THERMO-CHEMICAL PLASTIC RECYCLING

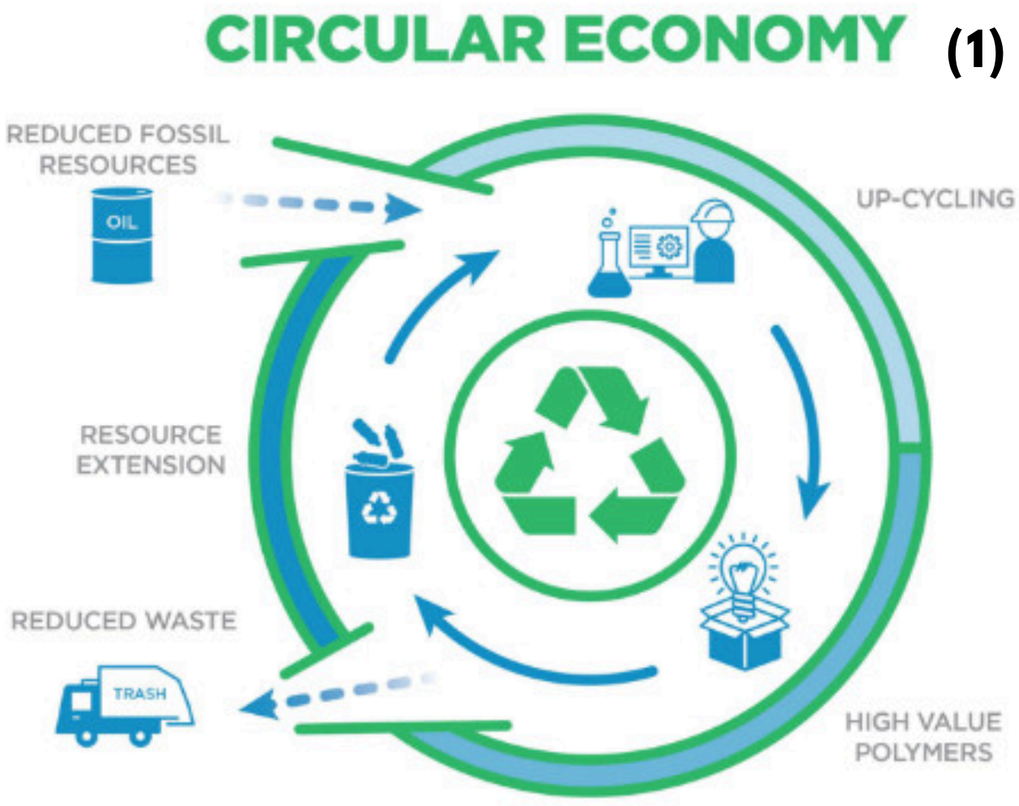
BY MUHAMMAD AAZIM FARIDY (RECURO) AND HELENE UNANDER (QUANTAFUEL)

WHAT?

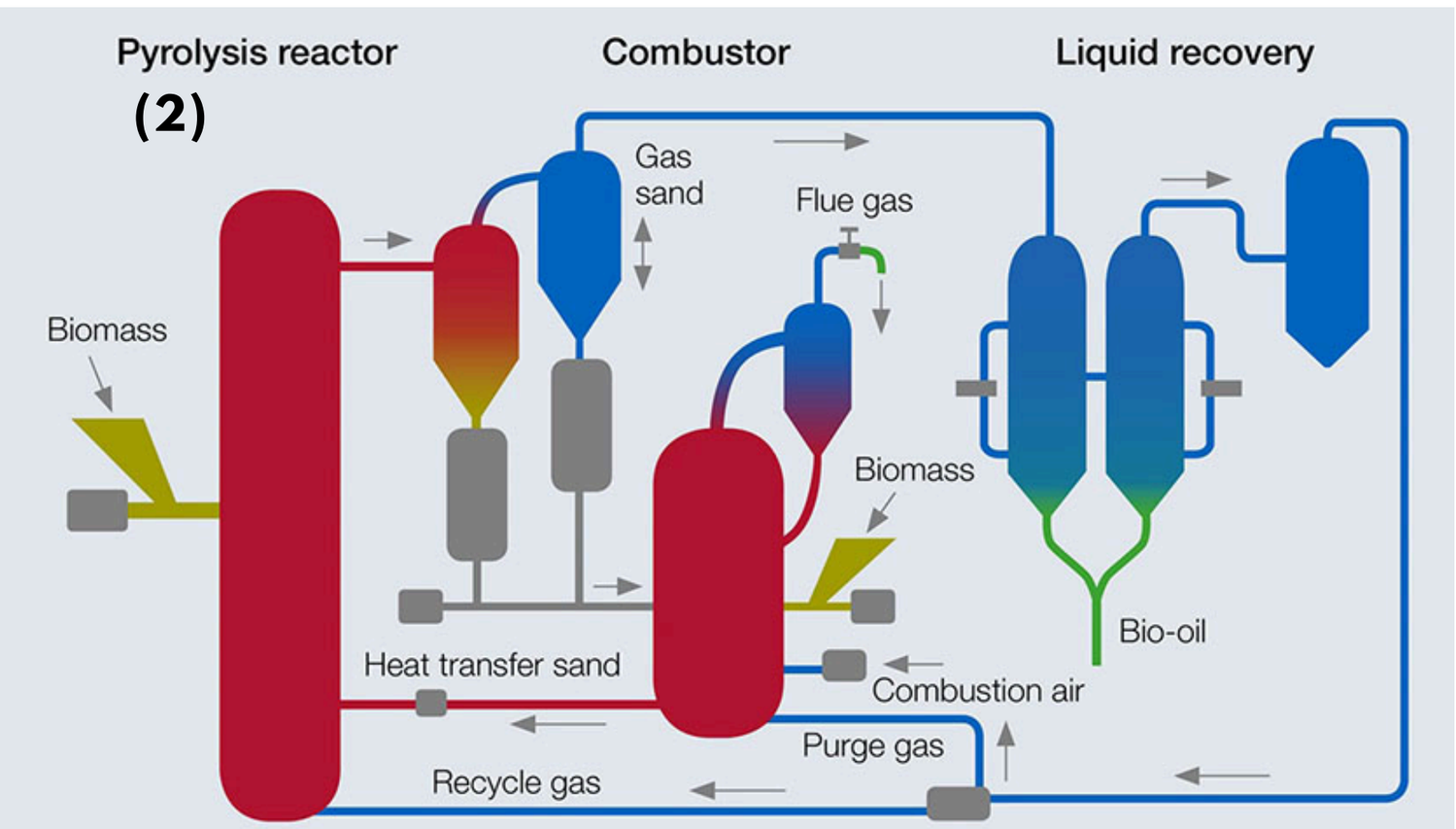
Thermo-chemical plastic recycling is a process that uses heat-induced chemical reactions to break down plastic waste into smaller molecules. These molecules can then be converted into useful chemicals, fuels, or new plastic products.

Quick Facts

- ***Innovative:*** *Uses advanced technology to recycle plastics that traditional methods, like mechanical recycling, can't handle. It breaks down mixed, contaminated, or non-recyclable plastics into valuable products.*
- ***Economic Value:*** *Generates valuable products and supports job creation.*
- ***Environmental Impact:*** *Reduces plastic pollution and lowers greenhouse gas emissions.*



(1)



(2)

OUR EXPERIENCE AS SUMMER INTERNS

Helene in Quantafuel

- *Worked in process department*
- *Digitization of a "process twin" of the process plant*
- *Simulation in Unisim Design with Python*
- *Additional task: Literature study of LOC (Limited Oxygen Concentration) in hot gas filters*

Aazim in Recuro

- *Worked on mass and material balance assessment*
- *Applied software tools such as Python, Excel and PowerBI for data analysis and visualization, enhancing the quality and accessibility of analytical outputs.*

WHY?

Plastic waste *poses a significant* ***environmental problem globally****, with a production of more than* ***350 million metric tons per year****. Thermo-chemical recycling offers a way to divert plastic waste from landfills and incineration,* ***reducing pollution*** *and* ***conserving landfill space****. In addition it supports the concept of a* ***circular economy*** *by reintroducing plastic waste back into the production cycle as raw materials or chemicals, thus* ***reducing the reliance on new plastics****. In some thermo-chemical processes, by-products from extra combustors can be used to* ***generate/recover process heat****, contributing to energy recovery and potentially* ***reducing dependency on fossil fuels****.* ***(3)***

HOW?

Pyrolysis

Plastics are heated in an O_2-free environment to produce oil, gas, and char.

Gasification

Plastics are heated with controlled amounts of O_2 or steam to convert them into syngas, mainly H_2 and CO, along with other products such as CO_2, H_2O, and small hydrocarbons

Depolymerization

Plastics are heated with catalysts to break down into monomers, which can be purified and used to create new plastics or chemical products.

REFERENCES

1. ***https://www.linkedin.com/pulse/challenge-waste-plastics-striving-more-circular-economy-di-mondo/***
2. ***https://www.plasticsandrubberasia.cn/en/news/green-materials-vtt-to-add-thermochemical-treatment-for-recycling-plastic-waste/***
3. ***https://www.sciencedirect.com/science/article/pii/S0959652622034643***