

PRODUCTION OF PELLETS FROM MAN-MADE WASTE:

used vegetable oil and grain granules



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Abstract

The project has developed a biphasic biofuel by combining waste vegetable oils and grain granules. This combination of biomasses has been designated "CerOil," derived from the roots of the words "Cereal" and "Oil." Preliminary results show that CerOil has a lower calorific value (LCV) of approximately 5,000 kcal/kg, which is 20% higher than that of traditional pellets.

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Introduction

CerOil aims to provide a carbon-neutral solution using agro-industrial waste such as vegetable oils and cereal granules.

The fuel offers significant advantages:

Economic: The procurement costs are sustainable for all components as they are not affected by erratic markets, geopolitical dynamics, and financial speculation.

Technological: The processes for refining an agro-industrial oil are known and relatively simple, and the combustion systems are traditional.

Environmental: In addition to achieving carbon neutrality, sustainability also stems from the fact that these biomasses are ineluctable anthropogenic waste, which are difficult to treat and even dangerous when considered individually.

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Materials, Methods and Experiments

Materials

- Waste vegetable oils
- Cereal granules

Methods

Biodiesel Synthesis:

- The Transesterification reaction is carried out in a basic environment with KOH as a catalyst.

The compost preparation stage is as follows:

- Mixing biodiesel with wheat granules in a 1:4 ratio.
- Homogenizing and extruding the mixture to form pellets 6 mm in diameter and 10-20 mm in length.

Combustion Experiments:

- Small cylinders placed in a perforated steel tray.
- Heating on a hotplate with an airflow of 40-50 m³/h.
- Ignition at 180°C and combustion at 1100-1200°C.

Calorific Value Determination:

The determination of the calorific value involved:

- A comparison of CerOil and ENplus A1 ISO 17225-2 certified pellets.
- Measurement of the temperature increase of 1 liter of water heated above the burner.

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Results and Discussion

The results showed that CerOil exhibited an estimated LCV of approximately 5,000 kcal/kg, 20%, which was higher than that observed for pellets. The combustion of the pellets was observed to be effective, with a stable flame and a burning rate of about 5 grams/min.

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Conclusions

Laboratory experiments have indicated that CerOil has a high calorific value. The reuse of agro-industrial waste through CerOil represents a promising solution for the achievement of carbon neutrality and the advancement of environmental sustainability.

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References and Literature

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