

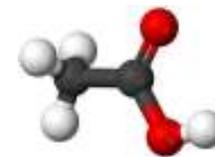
# MMT Waste to Electricity Presentation



Waste today is becoming the fuel of tomorrow.

Here we look at the key steps from the waste being collected, through to the electricity being produced from your garbage.

Our company accepts no liability for the content of this document, or for the consequences of any actions taken on the basis of the information provided in this example of converting waste to energy, unless that information is subsequently confirmed in writing following a detailed analysis make up of the waste. If you are not the intended recipient of this presentation, you are notified that disclosing, copying, distributing or taking any action in reliance on the contents of this information is strictly prohibited



Syn-Gas Molecule.

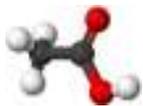
## The Problem

For many years, waste has been sent to landfill without a thought of what it is doing to the world, poisoning the air and seas all around our islands and mainland. The people have finally woken up and the governments of the world are putting into place stringent controls to reduce global emissions and to reduce the human carbon footprint.



**Waste will be diverted from Landfill to the Processing Plant.**

**Legislation will outlaw landfill of MSW in the near future where authorities will be fined huge sums of money for not taking steps to manage their waste.**

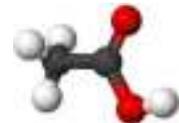
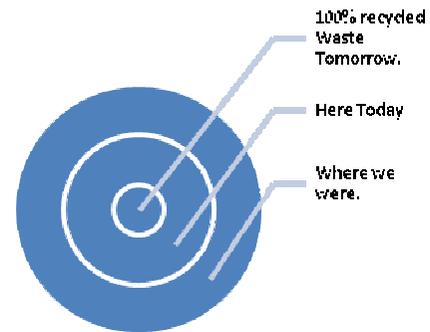


# WASTE SORTING AND RECYCLING

TM



The waste is redirected from the landfill to sorting areas where the waste is sorted, removing rubble. Glass, plastics, paper and all other valuable commodities that can be recycled are separated for reuse.





## The Manufacture of RDF from Sorted Shredded MSW.



Here sorted waste is shredded and dried.

RDF is then produced in the form of baled or pelletised fuel for processing into energy.

**One ton of MSW will produce ½ ton of RDF which will then be processed into clean energy.**



## Marston Moor Technologies Undertaking.

The options available following the pre sorting of the waste will be the removal of all ferrous and non ferrous materials, the non ferrous materials are removed sold or recycled.

Plastics are a high calorific material and can be mixed into the RDF to boost the energy levels of the waste to undergo a number of separate routes to energy. Some of the options available today are:-

Gassification: Pyrolysis: or a combination of both,

MSW – RDF – Syngas – HPSB – Electricity.

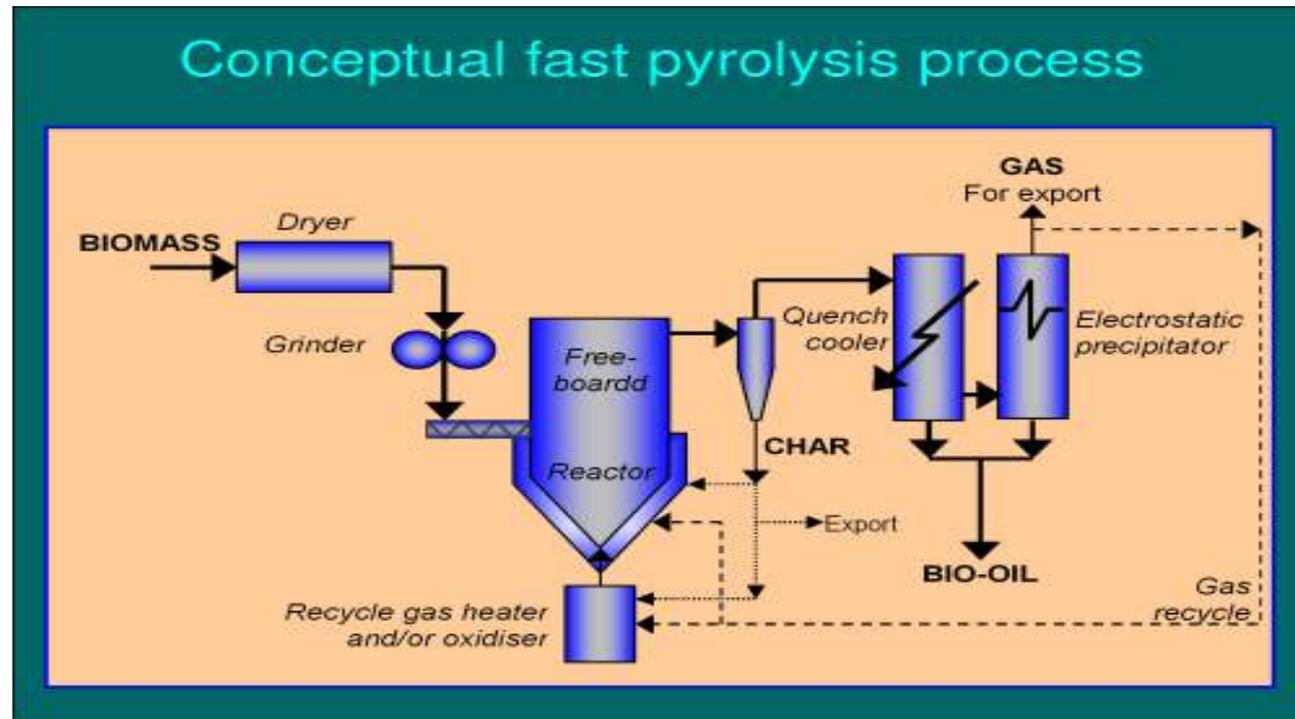
MSW- RDF-Pyrolysis-Syngas- Gasturbine-CHP.

Sorted HV Plastics – Pyrolysis- Synthetic fuels.

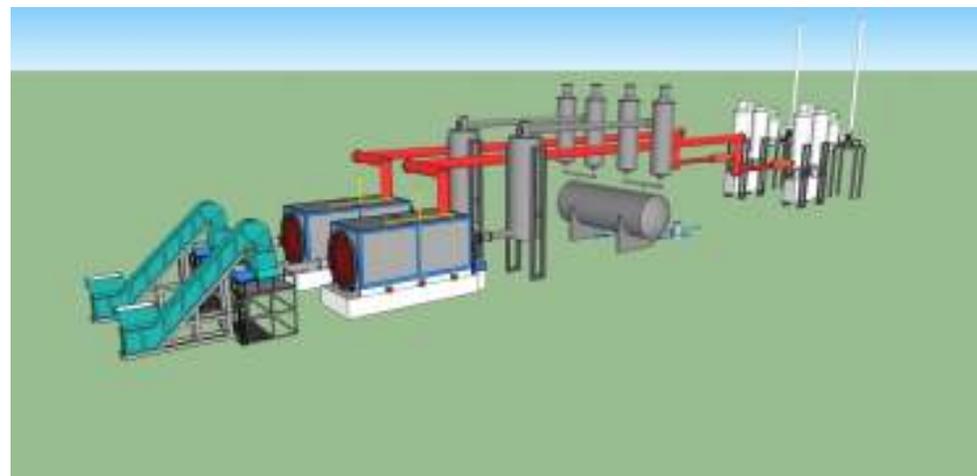
All these technologies have their place in the waste to energy business and each one will take its unique place to assist the country, in removing the burden of waste disposal. WORLDWIDE.

# Pyrolysis Schematic to Explain the Steps .

The development of Pyrolysis has taken huge steps in its development to make it possible to process carbonaceous materials into a gas, electricity or liquid fuel. The pyrolysis system takes seconds to do what evolution took hundreds of years to do. The residue from this process is Carbon, which then returns to the ground or can be put back into the life chain.



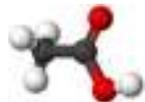
Typical process for the production of Syngas



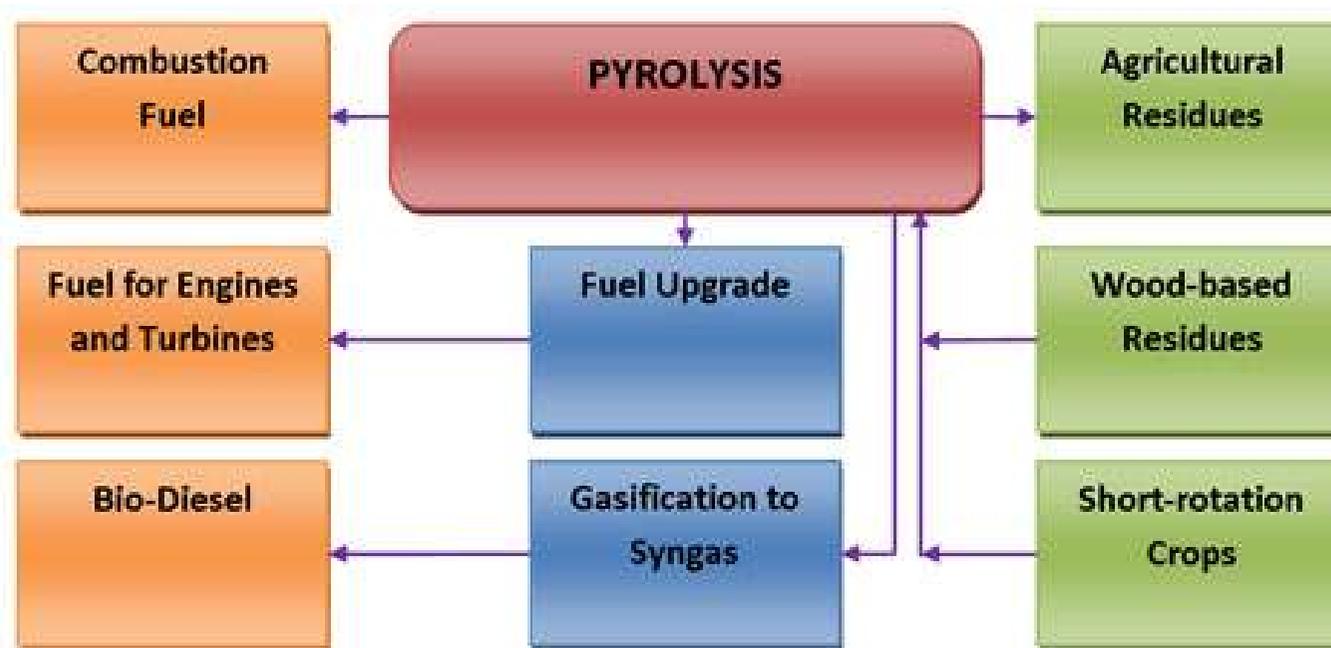
# Pyrolysis System Schematic



This schematic shows the ability for a compact system, from waste sorting of feedstock, through to pyrolysis and energy production.



## Pyrolysis Options.



The pyrolysis process is the hub of all systems, whereby the output can be one of many, be it a high quality hydrogen based gas, (Syngas) or a liquid fuel for use in the final energy production process.

**Here we take the high quality Syngas and reform it into electricity using the most efficient system possible today.**



## The Energy of a High Quality Syngas.



The energy within the Syngas from pyrolysis is typically measured in the value of its ability to produce heat, which is measured in units of a MJ

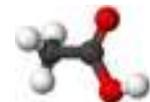
### Take an example Calculation.

Processing 0.75 tons of RDF in 1 hour, will produce between 11,220-14,580 MJ  
Taking the higher figure (14,580 Mj), the power produced from it will be:-

$14,580 \text{ MJ/h} \text{ divided by } 3600 = 4.05 \text{ MJ/s} = 4.05 \text{ MW}$   
(1MJ/s is the same as 1MW)

To convert this heat energy per second of 4.05MW to electricity we need to take into account generator thermal efficiency. So our calculation looks like this:=

If you take a Gas Gen-Set at a thermal efficiency of 36% we calculate:-  
Electrical power output to be  $4.05/100 \times 36 = \mathbf{1.458 \text{ MW}}$ .



# Syngas to Electricity using a CC Turbine.



To operate a Solar T60 Gas Turbine generator at full load requires a power input of 18MJ/s.  
If 0.75 tonne of RDF is processed in 1 hour by one pyrolysis unit, as in our previous calculation, the power output is 4.05MW thermal. 5 pyrolysis modules, giving a higher gas output, will produce 20.25 MW thermal. (18MW with 2MW to pass over to the CC), thereby:

Enabling the T60 Turbine to operate at 100 % full load condition generating  
**5.67MWe gross at NTA.**

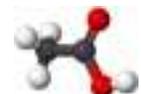
If we take a combined Gas Turbine in conjunction with a Steam Turbine, we expect an additional electrical output of 2 MW in addition to the same input to the Gas Turbine.

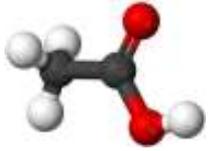
**Equating to 7.65 MWe Gross.**

The typical efficiency of a combined cycle gas turbine system will be 45%.

The efficiency of a Gas Engine would be seen to have a thermal e

A fuel cell today would be upwards of 50%.





## Typical Power Station •



180 tons of black bag MSW per day, will produce 90 tons of RDF per day. Therefore using 5 modules and 90 tons of RDF a day, a combined cycle Gas Turbine in conjunction with a Steam Turbine, will provide 5.67MW from the initial turbine output. As a bonus we get an additional electrical output of 2 MW for the same input to the Gas Turbine but through the use of the exhaust heat and carry over from the initial process.

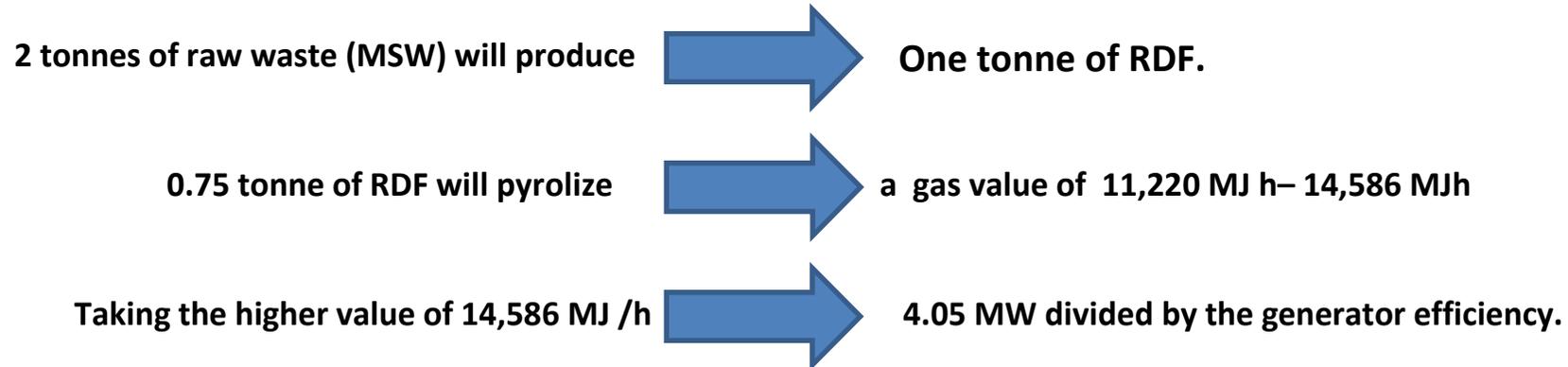
**Equating to 7.67 MW Gross.**

**Just 90 tons of RDF/day will provide the electricity for 6,500 homes.**

***“Green Electricity from rubbish”.***



# In Summary.



(converting Gas to Electricity using the CC Turbine Technology @45%)

**One Pyrolysis module produces 1.822 MW gross @ 45% efficiency.**

**Five modules will produce 9.114 MW electrical.**

**So 90 tonnes of RDF/day will equate to 9.114 MW or 218.736 MWh/day.**

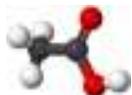
Returning a cash-flow of electrical sales + Rocs' = £110/MWh

**£24,060.96 a day.**

*Or*

**£8,421,336.00 a year.**

EXIT. 





# Project Evaluation Criteria.

- A contracted waste stream for 25 years.
- Building land set aside to building of the processing plant.
- A power purchase agreement available for 25 years for the electricity generated.
- Access to planning permits and building control acceptance.

Providing the framework criteria listed above can either be met or is in place, then please speak to one of the team, who will lodge your interest and allocate time to assist you in bringing about the best solution for your waste needs.

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