

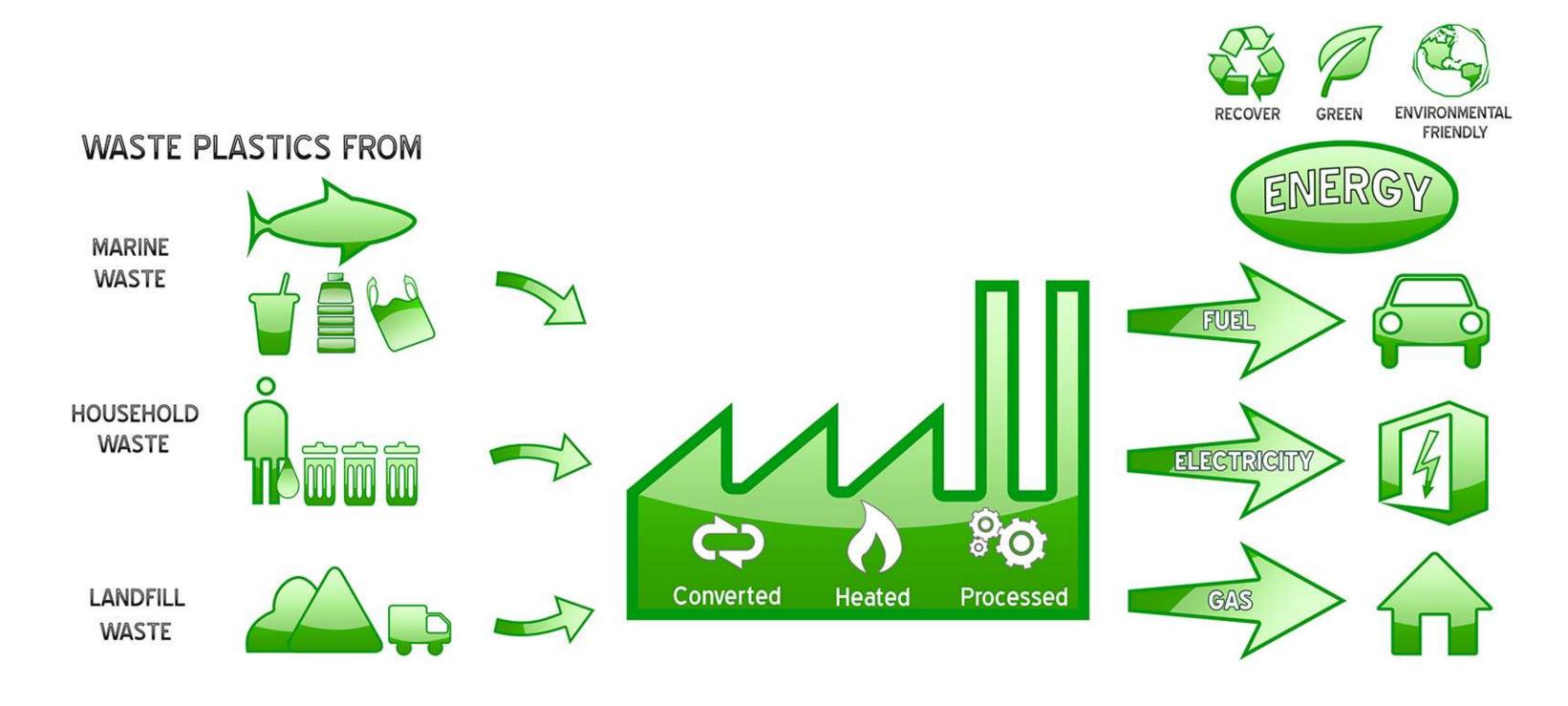
Plastic Waste Recovery Technology



Executive Summary

Plastic Recovery – Waste To Energy

- Reduce non-recycle plastics waste and convert them into energy.
- Minimized air, environmental and marine pollutions.
- Our process can reduce excessive dependence on oil mining.



Viro Technology Founder

Dr. Songpol Boonsawat

- Founder and Chief R&D Director.
- PhD in Environmental Engineering from Griffith University, Australia.
- Master degree in Industrial and Manufacturing Engineer from Asian Institution of Technology, Thailand.
- Bachelor of Materials Science from Khon Kaen University, Thailand.
- Project development scholars of The United Nations Economic and Social Commission for Asia and The Pacific (UNESCAP)
 - Research Project: Thermal Disposal Treatment Technology
 - Research Project: Waste and Energy Recovery Technology
 - Involved in the project development sites: Fiji, Morocco
- 2016 the Society of Environmental Toxicology and Chemistry (SETAC) Award Winner.



Viro Technology Founder

Dr. Songpol Boonsawat / Cont'd 2

- Researched and been developing plastic waste reduction technology for nearly 10 years.
- Dr Songpol participated IAESTE student exchange program during 2006 in Brazil, he had seen plastic waste in landfills and realized that it is a serious pollution problem to the earth.
- In 2006 to 2009 started the studies on plastic waste solutions.
- In 2009, he published his Master's thesis research, Environmental design: Aluminum Plastic Thermal Decomposition Method". In the same year, he designed his first generation blueprint.
- Between 2009 2012 he continued R&D on materials recycling technology. His technology research adopted by United Nations and used in Fiji and Morocco environmental project in 2011. Related journal published in 2012.
- In 2011, the first generation technology was built by a private company in Thailand with a total
 of 3 plants built.
- Over the years he has been invited to attend relevant conference around the world (Thailand, Japan, Australia), the publication of the technology was published.
- In late 2012, Dr Songpol continued his PhD at Griffith University, Australia and majored in hazardous waste recovery.
- Dr. Songpol was awarded by the Society of Environmental Toxicology and Chemistry (SETAC) based on his thesis research in 2009, Environmental design: Aluminum Plastic Thermal Decomposition Method".

Viro Technology Engineering Consultant

Mr. Yuttakan Makphan

- Engineering Consultant of Viro Technology.
- Expertise in Alternative & Innovative Energy Design and Development.
- Director of the Center of Development in Agriculture and Technology of Energy (Tha Makam), Kanchanaburi.
- Project Advisor / Executive Project Supervisor of The United Nations Economic and Social Commission for Asia and The Pacific (UNESCAP).
- CEO The institute of Alternative Energy Development of Asia Pacific
- Achieved Scholarship from United Nations to develop the Concept and Technology of Alternative Energy.
- Invited by the Department of Energy of Fiji Island to be an Executive Advisor of Energy and Technology.
- Developed 44 Energy Projects of local communities for Thai Government.
- Project Advisor of Waste Disposal Technology for Tourist Islands of Thailand.
- Develop BioGas System and BioMass System and for Royal Thai Army,
 Hotels and various industry sectors.
- Corporate working as consulting advisor and main contractor for UNESCAP.
- Co-Author with Dr. Songpol Boonsawat PhD., the implementation of a proper waste disposal treatment of Hazardous plastic products e.g. PCB boards and E-waste



Plastic Waste

The Issues

- Generally, recycling plastics is limited to less than 5 times and not all plastics can be recycled.
- Global recycling rate is particularly low and survey report shows that only 6% to 9% recovery rate.
- Investing into plastic recycling systems can be too costly.
- Plastics can not break down naturally, therefore landfill is the common solution adopted worldwide.
- It causes secondary pollution as it is not bio-degradable such as environmental and marine pollution.
- Incineration is a traditional solution however it releases toxicant gases and cause air pollution.



Plastic Waste

The Issues: Toxicants & Pollutants generated by Combustion of Plastics with O₂

- Dioxin
- Furan
- PBDP
- Bromine
- DibenzoFuran
- Phthalic Acid
- Biphenol A (BPA)
- HydroChloride (HCl)

- Sulfur Dioxide
- Nitrogen Dioxide
- Carbon Monoxide
- Carbon Particle
- Furfural
- Melamine
- Stibium (Sb)



Introduction

Plastic Categories – YES! Viro can eliminate all the Plastics below:













PETE

Clear tough
plastic e.g.
water bottles,
juice, soft
drink

HDPE

Common
White or
colored plastic
such as milk
and shampoo
bottles

PVC

Hard rigid or thick film clear and colored plastics **LDPE**

Soft flexible plastic e.g. plastic shopping bags and soft bottles

PP

Hard flexible packaging such as microwave ware, takeaway containers

PS

Rigid, Brittle
plastic such as
small tubs and
margarine/
butter
containers

OTHER

All other upcoming plastic from material development including nylon, ABS and acrylic











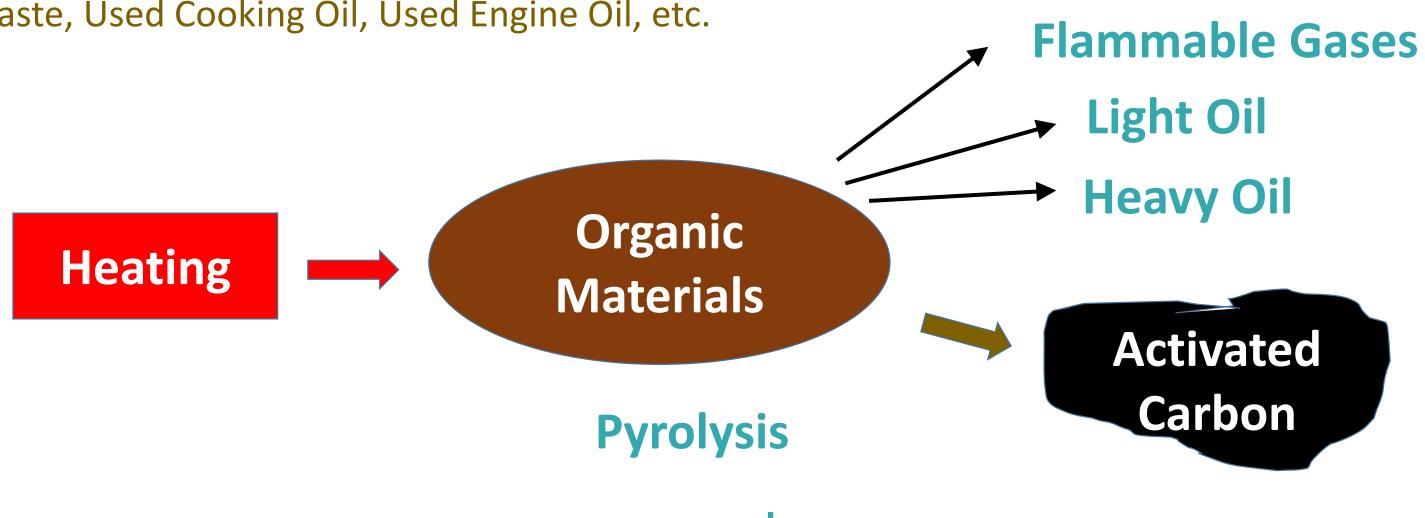




Viro Technology PYROLYSIS

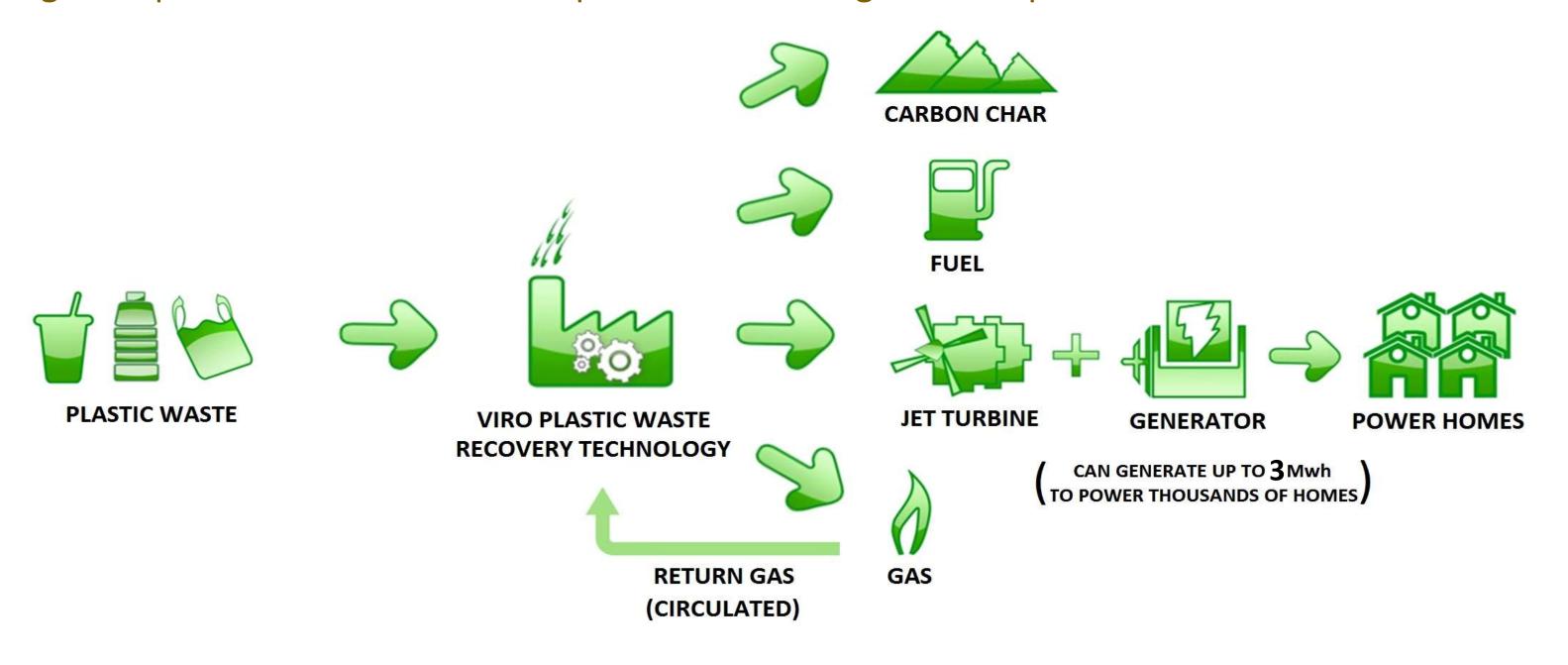
The Technology Summary

- Pyrolysis is a thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen.
- Pyrolysis involves the simultaneous change of chemical composition and physical phase, and is irreversible.
- There are similarities between Pyrolysis and Distillation, both Technologies need heating in reaction, and belongs to thermal decomposition reaction. But, both the Technologies are not the same and cannot group into the same category, because of the different in operations details and parameters, also difference in application.
- Extreme pyrolysis, which leaves mostly carbon as the residue, is called carbonization.
- Pyrolysis can deal with different kind of Organic Materials, including Plastics Waste, Food Waste, Crop
 Waste, Used Cooking Oil, Used Engine Oil, etc.



Plastic Waste Recovery Technology, since 2009

- By using high-temperature treatment, plastic waste can converted into several hydrocarbon, such as high-purity gas, diesel, kerosene, coal, activated carbon.
- Non-condensable gas can be circulated back into the system as energy, which can reduce 45% of energy that is required to run the technology.
- It is low cost and produces less emission.
- The technology can be combined with generators & turbines, which can generate electricity back to the grid to power homes. One ton of plastic waste can generate up to 3 MWh.



The Viro^{1.0} Plant – Thailand, since 2009



Viro^{1.0} System at Kanchanaburi, Thailand since 2009.



Viro^{1.0} System at Kanchanaburi, Thailand since 2009.



Viro^{1.0} System located at Koh Chang, Thailand since 2009.



An Active Production of **Viro**⁰¹ Plastic Waste Recovery System was shown to Thai Military.



Explanation of **Viro**⁰¹ System to the Thai Military by Mr. Yuttakan, Engineering Consultant of Viro Technology.



Demonstration to the Thai Military on the Diesel Combustion recovered through **Viro**⁰¹ System.

Products from the Viro^{1.0} System

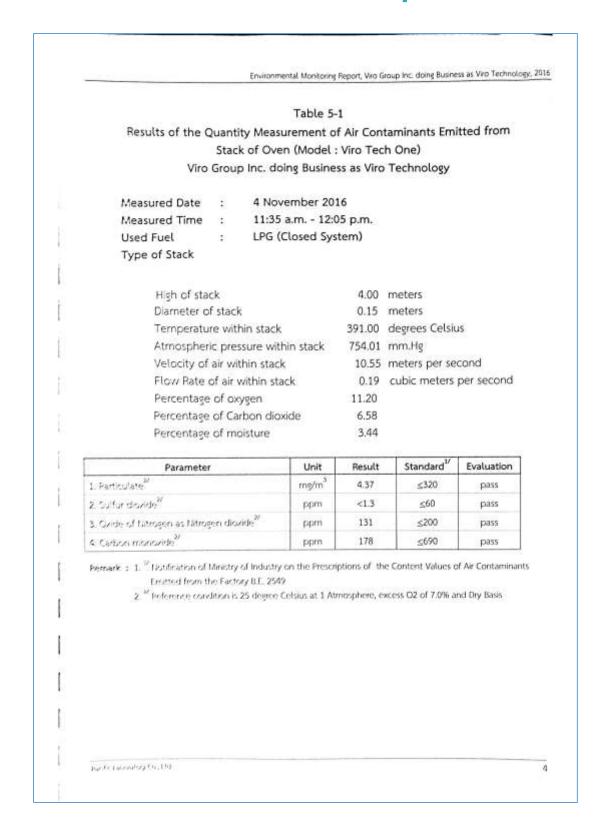


- High-Grade Fuel
- High-Grade Diesel
- Longer burning period.
- Low emission and clean.

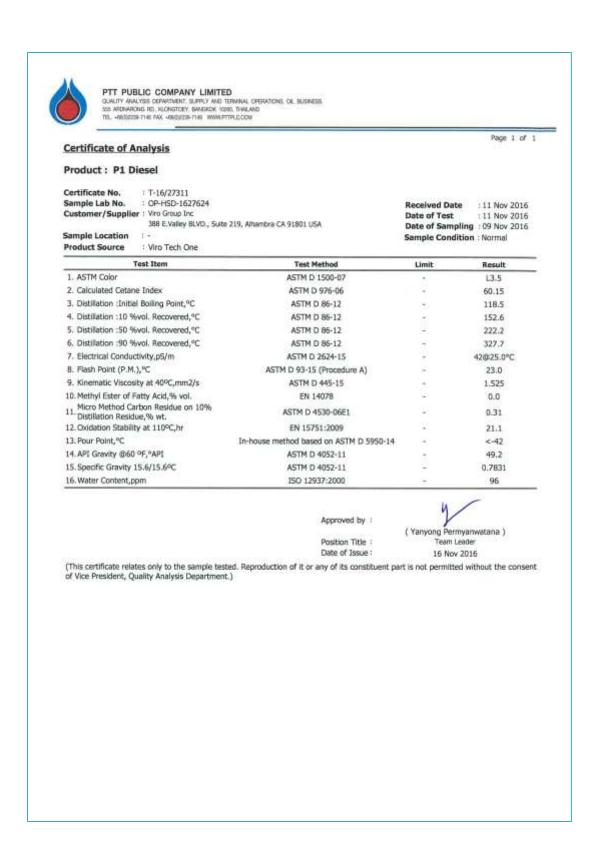


- Activated carbon powder can be compacted into charcoal bricks.
- It burns longer and stronger.

Emission Test Report and Fuel Analysis Reports





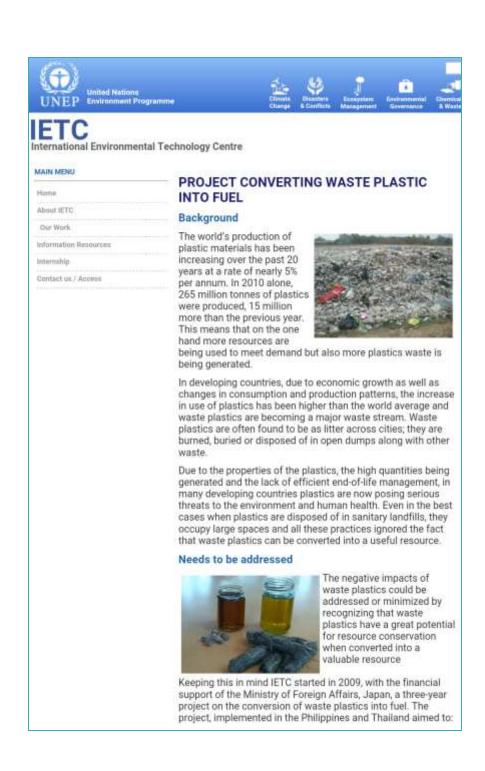


Emission Test was taken on one of the **Viro**^{1.0} System Plant in Thailand. The result is way below the US Emission Requirement.

Fuel and Diesel samples were collected from one of the **Viro**^{1.0} System Plant in Thailand and sent to the lab in Thailand for analysis. The Viro Fuel contains RON of 88 Standard. The report shows the fuel contains no lead, no Sulphur, no carbon, which means the fuel converted by the **Viro**^{1.0} System is cleaner.

The First Viro^{1.0} Project – Fiji & Morocco

(Involvement in the development for the United Nations Greening Program)

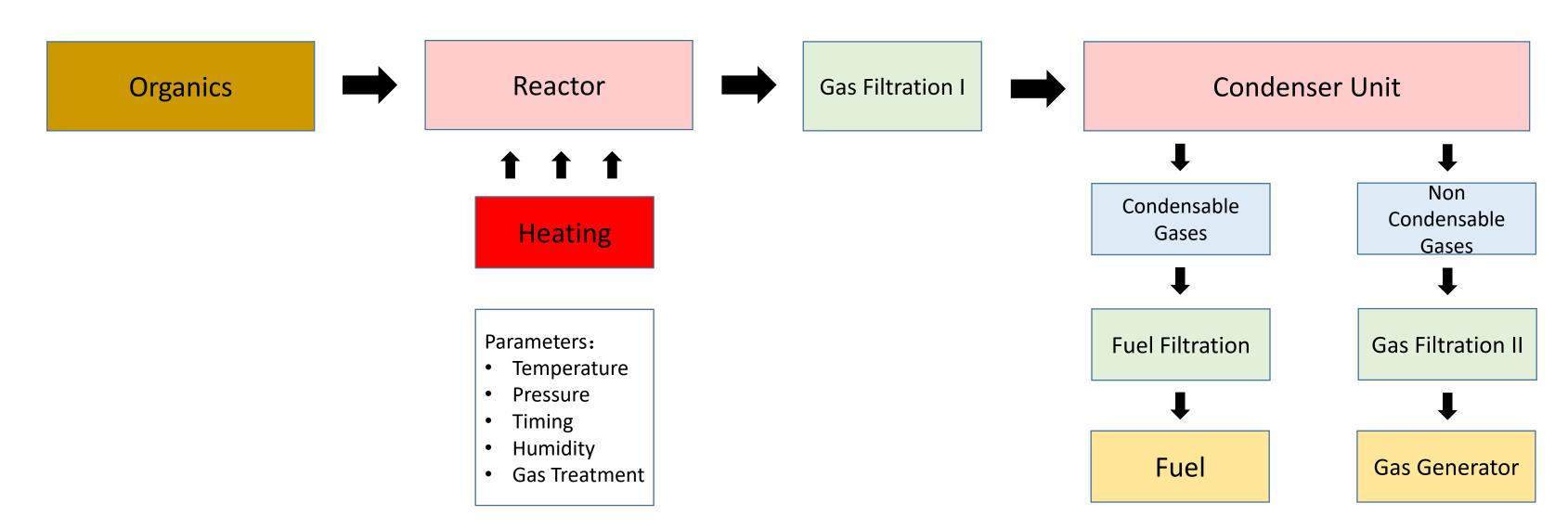


- Fiji and Morocco development projects dominated, preparation and construction by the United Nations ESCAP (UNESCAP) and the United Nations Environment Programme (UNEP).
- In 2012 to 2013, the United Nations used Dr Songpol's Plastic Waste Recovery Technology and the design blueprint to build a 5 tons capacity plant in Fiji and Morocco.
- A project is in progress in South Africa by the United Nations to develop a small plastic scrap.

The United Nations Environment
Programme (UNEP)
Project Converting Waste Plastic into Fuel
at Morocco.

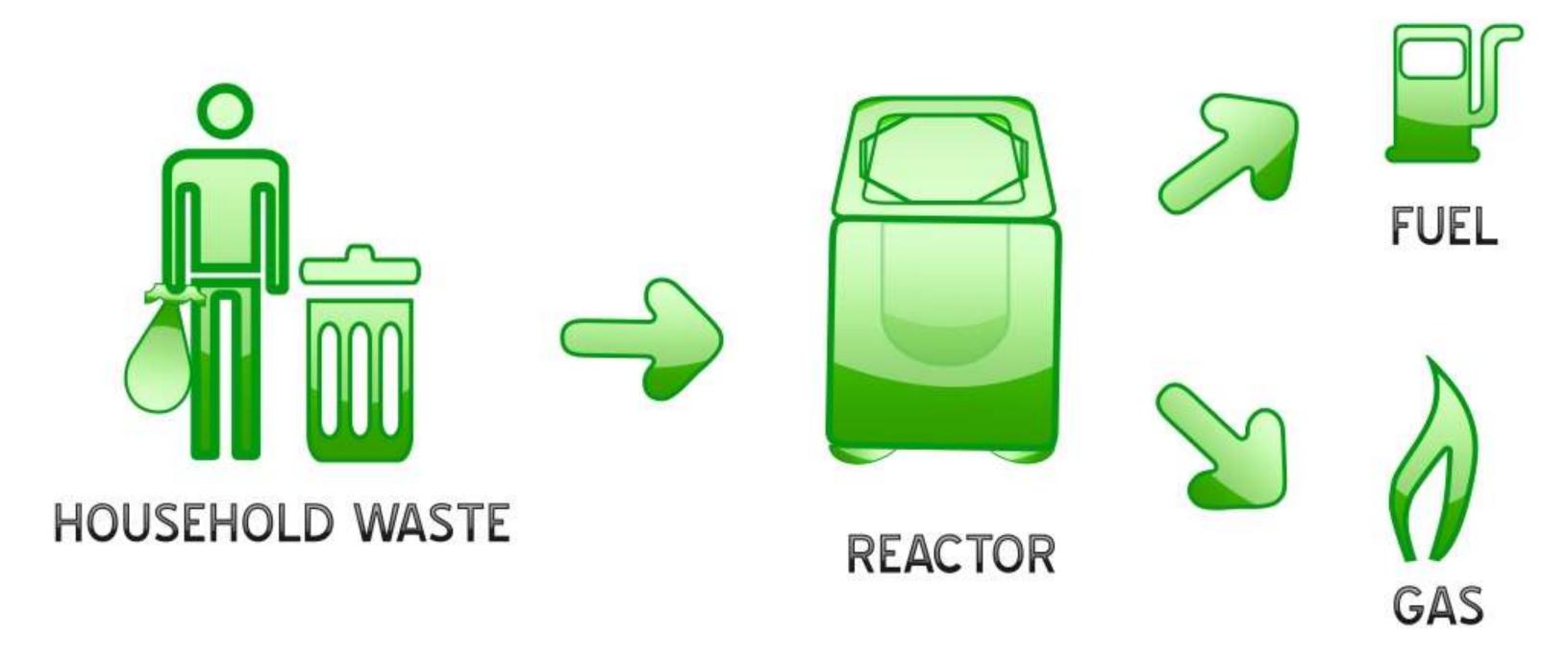
Plastic Waste Recovery Technology V2.0 – the Viro^{2.0} System

- Dr. Songpol has integrated the new V2.0 Technology, the Viro^{2.0} System, to the existing Plastic Waste Recovery System, after his further PhD studies in Australia.
- Viro^{2.0} System consists of a Dual-Filtration System to enhance the system to trap any possible toxicants and pollutants particles that was formed in the process.
- More effective vaporized carbon particles in plastics.
- Higher quality fuel and diesel and volume rate, obtaining clearer and cleaner fuel.
- Less Carbon Dioxide(CO2) emissions.
- The return gas can generate electricity by attaching Power Generator to the System.



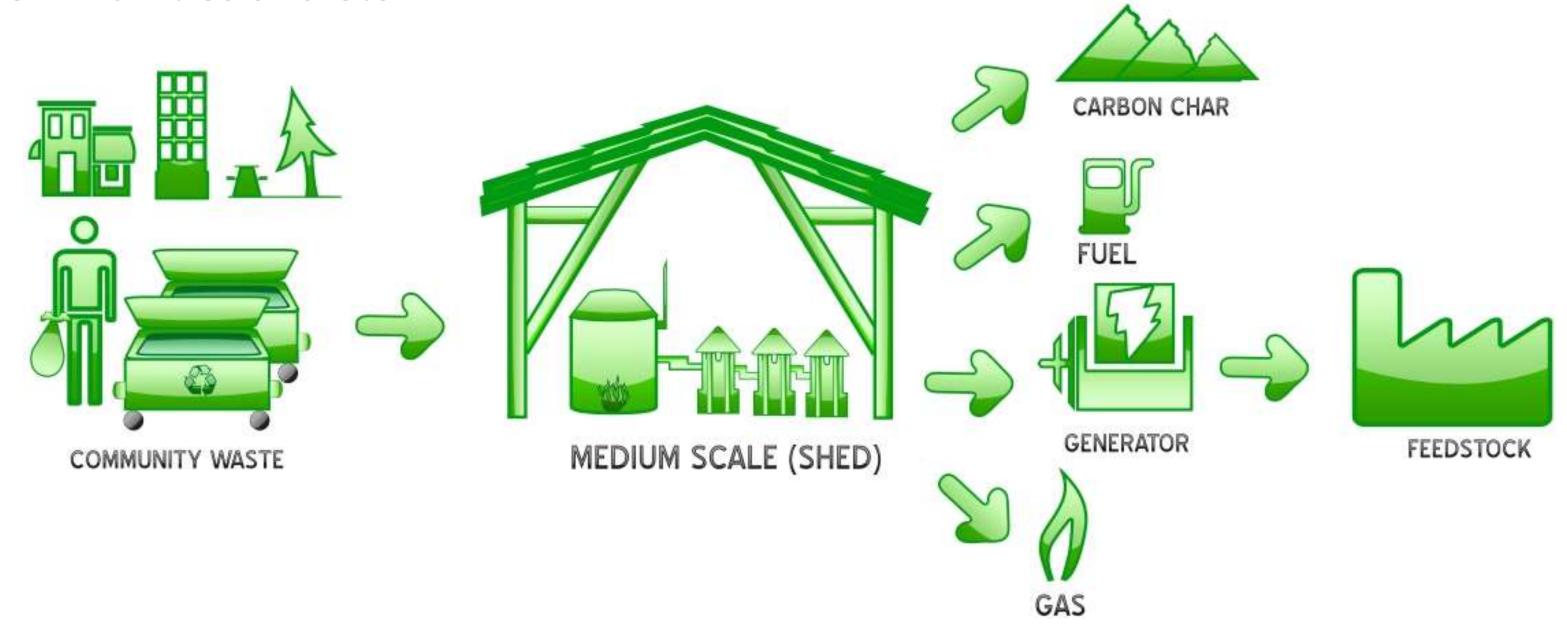
5 Kg Plastic Waste Recovery Machine

- Plastic waste capacity: 5 kg
- Fuel recovery rate: Up to 80%, equivalent to about 4 Liters
- Time frame: 30 minutes to 45 minutes
- Dimensions of the system is about the size of a washing machine
- Suitable as a general household unit or in restaurants, small shops, schools and etc.



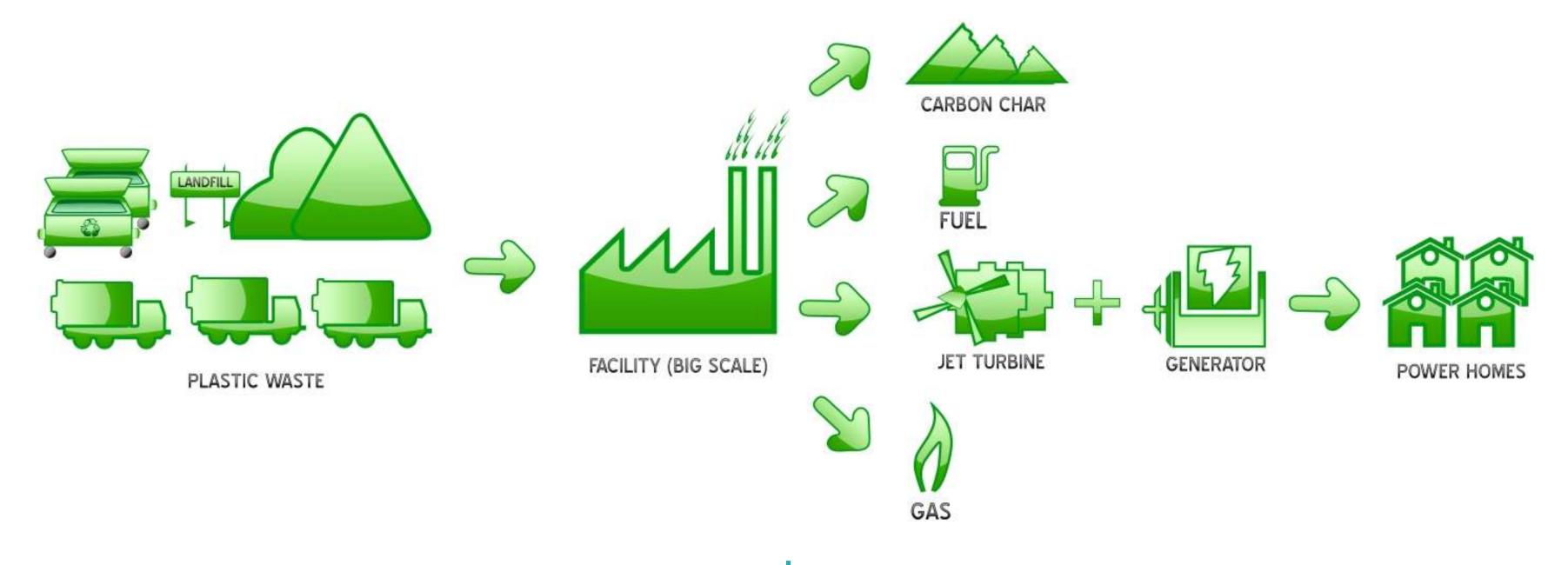
1000 Kg Plastic Waste Recovery System in Trailer

- Plastic waste capacity: 1000 Kg
- Fuel recovery rate: Up to 80%, equivalent to about 800 Liters
- Time frame: 90 minutes to 120 minutes
- Dimensions of the system is about the size of a Trailer, and it is movable
- Suitable for residential buildings, office buildings, hypermarket, residential communities and etc.

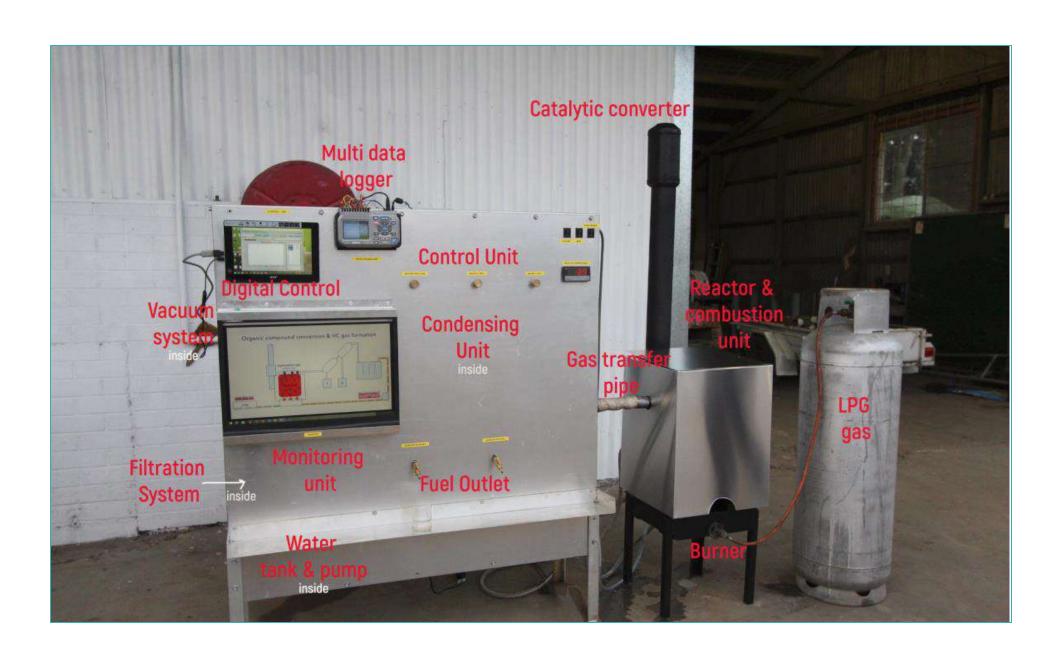


Mega Plastic Waste Recovery Plant

- Plastic waste capacity: Tons per day (through feasibility study)
- Fuel recovery rate: Up to 80% to 92%
- Time frame: Based on average, generally takes about 2 to 3 hours
- Size: Similar to large-scale production plant
- Ideal to co-operate with: Local councils, landfill management sites, Waste disposal companies, government and etc.



First Prototype of Viro^{2.0} System for Lab Testing in Australia



Location: Viro Technology R&D Office, Australia

Capacity: 1 Kg

Improvements:

- Newly developed filtration system for more effective vaporized carbon particles in plastics.
- Higher quality fuel and diesel and volume rate.
- Obtaining clearer and cleaner fuel.
- Less Carbon Dioxide(CO₂) emissions.
- A better efficient method to circulate return gas back into the system saving up to 45% of energy usage.

5 KG Prototype of Viro^{2.0} System for Demonstration at YuYao, NingBo, China



Presentation Location: YuYao, NingBo, China

Presentation Date: December 2, 2016

Capacity: 5 Kg

Plastics Used: PETE, HDPE, LDPE

Guests Invited:

- The Departments of YuYao Local Government.
- Venture Capital Management Teams.
- Experts from Petroleum Industrial.
- Local Businessmen and Entrepreneurs.

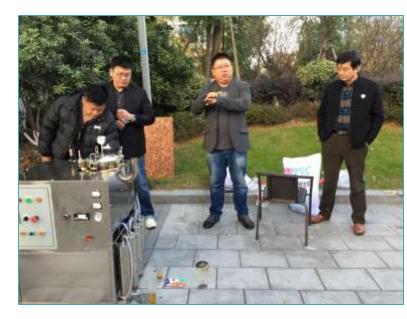
5 KG Prototype of Viro^{2.0} System for Demonstration at YuYao, NingBo, China / 2



















5 KG Prototype of Viro^{2.0} System for Demonstration at Shanghai, China



Presentation Location: Shanghai, China

Presentation Date: May 26, 2017

Capacity: 5 Kg

Material Used: HDPE, PP, PS, Used Engine Oil

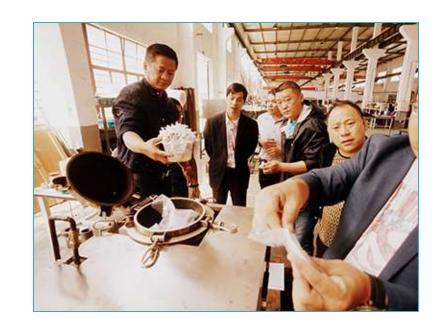
Guests Invited:

- Major Zhu of RuiChang, JiuJiang City, JiangXi Province.
- The Team of Business Development from RuiChang.
- Experts from Petroleum Industrial.
- Local Businessmen and Entrepreneurs.

5 KG Prototype of Viro^{2.0} System for Demonstration at Shanghai, China / 2

















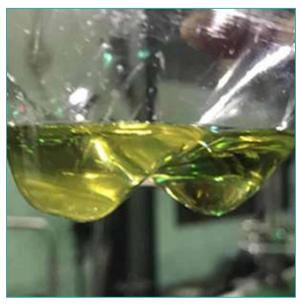


Viro^{2.0} System with Fully Computer Controlled



6/5 5003 6/5 5001





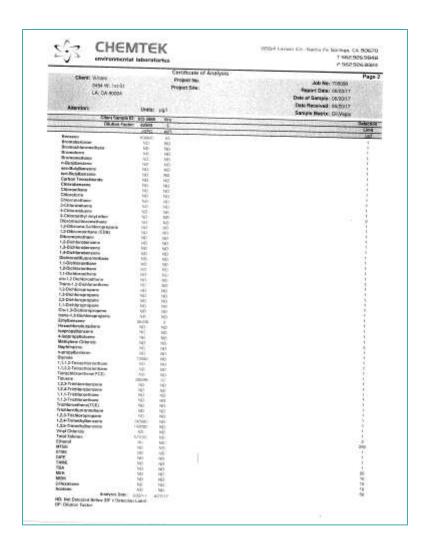
Location: Viro Technology Malaysia Office

Capacity: 3 Kg

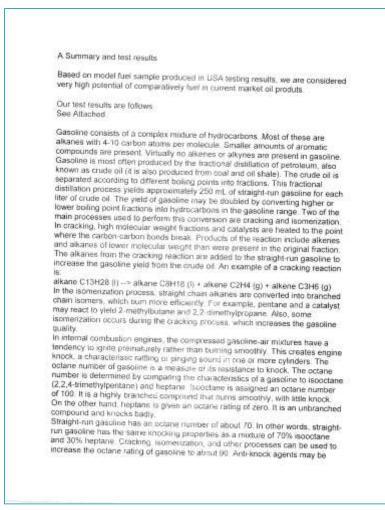
Improvements:

- Newly developed Gas Filtration System I & II for more cleaner emissions.
- Higher quality fuel and diesel and volume rate.
- Obtaining clearer and cleaner fuel.
- Using electricity as a heating source.
- Fully Computerized.
- Fuel was sent to California Certified Lab for testing and it was tested equivalent to RON 95 to RON 98.
- California State Fuel Seller Permit is obtained and Viro Fuels are able to sell in California Market.

CA Lab Test Report and Fuel Analysis Report







added to further increase the octane rating. Tetraethyl lead, Pb(C2H5)4, was one such agent, which was added to gas at the rate of up to 2.4 grams per gallon of gasoline. The switch to unleaded gesoline has required the addition of more expensive compounds, such as aromatics and highly branched alkanes, to maintain high octane numbers.

Gasoline pumps typically post octane numbers as an average of two different values. Often you may see the octane number as an average of two different values. Often you may see the octane rating quoted as (R+M)/2. One value is the research octane number (ROM), which is determined with a test engine running at a low speed of 600 rpm. The other value is the motor octane number (MON), which is determined with a test engine running at a higher speed of 900 rpm. If, for example, a gasoline has an RON of 98 and a MON of 90, then the posted octane number would be the average of the two values or 94. High octane gasoline does not outperform regular octane gasoline in preventing engine deposits from forming, in removing them, or in cleaning the engine. Consumers should select the lowest octaine grade at which the cars engine runs without knocking. Occasional tight knocking or pringing wort harm the engine, and doesn't indicate a need for higher octane. On the other hand, a beavy or persistent knock may result in engine damage.

Based on the test results tested by Chemiteck, fuel sample contained Potential Octane level 91-94.

We need to have a minimum 10 L of balk sample to determine accurate test for Octaine level.

This model sample kmited only for future references.

All test for motor engine shall be performed under approved testing agencies in USA.

Fuel sample was collected from our new fully computerized system of the Viro^{2.0} System and sent to the lab in Los Angeles. California for analysis. According to the lab report, the tested Viro Fuel shows a very high contain of benzene. Based on the Fuel Analysis Report prepared by California registered Professional Engineer, Mr. Seungil Ha, the tested fuel should be approved by United States of America agency and it is able to sell in US Market. And, the tested fuel contains very high Octane level of 91 to 94 (US Standard), which is equivalent to Euro Standard of RON 95 to RON 98. The Report also shows no Lead, no Sulphur, no Carbon, which means it is a cleaner Fuel from the Viro^{2.0} System. A California Fuel Seller Permit has successfully obtained by Viro Technology.

Endorsement Letters from Australian Government



Chris Gulaptis MP 29 September 2016 File No: 5428 Mr Songpol Boonsawat & Mr Eugene Keh Viro Solutions 2/144 Turf Street GRAFTON NSW 2460 Dear Songpol and Eugene I write to recognise the work that Viro Solutions Group, under the guidance of Songpol Boonsawat B.Sc, M. Eng, PHD Candidate, is making as a leader in the practical reduction of plastics in landfill. Having met with you both on a number of occasions, I have seen firsthand through your prototype the development you have made in converting waste plastic into liquid fuels I believe this new and innovative technology is something that we need to embrace in an endeavour to alleviate the current problem of the amount of plastic that is ending up in landfill, and it also has the potential to be implemented right across the country I wish you both every success with this project. With kind regards. Yours sincerely CCS alysts CHRIS GULAPTIS, MP Member for Clarence CG:jg clarence@parliament.nsw.gov.au 1 Prince Street, Grafton NSW 2460 fiix 02 6642 7574

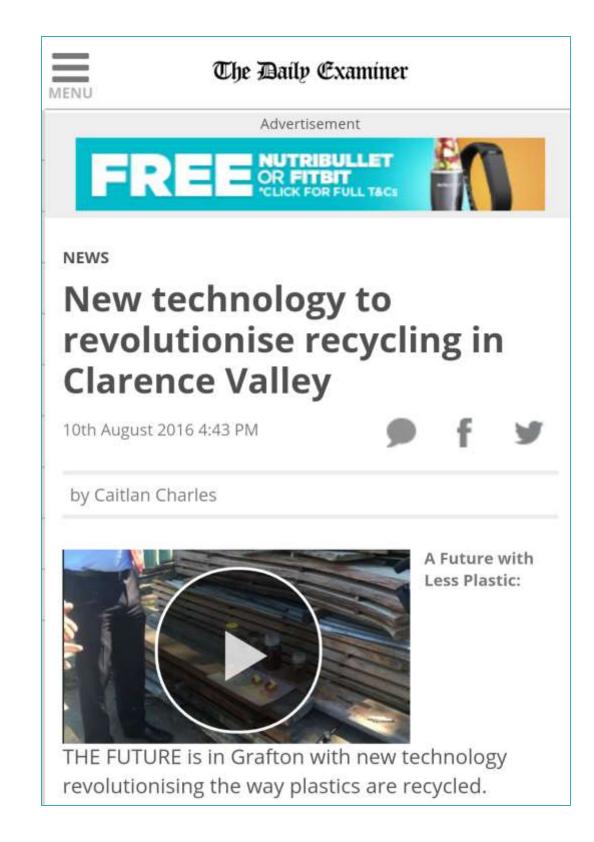
clarence VALLEY COUNCIL Reference: Waste and Sustainability Contact: Ken Wilson 30 September 2016 Songpol Boonsawat 2/144 Turf Street Dear Songpol Regional Landfill industrial building I refer to your requests to utilise part of the industrial building located at the Grafton Regional Landfill for the purpose of further developing your pyrolysis waste recycling technology. Council is very keen to promote more effective ways of manageing solid waste, in particular new ways of recovering resourses from our waste stream. Council is therefore pleased to provide in-principle support to the process of seeking Environmental Protection Authority approval to establish a pilot plant at the Grafton Regional Landfill site. It should be noted that the project is also likely to require an amendement to the industrial building's Development Consent and a variation to the landfill's Environmental Protection licence. Council's ability to assist you in the challenge of developing alternate waste technology may be limited, however where possible Council will be pleased to assist, including facilitating access to thermoplastic waste material. For further assistance please liase with Ken Wilson, Waste & Sustainability Coordinator on 0427 257 679. Locked Bag 23 GRAFTON NSW 2460 t 02 6643 0200 F 02 6642 7647 e council@clarence.nsw.gov.au w www.clarence.nsw.gov.au

Endorsement from MP Mr Kevin Hogan, House of Representatives, Australia. Endorsement from MP Mr Chris Gulaptis, New South Wales, Australia. Endorsement from Clarence Valley Council of Grafton, New South Wales, Australia.

Media Interview in Australia



Mr. Kevin Hogan MP posted on his Facebook regarding Viro Technology on the Plastic Waste Recovery together with Dr Songpol, Founder of Viro Technology.



"This type of plastic resin that is contaminated in the landfill comes from nature, but it doesn't look like the product from nature at all, it will stay there in landfill for another 200 years at least, or a thousand years, who knows," Mr Boonsawat said.

"Reverse engineering, called the thermal conversion process, can convert any organic compound produced from crude oil ... so in some way it can be turned into its origin."

Mr Boonswat dedicated nine years to finding a system that could convert plastic back to the its natural state, with the help of Eugene Koh, an IT professional, and Dennis Green, a mechanical engineer.



Eugene Keh and Songpol Boonsawat with their system that turns unwanted plastic into a more sustainable product.

Caitlan Charles

The process begins with the heating of the plastic in a vacuum chamber with an LPG gas system until

Interviewed by Australia's The Daily Examiner on August 10, 2016 with Founder Dr Songpol and Co-Founder Mr Eugene Keh at Viro Technology R&D office Grafton, Australia on the demonstration and publication on newspapers and online news.

Viro on Shark Tank Australia



Viro Technology was invited to the Shark Tank Show in Australia and was recorded live on November 21, 2016 for Season 3 as one of the contestants. The show was aired on Australian TV during June 2017. Viro Technology is also proudly being invited to attend the Shark Tank for the second time in 2018 to cast Season 4.

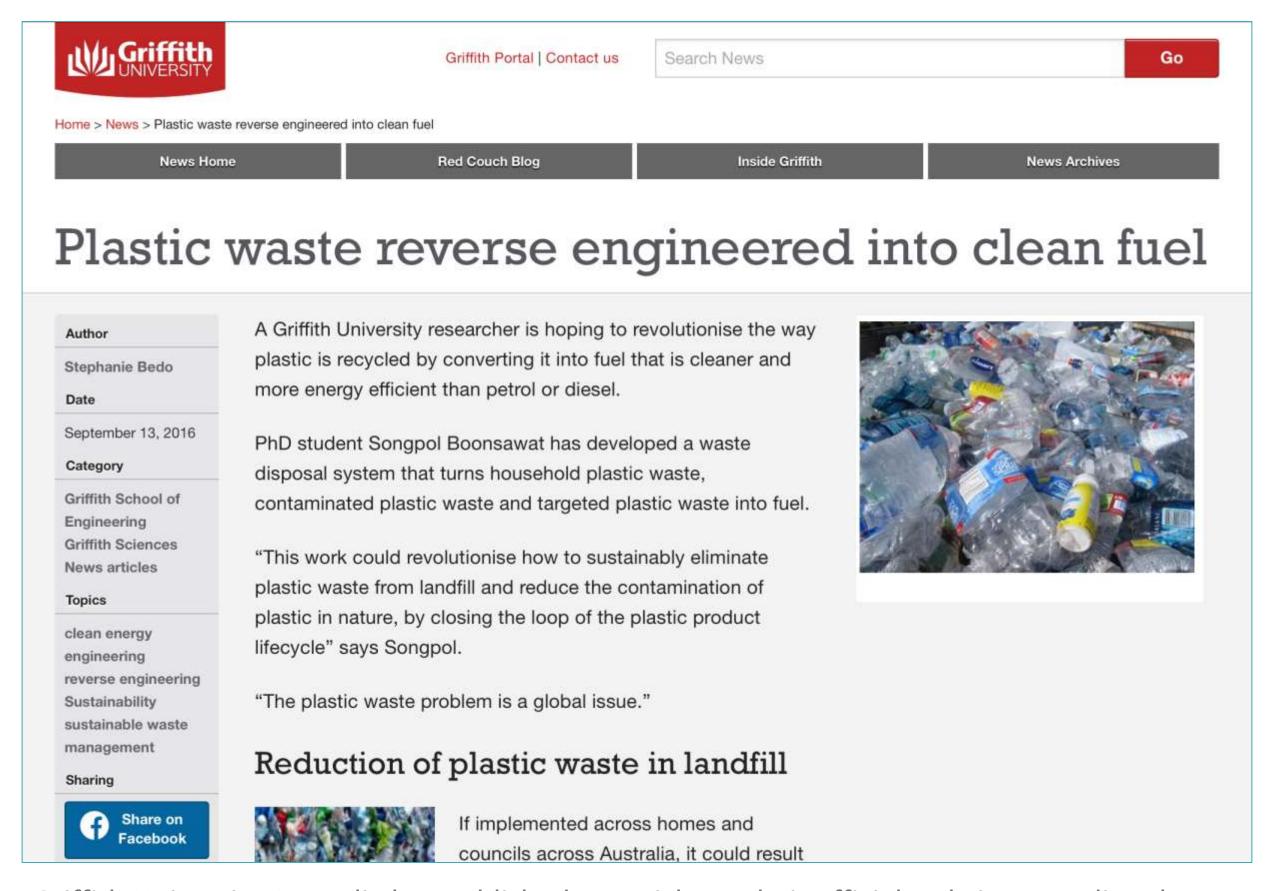
Prototype of Viro^{2.0} – Viro on TV NBN News, Australia



Prototype of Viro^{2.0} – Viro on Gold Coast 9 News, Australia

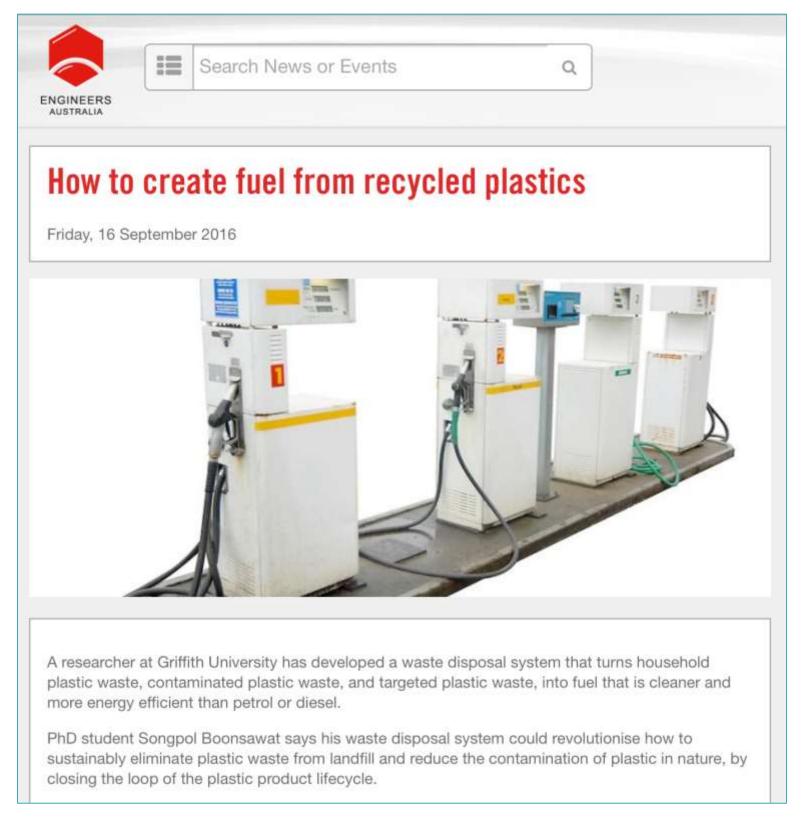


Viro Online



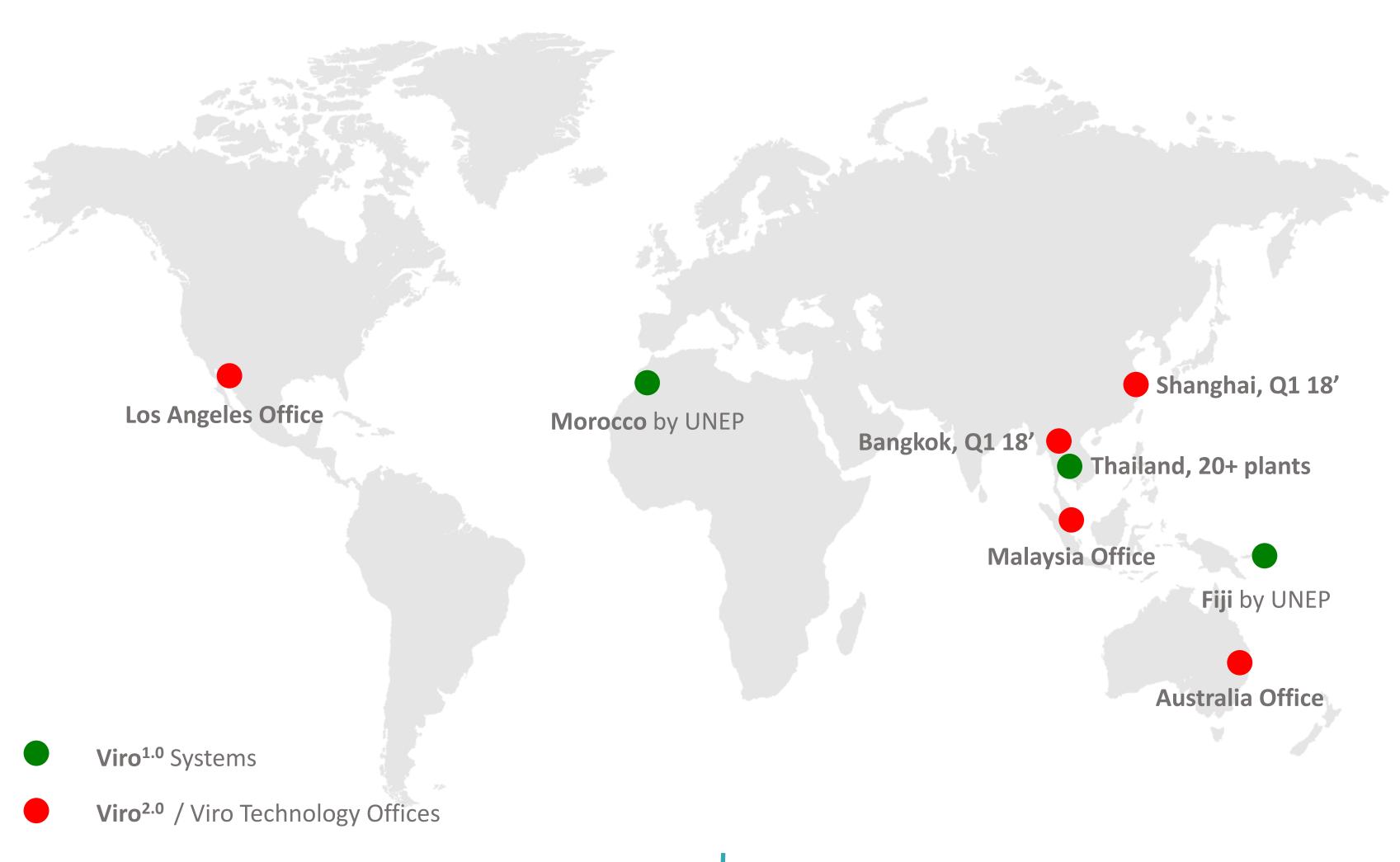
Griffith University Australia has published an article on their official website regarding the Plastic to Fuel Technology developed by Dr. Songpol, the founder of Viro Technology. https://app.secure.griffith.edu.au/news/2016/09/13/plastic-waste-reverse-engineered-into-clean-fuel/

Viro Online



Viro Technology was reported by the Institure of Engineers Australia on their website. https://www.engineersaustralia.org.au/portal/news/how-create-fuel-recycled-plastics

Viro Technology Distributed Locations





Viro Group, Inc DBA Viro Technology Viro Technology (Malaysia) Sdn. Bhd. Viro Technology (Australia) Pty. Ltd.

Coming Soon:

Viro Green Technology (Shanghai) / expected Q1, 2018
Viro Technology (Thailand) / expected Q1, 2018



Question?

Info@ViroTechnology.com