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De-Oxygenation of Vegetable Oils

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Problem and Motivation

Vegetable oils and fats subject to a different extent oxidative deterioration which finally makes them disabled for human consumption. The degree of oxidation depends on various factors, like fatty acid composition, content of free fatty acids, catalytic metal ions and antioxidants, temperature, light exposure and others more. But, the content of dissolved oxygen in the oil is of most importance. Without oxygen no oxidation can occur. Therefore the aim of the project was to search for suitable solutions to reduce the oxygen content in vegetable oils.

Pressing under nitrogen atmosphere

One possibility is pressing under nitrogen atmosphere using an enclosed press which is completely aerated by nitrogen. Fig. 1 shows the used equipment. Rapeseed and linseed oil were recovered from the seeds. By both feeding seeds and discharging oil and press cake high losses of nitrogen occur and entering of oxygen can not totally be avoided. As the main result it was found that oxygen contents below 2 mg 02 / kg oil are not to be succeeded.

Fig. 1: Enclosed press

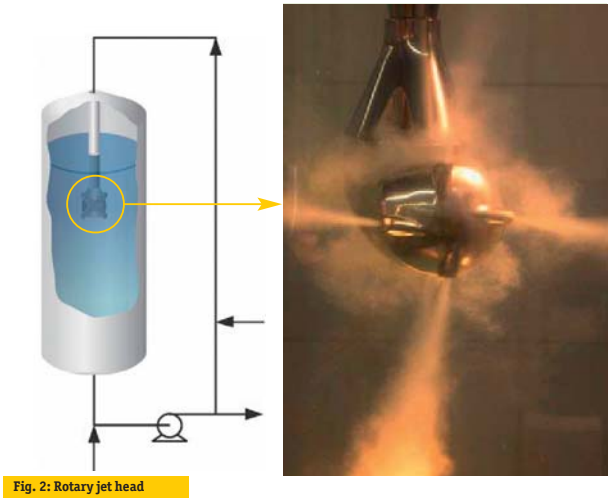

Fig. 2: Rotary jet head

De-Oxygenation by ISO-MIX technology

Another possibility to solve the problem consists in de-oxygenation of the oil directly after oil recovery. For that, treatment by the patented ISO-MIX rotary jet head is provided.

Experimentals

The ISO-MIX rotary jet head, rotating around two axes, creates very small bubbles which lead to a very large mass transfer surface and the necessary partial pressure difference to de-oxygenate the oil (Fig. 2). The test trials were carried out in two test plants of different size (Fig. 3), which contained about 800 l or 25 l oil. The ISO-MIX rotary jet head is driven by an oil stream which is withdrawn from the tank, circulated and reinjected into the tank at a pressure of about 3.0 bar. Nitrogen is added in the recirculation loop at a pressure of about 3.2 bar. The used oils were cold pressed rapeseed and linseed oil.

Results

Fig. 4 shows the oxygen content of a linseed oil depending on processing time exemplarily. It was possible to decrease the oxygen content in the oil from 32 mg O_2 / kg oil to 0.5 mg O_2 / kg oil within 12 minutes. The specific nitrogen demand was 0.1126 g/kg oil · min and can be reduced by technological means.

Fig. 3: Test plants

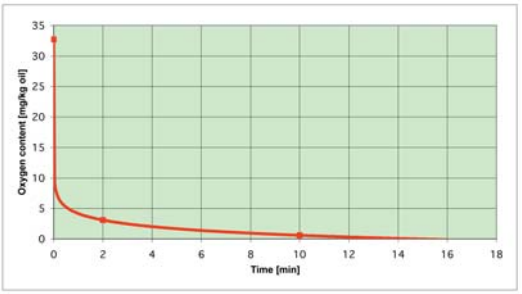

Fig. 4: Oxygen content of linseed oil during ISO-MIX treatment

Conclusion

The ISO-MIX technology is suitable for nearly complete de-oxygenation of vegetable oils. Provided that freshly pressed or refined, and oxidative not pre-damaged, oils are immediately be processed and filled under nitrogen into gas-proof containers, any aging by oxidation should be excluded.

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