

METHOD FOR OPERATING A FILTER PRESS USING A NON-MINERAL HYDRAULIC OIL

The invention relates to a process for a filter press using non-mineral oil.

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Filter presses are used to separate the solids from the liquid in a suspension to be filtered. This filtration process takes place between the filter plates, where several filter plates are joined together to form a filter plate assembly. With the aid of a normal hydraulic closing cylinder, pressure is exerted on the sliding
10 panel and the filter plate assembly behind it as far as the stationary end plate in order to guarantee the necessary leak-tightness between the filter plates. Each of the filter plates has a filter surface covered with a filter cloth, where the suspension to be filtered is pressed into the filter chamber formed between two filter plates and against the filter cloth. The filtrate between the filter cloth and
15 the filter surface is later discharged, and the filter cake remains in the filter chamber. When the filter plates are separated from one another, the filter cake then drops out. According to the state of the art, the filter plate assembly can also be pulled apart by means of the closing cylinder or a reversing plate shifting device with an electric or hydraulic drive. In order to achieve a high
20 throughput, the filter plate assemblies must have brief opening and closing times in addition to short filling and filtration times. Hydraulic units are designed for long and fast cylinder stroke in order to achieve brief opening and closing times.

Hydraulic units consist of a hydraulic drive and a hydraulic cylinder. The
25 hydraulic oil, which is pressurized, is inside the hydraulic cylinder. Depending on the geometric conditions and the pressure level in the filter chamber during filtration, the hydraulic unit must generate several hundred bar pressure so that it can ultimately apply up to 60 bar filtration pressure. Hydraulic oils are generally oils that remain stable over a broad range of pressures, i.e. neither
30 their chemical properties nor their physical properties change significantly or even irreversibly, and they do not interact chemically or mechanically with the contact surfaces. There are many mineral hydraulic oils that meet these

requirements. If, however, suspensions are filtered to provide products that must not be contaminated by mineral oils (e.g. the food and pharmaceuticals sectors), it is essential to use "food grade" mineral oils or non-mineral oils to which there are no basic objections if they do contaminate the product. Here, 5 "food grade" mineral oils are only permitted to a limited extent because product contamination is only acceptable in the event of defined process upsets. Non-mineral oils, i.e. vegetable oils, differ in their chemical composition, but also in their properties when used as hydraulic oils. Generally, they only remain stable in operation up to a low pressure and temperature level. Nevertheless, if these 10 oils are to be used in filter presses, the filter presses must be operated at low pressures, which is prejudicial to good solid/liquid separation. The geometric ratios, i.e. ratio of pressure cylinder cross-section to sealing area, can also be modified in such a way that the required sealing surface pressing can be achieved even at lower hydraulic pressures; such changes, however, have the 15 disadvantages of requiring more hydraulic oil, and the hydraulic cylinders needed are larger and also more costly as a result.

The aim of the invention is thus to avoid these disadvantages and develop a hydraulic system for filter presses that can operate without geometric changes 20 to closure systems designed for mineral hydraulic oils and that can use purely vegetable-based oil that does not create any problematical contamination in food industry applications as a full substitute for mineral-based hydraulic oil.

This objective is achieved by using the non-mineral product palm oil, palm 25 kernel oil, or derivatives/fractions thereof as hydraulic oil, circulated in a loop and maintained at a temperature at an interval to the melting temperature at a pressure greater than approximately 150 bar. As a result, the properties of the hydraulic oil can be retained over the entire pressure range required in such a way that the hydraulic unit can always be operated without any difficulties. The 30 hydraulic oil can also be changed easily or topped up if there is any slight leakage.

An advantageous development of the invention is characterised by the pressure being approximately 400 to 450 bar. Operation of the presses is particularly efficient at this pressure.

5 A favourable embodiment of the invention is characterised by the palm oil or palm kernel oil having a temperature between approximately 15°C and approximately 60°C, preferably between approximately 25°C and 50°C, where it can be an advantage for the temperature to be between approximately 30°C and approximately 45°C, for example approximately 35 to 40°C. In this operating range the palm oil or palm kernel oil has proved stable for particularly
10 long periods at high pressures.

An advantageous development of the process according to the invention is characterised by the palm oil or palm kernel oil having a temperature between approximately 55°C and approximately 70°C at start-up. At this temperature,
15 any residue left in the plant can also be removed easily and conveniently following a shutdown.

A favourable embodiment of the invention is characterised by the palm oil or palm kernel oil having maximum contamination of 5% by vol. from other non-
20 mineral oils.

It has also proved favourable if the palm oil or palm kernel oil has maximum contamination by mineral oils amounting to 0.5% of the volume of the hydraulic system.
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It is an advantage if the inner surfaces of the oil circuit have a finish that is resistant to palm oil or palm kernel oil. This can largely eliminate the risk of the oil decomposing and of the surfaces suffering chemical attack. At the same time, the hydraulic palm oil does not cause any contamination.
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It has proved particularly favourable if the palm oil or palm kernel oil is used also without any additives. This yields considerable cost savings and greater oil stability.

- 5 The invention also relates to a plant for a filter press using non-mineral oil. It is characterised by a separate oil circuit being provided, where a heat exchanger and/or pressure generating units can be provided in the separate oil circuit.

10 It is favourable if severable high-pressure pumps are arranged one after the other as pressure generating units.

It is also an advantage if the inner surfaces of the oil circuit have a finish that is resistant to palm oil or palm kernel oil. This can largely eliminate the risk of the oil decomposing and of the surfaces suffering chemical attack.

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Embodiment example 1:

A hydraulic system with three booster pumps was used at a filter press for production of palm oil at 60 bar in the first stage, 150 bar in the second stage, and at 400 bar in the third stage. Using palm oil with contamination of approximately 0.04%, the oil circuit was operated at a temperature of approximately 38°C. The oil remained stable over several days in continuous operation and showed no further contamination afterwards.

Embodiment example 2:

25 Virtually uncontaminated palm oil with contamination of 0.00005% was used in the plant described above. The temperature was approximately 40°C. Here, too, the oil remained stable over several days and was not further contaminated.

30 Palm oil and palm kernel oil as hydraulic oil in filter plants can be used as food-grade oils. The oil continues to provide good stability at the high pressures and temperatures used. When used in filter presses to produce palm oil or palm

kernel oil, it yields the additional advantage that the hydraulic oil can be taken directly from production operations and thus does not have to be purchased elsewhere at a higher price.

Patent claims

1. Process for a filter press using non-mineral oil, characterised by the non-mineral product palm oil or palm kernel oil being used in the oil circuit as hydraulic oil, where the palm oil or palm kernel oil is circulated in a loop and maintained at a pressure greater than approximately 150 bar and at a temperature at an interval to the melting temperature.
2. Process according to Claim 1, characterised by the pressure being approximately 400 to 450 bar.
3. Process according to Claim 1 or 2, characterised by the palm oil or palm kernel oil having a temperature between approximately 15°C and approximately 60°C, preferably between approximately 25°C and 50°C.
4. Process according to Claim 3, characterised by the palm oil or palm kernel oil having a temperature between approximately 30°C and approximately 45°C, for example approximately 35 to 40°C.
5. Process according to Claim 1 or 2, characterised by the palm oil or palm kernel oil having a temperature between approximately 55°C and approximately 70°C at start-up.
6. Process according to one of Claims 1 to 5, characterised by the palm oil or palm kernel oil having maximum contamination of 5% by other non-mineral oils.
7. Process according to one of Claims 1 to 5, characterised by the palm oil or palm kernel oil having maximum contamination of 0.5% by mineral oils.
8. Process according to one of Claims 1 to 7, characterised by the inner surfaces of the oil circuit having a finish that is resistant to palm oil or palm kernel oil.
9. Process according to one of Claims 1 to 8, characterised by the palm oil or palm kernel oil being used also without any additives.
10. Plant for a filter press using non-mineral oil, characterised by a separate oil circuit being provided.
11. Plant according to Claim 10, characterised by a heat exchanger being provided in the separate oil circuit.

- 12. Plant according to Claim 10 or 11, characterised by pressure generating units being provided in the separate oil circuit.
- 13. Plant according to Claim 12, characterised by severable high-pressure pumps being arranged one after the other as pressure generating units.
- 5 14. Plant according to one of Claims 10 to 13, characterised by the inner surfaces of the oil circuit having a finish that is resistant to palm oil or palm kernel oil.

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Abstract

- 5 The invention relates to a process for a filter press using non-mineral oil. It is characterised by the non-mineral product palm oil or palm kernel oil being used in the oil circuit as hydraulic oil, where the palm oil or palm kernel oil is circulated in a loop and maintained at a pressure greater than approximately 150 bar and at a temperature at an interval to the melting temperature. This
- 10 provides greater stability of the oil and extends the potential applications of the filter press. The invention also relates to a plant for implementation of the process.

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