Box 3.1: Chemical recycling and incineration

Chemical recycling

As the physical and economic barriers to effective recycling for mixed plastics have persisted – and facing increasing pressure to act on plastic pollution – the industry has begun to vigorously promote 'chemical recycling', or 'advanced recycling', as a catch-all solution.

Behind the innocuous-sounding name lies a range of processes and technologies – such as pyrolysis and gasification – to convert waste plastic into new plastic or fuel, by dissolving plastic with chemicals or using heat to break it down into monomers, naphtha, fuels or other by-products.[1] In theory, these new materials can go through a process of 'repolymerisation' to create new plastic products, but this technology is still uneconomical and technically challenging.[2] The reality for the majority of plastics undergoing chemical recycling is plastics-to-fuel, whereby the liquid and gas products from the process are turned into fuel, such as diesel or kerosene, and then burned just like any other fossil fuels.

The problems with chemical recycling vastly outweigh any perceived benefits. First, while the industry has been keen to highlight chemical recycling as a game-changing solution, its small scale and the level of investment show it is just another distracting sideshow the industry is using to divert attention away from anything that would slow production, hold the industry accountable for pollution, or prevent it from selling as much plastic (like its fixation – and for the same reasons – on recycling in the 1970s).[3] It is an immature industry that, according to sector specialists the Bureau of International Recyclers, is still 10 years away from viability – too long to be useful in addressing plastic waste and climate change.[4] There is a long history of technical failure in chemical-recycling projects, and Unilever's Creasolv® chemical-recycling project still struggles to produce a viable solution for chemically recycling multi-laminate sachets, after years of development.

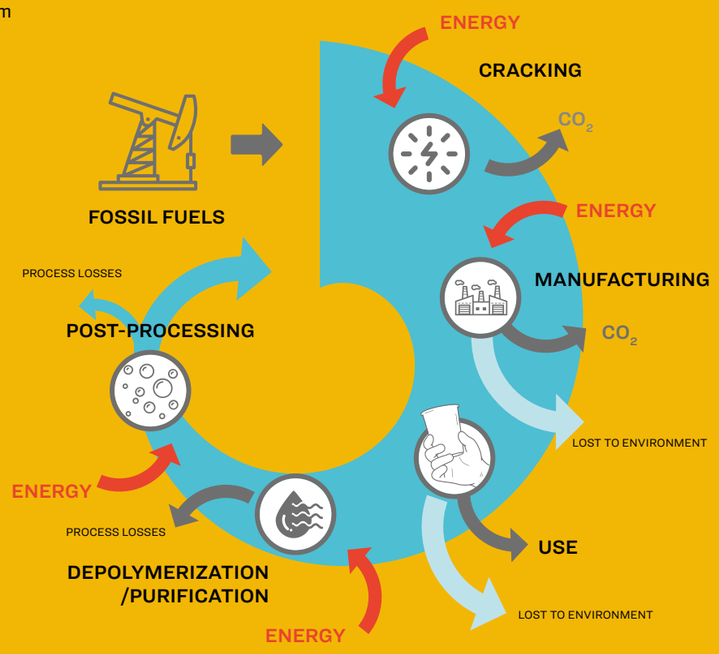
Second, it is far worse for the environment than effective mechanical recycling or other proven solutions to curb plastic pollution. The energy inputs required at each stage, and their associated GHG emissions, make it very inefficient with limited circularity – despite how Big Plastic touts it as a pillar of the circular economy.[5]

Third, there are great uncertainties around how safe chemical recycling is.[6] Gasification emits harmful toxic chemicals and carcinogens, and the emissions, liquid effluent and solid waste from chemical-recycling plants could harm human health and ecosystems – and contribute to climate change.[7,8]

Finally, the majority of chemical-recycling plants are producing not new plastics but plastics-to-fuel. When these fuels are burned, all the carbon originally extracted as fossil fuels is released back into the atmosphere as GHG emissions, contributing to climate change. Far from being part of the circular economy (as touted by the industry), plastics-to-fuel should be considered worse than landfill – and on par with incineration.[9] The focus should be on prevention of plastic waste, where possible, as well as scaling reuse and effective recycling. Concerningly, there has been a push in the US and EU to greenwash chemical recycling, either to weaken environmental regulation by classifying them as manufacturing, rather than waste-disposal, facilities (as pushed by the ACC)[10] or to allow plastic-derived fuels to be considered as akin to renewable energy.[11]

Figure 3.1: The leaky circular economy of chemical recycling

Source: Gaia (2020)[12]



Thermal recycling, energy recovery and waste-to-energy

These euphemistic terms all mean one thing – incineration. Incineration is at the very bottom of the waste hierarchy; it involves burning plastic simply to get rid of it, and generating energy as a by-product. Incineration turns one form of pollution (plastic waste) into other forms of pollution (such as toxic ash, emissions and wastewater).[13]

Burning plastic waste varies in its technology, from the open burning and backyard fires prevalent in countries with emerging and developing economies, to modern, architecturally distinctive 'waste-to-energy' plants such as the CopenHill plant in Denmark, featuring a ski slope and hiking trails,[14] the Spittelau facility in Vienna,[15] or the colourful and quirky Maishima incinerator in Osaka,[16] deceptively sold as innovative solutions to the plastics crisis. Emissions from incineration include many heavy metals, acid gases, particulates and dioxins all highly harmful to human health, and contributing to various cancers, birth defects, lung and respiratory disease, stroke and cardiovascular disease – to name but a few.[17] Even at the high-tech end, which claim greater emissions and pollution controls, a large body of evidence demonstrates significant short- and long-term effects to workers, communities and ecosystems and the unavoidable disposal problem of large quantities of toxic fly ash, sludge and effluent.[18]

Burning plastic is also terrible for the climate; even when energy recovery is accounted for, 1 tonne of plastic produces 1.4 tonnes of CO2 equivalents.[19] The 'waste-to-energy' euphemism also belies the fact that electricity generated through waste-to-energy has significantly higher climate effects than conventional power plants, such as those fuelled by gas.[20] Additionally, effective recycling saves more energy than waste-to-energy vgenerates, as it reduces the amount of virgin plastic (and therefore fossil fuels) that needs to be produced.[21,22]

Many countries lauded for their supposed 'recycling' achievements, such as Denmark and Sweden, have invested heavily in incineration – to the extent that they import waste (including recyclable materials) to feed their incinerators.[23] As a result of the mounting problem of plastic waste, the incineration industry is aggressively expanding into new markets – particularly in Asia, where the industry predicts a 7% compound annual-growth rate.[24] Incineration plants work best with steady streams of material to burn; once they are built, this creates a perverse incentive against effective policies to reduce plastic waste through bans, reuse or recycling.

Waste incineration is a true sticking-plaster solution – a short-term, end-of-pipe response that does not address the problem systemically. For this reason, oil and gas companies are particularly interested in pushing waste-to-energy or chemical-recycling technology, which allow them to continue producing endless torrents of disposable, hard-to-recycle plastic – and distract governments and citizens from the vital need to reduce plastic production. With the contribution of toxic chemicals from incineration and waste burning to respiratory and cardiovascular issues,[25] and strong correlation between air pollution and increased likelihood of death from Covid-19,[26] we are currently witnessing how burning our waste is not only a poor use of resources but also undermines public health by creating toxic environments.

'Waste-to-energy' plant, CopenHill in Denmark, featuring a ski slope and hiking trails

Credit: istock

Inside an incinerator in Sweden

Credit: Will Rose

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