The Indian website "India Carbon Outlook" published a piece of article regarding our oil-converting plant.
URL: http://india.carbon-outlook.com/content/waste-fuel-innovative-approach

Waste to Fuel: An innovative approach

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An expert from Recycle Energy Co., Ltd., a Japan based waste management company writes about an alternative to use waste plastics by converting them into oil.

Petrochemicals, such as plastics, are everywhere and indispensable in the modern society. Several methods have been attempted to deal with the huge amount of used petrochemicals such as mechanical recycle, landfill, incineration, or using them as fuel for the heat source.

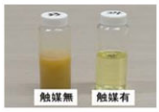
Here we focus on yet another alternative for making good use of waste plastics: converting them into oil. The ordinary method is pyrolysis however associated problems such as high content of wax as byproduct make it an unattractive proposition. Nowadays an innovative approach 'catalytic cracking' is gaining prominence and seems to be addressing all the generally associated problems with pyrolysis. This brand new technology is based on the research of Prof. Fujimoto in the University of Kitakyushu, Japan. By applying the technology, waste plastics are transformed back to what they used to be - the crude petroleum.

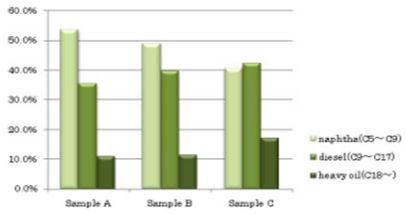
One of the key features of the catalytic cracking process is that plastics are constantly in contact with the solid catalyst during cracking. Thanks to the catalyst, more light oil is derived compared with pyrolysis.

Crushed plastics have to be blended evenly and efficiently with the catalyst hence both of them need to be kept fluid. By doing so the surface of the catalyst remains protected from immediately being covered by coke, which enables a comparatively long-term chemical reaction for the catalyst and also allows a longer interval for catalyst exchange. This newly-improved technology allows for non-stop operation by simultaneously facilitating feeding and gas decomposition.

The Cracked Oil

Another crucial feature of the technology is with regards to the composition of the cracked oil. The image illustrates that oil derived from catalytic cracking is clearer and with much less wax as compared to the oil derived from the Pyrolysis process.





Furthermore, graph 1 also provides a general idea of the composition of the cracked oil. Compared with pyrolysis by which heavy oil and wax are derived, this new approach enables derivation of lighter oil or in other words, naphtha (about 50%, used as plastic material). The yield of oil is as high as 80%. It is estimated that by converting 1 ton of waste plastics, 400kg of naphtha and another 400kg of diesel/kerosene/heavy oil are derived. Hence it helps reduce the usage of fossil fuel by around 40%.

More kinds of waste plastics convert into oil

Another important dimension is that more kinds of waste plastics can be treated /converted into oil.
Pyrolysis can only deal with PP/PE/PS and therefore others have to be eliminated out carefully.
On the other hand, through catalytic cracking even PVC up to 10% can be handled.
This is achieved by conducting both catalytic cracking and de-chlorination at the same time. With certain percentage of PVC being processable, high efficiency of sorting is attained.

The chart below summarizes the comparison of pyrolysis and catalytic cracking:

	High-temperature pyrolysis	Catalytic cracking
Operation type	Batch system	Continuous operation system
Material limitation	Limited in PP, PE, PS	PP, PE, PS + PVC, PET(less than 10 %)
Yield	～70 %	～86 %
Property of derived oil	Mostly heavy oil with high wax contained	Mostly light oil with almost no wax contained
Residual chlorine	A few thousand ppm～ a few hundred ppm	Less than 100 ppm
Thermal efficiency	Low thermal efficiency in batch system	Continuous production helps high thermal efficiency

Currently we're operating a 5kg/h pilot plant (fabricated in Feb., 2011) and are currently testing our customers' samples, trying to do the research in many different ways in order to derive the oil suitable for use even when the feedstock contains a high proportion of PVC. Furthermore, we are also trying to improve the catalyst so as to make it possible to convert PC, ABS, waste tyre, etc.

In addition to the pilot plant, we also maintain continuous operations of our 100kg/h pilot plant. Plant demonstrations to potential customers are held on a routine basis and we are working on the upgrade of the plant. We are also in the process of designing another plant (400kg/h) and plan to start the oil-converting business on our own around autumn this year.

Onto the realization of perfect recycle system

This new technology makes it possible to convert not only PP/PE/PS but also PVC/PET up to 10%. Further efforts on conversion of more variety of plastics into oil are ongoing. With all these efforts, the real 'recycle' of waste plastics seems to headed in the right direction.

Recycle Energy Co., Ltd.is a Japanese company established in June, 2010 and has been granted the license to use the patent by Kitakyushu Foundation for the Advancement of Industry Science and Technology (abbrev. TLO) to fabricate the oil-converting plants with catalytic cracking applied. Its parent company is in the business field of mechanical recycle and famous for resin trading.

References:

http://recycle-corp.com/english/e_index.html

Image(s) Courtesy:

Montgomery cty Division of Solid Waste Services
Recycle Energy Co., Ltd.