Claims

1. An insoluble sulfur production system, comprising a polymeric kettle having a first discharge port and a quenching tower having a feed port, wherein the first discharge port is in communication with the feed port, and the quenching tower comprises a cylindrical housing, a granulation device and a shear pump, the housing comprises a feed quenching section and a discharging section that are arranged from top to bottom, and the side wall of the housing is provided with a solvent inlet for providing a solvent and a quenching agent inlet for providing a quenchant, wherein:

   the feed port is arranged on the feed quenching section, and the granulation device is positioned in the feed quenching section and arranged nearer to the feed port than the solvent inlet and the quenching agent inlet;

   the discharging section is provided with a second discharge port and a filter screen above the second discharge port, and the side wall of the discharging section is provided with a circulating outlet and a circulating inlet in communication with an inlet and an outlet of the shear pump respectively above the filter screen, and

   the granulation device comprises a first feed pipe in communication with the feed port and a first distribution pipe in communication with the first feed pipe, the first distribution pipe comprises a first fixed pipe and a first rotary pipe that is sleeved on the first fixed pipe and can rotate with respect to the first fixed pipe, the pipe wall of the first fixed pipe is provided with a first discharge channel extending in the axial direction, the pipe wall of the first rotary pipe is provided with multiple groups of first discharge holes that can correspond to the first discharge channel, each group of first discharge holes are arranged in the axial direction, and the multiple groups of first discharge holes are distributed in the circumferential direction of the first rotary pipe.

2. The insoluble sulfur production system according to claim 1, the insoluble sulfur production system comprises a cooler, and the housing comprises a material separation section for solid-liquid separation and a material circulation section for circulating the materials between the feed quenching section and the discharging section, an inner circulating cylinder and a liquid distributor for spraying a quenchant or solvent into the inner circulating cylinder are arranged in the material circulating section, and a circulating liquid outlet for discharging the separated liquid is arranged in the side wall of the material separating section, the liquid discharged from the circulating liquid outlet is cooled by the cooler and sent by the circulating pump to the circulating inlet, the circulating inlet is in communication with the liquid distributor.

3. The insoluble sulfur production system according to claim 2, wherein a conical cylinder-shaped circulating flow guide plate expanding downward gradually is arranged on the periphery at the top of the inner circulating cylinder, with clearance between the circulating flow guide plate and the inner wall of the housing; preferably, the radius of the lower end of the circulating flow guide plate is 0.5-0.9 times of the radius of the housing.

4. The insoluble sulfur production system according to claim 3, wherein the inner wall of the material separation section is provided with a conical cylinder-shaped material flow guide plate

tapered toward the inner circulating cylinder, and the material flow guide plate is above the circulating liquid outlet; preferably, the material flow guide plate is configured in at least one of the following forms:

a. the distance from the lower end of the material flow guide plate to the upper end of the circulating flow guide plate is equal to the diameter of the inner circulating cylinder;

b. the radius of the lower end of the material flow guide plate is 0.5-0.9 times of the radius of the inner circulating cylinder;

c. the height of the material flow guide plate is 0.7-1.4 times of the radius of the upper end of the material flow guide plate.

5. The insoluble sulfur production system according to claim 2, the insoluble sulfur production system configured in at least one of the following forms:

a. the diameter of the inner circulating cylinder is 0.4-0.8 times of the diameter of the housing;

b. the distance from the lower end of the inner circulating cylinder to the filter screen is 0.1-0.5 meters;

c. the height of the inner circulating cylinder is 2-6 times of the diameter of the inner circulating cylinder;

d. the distance from the filter screen to the bottom enclosure of the housing is 0.5-1 meters;

e. the filter screen is in the same shape as the bottom enclosure of the housing.

6. The insoluble sulfur production system according to claim 1, wherein the solvent inlet and the quenching agent inlet are arranged in the side wall of the feed quenching section.

7. The insoluble sulfur production system according to claim 1, wherein the feed quenching section is provided with a quenchant distributor, which comprises a second feed pipe in communication with the quenching agent inlet and a second distribution pipe in communication with the second feed pipe, wherein the second distribution pipe is arranged in parallel to the first distribution pipe, the setting height of the second distribution pipe is lower than the first distribution pipe, and the second distribution pipe comprises a second fixed pipe and a second rotary pipe that is sleeved on the second fixed pipe and can rotate with respect to the second fixed pipe, the pipe wall of the second fixed pipe is provided with a second discharge channel extending in the axial direction, the pipe wall of the second rotary pipe is provided with multiple second discharge holes that can correspond to the second discharge channel and are distributed in the circumferential direction of the second rotary pipe, the outer wall of the second rotary pipe is provided with a doctor blade that can come into contact with the outer wall of the first rotary pipe, the first discharge channel is arranged toward the second distribution pipe, and the second discharge channel is arranged offset from the first distribution pipe.

8. The insoluble sulfur production system according to claim 7, wherein the doctor blade is a stainless steel blade, and/or the first distribution pipe and the second distribution pipe are a plurality of distribution pipes that are arranged corresponding to each other alternatively, the plurality of first distribution pipes are arranged side by side, the plurality of second distribution pipes are arranged side by side, and a connecting line between the centers of cross sections of a

first distribution pipe and a corresponding second distribution pipe in the same plane is at 40-50° with respect to the plane of arrangement of the first distribution pipes.

9. The insoluble sulfur production system according to claim 7, wherein:

the first discharge holes are in diameter of 0.5-3mm, and the spacing between adjacent first discharge holes in the same group is 3-15mm;

and/or each second discharge hole comprises a plurality of slits that extend in the axial direction sequentially and are in width of 5-20mm respectively, and/or the second discharge holes are arranged to provide the quenchant in the tangential direction of the second rotary pipe.

10. The insoluble sulfur production system according to claim 7, wherein the first rotary pipe and the second rotary pipe are connected to a driving device via a transmission device respectively; and/or the first rotary pipe and the second rotary pipe rotate in the same direction.

11. The insoluble sulfur production system according to claim 1, comprising a washing filter and a dryer, wherein the inlet and outlet of the washing filter are in communication with the second discharge port and the dryer respectively.

12. A method of producing insoluble sulfur through a low-temperature melting process with the insoluble sulfur production system according to any of claims 1-11, comprising:

S1. raising the temperature of liquid sulfur in the present of an initiator and under nitrogen shielding to perform polymerization reaction within the polymeric kettle;

S2. introducing the polymerized material into the quenching tower and carrying out granulation and quenching treatment sequentially;

S3. carrying out solvent curing and extraction integrated treatment on the quenched product in the quenching tower;

S4. carrying out liquid-phase circulated crushing and extraction integrated treatment on the cured and extracted product in the quenching tower.

13. The method of producing insoluble sulfur through a low-temperature melting process according to claim 12, comprising:

S5. outputting the slurry obtained through liquid-phase circulated crushing from the quenching tower for washing filtration;

S6. drying the solid product obtained through washing filtration to obtain an insoluble sulfur product.

14. The method of producing insoluble sulfur through a low-temperature melting process according to claim 13, wherein the material is granulated to 0.5-3mm size in the step S1; and/or the cured product is crushed to granules in size of 0.15mm or lower in the step S4.