



## PERP Report 2017S6: Plastics to Fuels and Chemicals

“Plastics to Fuels and Chemicals” is one in a series of reports published as part of the 2017 Process Evaluation/ Research Planning (PERP) Program.

### Report Overview

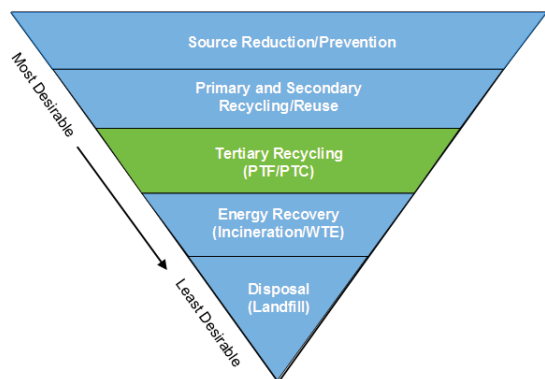
While a lot of attention has been paid to conventional recycling of plastics, only a small portion of plastics produced is currently recycled. While increasing conventional recycling is a priority, with more attention being focused on the amount of plastic waste finding its way into landfills and waterways, and creating a circular economy, new focus is being put on conversion technologies, which can complement recycling. The conversion technologies, also referred to as tertiary or chemical recycling, can be applied to hard-to-recycle and end-of-life plastics and offer an alternative to recycling, incineration, and landfilling.

Tertiary recycling includes two broad categories:

- Plastics to Fuels (PTF), generally using pyrolysis to break polymers down to reusable fuels
- Plastics to Chemicals (PTC), using chemolysis or pyrolysis to depolymerize polymers to their base monomers or other chemicals

While there may be overlap between these categories for some polymers, the end result is the same – increased value from the waste plastic, and reduction in waste.

### WASTE MANAGEMENT HIERARCHY



This report focuses on PTF and PTC technologies that range from lab scale to commercial scale. The report covers:

- PTF – technology discussion, challenges to commercialization, and profiles of 30 companies and organizations
- PTC – technology discussion and profiles of companies for polyethylene terephthalate, polystyrene, polyurethane, polyvinyl chloride, nylon, polycarbonate, and polymethyl methacrylate.

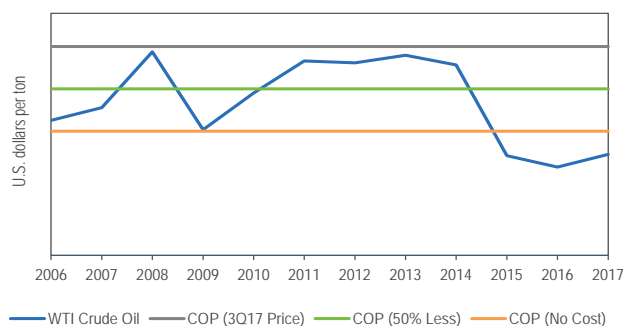
### Economic Analysis

Cost of production estimates were developed for plants at a USGC location. An analysis was completed for:

- Plastics to fuel (PTF) plant producing synthetic crude oil
- Plastics to chemical (PTC) plant for chemical recycling of PET

Using 3Q17 economics, the cost of production using different feedstock costs was compared with the annual price since 2006 of WTI crude oil for PTF and PET bottle resin for PTC, in order to analyze under what pricing scenarios these processes would be economical.

### COST OF PRODUCTION ANALYSIS FOR PTF



### Non-Cost Related Issues

The most important criteria when developing a new technology is generally whether or not the production economics are better than what is being replaced. This is where the value would come from. In a low oil environment, this can be particularly challenging. For PTF and PTC technologies, though, there are other factors that can be considered, mainly benefits to the environment. Many of these units feature a modular design so that they can be replicated for large volume applications (co-located at a recycling center or municipal waste treatment facility), yet small enough to go to where the waste is located (a beach, a boat cleaning up ocean waste, any small town or village in the world).

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