

## BIOFUELS

**As part of the Kyoto Protocol, the United Nations has called for the introduction of fuels obtained from biomass in order to reduce emissions of greenhouse gases.**

The increasing scarcity of worldwide oil reserves associated with the increase in crude oil prices has created the necessity for an increased utilisation of alternative fuel sources. These biofuels will become a fundamental component of our energy supplies in the future. Additionally, biofuels derived from biomass are manufactured from renewable energy sources. They are therefore, where emissions are concerned, in contrast to fossil energy sources, CO<sub>2</sub> neutral.

**Fuels with bio mass as energy source can be obtained, for example, from:**

- Cereals
- Cooking or other oils, e.g. rape seed, sunflower, soy
- Household waste
- Forestry residues
- Waste from food processing
- Tree waste

Biodiesel and Bioethanol belong to the most important biofuels being produced today. The increase of the market share for biofuels and their mixing with regular fuels has been defined in several directives within the EU.

AVA offers technologies from the fields of mixing and drying both for the production of Biodiesel as well as for the production of Bioethanol.

In the production of Biodiesel, AVA dryers are used in order to obtain methanol from the salt created during the process.

However, in the production of Bioethanol both mixing and drying-related applications are required. For this purpose, AVA mixers are used for the mixing of the raw materials. AVA dryers are used for drying the DDGS (Dried Distiller Grains & Solubles) at the end of the production process.



## BIODIESEL

Biodiesel is an alternative to regular crude oil-based diesel fuels due to the fact that the combustion characteristics in the engine are very similar. Biodiesel is therefore one of the substances that can be used as a replacement for fossil fuels.

The raw materials for the production of Biodiesel are vegetable oils such as rapeseed, sunflower, soy or fatty waste. The raw materials are used to obtain a pressed oil, which is broken up by a reaction with methanol and a catalyst (e.g. potassium hydroxide solution). This transesterification causes the by-products salt ( $K_2SO_4$ ), glycerine and methanol. In separate stages of the Biodiesel production, these three products are separated from each other and recovered for its usage. The raw glycerine is used to produce pure glycerine, which can be used, for example, as pharmaceutical glycerine. The methanol is recovered and fed back into the production process. The salt is sold as a fertilizer.

The treatment of the salt together with the associated recovery of the methanol is the starting point for AVA's drying technologies. The salt-methanol mixture is mechanically dewatered and fed into the AVA dryer. Here the methanol is evaporated, re-condensed and fed back into the production process. The dry and methanol-free salt potassium sulphate is used, for example, as fertilizer.

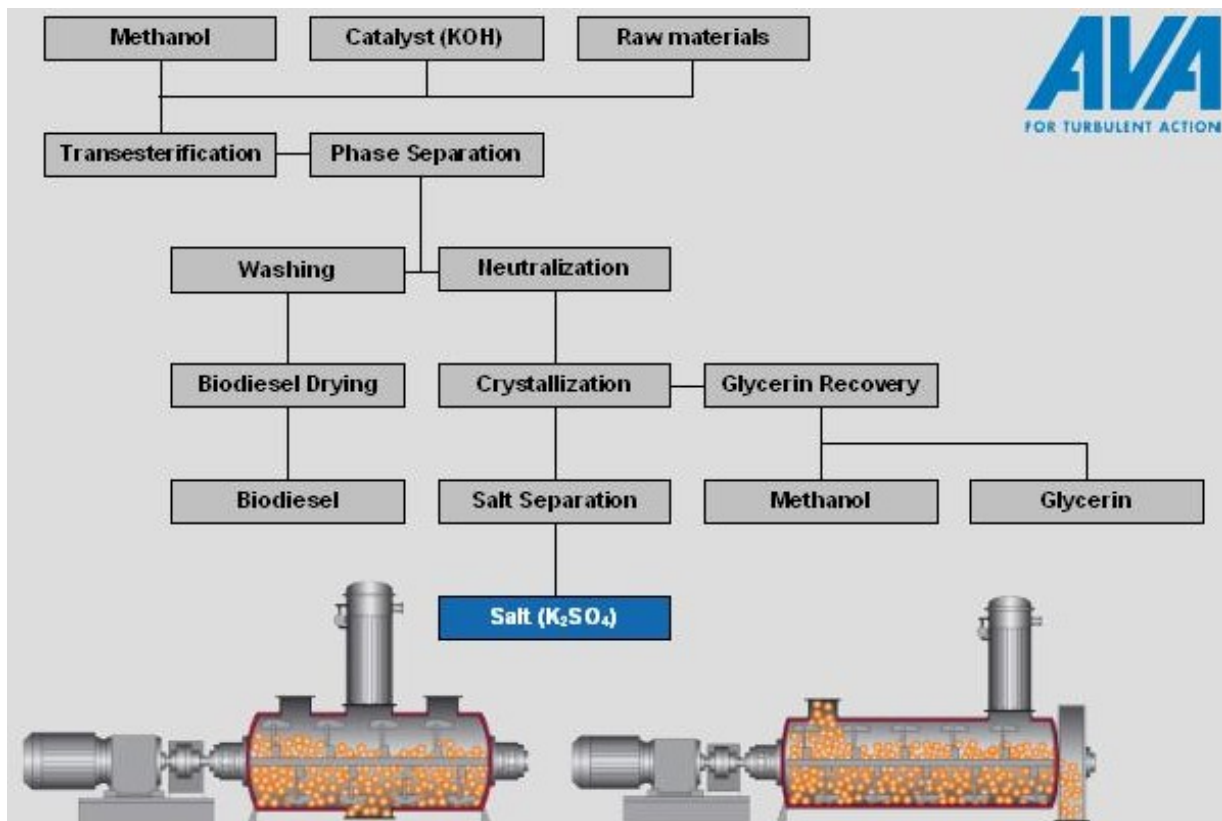
The AVA horizontal dryer is very well suited for a gentle drying of the salt. The shovel agitator the mixes and moves the product along the length of the interior drum wall which is heated by a jacket. The mixing of the agitated bulk creates a uniform product temperature and product humidity. Special shovel forms ensure an optimal heat transfer between the product and the heated wall. The result is advantageously short drying times. These can be further reduced in a batch operation by introducing a vacuum atmosphere.



For a continuous drying process, the horizontal shovel dryer HTK-T is used. In a slight underpressure atmosphere, the conveyed salt-solvent mixture is dried and separated from the methanol.

Batch operation is recommended especially for flexible processes with a variety in product moisture or with variable product capacities. Depending on the consistency of the product, drying is realised either with horizontal dryers of type HTC-VT or vertical conical dryers of type HVW-VT.

The vertical dryers with double-helix agitator achieve an efficient drying combined with an optimal cleaning and final product discharge.



Numerous references testify to our competence in the field of Biodiesel production and glycerine treatment. Ask us for further and more detailed information.

## BIOETHANOL

The importance of Bioethanol as an additive to regular fuel is increasing.

The production of Bioethanol is realised worldwide with various source materials based on freely-available raw materials. In North America, Bioethanol is mainly produced from maize, while in Europe wheat, rye or barley serve as raw materials. Predominantly Bioethanol is produced from the fermentation of these cereals based on sugar and starch and the subsequent distillation process. Following the distillation, the produced DGS slop is mechanically de-watered and dried to form DDGS (Dried Distillers Grains & Solubles) in order to be used, for example, as animal feed.

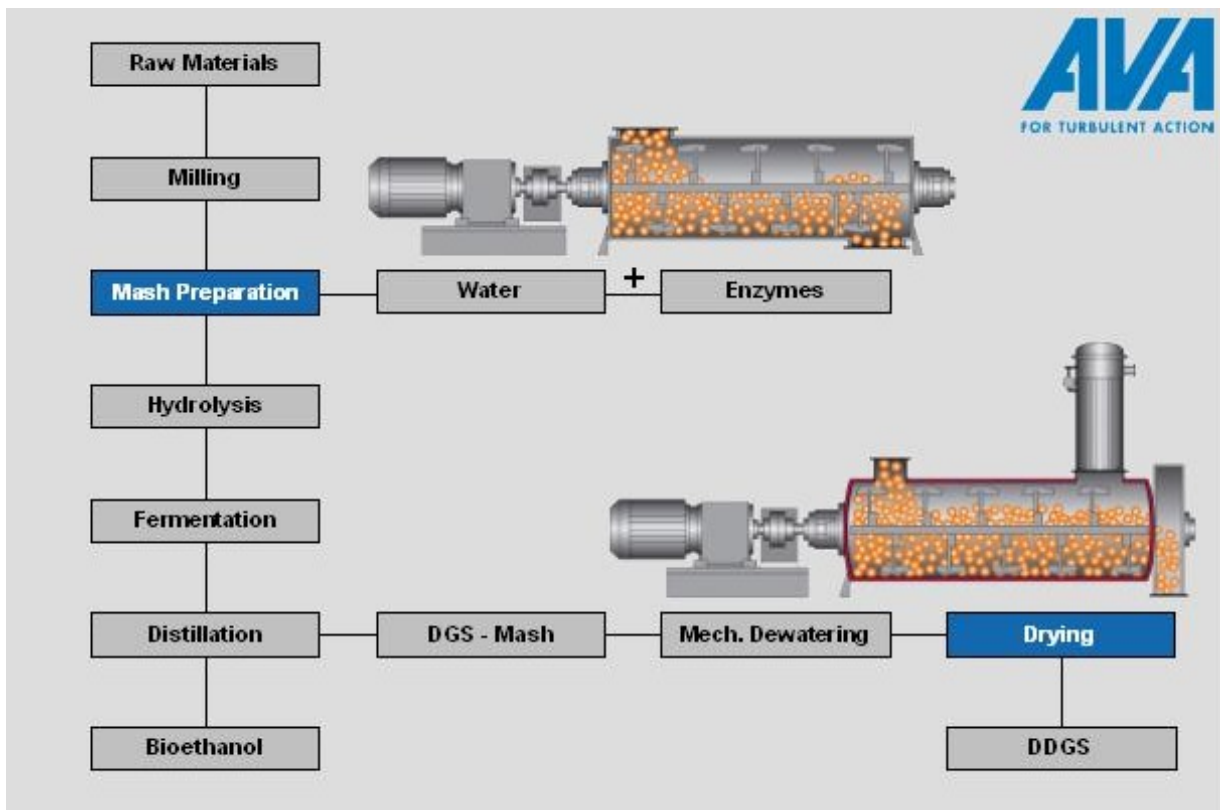
The essential factors for an efficiency and energy saving operation of a Bioethanol plant is the optimal treatment of the mash, the distillation of the Bioethanol and the efficient drying of the DGS distillery slop. Both central AVA processes – mixing and drying – are used here.

At the beginning of the production process, the various raw materials are ground and homogeneously mixed in an AVA mixer also with the addition of enzymes. This mixing is a continuous process, especially where a high throughput is required. The AVA horizontal mixer HTK for continuous operation creates a homogeneous mash from the initial products within a short time. Variations in the dosing of the products are optimally compensated with a high level of re-mixing inside the mixer.

An optimal mash treatment is the natural requirement for an efficient production process and is reliably achieved with the AVA mixers. The subsequent production stages for Bioethanol include hydrolysis, fermentation and distillation.



After the step of mechanical dewatering the DGS slop (Distiller Grains & Solubles) obtained from the distillation process is put into an AVA shovel dryer type HTK-T and dried in a slightly low-pressure atmosphere. The special shovel agitator serves to transport the product along the length of the dryer drum which is heated via a heating jacket. Mixing in an agitated bulk serves to create a uniform temperature and product humidity in the product chamber. Special shovel designs can be selected, especially for large capacities. This ensures an optimal heat transfer between the product and the heated drum. As a result advantageously short drying times and a sustainable product quality is achieved due to the particularly high level of re-mixing.



Numerous references testify to our competence in the field of Bioethanol production and glycerine treatment. Ask us for further and more detailed information.