



Josef Cyril  
Reiser



華東理工大學  
EAST CHINA UNIVERSITY OF SCIENCE & TECHNOLOGY

## Production of biodiesel from waste cooking oil

Graduate candidate	Josef Cyril Reiser
Examiner	Prof. Dr. Rainer Bunge
Co-examiner	Dipl. Ing. Martin Brunner, Von Roll Inova AG, Zürich
Subject area	Energy and Environmental Technology
Project partner	East China University of Science and Technology



Produced biodiesel from WCO

**Problem:** The restaurants of Shanghai produce 90 tons of waste every day and at present  $\frac{1}{3}$  of it is processed into animal food. The main by-product is the waste cooking oil which can be transformed into biodiesel with the appropriate treatment. This product could be sold instead of being disposed.

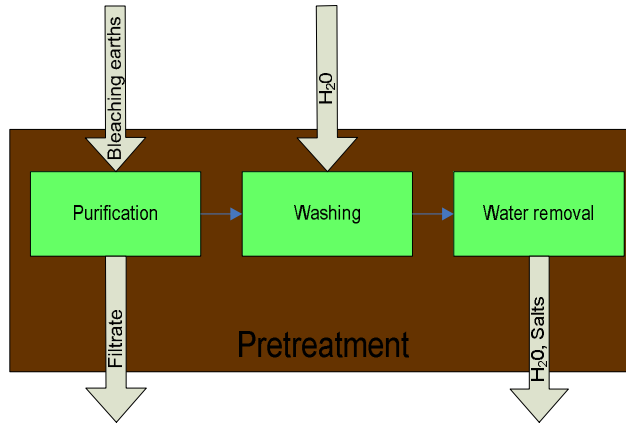
**Objective:** Main focus was on the pretreatment of the waste cooking oil for removing undesired substances such as salts and sugar, solids and water. After the pretreatment, a complete process of biodiesel production needed to be established.

The produced biodiesel had to be analyzed and checked regarding the ASTM standards for biodiesel.

**Solution:** The WCO oil was purified by using 5wt% of bleaching earths ( $H_2Al(SiO_3)_4$ ) to absorb particles in the oil, was washed with 10vol% of deionised water to wash out salts and sugar, which are preferably soluble in water, and was treated with calcium oxide, which has strong ability to absorb the residual water.



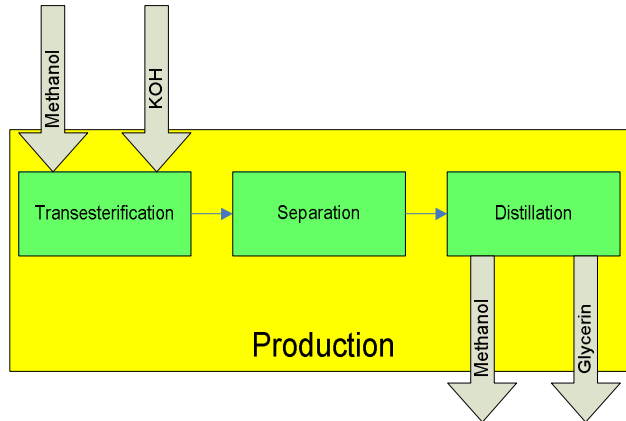
Before and after pretreatment



Processes for WCO pretreatment



Separation and distillation of biodiesel



Processes for biodiesel production

The transesterification for the biodiesel production was performed with an alkali-catalyzed process with a 1:2 methanol to oil ratio, using 1wt% of KOH as catalyst. It showed that this ratio was able to transfer nearly 100% of the WCO to biodiesel. The glycerin, a byproduct of the biodiesel production, was separated from the biodiesel by physical separation. The residual methanol was recovered from the biodiesel fraction and from the glycerin fraction by distillation, and was reused.

The analysis showed that the values for calorific value, flashpoint, acid value, viscosity and freezing point, met the ASTM standards for biodiesel production.