Comprehensive Energy-Saving Technology for RTO Flue Gas Waste Heat Utilization

Shuli Liu*
Environmental Technology Group (Qingyun) Limited, Shandong, 253000, China

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1. Introduction

High temperature gas discharged from the TNV system of automobile painting workshop can effectively improve the economic benefit of the factory. At present, the more mature scheme is to heat the high temperature exhaust gas through the heat exchanger to reduce the steam consumption in the factory.

2. Research on Mechanism of Regenerative Exhaust Gas Oxidation Device

Generally, the mechanism of comprehensive energy-saving utilization technology of RTO flue gas waste heat is organic waste gas, which is mainly produced in the manufacture of automobile paint spraying room and the operation of various drying equipment. These large amounts of organic waste gas are discharged from pipes. After it is operated and transported to the RTO equipment, it is incinerated at high temperature and recovered and utilized, and the heat energy generated when the exhaust gas is burned by the ceramic heat storage body of the RTO equipment is finally discharged. Generally speaking, the temperature of the gas released into the atmosphere after the use of thermal energy is about 250°C. Considering the safety factors, it is necessary to reduce the flue gas temperature to about 120°C. Before it is discharged As a result, the flue gas temperature has been reduced from 250 to 120°C, and there is still room for recovery. Therefore, aqueous media can be used in this process to maximize thermal energy and convert cold water into hot water to complete flue gas temperature drop and hot water prepa-
3. A probe into the Key Points of RTO Waste Heat Control System

RTO flue gas waste heat systems usually include different energy use areas. Therefore, equipment in each energy use field has relatively independent requirements for automation. At the same time, there is an inseparable relationship between production and energy consumption in different regions. Waste heat equipment usually has obvious application advantages in hot water heating and safety protection. Therefore, the relationship between the electrical control cabinets in each area is naturally more complex. Perfect and stable automatic control system is the key premise of safe production of automobile. RTO key points of flue gas waste heat control system usually include the following aspects:

In order to make full use of the RTO flue gas waste heat system, the basic conditions are first adjusted so that the flue gas pipe pneumatic valve is in place and the flue gas passes through the heat exchanger. Instead, it is necessary to ensure that the waterway is still in its original state. By controlling the position of the three-way control valve, water can pass through the waste heat exchanger from beginning to end. In the channel system, the initial setting of the channel valve and the flow of water must be determined during commissioning[22]. To avoid warning when the exhaust temperature is too low, the amount of water is too high, the water temperature is too high or the amount of water is too low. At the same time, in the temperature control of the RTO exhaust heat exchanger, the temperature is controlled in the range of 110 to 120, and the exhaust gas condenses in the heat exchanger, and the long-term corrosion will damage the whole heat exchanger.

When the RTO flue gas waste heat system receives the starting signal of the boiler room pump, the flow information is displayed on the switch of the inlet pipe flow object. The pneumatic valve in the flue gas pipe needs to be automatically converted to make the flue gas always available. It passes through the waste heat exchanger from beginning to end. At the same time, the RTO system needs to respond and operate accurately when receiving relevant information about boiler room pump. The backup signal of the pump ensures that the flue gas pipe can switch the pneumatic valve. When the boiler chamber receives the flue gas pneumatic valve, the forced signal should be switched and the pump should be stopped after 30 minutes. If the smoke temperature is too low and less than 120°C, an alarm signal should be issued. Therefore, the temperature probe must be connected to the inlet and outlet of the exhaust pipe. When the flue gas temperature drops below 120°C, a low temperature alarm is issued to regulate the channel three-way valve, thereby reducing the amount of water in the waste heat exchanger and protecting the RTO system[9].

When low temperature baking technology is used in automobile manufacturing, generally speaking, the RTO exhaust temperature of the paint factory is usually low, so the waste heat of the flue gas can not be comprehensively utilized. When organic waste gas is incinerated or refined through the RTO system, the temperature of the flue gas discharged at this time is usually 30-40 higher than that of the organic waste gas. The oven temperature is usually about 80 ohms for the bumper paint room and the bathroom paint room, but the exhaust gas temperature is usually 110-120 due to RTO refining, this cold flue gas is not very useful. Therefore, the comprehensive energy saving technology RTO flue gas waste heat utilization must fully consider this aspect.

The automatic control system used by the RTO must control the temperature of the flue gas to prevent excessive exhaust temperature of the RTO from damaging the heat exchanger. Since the furnace temperature in the RTO is usually as high as 800 ohms, if the pneumatic switch valve used in the RTO can not switch normally in this state, replace the high temperature gas in the RTO furnace and store it in the heat storage[23]. In this case, the RTO exhaust gas temperature will continue to rise, thereby damaging the heat exchanger. Remember that in RTO settings, the automatic control system should avoid excessive temperature and consider how to control RTO exhaust in case of extreme failure of the whole system.

Automatic air valve switching for flue gas piping must be carried out in accordance with relevant orders. To avoid automatic air valve failure and burn down the drying room. When switching between automatic throttle, make sure the throttle is open so that the unwanted throttle can be closed. As long as the hot air and bypass valves associated with the RTO system are always open, they should always be open.

4. Planning of Exhaust Gas Treatment System for Automobile Painting

In the planning process of automobile painting exhaust gas treatment system, it is necessary to consider reducing the energy consumption rate of the treatment process, re-
roducing the system investment and operation cost, and reduc-
ing the production of automobile painting exhaust gas. Ac-

According to this plan, the current mainstream automobile
painting waste gas treatment system is planned to use
automobile painting waste gas for recycling production,
manufacturing closed production space, thus reducing the
purpose of automobile painting waste gas treatment. At
the same time, the heat cycle utilization ratio and energy
consumption of automobile painting waste gas treatment
are improved[5].

4.1 Waste Gas Recycling Measures in Automotive
Painting Workshop

In order to reduce the treatment capacity of automo-
tive painting exhaust gas, the closed space can be used
for the production mode of circulating air for automobile
painting, but considering the protection and health needs
of personnel, it can not be realized. In order to solve this
problem, there are two main ways to solve this problem.
The first is to send fresh air in the personnel station, and
the circulating air is used in other positions without per-
sonnel demand. Compared with the original new wind,
the pressure of automobile painting exhaust gas treatment
has been greatly reduced. Another solution is to improve
the intelligent level of robot work, replace human inter-
vention, through machine programming, the robot in the
closed workshop to complete the car painting operation,
only after the completion of automotive painting waste
gas treatment. It reduces the energy consumption level
of automobile painting waste gas treatment system and
achieves the function of energy saving and emission re-
duction. Compared with the latter, the first way belongs
to the semi-new air conditioning system. The original
traditional air conditioning system is a new air condition-
ing system mode. In terms of energy consumption of air
conditioning, the improved air conditioning can also re-
duce the consumption of cold and hot energy and electric
power.

4.2 Heat Recovery and Utilization of Exhaust Gas
Treatment System in Automotive Painting and
Painting Workshop

The exhaust gas treatment system of automobile paint-
ing workshop mainly depends on the method of mixed
natural gas combustion after concentration to realize the
treatment of toxic and harmful waste gas. The burning
exhaust gas will cause air heat pollution and energy waste
directly into the atmosphere. The most efficient and fea-
sible way to recycle is to adjust the temperature of the air
conditioning system and to heat the fresh air system inside
the workshop[6]. Including air conditioning in the flash
drying oven after painting the car, its fresh air heating can
also use waste gas to burn waste heat.

4.3 Comparison and Comparison of Automobile
Painting Exhaust Gas Combustion Device

The volatile organic compounds in the exhaust gas of
automobile painting workshop are decomposed into water
and carbon dioxide after combustion to achieve harmless
treatment. In the application of combustion equipment,
there are two main structural forms: RTO and TAR. The
latter emission temperature can reach more than 300 de-
grees Celsius. TAR the emission temperature is low, only
about 100 degrees celsius, it needs independent heating
device, the economy of its own recycling residual tem-
perature is poor, but it can still carry out hot water prepar-
ation, air conditioning heating and other waste heat utili-
ization equipment, plus heat pump system, the temperature
difference can be used more, more waste heat resources
can be recovered. Because the waste heat utilization sys-
tem involves the cooperation between many systems, it
needs to be considered as a whole in the planning stage,
and the reserved space and the water load of the system
equipment need to be considered as a whole[7].

4.4 Energy-Saving Planning for Other Automo-
tive Painting Waste Gas Treatment Systems

The biggest problem in the process of indirect utiliza-
tion of waste heat treated by automobile painting exhaust
gas is that it contains more impurities, which is easy to
block and attach to the surface of heat exchanger, which
results in the decrease of heat transfer coefficient of heat
exchanger and can not reach the planning and design con-
ditions. In the face of this kind of problem, the best solu-
tion is to use the waste heat inside the painting workshop,
especially in the system to prevent pollution related other
systems. For example, the waste heat is treated by paint-
ing and painting exhaust gas in automobile, which is used
for moisture drying and volatile treatment in solid waste,
reducing the moisture content of solid waste, reducing
the fluidity and volume of solid waste, and increasing the
treatment efficiency[8]. At present, from the point of view of
reducing occupational diseases, many developed countries
have gradually used robotic arms to replace manual opera-
tions, which can not only achieve a substantial increase in
work efficiency, but also reduce human injury and reduce
economic investment in personal protection and protec-
tion. The unmanned automobile painting workshop can
completely use the full circulation air conditioning sys-
tem, add the equipment such as exhaust gas mixing and
solid filtration in the circulation process, form a closed
dworkshop and negative pressure control, reduce the pol-
lution to the environment, reduce the waste heat energy
consumption of air conditioning fresh air, and reduce the
waste gas treatment capacity of automobile painting.

5. Conclusion

To sum up, the waste heat reuse system is a process
of boiling water, in which the purpose of the automatic
control system is to ensure the safe and stable operation
of the waste heat reuse system, that is, the water can not
be boiled or dried. First of all, the wind pressure is used to
control the speed of the fan to ensure the constant pressure
in the air duct. On this basis, the system exhaust tempera-
ture is used to control the flow rate of circulating water to
ensure that the exhaust temperature is not too low.

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