Case Study/Pall Solutions Help Close the Waste Recycling Cycle

PICSAELPTENa

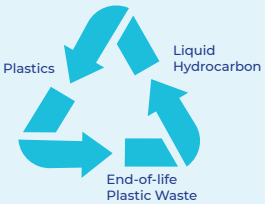
BACKGROUND

The issue of end-of-life plastic waste is becoming increasingly urgent, with 8 million tons of plastic entering our oceans annually. This poses a major threat to marine life and is a significant source of contamination for our food sources. Even when landfilled, plastic waste can take centuries to decompose. As a result, advanced solutions to close the cycle of plastic waste are urgently needed.

The obvious solution is to reduce our reliance on plastic but there are processes that make it possible to recycle it as part of the circular economy*.

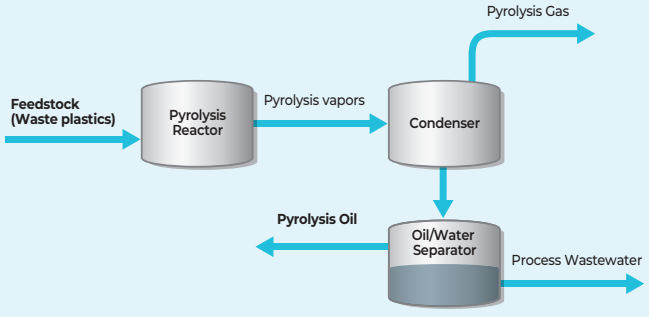
Introduction

The increasing demand for sustainable and practicable energy sources is driving the global pyrolysis oil market. Pyrolysis plants incinerate waste at very high temperatures in the absence of oxygen to obtain pyrolysis oil from sources such as waste plastics, polymers, biomass, and waste rubbers and tyres. Due to its high calorific value, pyrolysis oil can be employed as an industrial fuel to replace furnace oils or other industrial fuels.



However, to be used as feedstock for new plastics/polymers or as an upgraded fuel, pyrolysis oil must achieve a high cleanliness level, typically less than 0.5% water content, a flash point of at least 140°C (284°F), and a sulphur content of less than 0.5%. Additionally, the oil should be free of any visible particulates and any corrosive or toxic substances.

Simplified Process Diagram



Problem

A major European plastics recycling plant approached Pall to help them improve the quality of their pyrolysis oil by removing both residual solid and liquid contamination.

The issue of variable quality and type of waste plastic fed into the pyrolysis process results in the pyrolysis oil containing high levels of contaminants, such as particles, semi-solids, and water. These contaminants must all be removed for the oil to be marketable, as its quality determines the market price.

Pall solution

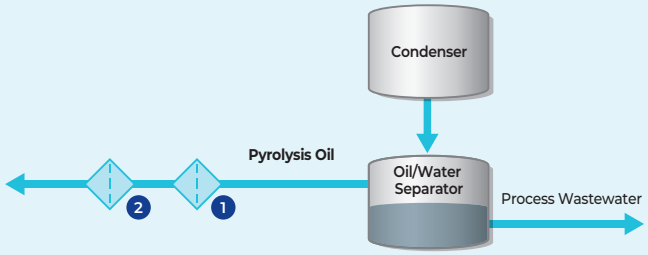
Pall and the plant process Engineers defined and deploy a very pragmatic action plan: First, take representative samples of pyrolysis oil to define its contamination (nature, concentration, size distribution, etc.). Second, carry-out pilot tests to not only define and validate the appropriate technologies but also size the full-scale solution.

The results concluded that the best solution was a combination of different graded Pall depth filter modules to remove high volumes of solids and semi-solids, followed by a high efficiency liquid/liquid coalescer to separate the liquid (free water) contaminants.

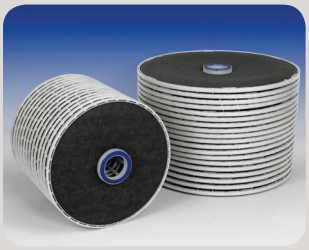
To further improve the visual appearance of the oil, activated carbon technology was offered to remove targeted chemical contaminants that darken the final product.

**The circular economy is a concept that promotes reuse, recycle, and reduce to minimize waste and maximize the lifespan of products.*

Pall Solutions Help Close the Waste Recycling Cycle



#	Technology	Goal
1	Depth filter modules with activated carbon	Particulate filtration + Discoloration
2	Liquid/Liquid Coalescer	L/L Coalescence (removing water from oil)



Activated carbon depth filter modules used to decolor pyrolysis oil

CONCLUSION

Pall's multi-stage solution allowed the customer to improve the final pyrolysis oil quality to meet the market's demand for cleanliness and protect the critical assets within the process from fouling. The pyrolysis oil which was hazy and dark fluid obtained by pyrolysis, was now bright and clear, and particle-free.

The Pall solution enhances the plant's reliability and productivity, so the customer can expect a reduction in the OPEX, increased yields and an ultimately higher value product. The customer is now standardizing the Pall solution for its future industrial pyrolysis projects.

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