

Oil processing in Decentralised Oil Mills

Results of a Survey

Since 1999 the number of decentralised oil mills in Germany has nearly tripled. For this reason the Technology and Support Centre of Renewable Raw Materials (TFZ) conducted a survey on "oil processing in decentralised oil mills in Germany" in the spring of 2004. The objective of this survey was to collect data about the current status of technical equipment in oil mills, as well as on mass flow rates, raw materials and products. Additionally, prices and proceeds of raw materials and products, as well as data on sales and distribution were documented.

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Keywords

Decentralized oil mills, vegetable oil, rapeseed oil fuel

Literature

Literature references can be called up under LT 05117 via internet <http://www.landwirtschaftsverlag.com/landtech/local/literatur.htm>.

The survey was mainly accomplished in written form, additionally phone interviews with the oil millers were conducted. The mail questionnaire was worked out by the working group "Qualitätsmanagement der dezentralen Ölsaatenverarbeitung" of the Kuratorium für Technik und Bauwesen in der Landwirtschaft e.V. (KTBL). Altogether 243 addressees received the questionnaire. 100 decentralised oil mills took part in the survey, 90 questionnaires were evaluable (rate of return 37 %).

Decentralised oil mills in Germany

In the year 1999 around 79 decentralised oil mills were known in Germany [1]. Until March 2004 the number of the plants has risen up to 219. In Bavaria (93 plants) and Baden-Wuerttemberg (36 plants) about 60 % of all German decentralised oil mills are located. A remarkable increase of plants can be observed for Bavaria, Baden-Wuerttemberg, North Rhine-Westphalia, Lower Saxony, Rhineland-Palatinate and Brandenburg. Figure 1 gives an overview about locations of decentralised oil mills in Germany.

The majority of the oil mills were built after 1991, only 2 % of the plants are older. The survey shows that between 1991 and 1995 approximately 20 %, and between 1996 and 2000 about 29 % of the plants were established. An exceeding increase can be noticed between 2001 and March 2004, in this period 49 % of all oil mills started their production.

Capacity of processing and production

In the year 2003 60 of the oil mills were processing, at an average of 250 days, together about 104,000 t rapeseed. This amount is equivalent to 35,000 t rapeseed oil and 69,000 t of press cake. Additionally 6.500 t of other oilseeds, e.g. false flax, sun flower and hemp were processed. Extrapolating the processed rapeseed of 60 plants (104,000 t) to all 219 plants, a total amount of 380,000 t rapeseed was processed in the year 2003 to 127.000 t rapeseed oil. This means that in 2003 about 10 % of the entire German rapeseed harvest was processed in decentralised

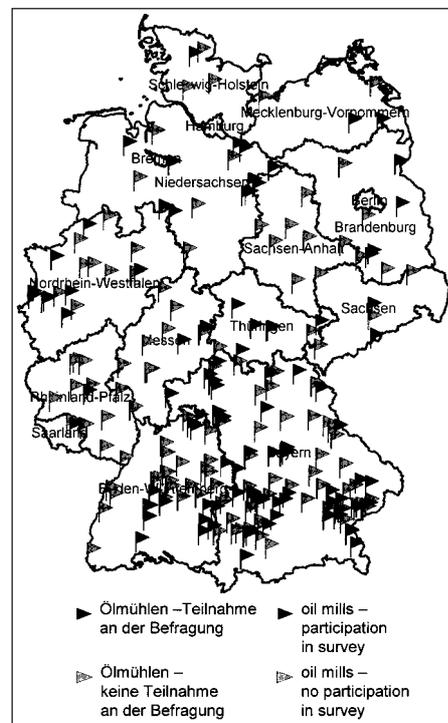


Fig. 1: Locations of 219 decentralized oil mills in Germany (state of march 2004)

oil mills. Table 1 shows the processing capacity of the evaluated plants.

The main production of the majority of the plants (49 %) is rapeseed oil fuel. Other primary products are edible oil (20 %), fodder oil (17 %) and oil as a raw material for the transesterification to fatty acid methyl esters (FAME) and also technical oils (14 %). Few plants do not focus on oil production, but on the production of press cake as a high-quality fodder.

Plant components

Approximately 59 % of all plants feature technical equipment for seed conditioning before the pressing step. Components for seed purification are available in 70 % and components for seed drying in 50 % of the decentralised oil mills. An extra foreign body separation is integrated in 73 % of the plants. Only 18 % of the plants perform seed crushing before pressing.

Pressing devices of the company Karl Strähle GmbH & Co. KG and the Maschinenfabrik Reinartz GmbH & Co. KG are mainly in use. Plants with low capacities pri-

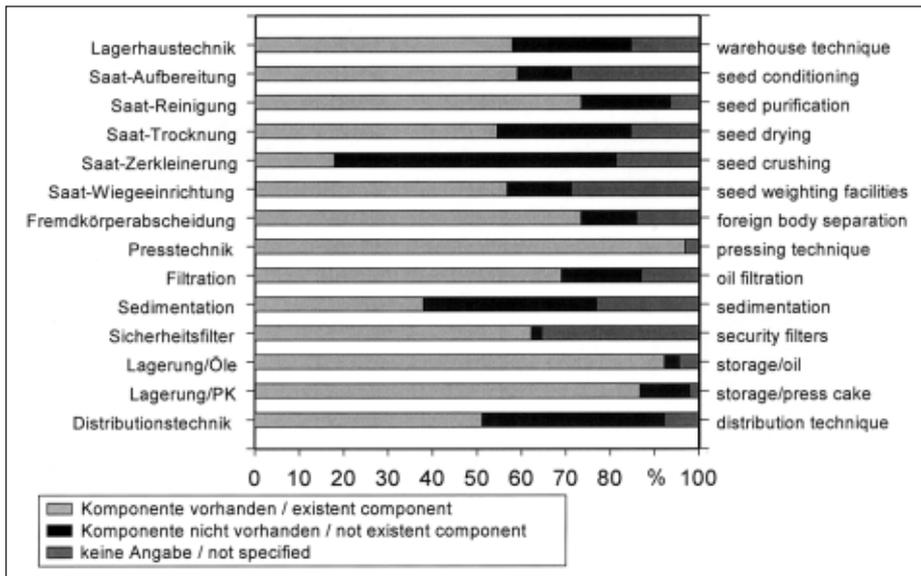


Fig. 2: Existence of components at the participating plants

marily feature the press types SK 60/1 and SK 60/2 of the company Karl Strähle with capacities of 15 and 30 kg seed per hour, respectively. The type SK 130 (capacity: 130kg seed per hour), also Karl Strähle and AP 10/06 (capacity: 100 kg seed per hour) of the company Maschinenfabrik Reinartz are used for ranges up to 150 kg seed per hour.

Filtration systems for the main oil purification are existent in 70 % of the plants. Generally, chamber filter-presses and pressure leaf filters are most prevalent. 38 % of the oil millers use the sedimentation process for oil purification. Filter systems for the purification, also called security filters, are installed in 62 % of the plants.

Distribution technology, like filling stations or a own tank truck are present in 50 % of the plants. Figure 2 gives an overview of the plant components.

Quality assurance

About 60 % of the interviewed oil millers use the quality parameters of the "Quality

Standard for Rapeseed Oil as a Fuel (RK-Qualitätsstandard) 05/2000" as guideline when producing rapeseed oil [2, 3]. Even 83 % of those plants, which produce mainly oil for fuel, act in accordance with the standard. Approximately 70 % of all evaluated plants give oil samples to a laboratory for analysis or analyse the oil by themselves. Up to 6 oil samples per year were analysed by 69 % of the plant operators. Between 7 and 12 samples and over 12 samples per year were analysed by 15.5 % each. Most frequently the parameters contamination, acid value, phosphorus content, water content and oxidation stability were checked. But also the sulphur content, residues of pesticides, fatty acid patterns and the vitamin E content were analysed.

Logistic and distribution

Approximately 13 % of the oil plants exclusively process oilseeds from their own farms. Oilseeds of regional origin (ambit up to 25 km) is processed by 55 % of the inter-

viewed oil millers, oilseed sources, up to 50 km are typical for 20 % of the oil millers.

58 % of the rapeseed oil produced is marketed as raw material for the transesterification to fatty acid methyl esters (FAME). Other important market segments are rapeseed oil fuel (22 %), fodder oil (14 %) and edible oil (1 %). About 11 % of the oil millers use the produced oil on their own farm. Oil delivering within an ambit of 25 km and 50 km, respectively, is conducted by 25 % of the oil millers, each. The distribution of oil over longer distances is accomplished by 36 % of the interviewed oil millers.

The by-product press cake is utilised by 11 % of the oil millers within their farm, 54 % of the interviewed plant operators distribute the press cake within an ambit of 25 km, 16 % within 50 km. Besides the direct usage of press cake as a feed, press cake is sold to feed producers. Occasionally press cake is used in biogas plants.

Costs and proceeds

Costs and proceeds for the products vary widely. Proceeds for rapeseed edible oil are between 0,55 € and nearly 5,00 € per litre (without r VAT). This high range of prices is due to the input of conventional and ecological seeds. Also the amount purchased, the expenses for distribution and trading units have influence on pricing. Ascertained prices for rapeseed and proceeds of the produced articles of the year 2003 are shown in table 2.

Conclusion and outlook

The survey has shown, that the processing of oilseeds in decentralised oil mills has developed to a remarkable branch of business in agriculture. In the year 2003 around 10 % of the German rapeseed harvest was processed in 219 decentralised oil mills at an average of 250 operating days. Rapeseed oil as a fuel for vegetable oil suited diesel engines as well as rapeseed oil as a raw material for the transesterification to fatty acid methyl esters (FAME) were the two main focuses, when producing cold-pressed oil. The by-product press cake is used as a high-quality feed. The acquisition of the rapeseed and the distribution of the two products (oil and rapeseed) happens mainly regional within an ambit of maximum 50 km. The components of the plants differ widely, which results in a high potential for process optimisation. To collect data of further developments of decentralised oil processing and to deduce measures to promote oil mill operators at the same time, a recurrent survey is proposed.

Processing capacity / seed (kg/h)	≤ 50	51 - 150	151 - 500	501 1000	> 1000
Percentage of plants	41 %	17 %	26 %	8 %	8 %

Table 1: Processing capacity of participating plants (n = 84 plants)

	costs rapeseed /t zero rated for VAT	fuel /t zero rated for VAT	proceeds fodder oil /t zero rated for VAT	edible oil /l zero rated for VAT	press cake /t zero rated for VAT
mean	251	617	646	2,10	168
median	246	610	620	1,54	165
min.	210	490	500	0,55	100
max.	440	750	1200	4,98	320

Table 2: Costs for rapeseed and proceeds of the products (n = 55 plants)