

# Bio-Crude Oil from wastewater Algae



Oxidation ponds showing SCWR location.

Solray Energy has built, and is operating, a revolutionary processing plant to convert algal biomass to a renewable bio-crude oil that is a replacement for fossil fuels. After harvesting from NIWA's demonstration High Rate Algal Pond system, the algae are subjected to high temperature and pressure in Solray's Super Critical Water Reactor (SCWR). The reactor has been designed to continuously process between 4 – 40 m<sup>3</sup> of harvested algal biomass per day, depending on the water content (1 – 30% solids).

While many others working in this space are recovering oil solely from the algal lipid, Solray is converting the whole algal biomass. The result is a bio-crude oil with a similar composition to fossil crude oil. The Christchurch Wastewater Treatment Plant demonstration is the culmination of 4 years of development of SCWR technology by Solray Energy.

This joint Solray, NIWA and CCC project will determine the energy efficiency and economics of conversion, extraction and refining of algal bio-crude oil at large-scale. The key steps in the process are illustrated below:



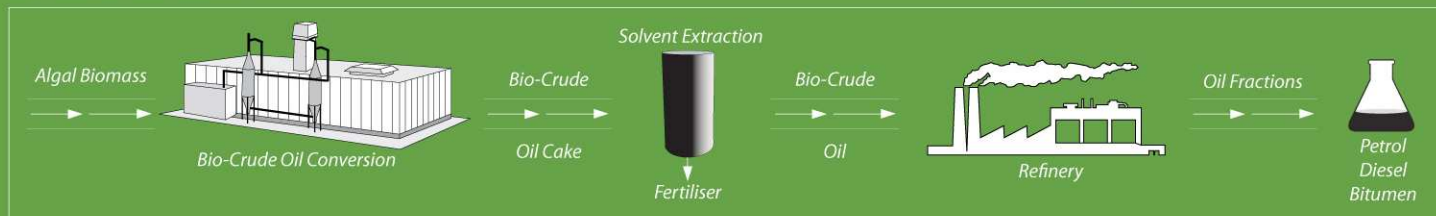
The Super Critical Water Reactor mimics processes that produced fossil oil. Intense heat (above 300 °C) and pressure (above 20 MPa) are used to convert algal biomass to bio-crude oil.



Solvent is used to strip the bio-crude oil out of the algae residue. The solvent is recycled and the algal residue used as fertilizer.



The bio-crude oil is separated into useful fractions such as petrol (20%), diesel (45%) and bitumen (20%). Other useful products include CNG, LPG, and waxes.



Benefits of Super Critical Water Reactor algal bio-crude oil conversion:

- Algal biomass does not have to be dewatered completely (5 – 30% solids).
- Bio-fuel production is maximized by conversion of the whole algal biomass.
- Bio-crude is similar to fossil crude oil – i.e., it provides a “drop-in” solution.
- Can be used to convert other organic material to bio-crude.
- Recovered nutrients can be recycled as fertilizer.
- GHG abatement is achieved by offset fossil fuel use through: renewable fuel production and fertilizer recovery.

**“The bio-crude oil from wastewater algae system is a technology for the future – it enables renewable fuel production whilst achieving low cost wastewater treatment, nutrient recovery and GHG abatement.”**



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