

Green Manufacturing of Industrial Waste Incineration Kiln Units

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Abstract

With the rapid development of the economy, industrial waste is growing rapidly, and more and more attention is being paid to the research of solid waste treatment in China. In order to practice "green water and green mountain is the silver mountain of gold", more advanced environmental protection science and technology should be applied to it, so as to achieve normal machinery manufacturing and reasonable use of resources at the same time. Therefore, it is necessary to consider its manufacturing from green materials, green design, green technology and other aspects.

Keywords

Waste; Incineration Kiln; Green.

1. INTRODUCTION

Industrial solid waste is the solid waste generated in industrial production activities, is the industrial production process is discharged into the environment of a variety of slag, dust and other wastes, with the development of industrial production, the number of industrial waste and production rate is bound to increase. In particular, metallurgy, thermal power generation and other industrial emissions are the largest, industrial waste in large quantities, a wide variety, complex composition, more difficult to deal with.

According to the data, from 2005 to 2016, the amount of industrial solid waste generated in China showed an increasing trend. Especially since 2011 due to the change of statistical caliber, the statistical data has increased significantly to 3.228 billion tons, with a year-on-year growth of up to 40%. Since then, it has been high, and as of 2016, China's industrial solid waste generation reached 3.271 billion tons. By the Ministry of Environmental Protection released the "2017 National Annual Report on Solid Waste Pollution Prevention and Control in Large and Medium-sized Cities" data pointed out that in 2016, 214 large and medium-sized cities generated 1.48 billion tons of general industrial solid waste, comprehensive utilization of 860 million tons, disposal of 380 million tons, storage of 550 million tons, dumping and disposal of 117,000 tons. General industrial solid waste comprehensive utilization accounted for 48.0% of the total utilization and disposal, disposal and storage accounted for 21.2% and 30.7%, respectively, comprehensive utilization is still the main way to deal with general industrial solid waste, some cities have effective utilization and disposal of historical stockpiles of solid waste, in for the treatment of industrial waste have national standards.

The development speed of China's machinery manufacturing industry is on a straight upward trend, which not only accelerates the economic change in China, but also brings a great influence on the world's economic development, and to a certain extent plays a certain role in boosting the world's economic development. But in promoting the world's economic development, but also to a certain extent to bring the world's energy crisis, the global ecological environment has also been damaged to a certain extent. In developing countries, the production process of many

industries still remains at the stage of development with low efficiency and low production capacity, but high consumption, which also largely affects the effective use of energy in the world. Therefore, with the needs of the times, the machinery manufacturing industry urgently needs to change the status quo through green manufacturing technology to play a certain role in the protection of the surrounding environment, but also to effectively make rational use of energy, which also helps China to achieve sustainable development strategy. Comrade Xi Jinping pointed out in the 19th National Congress report, adhere to the harmonious coexistence of man and nature. We must establish and practice the concept of green water and green mountains is the silver mountain of gold, and adhere to the basic state policy of saving resources and protecting the environment.

In the State Council on accelerating the development of energy conservation and environmental protection industry, the first article specifies that the development of a number of efficient boiler manufacturing base, to foster a number of efficient boiler large backbone production enterprises. Focus on improving boiler automation control, main and auxiliary engine matching optimization, fuel variety adaptation, low-temperature flue gas waste heat depth recovery, small coal-fired boilers efficient combustion and other technical levels, and increase the application of high-efficiency boilers to promote.

By the end of 2020, the national municipal waste incineration treatment capacity accounted for more than 50% of the total treatment capacity, and all meet the clean incineration standards. In the process of ecological civilization construction and new urbanization construction continues to promote, the problem of garbage siege is becoming increasingly serious, waste incineration kiln is the equipment for incineration of waste treatment, it can be expected that in the next few years under the policy-driven, China's waste incineration kiln ushered in a period of development opportunities.

2. THE MAIN FACTORS OF GREEN MANUFACTURING TECHNOLOGY

2.1. Green Materials

To realize green manufacturing technology, the most basic requirement is to use green materials, choose the materials with little or no pollution from the source of manufacturing, and improve the use value of materials, which is also the basic requirement for realizing green manufacturing in machinery manufacturing industry. From the current situation of the country's machinery manufacturing industry, reasonable research and development of recyclable or multiple recycling materials can achieve the effect of little or no pollution, to the maximum extent possible to meet the requirements of China's manufacturing industry. At the same time, the use of green materials should also be moderate control of the cost. For the machinery manufacturing industry, if it is obsessed with developing green materials, it may ignore the cost factor and fail to make the whole industry realize the benefits. Only in the case that the gains and pollution are optimized, is the core requirement of the whole machinery manufacturing industry[1].

2.2. Green Design

In machinery manufacturing, the concept of green should be considered comprehensively in the design process, with the quality, life span and impact on the environment of the product as the key considerations. In the design, according to the specific environmental conditions, green design solutions should be proposed, green, integrated and parallel as the main characteristics of the machine building design environment, and several factors associated with the product cycle should be taken into account in the design process. In addition, the multiple functions of the product should be reasonably improved to achieve the most optimal design effect.

2.3. Green Process

The green process plays an important role in the production of products by minimizing the emission of pollutants, reducing environmental pollution and increasing the utilization of resources[2]. From the perspective of energy saving and environmental protection and other technical aspects, green technology can further reduce the energy consumption of products and pollution of the environment, especially the generation of waste materials will be effectively limited[3]. In addition, the efficiency of the use of raw materials has been greatly enhanced, and many waste re-production of dry cutting technology is a common green process in the current machinery manufacturing.

2.4. Green Processing Method

Many materials that have been discarded in production can be rationally used in the next production through green processing methods, and the utilization rate can be improved through technology and reuse of resources. Therefore, in the design process, the products produced should be analyzed in depth, the raw materials and the structure of the materials produced should be reasonably distributed, and the reuse technology should be utilized to improve the utilization value and the function of the products.

3. MAIN BODY INTRODUCTION

As shown in **Figure 1** and **Figure 2**, the rotary kiln incinerator is an incinerator with a refractory liner set up inside a cylinder with a certain inclination to the horizontal, and the cylinder is rotated slowly, and the waste supplied from the upper part is transferred to the lower part, and air is supplied at the front or rear to make the waste burn. In addition to the incineration of waste with high calorific value such as waste oil, the rotary kiln incinerator is capable of mixed incineration with sludge, waste liquids and solid waste, and is often used as an industrial solid waste incinerator. This is especially true for wastes containing high levels of glass or silicon. The rotary kiln has the advantages of long residence time and good heat insulation, and it is capable of treating various industrial wastes well because the waste layer is fully turned by the rotary action. As a specific field of hazardous waste incineration, rotary kilns are widely used in the field of industrial waste treatment and have many advantages such as wide adaptability, stable and reliable operation, easy management and operation, and simple equipment maintenance. The most widely used in the field of hazardous waste incineration.

The advantages of incineration are significant volume and volume reduction, complete sterilization and sterilization, incineration and power generation, reduced transportation, etc., and high-temperature materials contact refractory materials. Easy to replace the furnace lining, for the transmission machine, located in the kiln shell, equipment maintenance is simple, but also to ensure that harmful gases do not leak out. The current domestic waste incineration pathway mainly by the rotary incineration kiln, slag incineration kiln, pyrolysis incineration. Rotary incineration kiln installations have the following advantages.

3.1. High Efficiency

The material is heated evenly and fully in the cylinder, the heat transfer is rapid, and the material and gas flow in the opposite direction, the heat is fully utilized, the waste gas passes through the preheater at the end of the kiln, the heat is used twice with the drying material, which greatly improves the thermal efficiency of the kiln, the incineration treatment raw materials tumble forward, several heat transfer methods co-exist in one furnace, the heat utilization rate is high. Can be incinerated together with the treatment of solid waste, liquid, colloidal solution, gas, etc., the ability to adapt to the incineration treatment materials, so the

efficiency is high, high equipment operating rate, the annual operating rate can generally reach 90%[4].

3.2. Simple Operation

Rotary kiln system operation is easy to grasp, easy to observe intuition, to ensure that the user can be put into production in a very short time, and can be designed according to the requirements of customer production related equipment, high efficiency. Simple transmission mechanism, transmission mechanism in the kiln shell equipment maintenance is simple, good sealing measures and negative pressure in the furnace chamber to ensure that harmful gases do not leak out, easy to operate and maintain.

3.3. The Breadth of Treatment of Waste Is Large

Strong adaptability to incineration materials, can simultaneously incinerate solid waste, liquid, colloid, gas; not only improves the efficiency of plant utilization, but also plays a role in environmental protection and energy saving, in line with green manufacturing production.



Figure 1. Barrel section (I)



Figure 2. Barrel part (II)

4. SUMMARY OF INNOVATION POINTS

The biggest innovation of this project is the "green" manufacturing of the incineration kiln unit, with three innovations.

Innovation one.

The pallet(Figure 4) wheel and bearing seat parts are changed from the original water glass sand(Figure 3) molding to disappearing mold casting, which has the advantage of green and environmental protection and reduces pollution.

Pallet wheel, bearing seat parts from the original water glass sand molding into disappearing mold casting, for the traditional water glass sand, resin sand, although has the casting size precision, surface finish, high molding efficiency, can manufacture complex shape and internal quality requirements of the casting, the old sand recycling easy and other advantages; However, resin sand production costs are high, environmental pollution is serious, in the people for their own living conditions and environmental However, the production cost of resin sand is high and the environmental pollution is serious, so the application of resin sand is limited due to the great investment in labor protection and production environment hygiene in the workshop. At the same time, it is difficult to regenerate old sand, and the discharge of waste sand causes alkaline pollution to the environment. It is not an environmentally friendly type of sand, and it is difficult to realize the green manufacturing of the manufacturing industry [5].



Figure 3. Pallet (vanishing mold)



Figure 4. Water Glass Sand

Innovation point two.

Improve the manufacturing process of coiled plate, precise forming, so that the steel plate coiler rolls the barrel with high production efficiency and material utilization, good barrel size accuracy and low energy consumption. There is a big improvement to the manufacturing process of the barrel. The traditional barrel is rolled by a plate coiling machine, which causes problems such as increased material loss, construction difficulty and reduced efficiency. This project adopts an innovative manufacturing process based on Pro/E three-dimensional modeling and release, improved rolled plate, which saves materials from the source, improves construction efficiency and ensures manufacturing quality. the biggest feature and strongest advantage of PRO/E is feature-based solid modeling and realization of mechanism motion simulation, which has the advantages of economy and effectiveness. The main processes are: component modeling, steel plate release, programming and downgauging, steel plate coiling, longitudinal seam welding, and barrel re-rounding.

This process improves the pipe rolling process, avoiding the problem of pre-adding the remaining straight edges, saving material and reducing the process of cutting the remaining straight edges, as well as eliminating the need for steel plate pre-bending treatment, optimizing the process and improving efficiency. The advantages of this method greatly improve the utilization rate of materials, reduce the edge waste, high efficiency, save the pre-bending, cutting edge, turnover and other more time-consuming process steps, efficiency is three times the original; less input costs, without investing in new equipment and related process equipment, station apparatus; improve the quality of the cylinder, because the use of flat plate butt, easy to achieve the rounding transition, eliminating the rounding dead angle, to ensure the roundness requirements, but also It also creates convenient conditions for subsequent mechanical processing. In line with the "green" manufacturing. As shown in the **Figure 5** below.



Figure 5. Rolling process

Innovation point three.

The cylinder (Figure 6) is connected by submerged arc automatic welding in fusion welding, with stable weld quality, no arcing and less fume, and high production efficiency. The welding of its longitudinal seam after the barrel section is rolled and the welding of the barrel ring butt weld after assembly are welded by submerged arc automatic welding operation. For manual arc welding (Figure 7), it has the disadvantage of high labor intensity of welders, poor labor conditions, welding, welders are always in the high temperature baking and toxic fume environment for manual operation and eye observation, environmental pollution is relatively large, there is also a certain physical impact.

Submerged arc automatic welding(Figure 8), on the other hand, is a method in which the arc burns under the flux layer for welding. Its inherent advantages of stable welding quality, high welding productivity, no arc and very little fume make it the main welding method in the fabrication of important steel structures such as pressure vessels, pipe section fabrication, box girders and columns. In recent years, although there have been many kinds of efficient, high-quality new welding methods, but the application area of submerged arc welding remains unaffected. From the point of view of the share of the weight of the molten metal of various welding methods, submerged arc welding accounts for about 10%, and has not changed much over the years compared to manual welding, two-place welding its advantages are stable welding quality, high welding productivity, no arc and very little smoke, in line with green manufacturing.



Figure 6. Cylinder



Figure 7. Manual arc welding

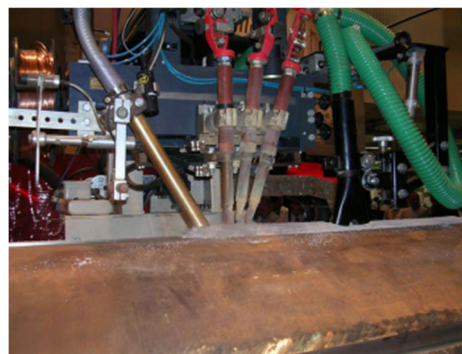


Figure 8. Submerged arc automatic welding

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