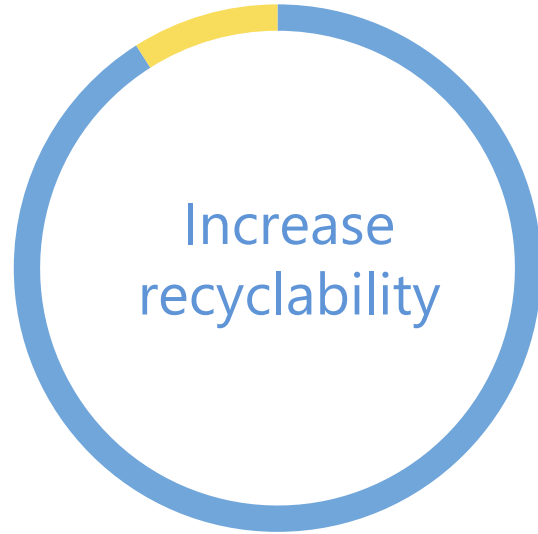


# CHEMICAL RECYCLING IN PRACTICE

Carlos Monreal  
Founder and CEO



# WHY CHEMICAL RECYCLING?



Preventing pollution

Recycling more

Prioritising highest waste  
management option



Enable the incorporation of recycled  
content in food-grade materials

Developing and improving recycling  
infrastructure



# PLASTIC ENERGY – WHO WE ARE



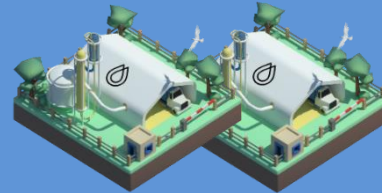
## **INDUSTRY LEADER IN CHEMICAL RECYCLING**

Convert end-of-life plastic waste into hydrocarbon oils.



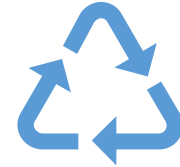
## **PATENTED TECHNOLOGY**

We have been developing for the past 10 years the Thermal Anaerobic Conversion



## **INDUSTRIAL PLANTS & OPERATIONAL EXPERIENCE**

2 industrial and commercial plants operating for the past 3 years



## **PLASTIC2PLASTIC PROCESS**

Only company to have validated and certified the Plastic2Plastic process for a circular economy of plastics



## **PARTNERSHIPS**

Long-term partnerships with major industry players

# PLASTIC ENERGY – OUR MISSION



## REDUCE POLLUTION

Improve waste management by diverting plastics away from landfills and incineration, and preventing leaks in our ocean



## CIRCULAR ECONOMY

Contribute to closing the plastic loop



## INCREASE RECYCLING

Support countries in reaching recycling targets by recycling previously non-recyclable plastics



## HIGH-QUALITY RECYCLED CONTENT

Increase availability of virgin-quality recycled content suitable for food-grade products



## REDUCE OIL DEPENDENCY

And the production of virgin plastics



## ECONOMY

Boost local economies by building new plants and creating jobs



Global  
Commitment

Plastic Energy signed the Ellen MacArthur Foundation New Plastic Economy Global Commitments

By 2025, Plastic Energy will convert at least 300,000 tonnes of low-grade plastic waste into feedstock for new plastic manufacturing (Plastic2Plastic).

# OUR FEEDSTOCK AND PRODUCT

## FEEDSTOCK

- Origin:
  - Currently, we focus on post-consumer flexible packaging, including plastic films, multi-layer or multi-material packaging.
  - We could also recycle plastics from other industries: automotive, agricultural...
- Preparation and target material:
  - No need to wash or separate by polymer-type
  - Remove non-targeted material to follow our specifications
  - Target polymers: Mix of PE, PP, PS
  - Control of the average contamination of the feedstock and limit to 10% the following: other materials, non-targeted polymers (PET, PVC, EPS, cat7), inks...

We can support mechanical recycling in increasing recycling rates, but we can't recycle everything. If we want to create a quality of product suiting the specifications of the petrochemical industry, better eco-design of plastic products is important for both mechanical and chemical recycling if we want to recycle 100% of the plastic we produce.

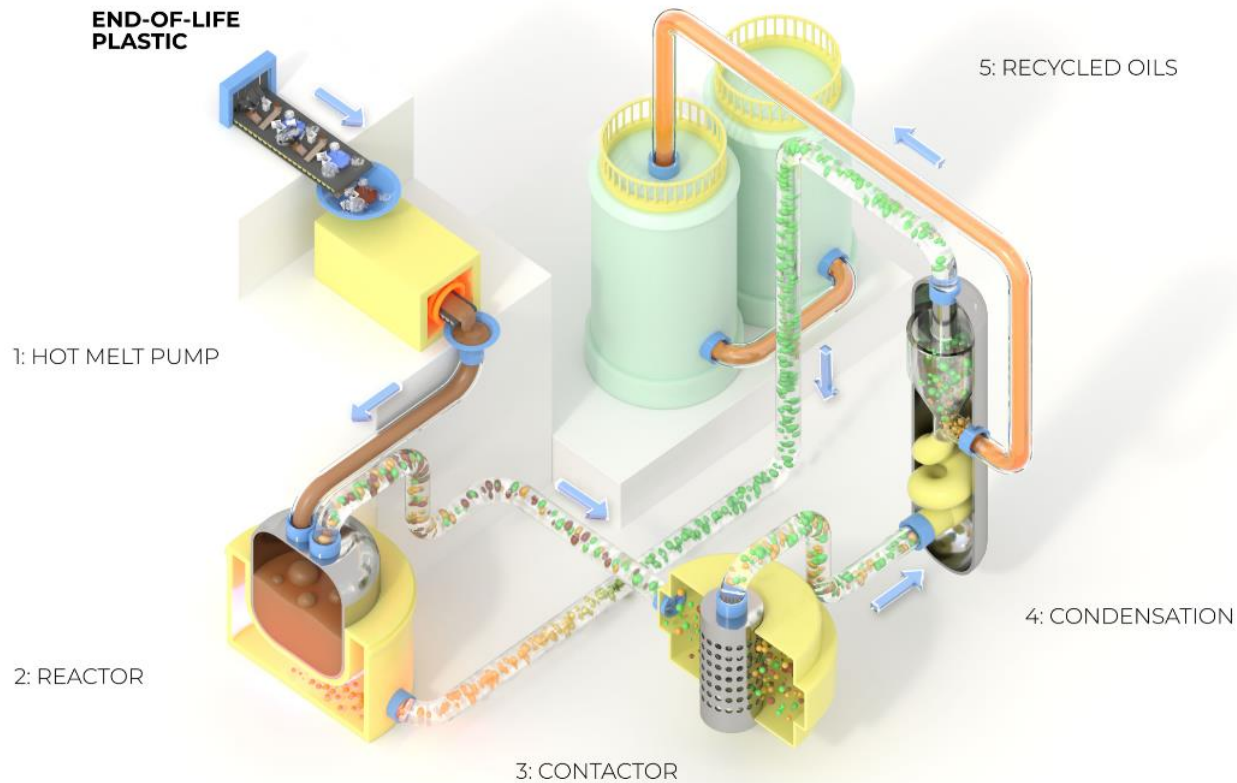
## PRODUCT

- Each tonne of plastic waste processed through our chemical recycling plant will produce approx. 850 litres of TACOIL
- The TACOIL replaces fossil oil in the cracker and can go on to make recycled, virgin-plastics.



# OUR TECHNOLOGY – THERMAL ANAEROBIC CONVERSION

## PROCESS



## TECHNOLOGY HIGHLIGHTS

- Robust and uncomplicated
- Semi-batch process
- No additional substances necessary
- Uniform and stable heating is essential for a controlled and consistent product
- Relatively mild temperature and low pressure
- Novel process solutions for heat utilization and energy recovery
- Practically energy neutral in the chemical process
- Modular system: Thermal process well-suited for scaling
- Various patents granted in the EU & US



# OUR CURRENT PLANTS – ALMERIA AND SEVILLA

## 🔹 PLANT CAPACITY

- We have two operational plants, in Seville and Almeria, Spain, that have been operational since 2015 and 2017
- Our current plants have a capacity to process 5,000 t/a of plastic each.

## 🔹 YIELD

- The approx. 72-75% TACOIL is sold to the petrochemical industry
- The approx. 18% syngas produced is used to power the plant and reduces the need for outside energy
- The approx. 8-10% Char produced is sold to the construction industry (cement, brick...) and energy production

**100% of the TACOIL produced is now going towards the production of new products.**



# PLASTIC ENERGY PLANT – ENVIRONMENTAL DATA



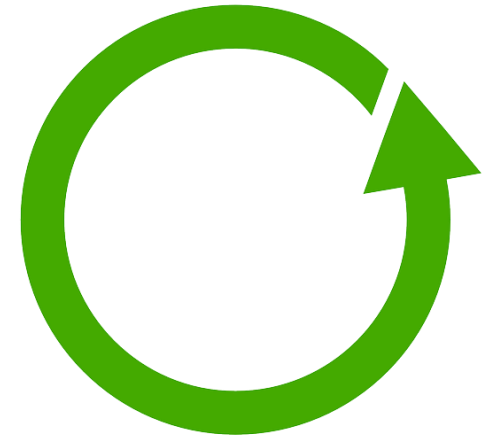
## LCA

- Independent LCA, ISO compliant by Quantis
- High level conclusions :
  - Plastic Energy's process has a considerably lower climate change impact than incineration with energy recovery.
  - Plastics made from Plastic Energy's recycling process have a lower climate change impact than virgin plastic.
  - Technology still in development and we expect improvements in the energy efficiency of the chemical recycling process.
- The following presentation will further develop on the LCA of chemical recycling



## ENVIRONMENTAL CONSIDERATIONS

- Pyrolysis plants in Europe need to comply with the EU Industrial Emissions Directive. We are putting in all investment necessary to fall below the limits set which involves some investments in equipment such as thermal oxidisers.
- Control of the environmental impact: Independent tests and monitoring are mandatory. Our plants, have a CEMS (continuous emissions monitoring system) to report to authorities.
- REACH: The pyrolysis oils have to be registered under REACH which control the potential risks associated to the product and requires pyrolysis oils to be produced and managed in an isolated environment and strictly controlled conditions (SCC).
- End-of-waste status: additional security that the output has the same properties as fossil oil and doesn't have additional health or environmental impacts. In-progress at the national or project basis.



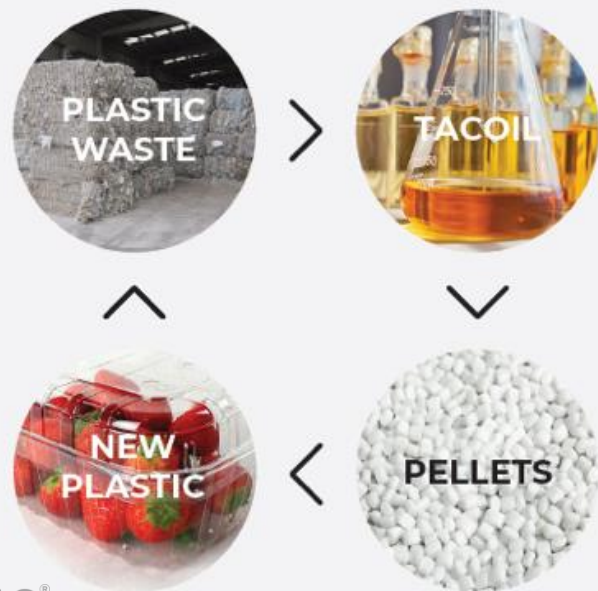


# DEMONSTRATION OF CLOSING THE LOOP - COMMERCIALISATION OF FOOD-GRADE PACKAGING WITH RECYCLED CONTENT FROM TACOIL

## 🔹 CERTIFIED CIRCULAR POLYMERS :

1<sup>ST</sup> company worldwide having validated & certified the circular economy of end-of-life plastics.

- Announced in Davos 2019
- Renewi, PLASTIC ENERGY, SABIC, Unilever / Vinventions / Walki Group
- Certified circularity and traceability by the ISCC+



## 🔹 PROPERTIES:

- Recycled oils replacing fossil oils in manufacturing process
- Food-grade packaging
- Endless recycling without degradation



Food-grade Magnum and Knorr packaging from recycled content from Plastic Energy's chemical recycling plant, commercialised on the European market.

New value chain collaboration with Sealed Air, petrochemical company SABIC, UK-based Tesco supermarkets, and Bradburys Cheese.

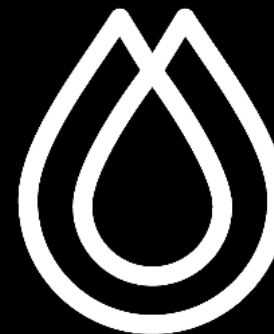


## OUR GROWTH



We will be building 10 chemical recycling plants by 2025.

Carlos Monreal – Founder and CEO of PLASTIC ENERGY



Minimal capacity of the new generation plant:  
20,000t/a of plastic processed



# OUR GROWTH WITH KEY PARTNERS



## Almeria (SP)

- Plant commissioned in 2015.
- First one in Europe with the REACH certificate.



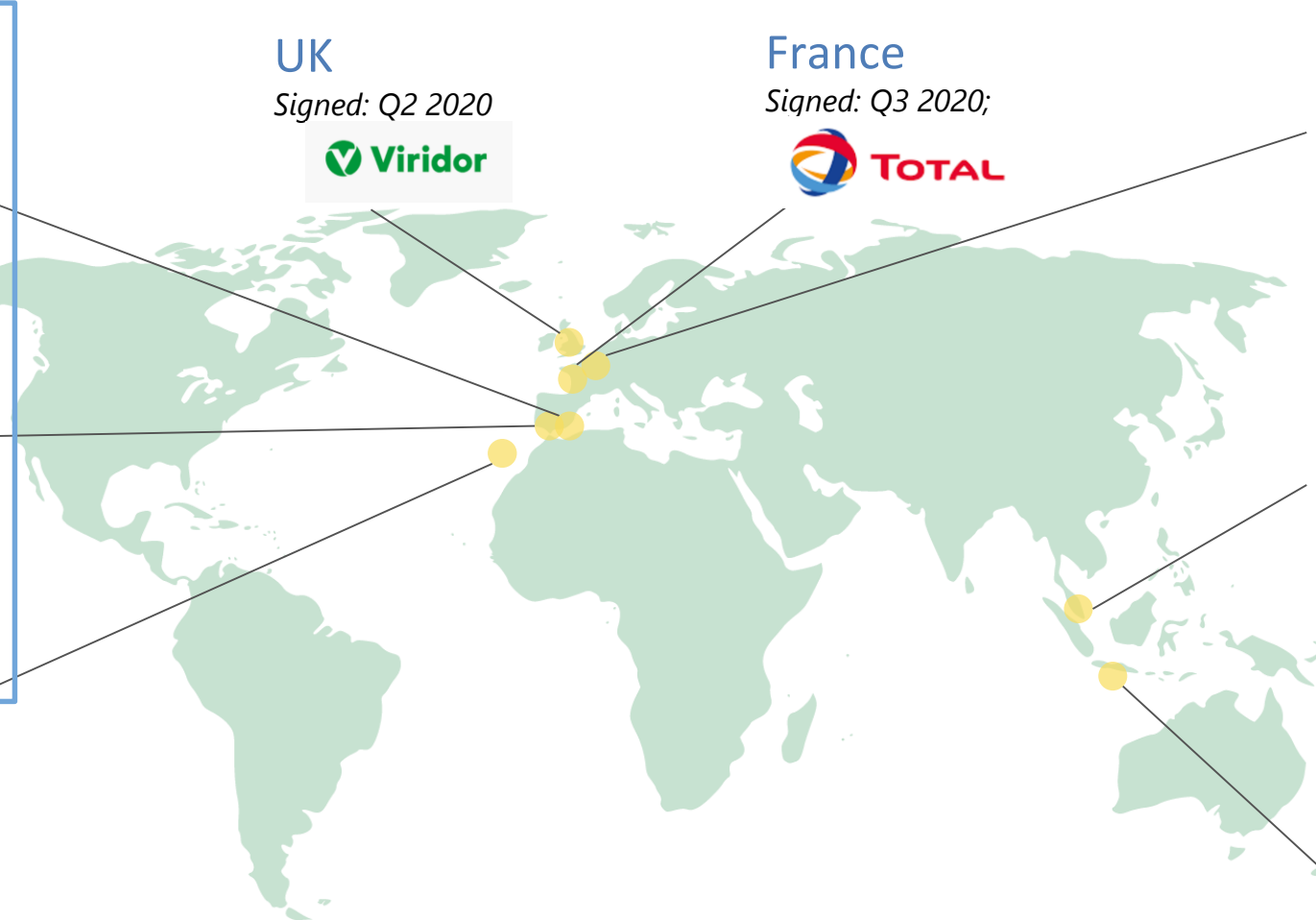
## Seville (SP)

- Plant operating since 2017
- Increase the capacity of Seville plant in 2022



## Tenerife (SP)

- Expected to be operational in 2022*
- Sustainability project



UK  
Signed: Q2 2020



France  
Signed: Q3 2020;



Geleen (NL)  
Signed: Q4 2018; Operating: 2022



Malaysia  
Signed: Q2 2019; Operating 2023



Indonesia  
- MoU signed in West Java for the construction of 5 plants

Other partner for plant in Europe:



...and many more in the pipeline



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