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Complete set of pyrolysis equipment for waste rubber and waste plastic to oil

废橡胶塑料裂解油化成套生产设备

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Complete set of pyrolysis equipment for waste rubber and waste plastic to oil

1 Scope

This standard specifies the terms and definitions, composition, model and basic parameters, requirements, testing, inspection rules, markings, packaging, transportation and storage of complete set of pyrolysis equipment for waste rubber and waste plastic to oil.

This standard applies to complete set of pyrolysis equipment for continuous and intermittent waste rubber and waste plastic (hereinafter referred to as complete production set).

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 151 Heat exchanger

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 2589 General principles for calculation of total production energy consumption

GB 2893 Safety colors

GB 2894 Safety signs and guideline for the use

GB 4053.1 Safety requirements for fixed steel ladders and platform - Part 1: Steel vertical ladders

GB 4053.3 Safety requirements for fixed steel ladders and platform - Part 3: Industrial guardrails and steel platform

GB 4655 Safety rules of static electricity in the rubber industry

GB 5226.1-2008 Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements

GB/T 6388 Transport packaging receipt and delivery mark

GB/T 9969 General principles for preparation of instructions for use of industrial products

GB/T 10610 Geometrical product specifications(GPS) - Surface texture: Profile method - Rules and procedures for the assessment of surface texture

GB/T 13306 Plates

GB/T 13384 General specifications for packing of mechanical and electrical product

GB/T 13452.2 Paints and varnishes - Determination of film thickness

GB/T 16157 The determination of particulates and sampling methods of gaseous pollutants emitted from exhaust gas of stationary source

GB 16297-1996 Comprehensive emission standard of air pollutants

GB 50058 Code for design of electrical installations in explosive atmospheres

GBZ 1-2010 Hygienic standards for the design of industrial enterprises

HG/T 2108 Determination of noise pressure level of rubber machinery

HG/T 3120 The general technological requirements for the appearance of the rubber and plastic machinery

HG/T 3228-2001 General specifications of painting for rubber and plastics machinery

NB/T 47003.1-2009 Steel welded atmospheric pressure vessels

SH 3009 Specifications for design of combustible gas emission system in petrochemical industry

SY 6503 Safety technical specification of combustible gas detection and alarm system for petroleum and natural gas engineering

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Complete set of pyrolysis equipment for waste rubber and waste plastic to oil

5.1.2 The pipes and valve joints shall be connected reliably, without leakage; all piping systems shall be clean and unblocked.

5.1.3 The complete production set shall be stable during normal operation; there shall be no abnormal vibration, no interference, jamming, or abnormal noise.

5.1.4 The heating device shall use controlled temperature hot air to heat the pyrolysis reactor.

5.1.5 The temperature of the solid product in contact with atmospheric air shall not be higher than 60 °C.

5.1.6 The working environment's sanitation requirements for complete production set shall comply with the provisions of 6.1 of GBZ 1-2010.

5.2 Functional requirements

5.2.1 The complete production set shall have:

a) Manual or automatic control mode;

b) The function of online control and display of the operating status of each device;

c) The function of automatically recording and printing various operating parameters (pressure, temperature, flow, motor frequency);

d) The function of real-time fault alarm and self-diagnosis.

5.2.2 The control system shall have:

a) Man-machine dialogue function;

b) Reserve an information network interface system;

c) Switch between manual control mode and automatic control mode without disturbance;

d) Data collection, calculation, processing, command functions for pressure, temperature, flow.

5.3 Technical requirements

5.3.1 Pyrolysis reactor

5.4.2 The exposed high-temperature parts of the complete production set that are accessible to the human body shall take protective measures, so that the temperature of the outer surface is not greater than 60 °C.

5.4.3 The safety protection parts of the complete production set shall be painted with yellow safety color or alternative black and yellow safety color stripes in accordance with the provisions of GB 2893.

5.4.4 The electrical equipment installed in the pyrolysis workshop in the complete production set shall meet the requirements of GB 50058.

5.4.5 The insulation resistance between the power circuit wires and the protective grounding circuit of the complete production set shall comply with the requirements in 18.3 of GB 5226.1-2008.

5.4.6 The withstanding voltage between all circuit wires of the electrical equipment of the complete production set and the protective grounding circuit shall comply with the provisions of 18.4 in GB 5226.1-2008.

5.4.7 The continuity of the protective connection circuit of the complete production set shall comply with the requirements in 8.2.3 of GB 5226.1-2008.

5.4.8 The electrical control system of the complete production set shall have overload protection and emergency shutdown devices.

5.4.9 There shall be audible and visual warning signals before the operation of the complete production set.

5.4.10 The highest point of the complete production set shall be provided with lightning protection devices.

5.4.11 All metal equipment, equipment shells, metal pipes, brackets, components and parts in the complete production set shall be directly anti-static grounded; the grounding resistance of the electrostatic grounding body shall not be greater than 100 Ω.

5.4.12 The intermediate oil tank of the complete production set shall be equipped with a cofferdam to prevent oil leakage; its volume shall be greater than the volume of the intermediate oil tank.

5.4.13 The steel ladders, protective railings and platforms in the complete production set shall meet the requirements of GB 4053.1 and GB 4053.3.

5.4.14 The complete production set shall be equipped with a flammable gas safety discharge device; its design shall meet the requirements of SH 3009.

5.4.15 The combustible gas detection and alarm system shall be installed in the

5.6.2 The appearance quality shall meet the requirements of HG/T 3120.

6 Test

6.1 Basic requirements testing

6.1.1 Test 5.1.2, 5.1.3, 5.1.4 through no-load test run and PLC program operation testing.

6.1.2 For the testing of 5.1.5, use a point thermometer to perform testing.

6.1.3 The test of 5.1.6 shall be carried out in accordance with the provisions of GBZ 1-2010.

6.2 Functional requirements testing

6.2.1 Perform the load test run, PLC program and operation inspection; it shall meet the requirements of 5.2.1.

6.2.2 Perform the no-load test run and PLC program operation inspection; it shall meet the requirements of 5.2.2.

6.3 Testing of technical requirements

6.3.1 Testing of pyrolysis reactor

6.3.1.1 The water pressure or air pressure test shall be carried out in accordance with the relevant requirements in 9.7 of NB/T 47003.1-2009.

6.3.1.2 After the processing of the dynamic sealing surface of the pyrolysis reactor is completed, the surface roughness of the dynamic sealing surface is tested according to the method specified in GB/T 10610.

6.3.1.3 See Table 3 for the tests of 5.3.1.4 ~ 5.3.1.6.

After the complete production set runs for 4 hours under load, use a thermometer to measure at least 3 points on each bearing housing; take the maximum reading.

6.3.6 Testing of annual throughput

6.3.6.1 Testing of annual throughput of continuous production set

After the load operation is normal, use a platform scale or a feeding metering device and a timer to measure the 8 h throughput. Take the average value as the hourly throughput. Then calculate the annual throughput according to formula (1).

Annual throughput (t) = hourly throughput (t/h) × 8000 h ……(1)

6.3.6.2 Testing of the annual throughput of intermittent production set

Use a platform scale or a feeding metering device and a timer to measure the throughput and time used in 3 cycles. Take the average value as the throughput per cycle and processing time per cycle. Then calculate the annual throughput according to formula (2).

Annual throughput (t) = Throughput per cycle (t/time) × [8000 h/processing time per cycle (h/time)] ……(2)

6.3.7 Testing of pyrolysis rate

6.3.7.1 Sampling of solid products obtained from pyrolysis

6.3.7.1.1 For continuous production set, take a sample every 2 h; take 100 g ± 5 g of sample each time, totally 3 times. Mix it uniformly and prepare for use.

6.3.7.1.2 When the output of intermittent production set is about 1/4, 1/2, 3/4 of the total output in the discharging process, take 100 g ± 5 g each. Mix it uniformly and prepare for use.

6.3.7.2 Results processing

The pyrolysis rate is calculated according to formula (3).

Pyrolysis rate = 1 - The oil content of the solid product obtained from pyrolysis… (3)

See Appendix D for the test method for the oil content of the solid product obtained by pyrolysis.

6.3.8 Testing of energy consumption

6.4.15 Carry out testing for 5.4.15 in accordance with the requirements of SY 6503.

6.5 Testing of environmental requirements

6.5.1 According to the method specified in Chapter 8 of GB 16297-1996, carry out testing for the atmospheric pollutants discharged by the complete production set in 5.5.1 and 5.5.2 and the atmospheric pollutants characteristic of the industry.

6.5.2 According to the method specified in GB/T 16157, carry out testing for the dust concentration at the outlet of the dust removal device in 5.5.3.

6.5.3 Perform noise testing for 5.5.4 according to the method as specified in HG/T 2108.

6.6 Painting and visual inspection

6.6.1 According to the method specified in HG/T 3228, carry out paint quality inspection on 5.6.1. According to the requirements of GB/T 13452.2, carry out testing for the thickness of the paint film.

6.6.2 Perform appearance quality inspection on 5.6.2 according to the method specified in HG/T 3120.

6.7 Test before no-load operation

Before no-load operation, it shall check the complete production set in accordance with 5.3.1.2 ~ 5.3.1.6, 5.4.1, 5.4.3 ~ 5.4.15; all of them shall meet the requirements.

6.8 No-load operation test

6.8.1 No-load operation test shall be carried out after the assembly inspection is qualified and meets the requirements of 6.7. The continuous no-load operation time is not less than 4 h.

6.8.2 During no-load operation, testing shall be carried out in accordance with 5.1.2 ~ 5.1.4, 5.1.6, 5.2, 5.5.4.

6.8.3 The no-load operation test of the complete production set is allowed to be carried out after installation at the user site.

a) When a new product is trial-produced and finalized, or an old product is subject to trans-plant production;

b) After formal production, when there are major changes in structure, materials, processes;

c) When the production is restored after suspension for 2 years;

d) When there is a big difference between the exit-factory inspection result and the last type inspection result;

e) During normal production, at least one unit/set shall be sample-checked every three years;

f) When the national quality supervision department puts forward a requirement for type inspection.

7.3.2 The samples for type inspection shall be products that have passed the exit-factory inspection; not less than one sample shall be taken each time.

7.3.3 Type inspection items shall be carried out in accordance with the provisions of Chapter 5 of this standard.

7.3.4 If the type inspection items all meet the requirements of this standard, it is judged as qualified. For type inspection, one set shall be randomly inspected at a time. If there are unqualified items, two more sets shall be selected for inspection. If there are still unqualified items, the inspection shall be carried out one by one.

8 Marking, packaging, transportation and storage

8.1 Marking

Each single unit of equipment in the complete production set shall have a product nameplate, precautions or warning signs, related movement direction signs. The type and size of the sign shall comply with the requirements of GB/T 13306. The product sign shall have the following content:

a) Product name;

b) Product model;

c) Annual throughput;

d) Production date;

Appendix D

(Normative)

Determination of oil content of solid products obtained from pyrolysis

D.1 Method summary

Under the condition of isolating air, weigh a certain amount of solid product sample and put it in a high-temperature furnace to heat it for a certain period of time. Then determine its mass loss.

D.2 Equipment

D.2.1 High temperature furnace, the temperature can be controlled at (450 ± 5) °C.

D.2.2 Crucible, volume 30 cm^3, with lid.

D.2.3 Stopwatch, accuracy 0.2 s.

D.2.4 Analytical balance, which has an accuracy of 0.1 mg.

D.2.5 Dryer, equipped with effective desiccant.

D.2.6 Oven, gravity convection type, controllable temperature is (105 ± 2) °C or (125 ± 2) °C.

D.3 Sample preparation

Crush all the samples taken to below 4 mm; use the quartering method to reduce it to about 60 g; grind it to make it all pass through a standard sieve of 0.25 mm.

D.4 Test procedure

D.4.1 Place the prepared sample in an oven (D.2.6) at 105 °C or 125 °C to dry for 1 hour. Take it out and move it to a desiccator (D.2.5) to cool to room temperature. Prepare for use.

D.4.2 In a 450 °C high temperature furnace (D.2.1), burn the empty crucible (D.2.2) for about 0.5 h. Take it out. Place it on the asbestos net on the workbench and cool it for 2 min ~ 3 min. Then move it into a desiccator to cool to room temperature. Use an analytical balance (D.2.4) to weigh it.

D.4.3 Place the dried sample in a weighed crucible. Gently tap the crucible on a firm and flat plate, to spread the sample flat in the crucible. Fill it to about 2

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