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Bokhar Gostar Tabristan

In the name of GOD

Setting up training and operation of spa boilers:

Identification of three pass boiler



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Things to consider before starting up .\

- Installing and fixing all equipment, including the metal spa boiler, expansion source, water circulation pumps, etc., according to the plans and installation instructions.
- Installation of all instrumentation equipment.
- Completion of all procedures related to piping and holders, water lines, gas and..
- Perform hydrotest according to the designed plan and mode approved by the third party inspection company.
- Insulation and painting of the boiler.
- Installation of control panel and power supply. Completion of cabling and wiring of electrical equipment.
- Obtaining approval for the installation of boiler equipment.
- Testing the parts inside the panel and instrumentation equipment.
- Having soft water (installing a resin hardening system before the boiler) to feed the Expansion sources.
- Possessing diesel and gas fuels.
- The possibility of sampling and analyzing boiler feed water to compare with the feed water standards of metal spa boilers.
- Ventilation of all lines after dewatering the system and removing trapped air in the metal spa boiler.



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Boiler drainage: Metal boiler

- 1- 1-After dewatering the expansion source, open the boiler vent valve and drain the metal boiler through the feeding path by the dewatering expansion tank. do it In the same way, all the lines of the heating system are drained and trapped air is pumped out by Circulason pumps Remove the air valves from the system. Note that at the time of venting all valves related to pumps, collectors Boiler and water lines should be open. Also, pay attention to reducing the water level of the expansion source, the filling path of the expansion source and the system. Control its level automatically to provide compensatory water.
- 2- 2- After draining the boiler, select the fuel for the burner with the corresponding key. If diesel fuel is selected, the level of the tank check the fuel daily, open the valves of the suction line and the fuel return line, and at the same time as the pump starts, the pressure and flow Control the diesel. Note: If diesel fuel is selected by the fuel selection key, the diesel pump will automatically start at the same time The torch starts.
- 3- 3- Turn on the boiler according to the instructions below and let the boiler start with a low flame:
- 4- 1. After placing the torch switch (torch on-off) in the (on) position, the torch relay is in the working cycle. and the burner starts working, at first the burner fan turns on and after a few seconds the engine damper starts to open. and works with full air. Then the damper returns to the low state and then the ignition circuit includes the transformer The booster, the spark electrodes and the electric valve of the pilot line (if the burner has a pilot) are



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activated and create a spark. It fits, then fuel and spark work together for a few seconds.

After that spark from the circuit removed and the flame will be stable. The electronic eye controls the flame and in any case there is no flame Shutdown order and warning is issued by alarm (exit-lock). which the operator is obliged to fix He took the appropriate action.

5- 2. After the flame stabilizes and the command to continue working by the electronic eye, the normal flame light (torch on) will be lit.

6- If the low or high flame adjustment key (rotation - manual or automatic) is in the automatic position, as soon as it becomes normal The flame, the engine damper starts to work and increases the fuel and air and the flame becomes high. Also the formation of a large flame It is also possible in manual mode and by adjusting the potentiometer (combustion rate) to high mode. Important note: at this stage, because the pot is cold, it should never work with high heat or high flame. The length of the flame must be controlled and For this purpose, we put the flame regulation key in the manual position and the flame regulation potentiometer in the low flame position. up to temperature The water in the pot will gradually increase. (end of part one) .

- It should be mentioned that the potentiometer is usually installed on high capacity boilers. If the boiler works with a high flame and the temperature of the boiler reaches the temperature set by the corresponding Augustat (temperature - low or high) The flame changes from a high state to allow flame, and if the burner is modulated, the length of the flame increases as



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the temperature

increases. It gradually decreases. When the water temperature of the boiler reaches the desired working temperature, the special on and off switch (temperature key - off or on) automatically turns off the boiler.

- The temperature difference between turning off and turning on the boiler can be adjusted. For example, when the boiler is at a temperature of (90°C) After the temperature drops, the temperature switch can be set so that the boiler is turned on again at a temperature of (80°C). If for any reason the boiler does not turn off automatically at a temperature of (90°C), the safety temperature switch (safety temperature key) It works at a higher temperature and gives the command to turn off the burner along with the alarm. And even if the security switch If the safety switch pressure and safety valves of the boiler do not work properly, with the increase in pressure due to the excessive increase in temperature, It will be arranged and in this way possible damage to the boiler and system will be prevented.

4- After performing the above steps, increase the temperature of the boiler to the working temperature and let the boiler run for about 25 minutes in manual conditions and still work with short flame.

5- Open the boiler drain valve and drain the boiler water for about 4 minutes so that the possible substances settled at the bottom of the boiler are removed and The quality of the water inside the boiler will increase.

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6- After completing the above steps and the initial settings of the boiler, you can now use the hot water and reduce the temperature to turn the boiler on automatically and with The high flame also adjusted the automatic operation of peripheral equipment including temperature switches, diesel fuel pump, line equipment He controlled the gas, boiler water level controller and expansion source.

Note: If the temperature of the chimney rises from the set level, while the alarm sounds, the command to turn off the burner by Chimney thermoregulator is issued. In this case, one of the following situations may have happened.

1. The water level inside the boiler has decreased and the level gauges have not worked properly.
 2. The internal surfaces of the fire-eating pipes are covered with soot and the heat transfer does not take place properly.
 3. The external surfaces of the fire pipes are deposited and the heat transfer does not take place properly.
 4. Smoke suction is too high (chimney damper is not adjusted)
 5. The thermoregulator or thermometer is out of calibration and the number shown is not real.
- The flue thermoregulator adjustment range for three-pass hot water boilers is up to 230 °C and for two-pass boilers up to 320 °C. is

Operations that must be done in every shift (daily schedule)

- Check the settings of the water temperature switches going back and forth to the boiler and the



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chimney temperature according to the thermometers of each part.

- Open the boiler's drain valve and let it drain for a few seconds (this action is to reduce the salts in the water).
- The flame inspection glass at the back of the boiler should be cleaned if it is dirty.
- Visit low flame and high flame.
- Keep the parts of the burner clean and clean the leaking oil daily and seal the leaking area.
- Make sure that the hardness of the water does not exceed the maximum limit of 60 PPM by sampling the feed water.
- Check the operation of the boiler water level controller and the expansion source.

(end of part two).

Weekly schedule of hot water boilers .\)

- Check the correct operation of all boiler warning signs, including bells and warning lights.
- Visit the fuel filter and feed pump strainer and clean it if necessary.
- When the torch is working, remove the electronic eye, you must immediately cut off the flame And the warning signs. Use the light source, this way the flame control circuit is checked.
- Clean the electric eye with a soft and clean cloth and put it in its place.
- Check the ignition electrodes and the fuel injection nozzle, clean them if you see deposits.
- Check the air and fuel damper connections.
- By pulling the valve lever, check its performance.
- If any problem is observed in the above steps, take immediate action to fix it, and if



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unsuccessful, contact an expert service technician. Use.

Monthly plan

1. Grease the propeller bearings.
2. Lubricate the electric motors according to the manufacturer's instructions.
3. Check the feed pump for leaks and making noise.
4. Visit the fuel filter and wash it with diesel if necessary.
5. Open the strainer of the water circulation pumps and, if necessary, remove sediments and possible blockages and clean the strainers completely.
6. Check all fittings and valves for leaks and fix them if there are any problems.

Seasonal program

- Clean the torch completely and check for leaks.
- Clean the second and third pass pipes with a special brush (if there is soot inside the pipes).
- Open the manholes and handholes and inspect the inside of the boiler completely in terms of deposits and rust.

Cleaning methods

All pipes can be accessed by opening the front and rear doors. and from the front of the boiler with a special brush inside the pipes Cleaned soot deposits. After cleaning the deposits and soot accumulated in the combustion chamber by removing the rear circular door You can also access the rear smoke box and clean the soot or soot deposits that have accumulated there. To re-install the front and rear doors, you should pay attention to their sealing and every time you open the



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doors, if you touch the

connections and If the fireproof tape around the door is damaged, repair or replace them.

Shutting down the boiler for a long time

To turn off the boiler for a long time, you can do one of the following two ways:

1- The method of drying the boiler

When you turn off the boiler, the pipes, the furnace pipe catch plates and all the surfaces that are in contact with heat and gas must be free from combustion soot. be cleaned After draining the water and heating the boiler, drain the water in the boiler and open the manhole, handhole and mudhole valves. Remove the mud, sediments and particles and clean the inside of the pot completely. You should try to make the inside of the pot completely dry and its moisture is taken as much as possible. The control float brought out the water level and cleaned their chambers from sediments Clean and dry rust shells and reassemble. Open the air outlet and boiler drain valves. And then using the material A suitable chemical dehumidifier will prevent internal parts from rusting and oxidizing while the boiler is off.

2- The method where the boiler is drained.

When the pot is drained, turn off the pot and try to make sure there are no bubbles inside. And one pot of water every week The load should be tested and chemicals stored for water treatment should be injected all the time to prevent oxidation. Also It is necessary to open the water taps once a day and run the boiler for 10 to 15 minutes with high flame.



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Defects that may occur in the system during operation.

A: The burner does not start working.

The following problems may have occurred, take action to fix them.

1. The burner key is not on.
2. The fuse in the circuit is burnt.
3. The relevant contactor has a problem.
4. The boiler should be in the off position (locked output).
5. The electric eye is exposed to light.
6. The relevant overload relay has worked.
7. Connections are generally not tight.
8. The burner door is not tightly closed.
9. The electrical circuit is defective.

B: The burner and fan motors are working and no flame is created. .\

1. - The connections are not correct or firm.
2. The air pressure switches have not worked.
3. Air and fuel damper microswitches have not worked.
4. The fuel source is empty.
5. The fuel is cold or the thermostat is broken (when the boiler is working with diesel fuel).
6. Burner motor or fuel pump or fan motor should be reversed.
7. The fuel filter is dirty.
8. The valves of the fuel line should be closed.
9. No spark is produced.

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10. Spark electrodes are dirty.
2. The regulation of the spark electrode is broken.
3. The setting of the electrodes is incorrect.
4. The connections are not complete.
5. The ignition transformer is broken.
6. The damper has caught air.
7. The ratio of air and fuel is not correct.
8. The gas pressure is not suitable.
9. The gas leak detector has worked.

(third part) the end .

C: The lit torch will be turned off immediately. .۲

- 1- The electric eye is dirty. .۱
 - 2- There is an obstacle in the path of the light of the flame and the electric eye. .۲
 - The electrical connections are not solid. .۳
 - The electrical connections in the circuit of the electric eye are closed on the contrary. .۴
 - The receiving current of the electric eye is low. .۵
- The ratio of fuel and air is not suitable and a complete flame is not created. .۶

D: The torch is turned off while working. .۱

- The fuel has run out.
- There is a problem with the fuel line.
- The fuel pump is out of order.
- Water has penetrated into the fuel.
- If you use diesel, the fuel is cooled.



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- The electrical connections are loose.
- The fuel pump has drawn air.
- There is a problem with the fuel solenoid.
- There is a problem with the ratio of fuel and air.
- The electric eye has problems.
- The power has been cut off.
- The steering circuit controller fuse is burnt.

E: The flame is smoking.

- The ratio of fuel and air is not correct.
- If you use diesel fuel, the temperature of the fuel is low.
- The fuel pressure is high.
- Pass pipes two and three are dirty.
- There are problems on the way to the chimney.
- The air in the combustion chamber is low.

G: The torch turns on and off constantly.

- The load of the boiler is low compared to its size and capacity.
- Leakage of connections related to temperature and sediment switches has caused disruption in their operation.
- The temperature switches (Augustat) are defective.
- The burner door is not tightly closed.



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Causes of defects in the boiler

The explosions that happen in the spa boiler are due to the following reasons:

- Existence of automatic systems in spa boilers, along with complete trust in these systems, which are intended to prevent pressure increase and so on.
- Control systems may not work properly for various reasons, therefore their installation can create a false sense of confidence, which should be prevented by daily and weekly inspections and tests according to the schedule.
- Procrastination in regularly testing safety valves
- Procrastination in properly maintaining the boiler and auxiliary equipment, including water level controllers, temperature switches, etc.
- As the way of placing the control system in automatic hot water boilers becomes more complicated, interfering with this system or blocking the safety controls may lead to malfunctioning of the boiler.
- The higher speed of combustion along with the fuel suspended in the furnace space in the boiler can quickly lead to incomplete combustion (in terms of fuel-air ratio) which causes an explosion in the smoke part of the boiler. This happens when the safety control systems do not work properly, the fuel valves are leaking or the pilot is not working properly.

Sediment formation:

The formation of deposits on the refractory surfaces is due to the contact of the impurities in the boiler water with the heat transfer surfaces. Among these impurities, the most important ones are calcium, magnesium and silica. Calcium and magnesium may form sulfate salts and give carbonates that indicate the formation of sediment. The presence of calcium in raw water is due to its presence in different forms such as lime, gypsum And... it is general. Magnesium also exists in various forms in water. The most famous of which is magnesium sulfate. Silica that in sand and glass are found to form a dense, extremely hard and virtually glassy sediment, the water that produces sediment in The term is called hard water. This hardness can be temporary, permanent or both, temporary hardness is possible with heat Allowing the feed water to be removed to 212°F in a heater. In this case, the salts that caused temporary hardness will settle down They come Permanent hardness can also be reduced or eliminated by purifying the water with hardness devices.(end of part four).

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A: Sediment is an effective thermal insulation, the presence of sediment with considerable thickness means less absorption of heat by water. as a result, it leads to a drop in the efficiency of the boiler.

B: Due to the fact that the sediment is unable to conduct heat, the thermal surfaces that are insulated from one side and from On the other hand, they are exposed to hot gases, they may quickly reach a dangerously high temperature, which is possible.

cause cracks in the pipes and even cracks in the shell and network. The formation of sediment often increases with the rate of evaporation. Therefore, deposits in the places where the temperature of the smoke has its maximum value It is heavier and denser. Sediment in tube-fired boilers is more serious and associated with many problems 1 mm on the pipes of water-tube boilers that are exposed to radiant heat may lead to pipe defects and cracks. while deposits on the tubes of tube-fired boilers cause a drop in the efficiency of the entire system, because in this case Fire tubes get their heat through the mechanism of heat transfer from place to place, not by radiation. The presence of heavy sediments is usually a sign of neglect, because these sediments can be removed in most cases with complete water purification. to go In places where sediment has formed to a considerable thickness, measures should be taken to remove them and in If the boiler is clean, appropriate steps should be taken to prevent the recurrence of sediment formation. Sediment can interfere with the proper functioning of control systems. For example, in the sediment safety valves around The seat causes the valve to stick in the closed position and the communication between the internal parts is blocked. Therefore, the formation of one sediment It is one of the most important factors causing defects in safety valves. that with a regular program in feeding water purification and frequent testing of milks, Such defects can be prevented.

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