YOUR LOW COST INVESTMENT TO PRODUCE BIODIESEL
Due to increasing crude oil prices in recent times fuel from other raw material has become more and more competitive.

The history of biodiesel fuel as the essence of plants containing oils and fats started in the beginning of the 20th century.

We are aware about the fact that fuel produced out of vegetable oil is as beneficiary for an engine like common fuel produced from crude oil or gas.
BEFA BIODIESEL PRODUCTION

IN 3 OPTIONS:

1. MOBILE MODULE MACHINES

2. STATIONARY MACHINES

3. COMPLETE PRODUCTION PLANT INCLUDING VEGETABLE OIL PRODUCTION

MOBILE MODULE MACHINES

Our mobile biodiesel machines have the advantage that they can be transferred from one production area to another and can be set up everywhere, i.e. on a patio or next to oily crop mills

The plant consists of a reaction vessel, heat exchanger, catalytic converter, hot water boiler, complete pipe system including valves, a high pressure pump, framework and a control panel. It can be transported on a trailer or a small truck from destination to destination. You just need following items to begin with your production:

• Electric energy
• Vegetable oil
• Alcohol (methanol)
• Catalyst
BEFA BIODIESEL PRODUCTION

STATIONERY MACHINES

The stationary machine will be integrated into the production area to remain there without being mobile. It consists in general of a catalytic mixer, the sedimentation and reaction vessel, electric heating, complete pipework with valves, 2 high-pressure pumps and the control panel.

COMPLETE PLANTS

A complete plant contains one production chain to produce vegetable oil out of oily crop and one chain for the production of biodiesel from vegetable oil. BEFA company has in its delivery program all necessary plant components so that according to customer's needs a complete biodiesel production plant can be erected.
BEFA BIODIESEL PRODUCTION

COMPLETE PRODUCTION PLANT INCLUDING

VEGETABLE OIL PRODUCTION – BEFA 600

In the following overview you see the production process chain beginning from the delivered raw material to the final product: biodiesel produced with the help of our technology.

**Biodiesel production**
8. Pump
9. Oil tank
10. BEFA 600
11. Storage tank
12. Filter
13. Filling pump

**Vegetable oil production**
1. Silo with screw conveyor
2. Crushing machine
3. Screw conveyor
4. Oil sump
5. Double sieve
6. Oil press
7. Filtering press
# BEFA BIODIESEL PRODUCTION
## TECHNICAL SPECIFICATION

<table>
<thead>
<tr>
<th>Description</th>
<th>Technical Data</th>
<th>Price (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Silo with screw conveyor</td>
<td>10 m³</td>
<td>14.900,00</td>
</tr>
<tr>
<td>2. Crushing Machine</td>
<td>Double-shaft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 l</td>
<td>2.230,00</td>
</tr>
<tr>
<td></td>
<td>1,5 kW</td>
<td></td>
</tr>
<tr>
<td>3. Screw conveyor</td>
<td>Length: 4 m</td>
<td>9.500,00</td>
</tr>
<tr>
<td></td>
<td>4 Heating rods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 kW</td>
<td></td>
</tr>
<tr>
<td>4. Oil sump</td>
<td>1.000 l</td>
<td>1.600,00</td>
</tr>
<tr>
<td>5. Double sieve</td>
<td></td>
<td>800,00</td>
</tr>
<tr>
<td>6. Oil press</td>
<td>2-3 tons / day</td>
<td>15.600,00</td>
</tr>
<tr>
<td></td>
<td>5,5 kW</td>
<td></td>
</tr>
<tr>
<td>7. Filtering press</td>
<td>Capacity: 60 kg / h</td>
<td>8.800,00</td>
</tr>
<tr>
<td></td>
<td>0,75 kW</td>
<td></td>
</tr>
</tbody>
</table>
# BEFA BIODIESEL PRODUCTION
## TECHNICAL SPECIFICATION

<table>
<thead>
<tr>
<th>Description</th>
<th>Technical Data</th>
<th>Price (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Pump</td>
<td>Capacity: 15 l / min</td>
<td>2.300,00</td>
</tr>
<tr>
<td></td>
<td>0,3 kW</td>
<td></td>
</tr>
<tr>
<td>9. Oil tank</td>
<td>20 m³</td>
<td>14.200,00</td>
</tr>
<tr>
<td></td>
<td>Double-jacket</td>
<td></td>
</tr>
<tr>
<td>10. BEFA 600</td>
<td>600 l / cycle</td>
<td>14.880,00</td>
</tr>
<tr>
<td></td>
<td>18,9 kW</td>
<td></td>
</tr>
<tr>
<td>11. Storage tank</td>
<td>5.000 l</td>
<td>6.700,00</td>
</tr>
<tr>
<td>12. Filter</td>
<td></td>
<td>1.500,00</td>
</tr>
<tr>
<td>13. Filling pump</td>
<td>45 l / min.</td>
<td>1.270,00</td>
</tr>
<tr>
<td><strong>Total amount:</strong></td>
<td><strong>94.280,00</strong></td>
<td></td>
</tr>
</tbody>
</table>

The output performance of this plant type is approx. 2,000,000 liter per year at 200 working days.
BEFA BIODIESEL PRODUCTION

USAGE OF PROCESS LEAVINGS

Pressed crop

Pressed crop as leavings is commonly used as additive to animal food. It is also possible to produce pellets and briquettes out of those leavings and to use them as combustibles. The pellets made out of rape seed crop provides a better fuel value than firewood.

Glycerin as by-product

1. After chemical refinement the glycerin can be used as following:

   a) Raw glycerine 95 – 96%:
      - food additives
      - solvents
      - colours
      - cosmetics
BEFA BIODIESEL PRODUCTION

USAGE OF PROCESS LEAVINGS

b) Energetic fraction with 55-60 % of free fatty acids (FFS):
   - combustibles
   - raw material for pharma and cosmetics industry
   - detergents

c) Solid potassium phosphate:
   - fertilizer

d) Biotechnical production of citric acid

e) Biotechnical production of oxalic acid

2. Conversion of raw glycerine with the help of special yeast to proteines as animal food additive

3. Usage as adhesive additive for the production of pellets and briquettes
Biodiesel is commonly made of rapeseed (Europe) or palm oil (Africa) as primary, and methanol as secondary raw material. Befa offers beside this also a production way with ethanol instead of methanol, and the know-how for many different primary raw materials as well.

Chemically, transestrified biodiesel comprises a mix of mono-alkyl esters of long chain fatty acids. The most common form uses methanol to produce methyl esters as it is the cheapest alcohol available, though ethanol can be used to produce an ethyl ester biodiesel. BEFA provides machines for the production of methyl ester and also ethyl ester. A by-product of the transestrification process is the production of glycerin. A liquid transestrification production process is used to convert the base oil to the esters.

Any Free fatty acids (FFAs) in the base oil are converted to soap, removed from the process and will be led over to the glycerine fraction. After this processing, unlike straight vegetable oil, biodiesel has combustion properties very similar to those of petroleum diesel, and can replace it in most current uses.
BEFA BIODIESEL PRODUCTION

A variety of oils can be used to produce biodiesel. These include:

• Virgin oil feedstock;
• rape seed and soybean oils are most commonly used in Europe, though other crops e.g. in Africa such as palm oil, Barbados nut (also known as “Pourghère”), and even algae show promise;
• Waste vegetable oil (WVO);
• Animal fats including tallow, lard, yellow grease.

Biodiesel feedstock plants utilize photosynthesis to convert solar energy into chemical energy. The stored chemical energy is released when it is burned, therefore plants can offer a sustainable oil source for biodiesel production. Most of the carbon dioxide emitted when burning biodiesel is simply recycling that which was absorbed during plant growth, so the net production of greenhouse gases is small and that of CO2 is zero.

We have a wide range of Biodiesel production plants, starting and using oil seeds, lard or chip fats. We also offer the complete infrastructure to produce oil from seeds and fats. On the following page you will find several plants for the production of biodiesel with the corresponding oil recovery rate:
BEFA BIODIESEL PRODUCTION

There are many sorts of crop from which vegetable oils can be produced: here is a selection

<table>
<thead>
<tr>
<th>Type of crop</th>
<th>Botanical expression</th>
<th>Occurence</th>
<th>Recovery rate (kg / ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cashew</td>
<td>Anacardium occidentale</td>
<td>Vietnam, India, Brazil</td>
<td>148</td>
</tr>
<tr>
<td>Rubber tree</td>
<td>Hevea brasiliensis</td>
<td>Brazil</td>
<td>195</td>
</tr>
<tr>
<td>Kenaf</td>
<td>Hibiscus cannabinus L.</td>
<td>Asia (esp. South/East), also South East Europe and Africa</td>
<td>230</td>
</tr>
<tr>
<td>English Marigold</td>
<td>Calendula officinalis</td>
<td>Europe, Asia</td>
<td>256</td>
</tr>
<tr>
<td>Upland cotton</td>
<td>Gossypium hirsutum</td>
<td>North and Middle America</td>
<td>273</td>
</tr>
<tr>
<td>Cannabis</td>
<td>Cannabis sativa</td>
<td>Asia, South and Central America, Africa, Netherlands</td>
<td>305</td>
</tr>
<tr>
<td>Soya bean</td>
<td>Glycine max</td>
<td>Middle and East Asia, South America</td>
<td>375</td>
</tr>
<tr>
<td>Coffee</td>
<td>Coffea arabica</td>
<td>East Africa to Middle East</td>
<td>386</td>
</tr>
<tr>
<td>Flax</td>
<td>Linum usitatissimum</td>
<td>Eastern Mediterranean Europe to Middle Asia</td>
<td>402</td>
</tr>
<tr>
<td>Common Hazel</td>
<td>Corylus avellana</td>
<td>Europe, Asia</td>
<td>405</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>Cucurbita pepo</td>
<td>North America, Continental Europe, India, Australia, New Zealand</td>
<td>449</td>
</tr>
<tr>
<td>White Mustard</td>
<td>Brassica alba</td>
<td>North Africa, Middle East, Mediterranean Europe</td>
<td>481</td>
</tr>
<tr>
<td>Gold-of-Pleasure</td>
<td>Camelina sativa</td>
<td>Northern Europe, Central Asia, North America</td>
<td>490</td>
</tr>
<tr>
<td>Sesame</td>
<td>Sesamum indicum</td>
<td>All tropical regions in the World</td>
<td>585</td>
</tr>
<tr>
<td>Tung tree</td>
<td>Aleurites fordii</td>
<td>China, Argentina, Paraguay</td>
<td>790</td>
</tr>
</tbody>
</table>
# BEFA BIODIESEL PRODUCTION

<table>
<thead>
<tr>
<th>Type of crop</th>
<th>botanical expression</th>
<th>occurrence</th>
<th>Recovery rate (kg / ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower</td>
<td>Helianthus annuus</td>
<td>North and Middle America, Europe, Middle East, China, Russia</td>
<td>800</td>
</tr>
<tr>
<td>Cacao</td>
<td>Theobroma cacao</td>
<td>Middle and South America, Western Africa, Indonesia</td>
<td>863</td>
</tr>
<tr>
<td>Peanut</td>
<td>Arachis hypogaea</td>
<td>Mexico, Central America</td>
<td>890</td>
</tr>
<tr>
<td>Opium poppy</td>
<td>Papaver somniferum</td>
<td>Middle East, Asia</td>
<td>978</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>Brassica napus</td>
<td>Europe, North and Middle America, Asia, Australia, New Zealand</td>
<td>1000</td>
</tr>
<tr>
<td>Olive</td>
<td>Olea europaea</td>
<td>South and Southeast Europe, Minor Asia, Iran to China, North Africa (Maghreb), South Africa, Australia, New Zealand</td>
<td>1019</td>
</tr>
<tr>
<td>Castor oil plant</td>
<td>Ricinus communis</td>
<td>Southeast Europe, East Africa, India, China, Brazil</td>
<td>1188</td>
</tr>
<tr>
<td>Jojoba</td>
<td>Simmondsia chinensis</td>
<td>Middle and South America, Israel, Palestine</td>
<td>1528</td>
</tr>
<tr>
<td>Babassu Palm</td>
<td>Orbignya martiana</td>
<td>South America (esp. Brazil)</td>
<td>1541</td>
</tr>
<tr>
<td>Barbados nut (Pourghère)</td>
<td>Jatropha curcas</td>
<td>Central America, Africa, Asia</td>
<td>1590</td>
</tr>
<tr>
<td>Macadamia Nut (Pourghère)</td>
<td>Macadamia terniflora</td>
<td>Australien, Malaysia, Hawaii</td>
<td>1887</td>
</tr>
<tr>
<td>Brazil Nut</td>
<td>Bertholletia excelsa</td>
<td>South America</td>
<td>2010</td>
</tr>
<tr>
<td>Avocado</td>
<td>Persea americana</td>
<td>Middle, Central and South America, Indonesia, Phillipines, Australia, New Zealand</td>
<td>2217</td>
</tr>
<tr>
<td>Coconut</td>
<td>Cocos nucifera</td>
<td>India, Indonesia, Brazil</td>
<td>2260</td>
</tr>
<tr>
<td>African Oil Palm</td>
<td>Elaeis guineensis</td>
<td>Malaysia, Indonesia, several African countries</td>
<td>5000</td>
</tr>
</tbody>
</table>
BEFA BIODIESEL PRODUCTION
MOBILE MODULE MACHINES

Biodiesel production process layout

Temperature 60°C
Atmospheric pressure

Parameters

Components
Potassium hydroxide
Methanol
Oil

Pre-reacted mixture
Mixing pump

After 24h

Products
Glycerine
Methylester (Biodiesel)

Filtering unit
### TECHNICAL DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Output performance</th>
<th>Power Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEFA 100</td>
<td>100 l/cycle up to 15 cycles/day</td>
<td>6.5 kW</td>
</tr>
<tr>
<td>BEFA 300</td>
<td>300 l/cycle up to 15 cycles/day</td>
<td>12.9 kW</td>
</tr>
<tr>
<td>BEFA 600</td>
<td>600 l/cycle up to 10 cycles/day</td>
<td>18.9 kW</td>
</tr>
<tr>
<td>BEFA 1000</td>
<td>1000 l/cycle up to 10 cycles/day</td>
<td>18.9 kW</td>
</tr>
<tr>
<td>BEFA 2500</td>
<td>2500 l/cycle up to 7 cycles/day</td>
<td>24.0 kW</td>
</tr>
</tbody>
</table>

### PRICES

<table>
<thead>
<tr>
<th>Type</th>
<th>Price (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEFA 100</td>
<td>7.560,00</td>
</tr>
<tr>
<td>BEFA 300</td>
<td>9.900,00</td>
</tr>
<tr>
<td>BEFA 600</td>
<td>14.880,00</td>
</tr>
<tr>
<td>BEFA 1000</td>
<td>22.800,00</td>
</tr>
<tr>
<td>BEFA 2500</td>
<td>42.960,00</td>
</tr>
</tbody>
</table>
BEFA BIODIESEL PRODUCTION
MOBILE MODULE MACHINES

BEFA 100

**Components**

Output performance: 100 l/cycle up to 15 cycles/day

Reaction vessel: capacity 140 l

Heating coil

Catalytic converter: capacity 20 l

Hot water boiler: 5,0 kW

Pipe system incl. valves

High-pressure pump: 1,5 kW

Framework

Control panel

Connection power: 6,5 kW; 220 / 380 V; 50 Hz

Dimensions: 1000 x 610 x 1400 mm
BEFA BIODIESEL PRODUCTION
MOBILE MODULE MACHINES

BEFA 300

Components

Output performance: 300 l/cycle up to 15 cycles/day
Reaction vessel: capacity 420 l
Heating coil
Catalytic converter: capacity 60 l
Hot water boiler: 11,0 kW
Pipe system incl. valves
High-pressure pump: 1,9 kW
Framework
Control panel
Connection power: 12,9 kW; 220 / 380 V; 50 Hz
Dimensions: 1300 x 710 x 1800 mm
BEFA BIODIESEL PRODUCTION
MOBILE MODULE MACHINES

BEFA 600

**Components**

Output performance: 600 l/cycle up to 10 cycles/day
Reaction vessel: capacity 850 l
Heating coil
Catalytic converter: capacity 120 l
Hot water boiler: 16,0 kW
Pipe system incl. valves
High-pressure pump: 2,9 kW
Framework
Control panel
Connection power: 18,9 kW; 220 / 380 V; 50 Hz
Dimensions: 1900 x 910 x 2400 mm
BEFA BIODIESEL PRODUCTION
MOBILE MODULE MACHINES

BEFA 1000

**Components**

Output performance: 1000 l/cycle up to 10 cycles/day
Reaction vessel: capacity 1350 l
Heating coil
Catalytic converter: capacity 200 l
Hot water boiler: 16,0 kW
Pipe system incl. valves
High-pressure pump: 2,9 kW
Framework
Control panel
Connection power: 18,9 kW; 220 / 380 V; 50 Hz
Dimensions: 2000 x 1000 x 2500 mm
BEFA BIODIESEL PRODUCTION
MOBILE MODULE MACHINES

BEFA 2500

Components
Output performance: 2500 l/cycle up to 7 cycles/day
Reaction vessel: capacity 3400 l
Heating coil
Catalytic converter: capacity 500 l
Hot water boiler: 20 kW
Pipe system incl. valves
High-pressure pump: 4,0 kW
Framework
Control panel
Connection power: 24,0 kW; 220 / 380 V; 50 Hz
Dimensions: 2400 x 1210 x 3000 mm
BEFA BIODIESEL PRODUCTION
STATIONARY MACHINE

Output performance: 1000 l per day

The plant consists of:
1. Catalytic mixer 200 l
2. Sedimentation and reaction vessel 1400 l
3. Electric heating 18 kW
4. Pipework with valves
5. High-pressure pumps (2 pcs.) 3kW
6. Control panel
7. Connection power: 21 kW, 220/380 V; 50 Hz
8. Dimensions: 2400 x 1200 x 1800 mm (l, h, w)

Price: 18.800 EUR
BEFA BIODIESEL PRODUCTION
BIODIESEL STORAGE TANKS

DOUBLE JACKET
ACC. TO EU REFERENCE
1, 2, or 3 chambers
# BEFA BIODIESEL PRODUCTION

## BIODIESEL STORAGE TANKS

### PRICE LIST

<table>
<thead>
<tr>
<th>Volume (l)</th>
<th>Chamber(s)</th>
<th>Dimensions</th>
<th>Weight (t)</th>
<th>Price (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.000</td>
<td>1 chamber</td>
<td>Ø: 2 m, l: 2.3 m</td>
<td>1.2 t</td>
<td>6.700,00</td>
</tr>
<tr>
<td>10.000</td>
<td>1 chamber</td>
<td>Ø: 2 m, l: 3.8 m</td>
<td>1.7 t</td>
<td>10.500,00</td>
</tr>
<tr>
<td></td>
<td>2 chambers</td>
<td>Ø: 2 m, l: 3.8 m</td>
<td>1.9 t</td>
<td>11.950,00</td>
</tr>
<tr>
<td>15.000</td>
<td>1 chamber</td>
<td>Ø: 2 m, l: 5.3 m</td>
<td>2.4 t</td>
<td>13.400,00</td>
</tr>
<tr>
<td></td>
<td>2 chambers</td>
<td>Ø: 2 m, l: 5.3 m</td>
<td>2.6 t</td>
<td>14.100,00</td>
</tr>
<tr>
<td>20.000</td>
<td>1 chamber</td>
<td>Ø: 2 m, l: 6.8 m</td>
<td>3.0 t</td>
<td>15.500,00</td>
</tr>
<tr>
<td></td>
<td>2 chambers</td>
<td>Ø: 2 m, l: 6.8 m</td>
<td>3.2 t</td>
<td>17.000,00</td>
</tr>
<tr>
<td>30.000</td>
<td>1 chamber</td>
<td>Ø: 2 m, l: 9.8 m</td>
<td>4.3 t</td>
<td>20.000,00</td>
</tr>
<tr>
<td></td>
<td>2 chambers</td>
<td>Ø: 2 m, l: 9.8 m</td>
<td>4.6 t</td>
<td>21.400,00</td>
</tr>
<tr>
<td></td>
<td>3 chambers</td>
<td>Ø: 2 m, l: 9.8 m</td>
<td>4.8 t</td>
<td>22.600,00</td>
</tr>
</tbody>
</table>

- **Filling pump**
  - 45 l per minute: EUR 1.270,00
  - 70 l per minute: EUR 1.850,00
BEFA BIODIESEL PRODUCTION
OIL PRESSING MACHINES

BEFA S18-0C

Output: up to 2.500 l/day
Electric motor: 7,5 kW; 220/380 V, 50 Hz
Rotation: 30-40 rpm
Dimensions (l x b x h): 700 x 1200 x 1600 mm
Weight: 280 kg

Price: EUR 14.000,00
BEFA BIODIESEL PRODUCTION
OIL PRESSING MACHINES

BEFA S16-8C

Output: up to 3.750 l/day
Electric motor: 7,5 kW; 220/380 V, 50 Hz
Rotation: 30-40 rpm
Dimensions (l x b x h): 600 x 1640 x 1250 mm
Weight: 480 kg

Price: EUR 19.500,00
BEFA S13-0C

Output: up to 15,000 l/day
Electric motor: 17 kW; 220/380 V, 50 Hz
Rotation: 15-17 rpm
Dimensions (l x b x h): 2900 x 2600 x 1850 mm
Weight: 5000 kg

Price: EUR 75,000,00
BEFA BIODIESEL PRODUCTION

BEFA is also able to provide further equipment and technology for the processing of oily crop

1. Storage tanks for raw materials
2. Equipment for cold and warm pressing of oily crop
3. Machines for the production of pellets and briquettes from pressed crop
4. Filters and filtration systems for vegetable oil and bioester
5. Laboratories (stationery or mobile) for permanent quality control
6. Know-how for chemical and biochemical conversion of glycerine as by-product into more valuable products
MADE IN AUSTRIA

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Fax: ++43 1 479 02 08-17
E-mail: office@befa.net
Web: www.befa.net