

Pyrolysis and Gasification factsheet

Definitions Matter

Are Pyrolysis and Gasification technologies incinerators? Yes, under EU and US legislation.

Incineration technologies: Mass Combustion, Gasification, Pyrolysis, Plasma Arc.

European Union Directive 2000/76/EC on the incineration of waste (The Waste Incineration Directive) and:

US Environmental Protection Agency Title 40: Protection of Environment, Hazardous Waste Management Systems: General subpart B-definitions, 260.10, current as of Feb 5, 2008.

The relevant US federal code is here:

<https://www.law.cornell.edu/cfr/text/40/60.51a>

<https://www.law.cornell.edu/cfr/text/40/60.50a#k>

In general, pyrolysis and gasification units are classified as municipal waste combustors. There is an exception for pyrolysis units that satisfy three conditions (effectively, chemical recycling units):

- the feed materials are only plastics, rubber, and/or tires, with incidental contamination.
- the output is marketed and used as feedstock by a chemical plant or petroleum refinery.
- the yield (output: input ratio) is at least 70%.

It does not apply to pyrolysis plants that process MSW or biomass or Refuse Derived Fuels, etc. It does not apply if the pyrolysis oil is burned rather than used as a feedstock for further transformation.

Currently there are no successfully operating pyrolysis/chemical recycling plants in Australia producing new virgin plastics from pyrolysis chemical feedstocks. Although technically feasible, the global reality is that pyrolysis, gasification and “chemical recycling” has failed to deliver.

Pyrolysis: Is the thermal decomposition of waste in the absence of oxygen to create oils, char, and syngas. In most cases and depending on the feedstock, the resulting outputs are used as fuel and burnt for energy. Often described as a two-stage incinerator 1. Thermal oxidation of the waste and 2. Burning the syngas.

Gasification: Is the thermal decomposition of waste in the presence of small amounts of oxygen.

Municipal solid waste is a highly heterogeneous material making it unsuitable for both Gasification and Pyrolysis technologies due to the complex chemical mixtures and materials contained in the waste stream. More homogeneous waste streams such as plastic still pose significant problems due to the complex chemical ingredients, including additives, in plastic waste that create contaminants in the syngas and other outputs requiring expensive treatment to remove. This is why nearly all pyrolysis technologies using plastic fail with most leading to plastic to fuel outcomes and therefore cannot be regarded as “recycling”.

All plastic polymers are hydrocarbon – made of hydrogen and carbon but they also contain other elements – oxygen, nitrogen, sulphur and the halogens of chlorine, fluorine and bromine, as well as a range of other additives and Non-Intentionally Added Substances (NIAS) such as dirt and other contaminants that accumulate throughout their lifecycle. This is why claims that pyrolysis and chemical recycling technologies do not produce dangerous pollutants like Dioxins are false. Such Persistent Organic Pollutants are not prevented through the absence of oxygen within the technology itself but rather are inevitably created because the precursors to their development are contained in the plastic or waste itself. In addition, the burning of any syngas or plastic derived fuel will generate dangerous POP's as it exits the stack and cools down – known as the De-Novo Synthesis. Put simply, pyrolysis, gasification and the use of any resulting fuels will generate globally restricted and deadly POP's pollution as well as significant quantities of climate and toxic air pollution.

So why is Australia promoting pyrolysis and gasification as solutions for waste management and especially plastic?

Waste incineration is deeply unpopular with the public and is being discouraged globally due to the highly toxic air pollution, climate threat and toxic ash it creates. By rebranding Pyrolysis and Gasification as non-incineration technologies, industry and governments can more easily approve these technologies and convince the public that they are the solution to the global plastic waste crisis. However, the global plastic waste crisis has no such simple solution. Plastic poses adverse human health and environmental impacts at every stage of its lifecycle. The plastic and petrochemical industry know this and push chemical recycling as their solution because they want to increase plastic production. This is why we urgently need a cap on plastic production. Plastic producers must be required to eliminate all toxic inputs and provide for the safe and thorough collection of all their plastic wastes. The problem is industrial design failure and not consumption.

For more information:

www.zerowasteaustralia.org



Zero Waste Australia