
Agricultural Institute of Slovenia
Department of Agricultural Engineering
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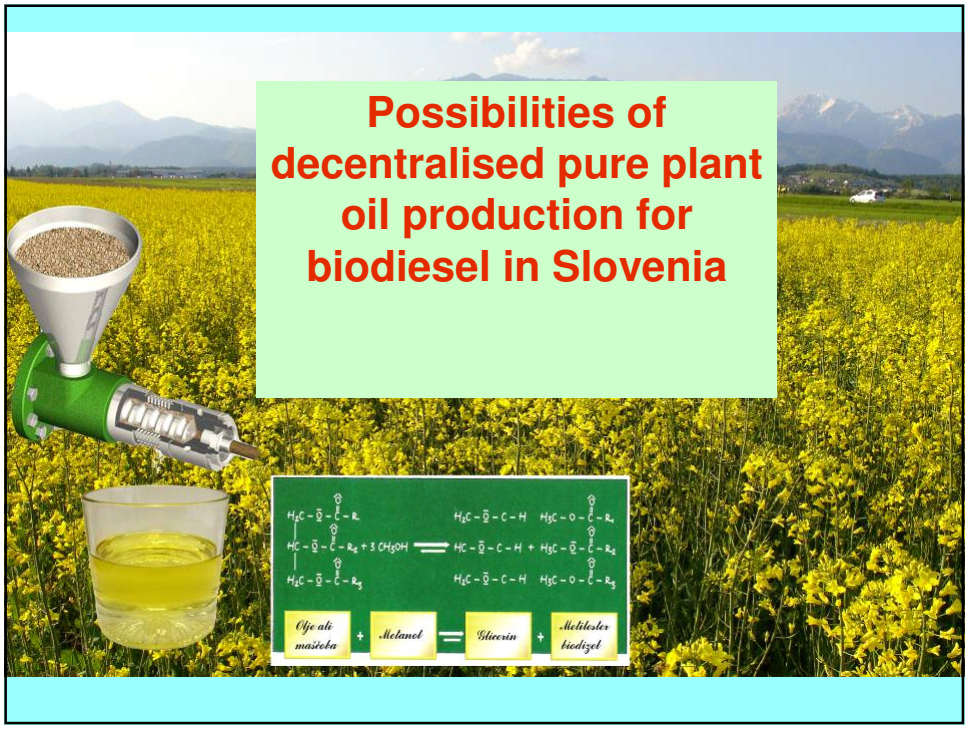
14 9 2005


Possibilities of decentralised pure plant oil production for biodiesel in Slovenia
Olje ali maščoba
Metanol
Glicerin
Metilester biodizel

Dr. Rudolf Diesel, 1858 – 1913 Patent for engine 1893


PATENT-URKUNDE

an Rudolf Diesel, Ingenieur, in Berlin

GEGENSTAND DES PATENTES IST:

Arbeitsverfahren und Ausführungsart für Verbrennungskraftmaschinen.

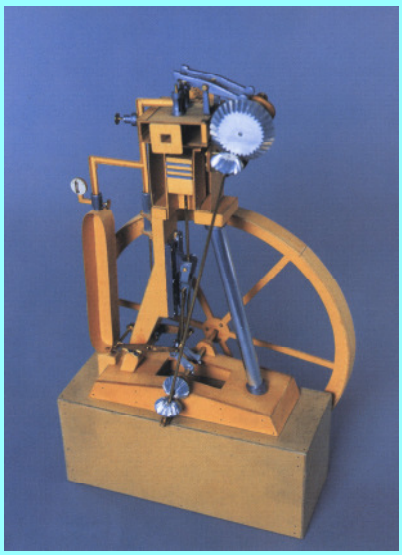
ANFANG DES PATENTES: 28. Februar 1892.

Berlin, den 23. Februar 1893.

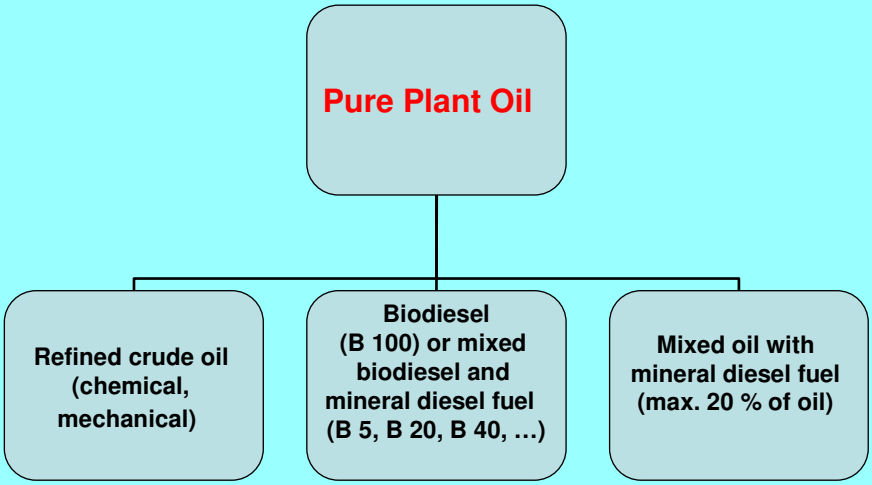
KAISERLICHES PATENTAMT.

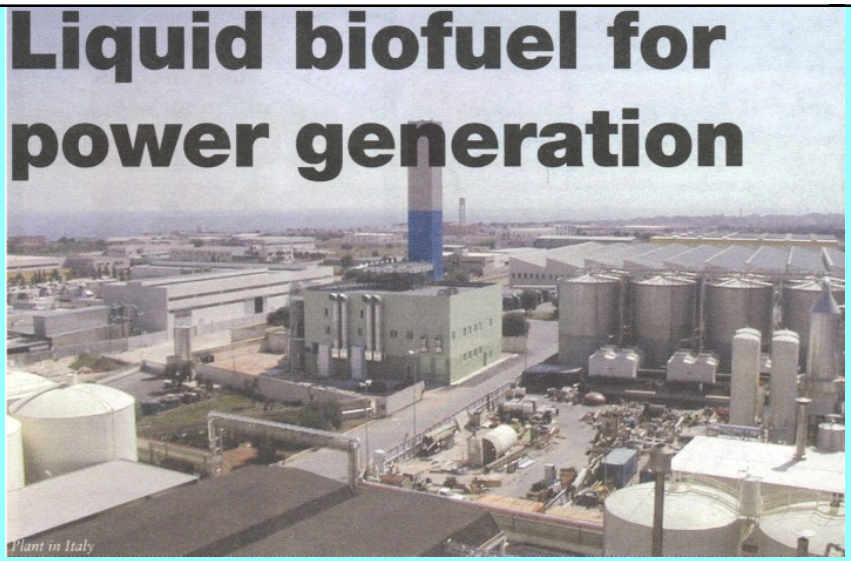
Diesel engine in 1900 ran on peanut oil!

In 1912 Diesel said: "The use of vegetable oils for engine fuels may seem insignificant today. But such oils may become in the course of time as important as petroleum and the coal tar products of the present time"



Possibilities of using Pure plant Oil for energetic use (vehicle propulsion and cogeneration)





Electric plant on Pure Plant Oil, Monopolli - taly. In use from August 2004, power 16 MW (later increased power on 24 MW). Oil consumption 45000 ton/year. Investment: ItalGreen Energy, Casa Olearia Italiana Group

Energy from fields!

In industrialised countries oil is produced mostly from rapeseed and sunflower. For the production of energy non-refined and refined plant oils up to different degrees can be used.

Why "Biodiesel" ?

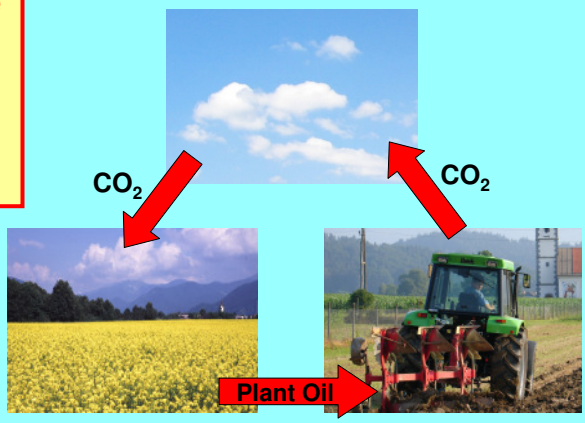
In the European countries and also in the some parts of world Biodiesel has been used for more than a two decades, it is therefore the most tested among the alternative fuels.

Advantages:

- closed circle CO_2
- results in 35 to 39% lower CO emissions (35 to 99 with oxidation catalytic converter) and up to 22% lower emissions of incombustible hydrocarbons (CH) in the atmosphere,
- positive energetic balance,
- it lowers the degree of smoking of exhaust systems (up to 70 %),
- it does not contain harmful aromatic compounds (benzene, toluene etc.),
- in case of fuel spillage it is not dangerous for the environment (biologically degradable),

Pure Plant Oil production: its importance for reduction of emissions of greenhouse gases

CO_2 derived from the combustion of Biodiesel is from the aspect of emissions of GHG´s environmentally neutral



Side effect of Pure Plant Oil production: ground water protection

Pure Plant Oil is biodegradable – it reduces the risk of water pollution in the case of fuel spillage

Side effect of Pure Plant Oil production: improved supply of protein feeds

Present situation:
Animal production in Slovenia depends almost entirely on imported oilseed meals and cakes, mainly of soybean meal from America

Future: **Rapeseed cakes and meals may replace a part of imported protein feeds. Cakes from local production can be also an important non-GMO protein source for the production of special animal products.**

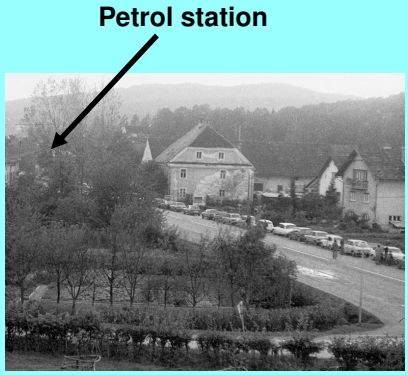
Side effect of Pure Plant Oil production: improved quality of animal products

Rapeseed cake in diets for domestic animals may alter fatty acid composition of animal products (increased level of polyunsaturated fatty acids)

Beneficial effect on human health (coronary diseases)

Side effect of Pure Plant Oil production: security in fuel supply

Decentralised biodiesel production improves the security in the field of fuel supply (dispersed reserves of energy in the form of fuel or rapeseed)



Yugoslavia, 1983

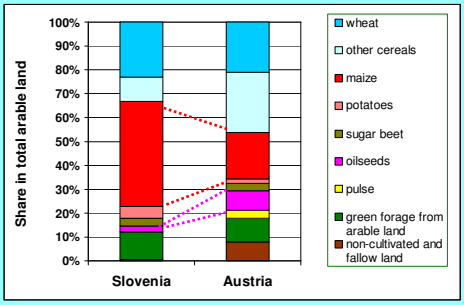
Can it happen again?

Side effect of biodiesel production: improved crop rotation

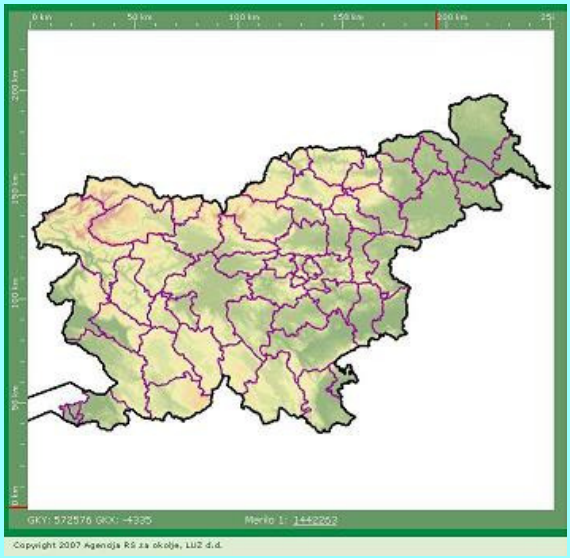
Present situation:

The highest proportion of maize in crop rotation in Europe

The share of oil plants has been less than 2% in the field crop rotation in Slovenia before 2003.



Potential for growing rape seed 15 000 – 20 000 ha in Slovenia



Present situation in Slovenia

- Last year rape seed was growing on 5208 ha (source of data SURS). Index 2006/2007 was 181,4.
- Other source (unofficial) 7200 ha
- Average yield in 2007 was 3,2 t/ha (year before only 1,8 t/ha).
- For biggest biodiesel production in future focal point must be on higher domestic growing of rape seed in accordance with crop rotation and higher yields/ha.

Extraction of oil seed

- **Industrial oil production**

  Extraction oil seed with solvents

  Mechanical extraction

- **Decentralised oil production**

  Mechanical oil seed extraction

Decentralised Pure Plant Oil production

IDEA:

Farmers and environment may benefit from decentralised oil production for biodiesel

Decentralised oil and biodiesel production

Definition: Decentralised oil production is a production in smaller productional units (on farm or close to farms) pressing up to 5 t of rapeseed per day. Units have to be situated on different locations over the Slovenian country.

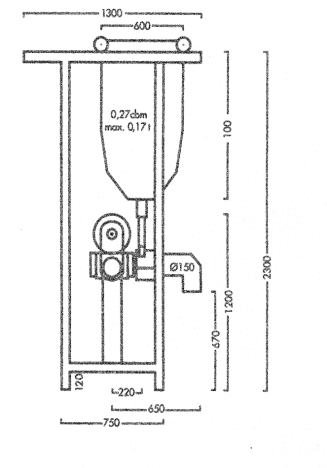
Decentralised production units can operate economically and environmental friendly, if their technical equipment and working process are as simple as possible and they use as little energy as possible.

Primerjava decentralizirane in industrijske ekstrakcije semena

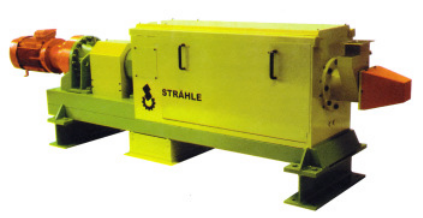
- Majhna velikost obrata (manjša ali srednje velika podjetja)
- Lokacija blizu pridelovalnih površin
- Proizvodne kapacitete do 5 t/dan (25 t/dan)
- Proizvodnja hladno stisnjenega olja in oljnih pogač (peletov)
- Nizka vsebnost fosforja v olju (pod 10 ppm)
- Visoka hranilna vrednost oljne pogače (10 – 17 % olja v pogači)
- Nizki investicijski stroški
- Majhna poraba energije (80 kWh/t semena), v povprečju 6 krat manjša kot pri industrijski ekstrakciji
- Do okolja prijazna proizvodnja (ni uporabe kemičnih topil ali toplotne obdelave semena, ni odpadne vode)
- Nizki transportni stroški (karakteristično do 50 km razdalje)
- Stroški varnostnih ukrepov nizki
- Visoka fleksibilnost (hiter proces prilagajanja na semena drugih oljnic)
- Ustvarjanje dodatne vrednosti v ruralnem okolju

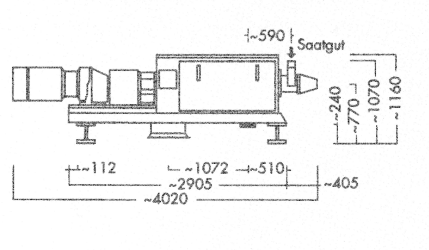
- Korporacije – povezava z multinacionalnimi koncerni
- Lokacije blizu velikih transportnih križišč
- Proizvodne kapacitete večje od 500 t/dan
- Proizvodnja rafiniranega in pol rafiniranega olja, oljne pogače z ekstrakcijo s topili
- Visoka vsebnost fosforja v olju
- Pogača ni ekološko pridelana
- Visoki investicijski stroški
- Visoka poraba energije (470 kWh/t semena)
- Uporaba kemičnih topil
- Odpadna voda iz postopka rafiniranja
- Stroški varnostnih ukrepov visoki
- Nizka fleksibilnost (ni mogoča hitra prilagoditev na semena drugih oljnic)
- Dolge transportne poti (tudi med kontinentne povezave)
- Visoki stroški za zavarovanje okolja

Micro presses capacity 5 - 15 kg/h oil seed
Mini presses capacity 15 - 50 kg/h oil seed



Medium capacity presses 100 – 300 kg/h



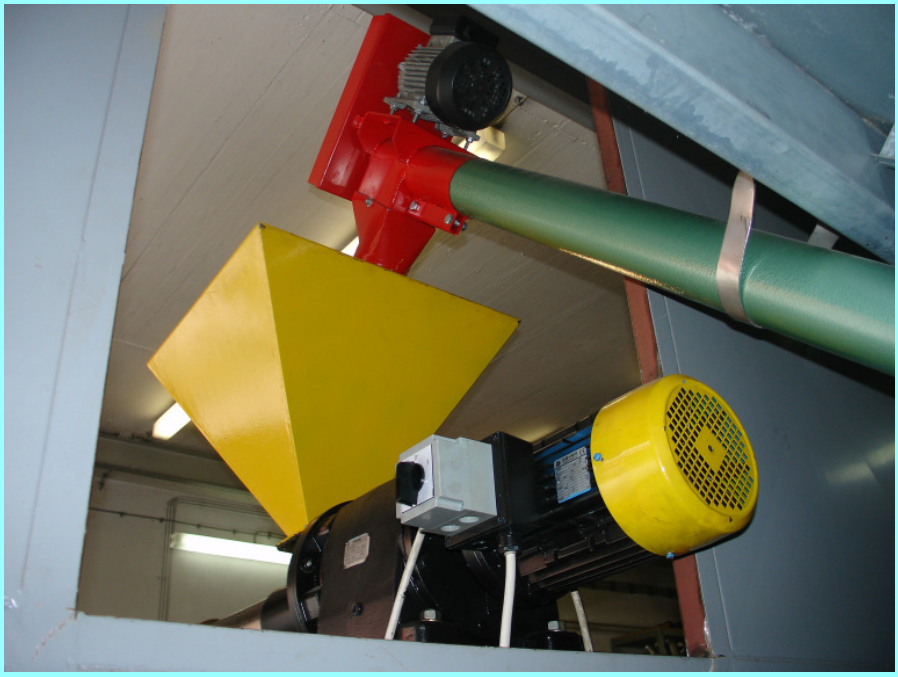


High capacity presses 300 kg/h do 2000 kg/h

Pressing in a large capacity plant (battery of presses)

Experimantal press for decentralised production of rapeseed oil (developed at the Department of Agricultural Engineering – Agricultural Institute of Slovenia

Small scale Pure Plant Oil production – pilot plant, Agricultural Institute of Slovenia, Department of Agricultural Engineering



Laboratory testing of pure plant oil and biodiesel (made in decentralised unit) on Slovenian tractor Agromehanika AGT 835 (Agricultural Institute of Slovenia, Department of Agricultural Engineering)

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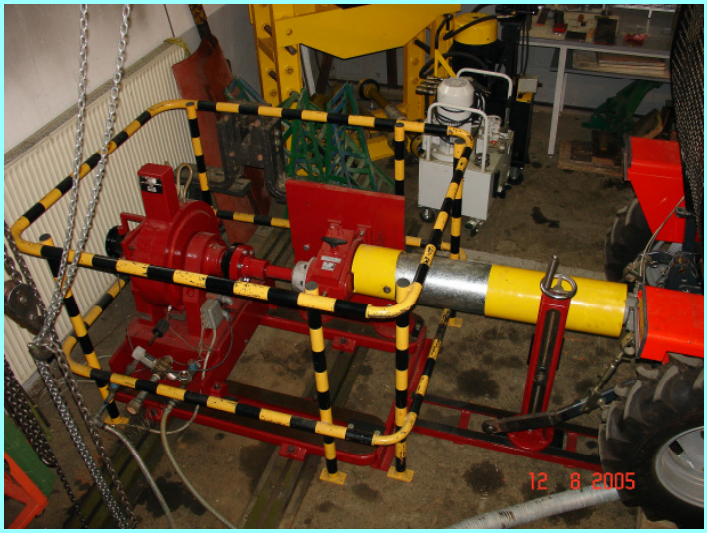

Public presentation of biodiesel use for vehicles (European week of mobilitiy in capital Ljubljana)

THE PRESENT SITUATION IN SLOVENIA

- Production of Pure Plant Oil aproximately 8 000 t in year 2007
- One pure plant oil production plant with total capacity 12 000 t/year
- Few micro pure plant oil producers
- One small pilot plant for pure plant oil
- In construction 5 to 10 mini and medium plants for pure plant oil on farms
- Collectors of waste cooking oil

FUTURE OF BIODIESEL?

- After 2020 production of biodiesel will base on agricultural residues and waste wood biomass (Fischer - Tröpsch process)
- Biodiesel made with Fischer - Tröpsch process will have better physical and chemical characteristics than present biodiesel and mineral diesel fuel
- Price for production of biodiesela with Fischer - Tröpsch system in future can drop up to 50 % in comparision with present price of biodiesel