

Micro diesel engine

Background

For small farmers in developing countries, wanting to grow a crop through irrigation in the dry season, two options are open for pumping the water: manual or motorized.

For manual pumping the treadle pump is very suitable, for motorized pumping, diesel or petrol engine pump-sets are widely used. Often farmers start with a manual pump and after having made some money, would like to move a step up to a motor pump. This, however, is often not possible, because the cost of the available motor pump-sets is beyond their means. The micro diesel, because of its unique design, simplicity and small size offers the possibility to be available to farmers for an affordable price. It seems reasonable to expect that if a low cost diesel pump-set, such as the micro diesel, will be introduced on the market, millions of small farmers will want to buy one. Apart from the low initial cost, the micro diesel is very fuel-efficient. It will run 7 hours on one liter when pumping 2 l/s, which is twice the capacity of a treadle pump!

Expected benefits

With a micro diesel pump-set more land can be irrigated, thus increasing the earnings for the farmers, at the same time freeing them from the drudgery of pumping manually, leaving them more time to spend on other agricultural activities. More irrigated land means more food production. While manual pumping is usually limited to vegetable gardening, with the micro diesel also staple food can be produced.

Applications

Apart from lifting water for irrigation, the micro diesel can also be used for driving post harvest processing equipment, fishing boats, electricity generation, etc.

The technology

The special thing about this engine is that although it is a diesel engine, it has no fuel-pump or injector. The fuel is mixed with air in a sort of simplified carburetor, and drawn into the engine crankcase (two stroke). When the piston is at bottom dead center, the compressed fuel-air mixture is transferred to the combustion chamber above the piston. The piston, moving upwards, compresses the mixture until the temperature reaches the point where spontaneous combustion occurs.

In order to get the combustion to take place at more or less the right time, the compression needs to be set correctly. The engine is started with maximum compression and as it warms up the compression is gradually reduced, until after some minutes, the engine operating temperature is stabilized and no further adjustment is necessary.

This extremely simple design with very few moving parts, makes the engine cheap to produce, reliable and easy to repair.

Specifications

Displacement	18cm ³
Power output	0,6hp at 6000rpm
Cycle	two stroke
Compression	Variable between 0 and 1:50
Fuel	Kerosene, diesel or vegetable oils
Weight of bare engine (approx)	15kg
Cooling	Water cooled, air-cooling optional
Speed control	Internal governor
Power take-off shaft	1500rpm, 1:4 ratio to crankshaft
Starting	Crank
Power take-off (2, start shaft)	365 rpm
Specific fuel consumption	300-400gr/hp.h
Fuel cons. at 0,2hp/5700rpm	0.15 l/h

Cost

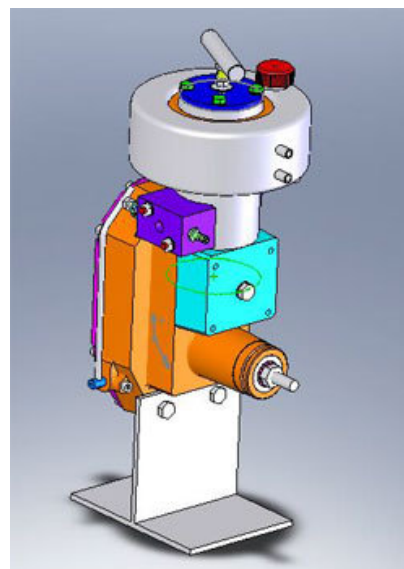
When mass-produced in China or India, the engine is expected to cost about US\$ 60, off factory. The retail price for farmers depends on the margins in the supply chain, possible transport costs and taxes.

Environmentally friendly

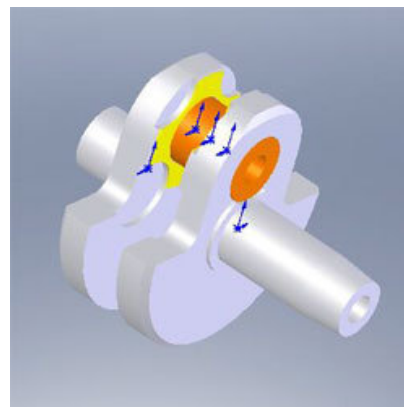
Because the engine can work well on pure (unrefined or esterised) vegetable oil, it offers an opportunity for future mechanization of farmers without negative effects on the environment. Furthermore, farmers can grow their own oil crops and so keep the fuel cost within their own community.



micro diesel prototype



micro diesel 3D drawings



crankshaft assembly drawing

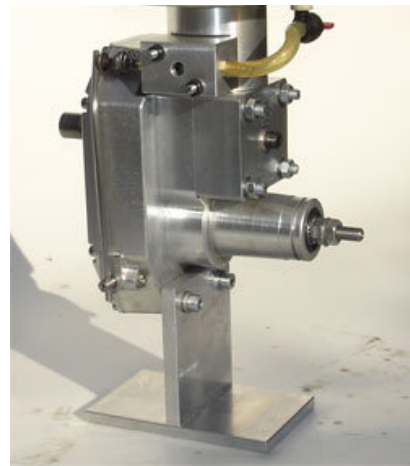


...en van de community.

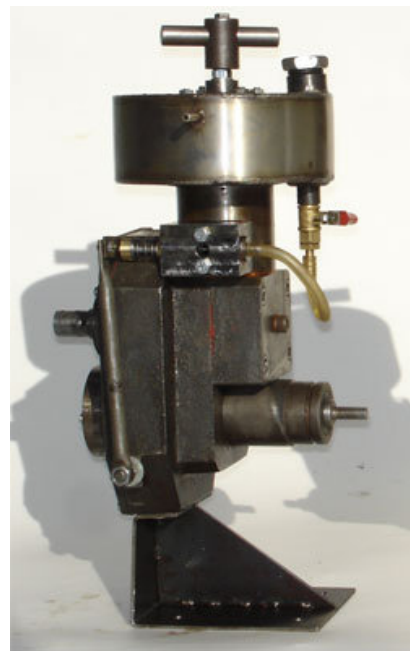
Current status

A prototype was built in the Netherlands, based on original parts and design of the German inventor Ir. Teegen. This prototype serves as a "proof of concept". As a next step, two more prototypes have been built in China and the Netherlands. These prototypes will be used for extensive testing.

Extensive performance data will be available by the end of 2007.



prototype produced in the Netherlands



prototype produced in China