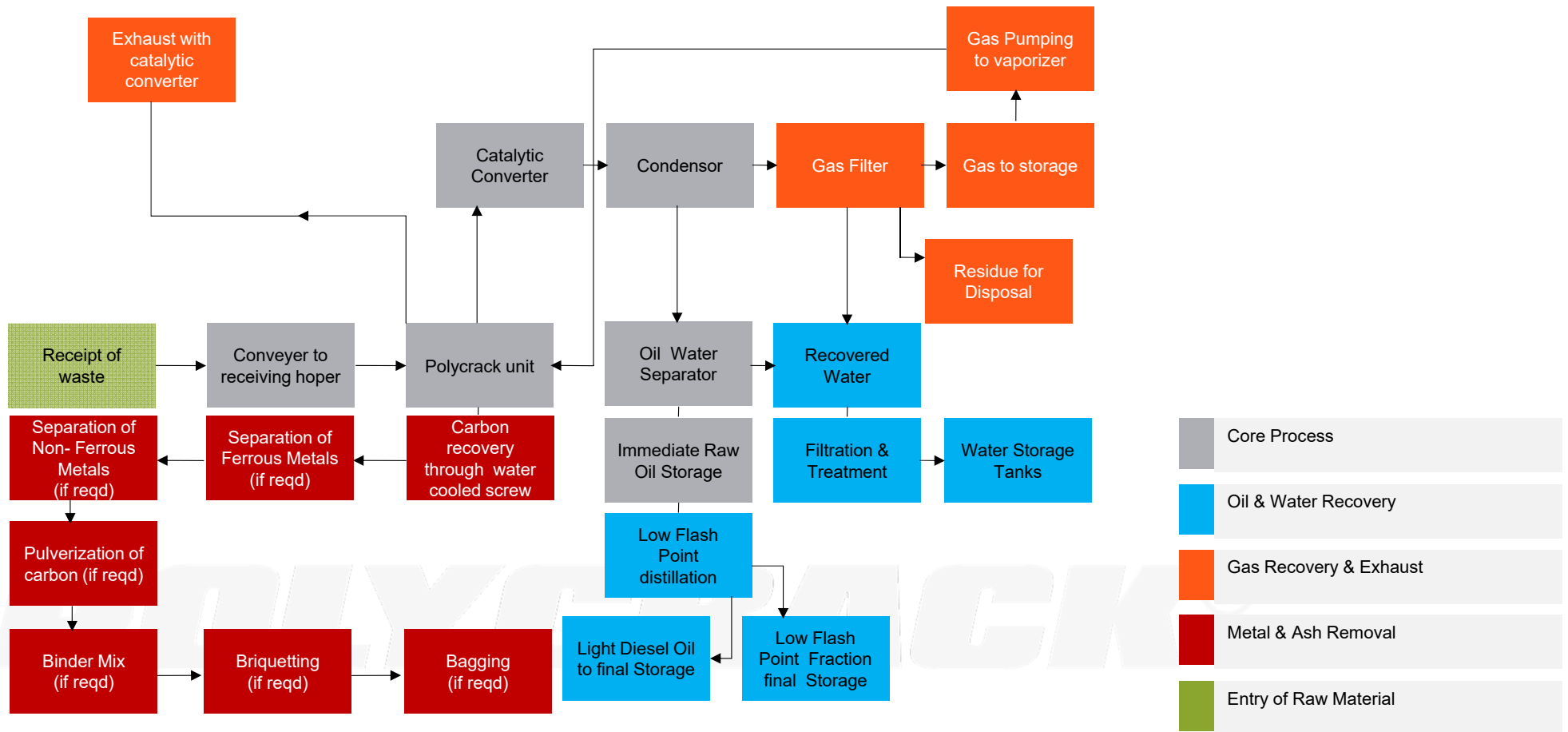
Polycrack – Comparison with other Technologies

Technology	Heat Rate	Input	Output	Emission
Polycrack	450°C	Unsegregated Mixed Waste	Oil, Gas, Activated Carbon & Moisture	Low
Pyrolysis	600°C	Dry Segregated Waste	Oil, Gas, & Charcoal	High
Incineration	850°C	Unsegregated Mixed Waste	Ash, Fly ash, and Flue Gas	High
Gasification	1,500°C	Segregated Mixed Waste	Syngas	Medium
Plasma Arc Gasification	2,000°C	Segregated Mixed Waste	Syngas	Medium
Refuse Derived Fuel	1,200°C	Plastics & Biodegradable waste	Fuel	Low
Biogas	750°C	Organic Waste	Gas	Low
Thermal depolymerization	500°C	Plastic & Organic Waste	Oil	Medium

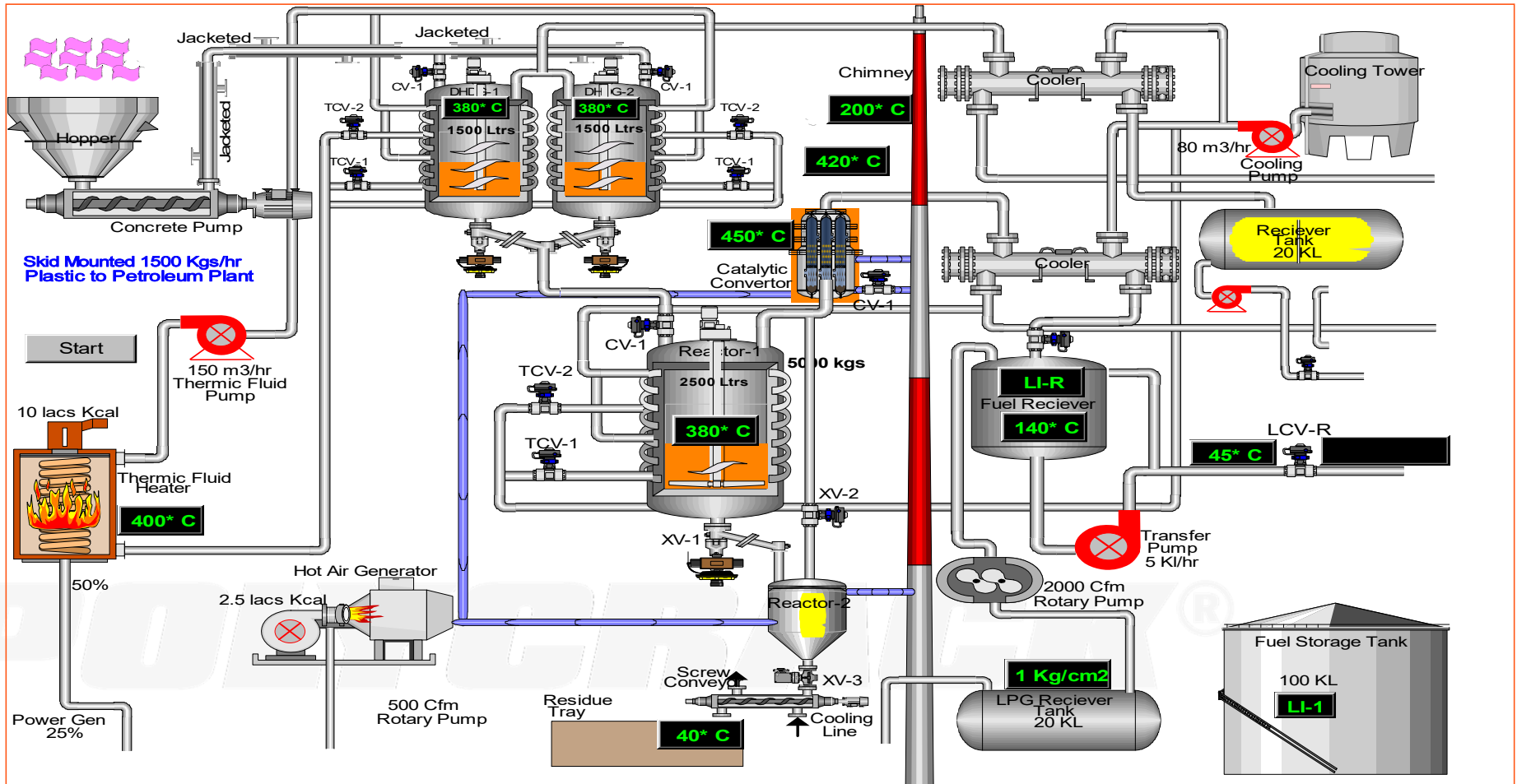
Polycrack Input – Output Data

Sr. No.	Input	Oil	Gas	Carbon	Moisture	Scrap
1	PET	0%	35%	35%	30%	0%
2	HDPE	80%	10%	10%	0%	0%
3	LDPE	80%	12%	8%	0%	0%
4	PVC	35%	20%	45%	0%	0%
5	Nylon 6	20%	35%	45%	0%	0%
6	PP	75%	10%	15%	0%	0%
7	Auto Plastic	55%	15%	30%	0%	0%
8	MSW	7%	22%	45%	26%	0%
9	Tyres	45%	15%	40%	0%	0%
10	Electronic Waste (Plastics)	50%	15%	35%	0%	0%

Polycrack Technology : Process flow chart



Polycrack Process Flow Diagram



Polycrack System- Input yield details

- Preferred feedstock



Mixed Plastic



MSW



Used Tyres



Fat, Oil & Grease



E Waste



Sludge

Conversion Ratio and its Yield

Types of Plastic	Yields
HDPE, LDPE, PP	1 k.g. to 1.1 litres
Other Plastics	800 ml per k.g.
PVC	300 ml per k.g.
PET	Not Applicable

Fuel Quality Comparison

Specifications	Regular Diesel Fuel	Polycrack Fuel
Colour Visual	Orange	Pale Yellow
Specific Gravity 28 deg C	0.81 – 0.85	0.81 – 0.85
Gross Calorific value	11, 210	11, 260
Net Calorific value	10, 460	10, 500
API gravity	40 - 45	40 - 45
Sulphur content	0.1	<0.002
Flash Point	35	*35 – 65

*Flash point can be adjusted as per local norms to produce oil or LDO as the case may be.

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Polycrack Technology: Output

Process parameters

Parameter	Polycrack
Plastic	All plastics including Polyethylene Polyproplene, Polystyrene, PVC, PVA, Industrial plastics, automobile fluff, biomedical waste etc.
Temperature	190 – 350 deg c
Pressure	Atmospheric/vacuum
Nitrogen Puring	Not required
Yield	Input dependent
Example yield of fuel from HDPE	1.1 liter per kg of plastic
Fuel Quality	Excellent meets standards
Catalyst	Consumable
Residue from process	Free flowing carbon powder

Output Yield Data

Product Yield	Quantity (wt%)
Gas	8-12%
Liquid Hydrocarbons	60-80%
Coke Residue	10-12%

Analysis of Output

Carbon No.	Corresponds to	Quantity (wt%)
Up to C10	Gasoline	34.0
C10 to C13	Kerosene	27.0
C13 to C20	Diesel	23.0
C20 and Above	Fuel Oil	16.0

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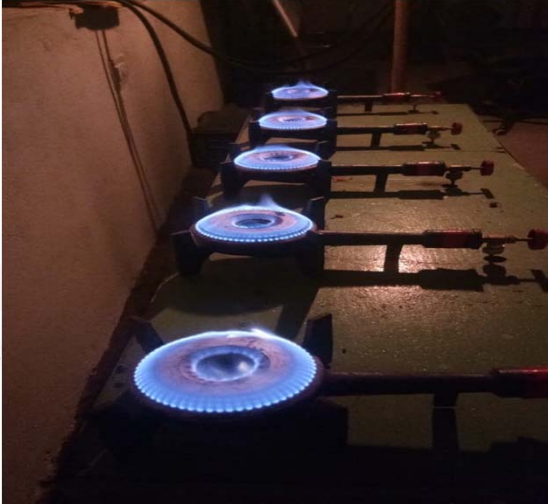
Installed Plant – New Moti Baug – New Delhi



Successfully operating since May 2014 and achieved the status of zero discharge premise.

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Polycrack Plant at East Coast Railway Workshop, Bhubaneswar



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Polycrack Plant at Hindalco - Sambalpur



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Upcoming Polycrack Site at Amman, Jordan



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Polycrack – Upcoming site at Sunoco Refinery-USA

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Polycrack Unit - Slovenia



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Visitors to New Moti Baug Plant



Amber Rudd (UK) & Ms Meenakshi Lekhi



Japan



Ambassador of Egypt



Ambassador of Tunisia

Visitors -



University of Minnesota



Students from Africa



Delegation from Italy



Australian Delegation

Thank you

For more information write to tony@polycrack.com

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