The new trend in Europe

ENERGY FROM WASTE (EFW) FACILITIES ARE WELL ESTABLISHED IN EUROPE WITH AROUND 500 OPERATING PLANTS. BY FURTHER IMPLEMENTING CARBON CAPTURE, IT IS POSSIBLE TO GO CARBON-NEGATIVE, MEANING A NEW STANDARD COULD BE WITHIN AUSTRALIA'S REACH.

EfW technology plays an important role in closing the gap in the circular economy, since residual non-recyclable waste is utilised in energy and resource recovery facilities.

EfW produces stable renewable energy and is therefore part of the solution against global rising temperatures, due to excessive greenhouse gas emissions. By landfill diversion, emissions of harmful substances are reduced, such as methane, which is more than 80 times more potent that CO2.

Additionally, EfW reduces residual waste volumes and masses by 95 per cent and 80 per cent, respectively. Bottom ashes are a suitable and safe material for road construction.

With this considered, the residual mass which needs to be landfilled is as low as 3 to 4 per cent of the incoming waste.

In terms of emissions to air, EfW facilities are equipped with comprehensive flue gas cleaning systems complying with extremely strict emission requirements. They also avoid inflicting negative impacts on human health.

Ramboll's EfW Project Manager Lasse Sander Tobiasen says regulations have heavily influenced what is now a safe, efficient, and developed technology.

"Since 1989, the European Union has regulated harmful emissions to water and air from EfW plants and thus provide EU-wide environmental governance creating a level playing field across the EU," he says.

Image: Hufton&Crow

The Amager Resource Center in Copenhagen.

"Over the years, EfW technologies have matured to meet ever stricter emissions requirements – EU emission limits are now the most stringent in world."

In Europe, it is common for EfW facilities to be in urban areas where energy demand is high, and to minimise transport of residual waste.

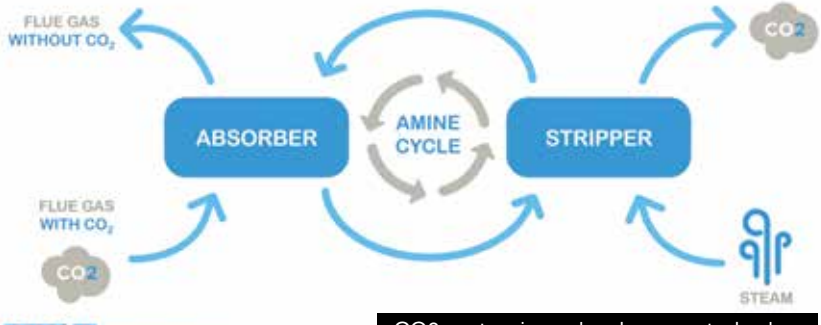
European statistics show that in 2019, 48 per cent of residual waste was recycled and 27 per cent was utilised in EfW facilities, while 24 per cent was sent to landfills.

Although there are large differences across the EU, figures show that countries with a high share of recycling also have a high share of EfW.

This debarks the myth that EfW is in competition with recycling, in fact recycling and EfW complement each other in countries which feature a mature and well-developed waste sector.

Denmark is an example of this trend, where 52 per cent of all residual waste was recycled and 48 per cent was utilised in EfW in 2019 – with all but zero being landfilled.

The EU has set a goal of 55 per cent reduction of CO2 emissions since levels



CO2 capture is an already proven technology, having been utilised throughout Europe.

in 1990, and to be carbon neutral by 2050.

Some European countries have set even more ambitious goals, with countries like Denmark aspiring to reduce CO2-emissions by 70 per cent by 2030.

To reach such high reduction rates, action is needed across many sectors, however, a new evolving technology being introduced is carbon capture, where CO2 is removed directly from the flue gas in power plants.

BREAKING DOWN CARBON CAPTURE

Carbon Capture is a term usually applied to describe the removal of CO2 from gas streams, such as flue gas from EfW or other energy facilities.

Of the CO2 capture technologies available, CO2 capture is the most studied and commercially mature technology.

Amine CO2 capture systems can be fitted to the tail-end of all power generation facilities. The CO2 removal takes place in an absorber column where an aqueous amine solution is brought into contact with the flue gas, whereby CO2 is absorbed by the amine.

After the absorber column, the amine solution, now loaded with CO2, is directed to a stripper column where the solution is heated which strips the CO2 from the solution for later collection and compression.

Amager Resource Center (ARC) in Copenhagen is an award-winning EfW facility that entered commercial operation in 2017. ARC is one of the world's cleanest and most efficient facilities.

Supporting political demand, ARC now has the ambition to become one of the world's first CO2-neutral facilities and has already taken the first steps to achieve this goal.

A Carbon Capture pilot project commenced operation in June 2021 with a pilot unit capable of capturing 850kg of CO2 daily.

The pilot project's objective is to gain knowledge and experience to develop the future full-scale Carbon Capture facility planned for 2025.

It is also designed to capture 90 per cent of the plants' total CO2-emissions, equaling some 500,000 tons of CO2 annually.

As Lasse explains, the facility will largely contribute to diminishing carbon emissions.

"As a matter of fact, around two-thirds of the CO2 from EfW facilities is derived from feedstock from biogenic sources, which is recognised as a renewable source in Europe," he says.

"If this is considered, carbon capture equipped on EfW facilities would actually be carbon negative."

There are already large-scale Carbon Capture facilities in operation in Europe. Even though these facilities are smaller than and different to the proposed facility at ARC in 2025, it confirms that the technology is technically viable.

The captured CO2 can be stored in depleted hydrocarbon subsurface geology, utilised as feedstock in Power-to-X green fuel production, or for boosting growth in greenhouses growing tomorrow's vegetables.

THE AUSTRALIAN CONTEXT

EfW is a mature technology with many benefits. In terms of greenhouse gas emissions, an estimated 0.8–1.0 tons of CO2 are saved for each ton of waste diverted from landfill.

As Lasse adds, such technology would be a big boost for reducing Australia's emission production.

"While landfill diversion by implementing EfW facilities is the most low-hanging fruit, adding carbon capture will give approximately 500kg more CO2 reduction per ton of waste," he says.

"This technology can play a key role in Australia's efforts towards becoming more carbon neutral in the future."

Circa 93 per cent of Australia's energy supply in 2019 was from fossil fuel sources. With an EfW transition, the potential for decreasing CO2 emissions from energy production is abundant.

The exciting expansion with Carbon Capture is also a further step to abide the climate goals that are set, both domestically and internationally, and battle the challenges of global warming.

However, carbon capture is not financially viable without some sort of subsidy or financial compensation for the benefits relating to greenhouse gas emissions. For carbon capture to be more widespread, a proper framework needs to be developed.

For more information, visit https://ramboll.com/services-and-sectors/energy/waste-to-energy