

QM Recycled Energy mission statement, background and technical information



We can change the future... so this doesn't become inevitable



QMRE's mission is to turn plastic waste into oil and then back to new and renewable plastic.

The profitable, environmental solution to end-of-life plastics



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The Problem

Rivers choked, seas contaminated, landfill sites brimming over, furnaces pumping ever more noxious materials into the atmosphere; it is clear that something needs to be done to stem the tide of plastic waste pollution.



The British Plastics Federation (BPF) estimates that 46% of the UK's plastic waste is incinerated, 19% exported and 17% goes to landfill.

Government figures for 2021 suggested that the UK produces over 2.5 million tonnes of plastic packaging every year. However, analysis by RECOUP - an industry body established to promote recycling - indicates that the UK recycles just 230,000 tonnes of household plastic packaging waste each year. This means that less than 10% of household plastic packaging waste is recycled in the UK.

As the BBC's Blue Planet programme and subsequent media articles have shown, much of that plastic waste finds its way into the environment. Microplastics are found in the air, soil, oceans and waterways all the way up through the food-chain to humans.

Clearly, existing measures to deal with plastic waste have failed. A new solution is required. - which QMRE is about to deploy.

Plastic is produced from fossil fuels - oil, gas and plant materials. These are refined into ethane and propane. These are treated with heat in a process called cracking which turns them into ethylene and propylene. These materials are combined together to create different polymers - or plastics.

It is possible to reverse this process - turn the plastic waste back into oil and then, with additional processing, make new and renewable plastic time and again.

This is QMRE's new solution to the problem of plastic waste pollution.

The Solution

QMRE is introducing a network of Vixla plastic waste-2-oil systems in the UK and Republic of Ireland. It is envisaged that the network will encompass both QMRE-owned sites and customer sites.

The technology behind the system is based on pyrolysis -the thermal decomposition of materials at high temperatures. Essentially, a chemical reaction takes place in the absence of oxygen breaking down the hydrocarbon chains - the building blocks that make plastic - in a very efficient way, allowing those building blocks to be reconstructed time and again.

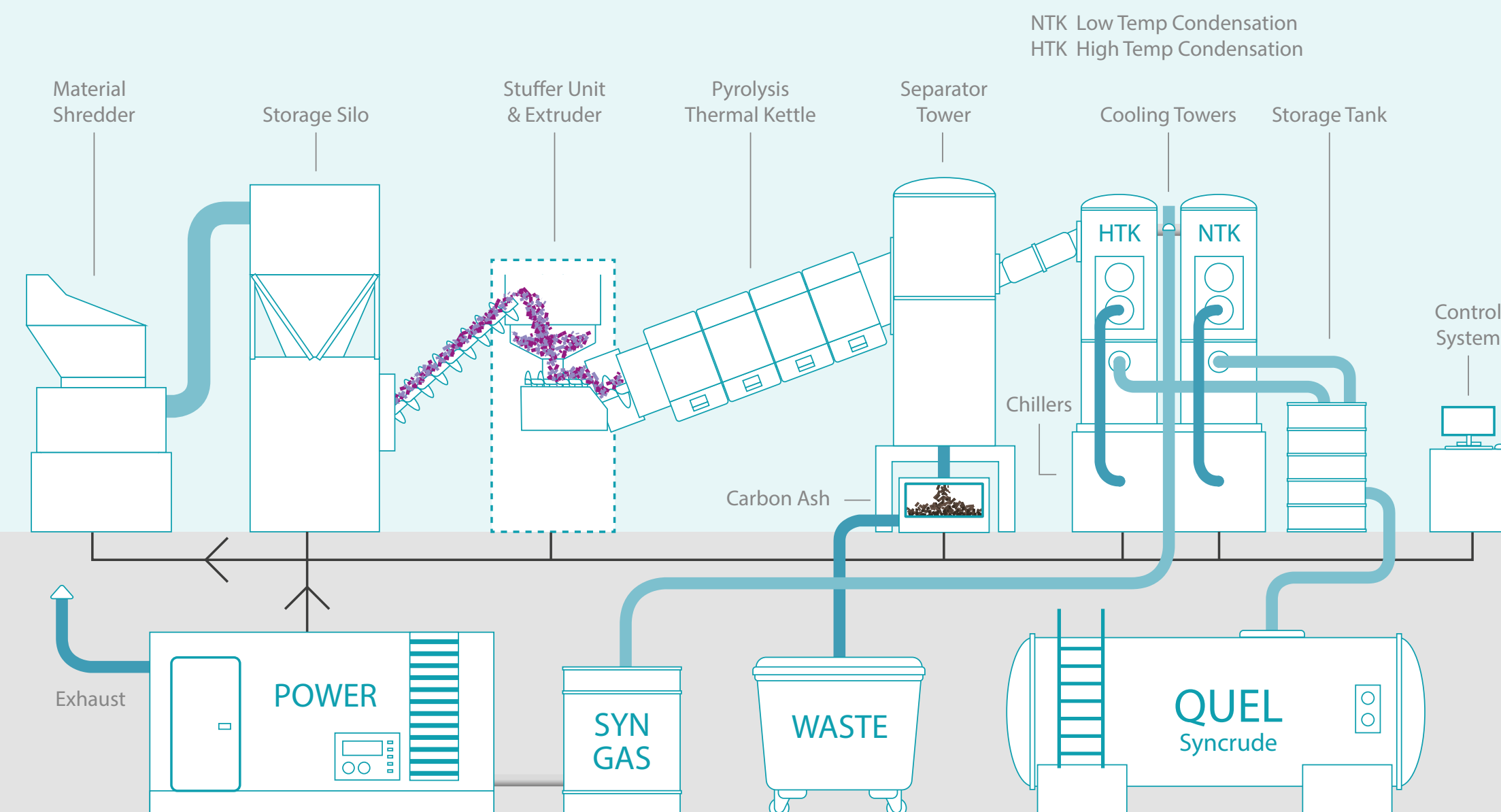
QMRE has enhanced the pyrolysis operation by various developments to provide a more efficient and effective solution which is in essence a thermolysis-led process.

A typical QMRE Vixla system will convert 5,000kg of plastic waste into 5,000 litres of QUEL (pyro -oil)- 85% of the total, 12% gas, used to heat the process and 3% carbon ash, used in construction products. The system- the P5000 - operates for 330 days of the year. The P5000 will allow 550-600,000 tonnes of plastic waste to be recycled per annum, which is 10-12% of the 2021 plastic waste figures. (Source: ORA -Original Recycling Association, 2022).

The QUEL will be sold to plastic cracking companies who will use it to make new and renewable plastic in lieu of using feedstocks from fossil fuels.

The technology behind the solution

Plastic is cleaned and size-reduced and fed into what is, in effect, a thermal kettle, which is heated to around 450 degrees. At this heat level the pyrolysis reaction occurs - breaking down the long plastic hydrocarbon chains - producing gas and oil which enter a separator. The liquid element enters the condenser and cools as liquid oil. The gas enters the purification system and is burned to provide power for the plant. The synthetic oil created is sealed from the atmosphere and stored in tanks. The element of carbon ash created as a result of the process is packaged.



- Typical users of this syncrude oil will be plastic cracking factories that produce recycled plastic.
- Currently, the system is semi-self-powered, electronic and continuous. The only similarity with previous generations is the separation of gases in an inert atmosphere, as fire is not used in the heating process, hence low CO₂ emissions. Historically, batch pyrolysis consumed more energy than could be saved by converting the product. QMRE generates 11 Kwh of energy from 1 kg of plastic waste, only combusting 1 Kwh power to run the system, leaving 10 Kwh to be converted back into pyro-oil for further reprocessing.
- Effectively, we break down the hydrocarbon chains - the building blocks that make plastic - in a very efficient way, allowing those building blocks to be reconstructed time and again. C1-C4 non-combustible gases flow to the GenSet, C5-C14 is the Naptha fraction used for processing into new plastic while C15 - C30 elements are the heavy oil fraction commonly used in combustion engines. There is no limit to the number of times the plastic can go through this process.
- The Vixla systems are installed in 40 -foot containers affording a compact, modular system that can be conveniently taken to where the plastic waste problem exists.

QMRE Technology - Specifics

QMRE Vixla (series) plant & equipment – technology guide

FEATURE	EXPLANATION	FEATURE	EXPLANATION
Pyrolysis proven technology	Pyrolysis – from the Greek ‘pyro’ meaning fire and ‘lysis’ meaning separating. Been around in one form or another since ancient times. Estimated to be some 15 different businesses operating at 87 different plants throughout the world using pyrolysis	Self-generating power source	The gases generated by the pyrolysis reaction are used to power the plant so that after an initial power input the system becomes self-sustaining
Continuous production process	QMRE considers this a more efficient and ultimately far more profitable method of production - a patented version that has existed for only 12 years	Continuous monitoring & upgrades	The system is highly automated and controlled. It can be monitored locally or centrally via specific interfaces. Regular software development and updates ensure the system remains at the cutting edge
Container-sized operation	The Vixla series is purpose-built to fit into a sea container affording an easy-to-handle, convenient and space-saving manufacturing facility. Easy to transport and thus can be directed to specific plastic waste problem areas. It functions externally and requires only circa 25,000 sq.ft. of space on a secure concrete apron on which to run	Minimal logistics costs	The Vixla range of plant and equipment means landfill and other costs involved in disposing of plastic waste are mitigated or removed
Plug-and-play	The Vixla series is delivered in the container and comprises a day buffer and transport system, substrate entry processor, pyrolysis reactor, separator and residue discharge facility, condensation chamber, cooling system, filter & discharge pumps and control system	Additional income streams	The Quel syncrude oil created by the Vixla plant can be sold back to QMRE providing an additional income stream for the operator
Scalable	The Vixla P5 series plant converts 5000 kg of plastic waste into 5000 litres of oil. Two P5000 units will convert 10 tonnes of plastic into 10,000 litres of oil per day	Regulatory matters	The QMRE electronically-powered pyrolysis plant & equipment operation is unique. It is a clean and efficient process and can be used under a Local Authority jurisdiction. It will run under a SWIP (Small Waste Incineration Plant) permit, unlike competitors that require Environment Agency permits
		Management expertise	QMRE has a professionally- and commercially- tried and tested management team that will oversee all site start-ups and operations

Sustainability & CO₂ emissions



2.9t

BURNING PLASTIC


Burning plastic creates 2.9t of carbon emissions



2.53t

INCINERATING PLASTIC


Incinerating is little better creating 2.53t of CO₂ emissions



1.45t

OIL AND GAS FIRED PLASTIC PYROLYSIS


Traditional oil-fired pyrolysis plants are an improvement but still create 1.45t of CO₂ emissions



0.45t

MARIE/P1000
Currently using pyro-gas from the process and diesel

QMRE's development plant is much better creating just 0.45t of CO₂ emissions



0t

P2500 & P5000 OPTIMISED with HVO
Possible to fit Carbon Capture

QMRE's production models have system enhancements resulting in a targeted zero CO₂ emissions operation

Industry cost savings/ environmental benefits

- QMRE customers will no longer have to pay plastic waste disposal fees of £120/tn (incinerator) or £180/tn (landfill)
- Each new site will lead to new jobs both during construction and in ongoing operations
- The production of new and renewable plastic from plastic waste decreases the requirement for new, virgin plastics
- There is a £200 per tonne UK tax for packaging with less than 30% recycled plastic (this is 800 euros in Europe).
- Recycling plastic prevents it seeping into the land, rivers and seas and addresses one of the planets most pressing environmental problems
- QMRE will fabricate and construct plastic waste-2-oil systems in the UK creating jobs and investment opportunities

	Can handle mixed materials	Offers scalable recycling	Contributes to curb down the overall CO ₂ emissions	Further development potential
Landfills/ Incineration	✓	✗	✗	✗
Mechanical recycling	✗	✗	✓	✗
Chemical recycling	✓	✓	✓	✓

Set-Up

A basic site will be set-up with pyrolysis equipment, a pre-treatment system to wash and dry the plastic waste, oil storage and truck loading, generators and water treatment.

As the operation of each site is 24/7-330 days/year a shift system has been designed to ensure a safe operation for the continuous running plant.

For safe operation, three operators are required to run three pyrolysis machines and the associated equipment.

