Claims

1. An oil slurry filter, which comprises at least one filter component of flexible texture, said filter component of flexible texture is formed from flexible filter material, said flexible filter material is made from at least one material selected from polypropylene, polyethylene, nylon, polyamide fiber, polyester fiber, polypropylene fiber, polyphenylene sulfide, polyimide, polytetrafluoroethylene, aramid fiber, polyurethane, glass fiber, and vinylon,

wherein said flexible filter material has a basis weight of 300-1000 g/m^2, preferably 520-660 g/m^2; a warp-direction breaking strength of 850 N/5cm-9000 N/5cm, a weft-direction breaking strength of 1000 N/5cm-11000 N/5cm; preferably a warp-direction breaking strength of 1000 N/5cm-2400 N/5cm, preferably a weft-direction breaking strength of 1200 N/5cm-2600 N/5cm; a thickness of 0.5-3.4 mm, preferably 0.5-3.0 mm, more preferably 1.8-2.9 mm,

wherein said flexible filter material at least includes a solid-removal layer and a base cloth layer; said solid-removal layer and said base cloth layer are provided adjacently, said solid-removal layer has a porosity of 85%-98%; said base cloth layer has a porosity of 30%-40%, the flexible filter material has a filtering precision of 0.1-25 micrometers;

wherein the filter is an up-flow filter, said oil slurry filter includes an oil slurry inlet arranged at the lower part of the filter, a filtered oil outlet arranged at the upper part of the filter, a filter residue outlet arranged at the lower part and/or the bottom of the filter, and a purge medium inlet arranged at the top and/or upper part of the filter; preferably further includes a filter aid inlet arranged at the lower part of the filter.

2. The oil slurry filter according to claim 1, wherein said filter component of flexible texture is in the form of a flexible filter bag, the flexible filter bag is prepared by a stitching process, and the pores from stitching are sealed with an acidic sealant material.

3. The oil slurry filter according to claim 1 or 2, wherein said flexible

filter material has a filtering precision of 0.1-15 micrometers; or

The flexible filter material has a filtering precision of 2-15 micrometers, preferably 2-10 micrometers; or

The flexible filter material has a filtering precision of 3-25 micrometers; or

The flexible filter material has a filtering precision of 0.1 to less than 2 micrometers.

4. The oil slurry filter according to any one of claims 1-3, wherein the pressure difference used for the oil slurry filter is 0.01-0.5 MPa.

5. The oil slurry filter according to claim 1, wherein said base cloth layer is made from polytetrafluoroethylene and/or polyphenylene sulfide; said solid-removal layer is made from polytetrafluoroethylene with a three-dimensional void structure.

6. The oil slurry filter according to claim 1, wherein said flexible filter material at least includes a solid-removal layer, a base cloth layer and a lining layer, said lining layer is located on a side of the base cloth layer opposite to the solid-removal layer, and made from fibers having a fineness of 1-3D; preferably the raw material of fibers of which said lining layer is made is one or more materials selected from polyethylene, nylon, polyester fiber, polypropylene fiber, polyphenylene sulfide, polyimide, polytetrafluoroethylene, aramid fiber, polyurethane, and glass fiber.

7. The oil slurry filter according to claim 6, wherein said flexible filter material at least includes a solid-removal layer, a precision layer, a base cloth layer and a lining layer, said precision layer is located between the solid-removal layer and the base cloth layer, and made from superfine fibers having a fineness of 0.2-0.3D; preferably the raw material of fibers of which said precision layer is made is one or more materials selected from polyethylene, nylon, polyester fiber, polypropylene fiber, polyphenylene sulfide, polyimide, polytetrafluoroethylene, aramid fiber, polyurethane, and glass fiber.

8. The oil slurry filter according to any one of claims 1-7, wherein the

filter component includes a filter cake layer formed from a filter aid provided on said filter component; said filter aid is selected from diatomite, cellulose, perlite, talcum powder, activated clay, filter residue obtained from a filter, spent catalytic cracking catalysts or mixtures thereof; the filter cake layer formed from the filter aid has a thickness of 0.1-10 mm.

9. An oil slurry filter unit, which includes at least one oil slurry filter according to any one of claims 1-8;

preferably includes at least two oil slurry filters, said oil slurry filters are in series connection and/or parallel connection.

10. The oil slurry filter unit according to claim 9, which includes an oil slurry inlet pipeline and a filtered oil outlet pipeline respectively in communication with each filter; preferably further includes a filter residue discharge pipeline respectively in communication with each filter; preferably further includes a purge medium buffer tank and a purge medium inlet pipeline respectively in communication with each filter; preferably further includes a filter aid buffer tank and a filter aid inlet pipeline respectively in communication with each filter.

11. The oil slurry filter unit according to claim 10, wherein said purge medium is an inert gas and/or a flushing oil, preferably the purge medium is at least one selected from nitrogen gas, fuel gas, and filtered oil; said filter aid is selected from diatomite, cellulose, perlite, talcum powder, activated clay, filter residue obtained from a filter, spent catalytic cracking catalysts or mixtures thereof; preferably a filter aid and a mixing medium are loaded in a filter aid buffer tank, said mixing medium is a liquid hydrocarbon, further preferably a filtered oil.

12. A multiple-filter system for the oil slurry filtration, which includes a filter system and a control system;

the filter system includes the oil slurry filter unit according to any of claims 9-11, said filter unit includes at least two oil slurry filters;

said control system includes an online pressure difference monitoring module, a filter control module and a purge control module, said online

pressure difference monitoring module is used to monitor the pressure difference of the filter used online, said filter control module is used to control the filter to switch on and switch off the filter system, and said purge control module is used to control the blowback process of the filter.

13. The multiple-filter system according to claim 12, wherein said online pressure difference monitoring module includes pressure gauge(s) or differential-pressure gauge(s) provided on the oil slurry inlet pipeline and the filtered oil outlet pipeline of each filter, said filter control module includes control valve(s) provided on the oil slurry inlet pipeline, the filtered oil outlet pipeline and the filter residue discharge pipeline of each filter, said purge control module includes control valve(s) provided on the purge medium inlet pipeline of each filter.

14. A multiple-stage filter system for the oil slurry filtration, which includes a primary filter unit and a secondary filter unit and/or a tertiary filter unit;

said primary filter unit includes a first filter system, said first filter system includes the oil slurry filter unit according to any of claims 9-11, said filter unit includes at least one oil slurry filter;

said secondary filter unit includes an automatic backwashing filter device having a driving means;

said tertiary filter unit includes a second filter system, said second filter system includes at least one filter;

the filtering precision of said secondary filter unit is less than the filtering precision of the primary filter unit, the filtering precision of said tertiary filter unit is less than the filtering precision of said primary filter unit and less than the filtering precision of said secondary filter unit;

the filtered oil outlet of said primary filter unit is in communication with the inlet of said secondary filter unit and/or the inlet of said tertiary filter unit respectively.

15. The multiple-stage filter system according to claim 14, wherein when the multiple-stage oil slurry filter system includes a primary filter

unit and a secondary filter unit, the filtered oil outlet of the primary filter unit is in communication with the inlet of the secondary filter unit; or

when the multiple-stage oil slurry filter system includes a primary filter unit and a tertiary filter unit, the filtered oil outlet of the primary filter unit is in communication with the inlet of the tertiary filter unit; or

when the multiple-stage oil slurry filter system includes a primary filter unit, a secondary filter unit and a tertiary filter unit, the filtered oil outlet of the primary filter unit is in communication with the inlet of the secondary filter unit and the inlet of the tertiary filter unit respectively, preferably the filtered oil outlet of the secondary filter unit is in communication with the inlet of the tertiary filter unit; or

when the multiple-stage oil slurry filter system includes a primary filter unit, a secondary filter unit and a tertiary filter unit, the filtered oil outlet of the primary filter unit is in communication with the inlet of the secondary filter unit, the filtered oil outlet of the secondary filter unit is in communication with the inlet of the tertiary filter unit.

16. The multiple-stage filter system according to claim 14 or 15, wherein the filtering precision of said primary filter unit is 2-15 micrometers, further preferably 2-10 micrometers; the filtering precision of said secondary filter unit is 0.1-7 micrometers, preferably 1-5 micrometers; the filtering precision of said tertiary filter unit is 0.1-1.0 micrometer.

17. The multiple-stage filter system according to any one of claims 14-15, wherein the filter area of said secondary filter unit is one twentieth to one-tenth of the filter area of the primary filter unit; the filter area of said tertiary filter unit is 1.5-20 times the filter area of the primary filter unit.

18. An oil slurry filtration process, which comprises a filtration step of sending an oil slurry to the oil slurry filter according to any of claims 1-8 to carry out the filtration.

19. The oil slurry filtration process according to claim 18, wherein the pressure difference used for the filter is 0.01-0.5 MPa; the filtration

temperature is 30-250ºC preferably 50-240ºC, further preferably 60-180ºC.

20. The oil slurry filtration process according to claim 18 or 19, which further comprises a blowback step of using a purge medium to blowback the filter; preferably said purge medium is an inert gas and/or a flushing oil, more preferably the purge medium is at least one selected from nitrogen gas, fuel gas, and filtered oil.

21. The oil slurry filtration process according to any one of claims 18-20, which further comprises a filter cake layer formation step that before the filtration step, the filter aid is sent to the filter to form a filter cake layer of the filter aid on the filter component of the filter; preferably said filter aid is selected from diatomite, cellulose, perlite, talcum powder, activated clay, filter residue obtained from a filter, spent catalytic cracking catalysts or mixtures thereof; preferably in said filter aid formation step middle, the pressure difference of the filter is 0.01-0.07 MPa; the filtration temperature is 30-250ºC, preferably 50-180ºC; preferably said filter aid is sent to the filter in a manner of forming a slurry with the mixing medium, said mixing medium is a liquid hydrocarbon, preferably a filtered oil.

22. An oil slurry filtration process, which comprises:

(1) filtration step: allowing the oil slurry to be sent to a part of the filters of at least two oil slurry filters according to any one of claims 1-8;

(2) control step： allowing the online pressure difference monitoring module to monitor the pressure difference of the online filter, allowing the filter control module to control the filter to switch on and switch off the filter system, allowing the purge control module to control the blowback process of the filter; and

(3) blowback step: using a purge medium to blowback the filter that is switched off the filter system, wherein

when the online pressure difference monitoring module monitors that the pressure difference of the online filter reaches a set value I, the other parts of the filters of the aforementioned filters are switched on the filter system through the filter control module and used in the aforementioned

filtration step, and the online filter of which the pressure difference reaches the set value I is switched off the filter system, said set value I is in a range of 0.01-5 MPa,

the filter that is switched off the filter system is subjected to the residue unloading and the blowback with a purge medium through the purge control module,

preferably, in the online filter, the filtration temperature is 30-250ºC, preferably 50-240ºC, further preferably 60-180ºC.

23. The oil slurry filtration process according to claim 22, wherein when the online pressure difference monitoring module monitors that the pressure difference of the online filter reaches a set value II, the other parts of filters of the filters are switched on the filter system through the filter control module and used in the filtration step, when the online pressure difference monitoring module monitors that the pressure difference of the online filter that is subsequently switched-on reaches a set value III, the online filter of which the pressure difference reaches or exceeds the set value II is switched off the filter system; provided with that set value III < set value II < set value I; and the set volume II and the set value III are in the range of 0.01 to 5 MPa.

24. The oil slurry filtration process according to claim 22 or 23, wherein before (1) filtration step, said process further comprises:

(1') filter cake layer formation step： allowing the filter aid to be sent to a part of the filters of at least two oil slurry filters according to any one of claims 1-8 to form a filter cake layer of the filter aid in the filter;

in the filtration step, the oil slurry is sent to the filter in which the filter cake layer of the filter aid has been formed;

when the online pressure difference monitoring module monitors that the pressure difference of the filter in the filter cake layer formation step reaches a set value IV, the filter in which the filter cake layer is formed is switched on the filtration step through the filter control module to carry out the oil slurry filtering, said set value IV is in the range of 0.01 to 0.07 MPa.

25. The oil slurry filtration process according to any one of claims 22-24, wherein the multiple-filter system according to claim 12 or 13 is used.

26. An oil slurry filtration process, which comprises:

a primary filtration step: allowing an oil slurry to be sent to a primary filter unit and filtered to obtain a primary filtered oil slurry, said primary filter unit includes a first filter system, said first filter system includes the oil slurry filter unit according to any one of claims 9-11, said filter unit includes at least one oil slurry filter; and

allowing the primary filtered oil slurry to be sent to a secondary filter unit and/or a tertiary filter unit and filtered;

said secondary filter unit includes an automatic backwashing filter device having a driving means;

said tertiary filter unit includes a second filter system, said second filter system includes at least one filter;

The filtering precision of said secondary filter unit is less than the filtering precision of the filter in the primary filter unit, and the filtering precision of said tertiary filter unit is less than the filtering precision of the primary filter unit and less than the filtering precision of the secondary filter unit.

27. The oil slurry filtration process according to claim 26, wherein the filtering precision of said primary filter unit is 2-15 micrometers, further preferably 2-10 micrometers; the filtering precision of said secondary filter unit is 0.1-7 micrometers, preferably 1-5 micrometers; the filtering precision of said tertiary filter unit is 0.1-1.0 micrometer.

28. The oil slurry filtration process according to claim 26 or 27, wherein the filtration temperature of the filter in the first filter system is 30-250ºC, preferably 50-240ºC, more preferably 60-180ºC; the pressure difference used for the filter in the first filter system is 0.01-0.5 MPa; the filtration temperature of the filter in the second filter system is 30-250ºC, preferably 60-180ºC.

29. The oil slurry filtration process according to any one of claims 26-28, wherein the multiple-stage filter system according to any one of claims 14-17 is used.

30. Use of the oil slurry filter according to any one of claims 1-8, the oil slurry filter unit according to any one of claims 9-11, the multiple-filter system according to claim 12 or 13, the multiple-stage filter system according to any one of claims 14-17 in filtering a liquid hydrocarbon containing particle impurities, preferably filtering a liquid hydrocarbon containing catalytic cracking oil slurry and/or coal tar.