Development of a local market for the oil

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Development of a local market for the oil

to operate diesel generators for schools,

to run corn mills and as a fuel for (a few) vehicles equipped with a diesel engine.

Project target was: a market created for 25 diesel engines distributed over 25 villages.

Local technicians will receive training on how to convert diesel systems for plant oil operation, which involves the assistance of experts from abroad.

The oil will be pressed at 10 different sites (within 5 schools and 5 small enterprises) to create an guaranteed initial market for the farmers to sell the seeds and the oil.

Development of a local market for the oil

- **Other options for the oil:**
- use as lamp oil for lighting in households
- for soap production, mosquito repelant cream, disinfectant, bio-pesticides

- The **knowledge** acquired will be **disseminated**

- and the experiences and local revenues will **generate new, comparable projects**.

Plant oil as replacement for fossil diesel fuel

- **Plant oil as replacement for fossil diesel fuel**
- PPO, Pure Plant Oil
- SVO, Straight Vegetable Oil
- JPO, Jatropha Plant Oil

- **Bio diesel** is Plant oil (JPO treated with chemical ingredients, esterifying the oil.

Oil qualities in relation to use in diesel engines.

- using plant oil as fuel in diesel engines is not so simple.
- running any diesel engine on oil for 24 hours is not a problem.
- But problems often occur after that within the first 500 hours in which total breakdowns of engines occurred.

The variables which might cause difficulties are:

- 1 much higher **viscosity** of PPO in comparison with fossil diesel,

- 2 **Too high values of contents of**:
- phosphor,
- acid,
- water,
- contamination with particles,
- oxidation, etc.

a great variety between diesel engines,

- the DI types and IDI types
- and with different types and makes of fuelpumps.

These causes that each engine has to be modified and tuned in its own way to let it run smoothly on PPO.

See section 5.2 of the Jatropha Handbook [see www.fact-foundation.com], by Niels Ansoe

Diesel varieties in QNP

Diesel varieties in QNP

Modifying diesel engine program

- high viscosity of the PPO can be reduced by increasing the temperature of the PPO.
- Diesel engines can be modified, making use of exhaust or cooling water to increase the temperature of the PPO.
- Start up problems, when the engine is still cold , can be overcome by mounting a second tank, with fossil diesel,
- the engine can be started on normal diesel and after some minutes, when it has got heated up, the fuel can be switched to PPO.
- The so called dual fuel mode.

Modifying diesel engine program

- existing diesel modification kits in Europe (like delivered by Elsbett) are too expensive for the diesel owners of the maize mills in QNP to be earned back in a short time.
- Therefore, a **technical investigation program** was started to develop a cheap modification kit.
- diesel engines should be modified and some endurance tests be done to check if the engines were performing well on PPO, with these kits.

First test with modification kit on Lister ST3 in NL, has succesfully run 600 hrs on PPO

2d test with modification kit on Feidong diesel engine in Chimoio

3d test with modification kit on Feidong diesel engine in Bilibiza

Parts of the Modification kit, by Niels Ansoe, based on use of cooling water for 3d and 4th tests

Present status

- the endurance tests are not finished yet.
- no problems were mentioned sofar.
- this kit has a total cost of around € 200, and seems suitable for these types of engines.
- Since these test have not been concluded, and therefore no guarantee can be given yet, potential clients could not be approached yet for modification.

Modification of the Nissan 4Wd car

- The project car, a Nissan 4wd was modified by Niels Ansoe in Oct 2009, to run on PPO.
- The system is a 1-tank system : enabling the car to start and run on 100% PPO without starting first on diesel.
- Niels provided the parts from Denmark, costing around € 700.
- The purpose was mainly to demonstrate that driving on PPO with a normal modern car is also possible.

Car modification

The Nissan

Filling up with PPO

Oil quality

The quality of oil depends on the whole production chain, from soil preparation to oil storage and distribution.

For example:

- harvesting green unripe seeds results in too high phosphor contents, bad for diesel engines.
- Storage in galvanised tanks leads to creation of polymers, blocking fuel filters.
- Too high pressing temperature increases the phosphor contents in the oil

Test of first JPO from BBC against DIN V 51605

Report-No. : 182600 end of test period : 03.05.2010

Sample Designation : Jatropha oil from FACT project Mozambique
Sample Appearance : yellowish, turbid, characteristic odour
Sample Container : PE-bottle 500 ml
ASG-ID : 168411 Seal : -

Parameter	Method	Result	Specification DIN V 51 605	Unit
Total contamination	DIN EN 12662	32	max. 24	mg/kg
Acid value	DIN EN 14104	13,34	max. 2,0	mg KOH/g
Oxidation stability 110 °C	DIN EN 14112	11,6	min. 6,0	h
Phosphorous content	DIN EN 14107	19,4	max. 12	mg/kg
Earth alkali content (Ca + Mg)	DIN EN 14538	12,6	max. 20	mg/kg
Ash content	DIN EN ISO 6245	0,010	max. 0,01	% (m/m)
Water content	DIN EN ISO 12937	1393	max. 750	mg/kg

Notice:

All results out of specification limits were confirmed by repeat analysis

RESULTS OF TEST

- The test gave very negative results.
- the critical variables were far too high to make the oil valuable for using as PPO in engines.
- Their needs to be a quality control method of the JPO
- It was decided to use this oil for making soap and continue the endurance test with the diesels with cooking oil.

Neutralization of Oil

acidity can be neutralized by adding caustic soda and heat, resulting in clean oil and soap residues

Jatropha oil, before neutralization treatment left, acidity 17, after treatment right, acidity 3

Quality control method

- Execute in house this titration to find out the JPO acidity in future.
- Regularly an JPO sample could be send to ASG for the full testing.
- build up a small laboratory and attract a chemical engineer who could be trained at Diligent in Tanzania to execute the required testing of the JPO on the standards as set in DIN V 51605.

Conclusions

- The main purpose of the project: to develop a local market for Jatropha, has not been achieved within this period,
- but the possibility to do so is still realistic