NovaCrack®
Feedstock Recycling of Mixed Plastics Waste

INTRODUCTION
The environmental challenge of dealing with mixed plastics waste, a major concern for the waste industry, local authorities and increasingly for households, has opened up a commercial opportunity for the petrochemical sector. A team of scientists and engineers at the University of Manchester has developed a rapid new depolymerisation process, NovaCrack®, based on catalytic hydrocracking, which offers a sustainable source of naphtha with attractive process economics.

THE TECHNOLOGY
NovaCrack® has the ability to consume a mixed polymer feed, including PE, PP, PS, PET and PVC, which make up 74% of EU plastics demand and are all found in the municipal waste stream, to yield a clean, low-sulfur, naphtha-rich hydrocarbon stream suitable for supplementing cracker feedstock.

The key innovation arises from the use of a novel, patent-protected catalyst system, which has enabled the design of a continuous process, as a result of the dramatically increased reaction rates and lower temperatures involved.

The process conditions are considerably less severe and significantly faster than existing technologies, and the process has been shown to be PVC tolerant.

KEY BENEFITS
NovaCrack® is differentiated from pyrolysis and waste-to-energy processes in that it retains a substantial proportion of the underlying value of commodity polymers.

- Cost effective source of naphtha substitute for the petrochemical industry.
- Rapid process able to handle mixed plastics waste, including films and PVC.
- Carbon benefits from diversion of plastics from landfill / RDF and by reducing dependence on the use of crude oil in plastics manufacture.
WHAT ARE THE DRIVERS?

Europe generates 25 million tonnes (MT) of plastics waste annually; just 25% (6.0 MT) is recycled at a similar economic value, 33% (8.3 MT) is sent for energy generation, which is notoriously inefficient, losing most of the value of the material, and 42% (10.4 MT) goes to landfill, incurring cost and adding no value. [Source: Plastics - the Facts 2011, PlasticsEurope]

The UK produces 2.5 MT of plastics waste. DEFRA’s recycling target rises from 35% in 2012 to 45% in 2014 while plastics waste will grow to 2.7 MT, resulting in 1.5 MT of sent to landfill each year, assuming timely development of methods to achieve the desired recycling rate. The disposal cost will rise from £86 to £102 per tonne, due to Government policy, increasing the total cost (landfill tax and gate fees) of the 1.5 MT from £143m in 2012 to £151m in 2014. [Source: WRAP Gate Fees Report, 2010]

While most UK local authorities now collect plastic bottles, (281,000 tonnes in 2010), only 28% collect non-bottle plastics from households, (71,000 tonnes). The reasons for this are lack of UK markets for the material, no facilities for sorting and handling, too challenging, no confidence in market and concerns over exporting. Even where facilities exist, cross contamination is a major problem, especially with plastic films. The end result is usually of low value with limited applications, or finds use in Refuse Derived Fuel (RDF) to boost calorific value, itself environmentally and economically less desirable than recycling. Much plastic waste is exported, losing value for UK industry and recycling targets will reach 57% by 2020. [Source: DEFRA, EPRO, RECOUP]

Clearly, the most economically attractive materials will be recycled. However, tolerance to contamination from other plastics is low and, despite recent advances in separation and sorting technologies, the recycling targets are extremely challenging. Significant improvements are required to enable these to be met and it is unlikely that they will be achieved by mechanical recycling alone.

On the demand side, a typical cracker would process around 3 million tonnes of naphtha p.a. mostly bought on relatively stable long-term contracts. The cost of naphtha has been variable in recent years, tracking the cost of Brent Crude and some is bought on short-term contracts and on the spot market, adding extra cost and volatility to the business. A NovaCrack® plant would replace this and could consume up to 20% of the waste plastics currently sent to landfill in the UK.

INTELLECTUAL PROPERTY

The IP comprises an international patent portfolio with other filings anticipated to follow in associated technology areas.

THE OPPORTUNITY

The next stage of development is scale-up to continuous operation via a mini-plant operating in the range 1 - 10 kg hr\(^{-1}\). UMIP is actively seeking interest from companies in relevant sectors to further develop NovaCrack®. It is envisaged that commercialisation will continue by the grant of appropriate licenses.

CONTACT

Simon Clarke, Licensing Manager, UMIP, Core Technology Facility, 46 Grafton Street, Manchester M13 9NT
✉: Simon.Clarke@umip.com  ☎: Tel: +44 (0) 161 306 8510

© UMIP June 2012

NovaCrack® is a registered trademark of the University of Manchester

UMIP - REPUTATION AND VALUE THROUGH INTELLECTUAL PROPERTY®