ISSN: 2414-1895 DOI: 10.6919/ICJE.202308_9(8).0020

# Feasibility Study on Uniform Distribution of Rotary Bottom Furnace

Cheng Lin, Haojie Mu

Zenith Steel Group Company Limited (Nantong), Nantong, Jiangsu 226000, China

## Abstract

**Feasibility Study on Uniform Distribution of Rotary Bottom Furnace This article discusses a solution to the uniformity of distribution in the vibrating distributor of rotary bottom furnace, involving the field of distributor distribution technology. It solves the problem of drying pellets entering the vibrating distributor in the existing production process. Under certain environmental factors, the feeding amount decreases from the middle to both sides, leading to a certain risk of causing the furnace bed to be stuck. This plan includes multiple fabric grooves arranged side by side, each with a rotating shaft. The lower end of the rotating shaft is connected to a material flow flap, which is blocked in the fabric groove. The rotating shaft drives the material flow flap to rotate at different angles to control the material flow in the corresponding fabric groove; Connect the fixing piece to the upper end of the rotating shaft to fix it at the set angle. By individually controlling the rotation angle of different material flow flaps, the material flow in different areas is controlled, achieving the effect of evenly flowing materials into each area of the furnace bed.**

## Keywords

**Rotary Hearth Furnace; Distributing Device; Material Flow; Even.**

## 1. Introduction

The treatment of iron and zinc containing dust and mud in a rotary hearth furnace is an emerging resource recycling process in China. This process produces carbon containing pellets from zinc containing iron dust and mud, and after drying, the drying pellets are evenly distributed onto the rotary hearth furnace bed by a vibrating distributor for reduction. The thickness of the furnace bed material layer directly affects the original effect of the pellets. At present, the reduction method for carbon containing drying pellets in rotary hearth furnaces at home and abroad is to use the eccentric block rotation in the vibrating distributor to generate centrifugal force, forcing the movable parts such as the sieve chamber and vibrator to move in a continuous circular or nearly circular motion to promote continuous material flow. The final vibration evenly distributes the dried carbon containing pellets onto the rotary hearth furnace bed [1].

Due to certain environmental factors affecting the actual production process, such as adjusting the ball pressure and uneven discharge of the chain grate, the instantaneous amount of drying pellets entering the vibrating distributor decreases from the middle to both sides. The drying pellet material mainly concentrates in the middle of the distributor and spreads to both sides, resulting in a thickness of the middle material layer of the furnace material being greater than the thickness of the inner and outer ring side material layer, It will cause the height of the middle part of the furnace bed to be greater than that of both sides, which may pose a risk of material jamming in the furnace bed for a long time [2].

ISSN: 2414-1895 DOI: 10.6919/ICJE.202308_9(8).0020

## 2. Working Principle of the Plan

We have envisioned a device for uniformly distributing materials through a vibrating distributor in a rotary hearth furnace, which includes multiple distribution grooves arranged side by side. Each distribution groove is equipped with a rotating shaft, and the lower end of the rotating shaft is connected with a material flow flap. The material flow flap is blocked in the distribution groove, and the rotating shaft drives the material flow flap to rotate at different angles to control the material flow in the corresponding distribution groove; Connect the fixing piece to the upper end of the rotating shaft to fix it at the set angle.

Above each fabric trough is an upper horizontal plate, and the rotating shaft is rotatably connected to the upper horizontal plate. The upper end of the rotary shaft is connected to a radially arranged fixing piece, and the outer end of the fixing piece is provided with a through hole, which is positioned at different positions on the upper horizontal plate through the fixing piece. The fixing piece includes connecting bolts, and multiple corresponding arc-shaped slots are opened in the upper horizontal plate, which are adapted to the rotation path of the fixing piece through hole. The connecting bolts pass through the fixing piece through hole and the arc-shaped slot, and the fixing piece is fastened at different positions of the arc-shaped slot. Above each of the fabric grooves, there is also a lower horizontal plate, which is rotationally connected to the upper horizontal plate and the lower horizontal plate. The height of the lower horizontal plate is located at the allowable height of the material layer. The lower horizontal plate is inclined and set, with one side high near the feeding direction and one side low near the discharging direction. The height of the discharging direction controls the height of the material layer. The ends of each fabric trough are distributed along a diagonal or curved line. The end of the fabric groove is equipped with a discharge baffle, and there is a gap between the discharge baffle and the fabric groove.

In short, by modifying the front feeding port of the vibrating distributor and forming several feeding grooves through long and short guide plates, materials can flow to various areas of the furnace bed. A certain height of discharge baffle is arranged in front of the end of the guide plate discharge port to prevent materials from rushing past; At the feed inlet of the guide plate, the fixed plate rotates to drive the shaft to rotate, thereby driving the material flow flap to rotate, thereby controlling the material flow of each distribution slot and effectively controlling the height of the material layer, so that the material can flow evenly to various areas of the furnace bed according to the required height [3].

## 3. Illustrated Figures

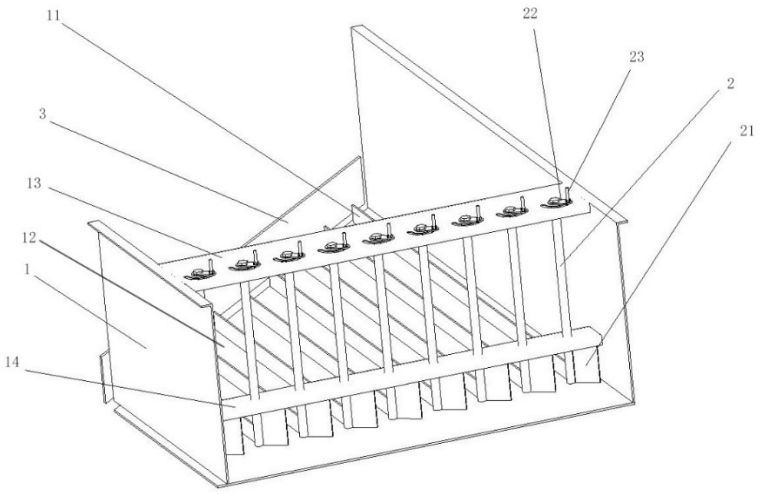


**Figure 1.** is a schematic diagram of the overall structure of the scheme device

ISSN: 2414-1895 DOI: 10.6919/ICJE.202308_9(8).0020

In the figure, 1. The shell of the distributor; 11. Guide plate; 12. Fabric trough; 13. Upper horizontal plate; 14. Lower horizontal plate; 2. Rotating shaft; 21. Material flow flap; 22. Fixed piece; 23. Connecting bolts; 3. Discharge baffle.

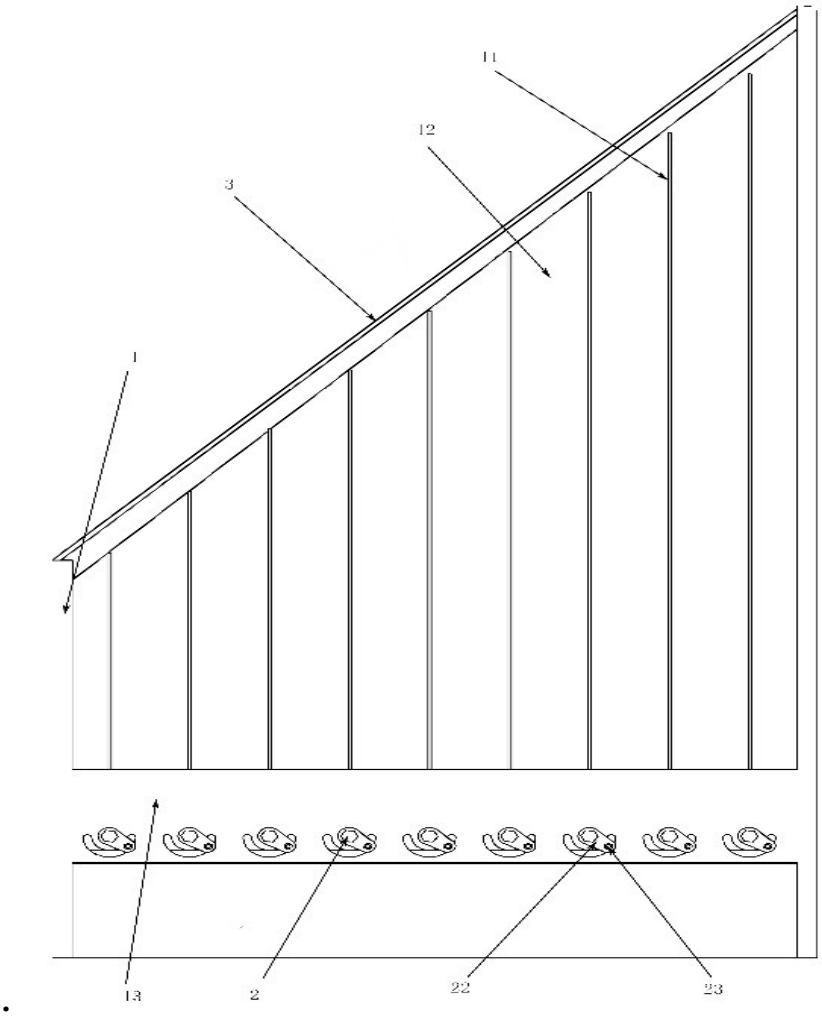


**Figure 2.** is a top view of the scheme device

As shown in Figures 1 and 2, the original vibrating distributor's front end discharge port has been modified. Multiple parallel guide plates of varying lengths have been welded and fixed at the front end of the distributor shell, forming multiple distribution grooves arranged side by side. The ends of each distribution groove are distributed along an inclined line or curve (relative to the straight line in the width direction of the distribution groove), allowing the material to flow to various areas of the furnace bed.

As shown in Figure 2, the end of the fabric trough (discharge end) is set along a diagonal line that intersects with the width direction of the fabric trough, and a diagonal discharge baffle is welded and fixed between both sides of the distributor shell, blocking the direction of the end of the fabric trough to prevent materials from rushing past. There is a gap between the discharge baffle and the fabric trough.

As shown in Figure 1, there are horizontally arranged upper and lower horizontal plates above the feeding end of the fabric trough. Both ends of the upper and lower horizontal plates are welded and fixed to the inner walls of both sides of the fabric distributor shell, and the height of the lower horizontal plate is at the allowable height of the material layer. Among them, the lower horizontal

ISSN: 2414-1895 DOI: 10.6919/ICJE.202308_9(8).0020

plate is set with an inclination, and the side close to the feeding direction is high, while the side close to the discharging direction is low. The height of the discharging direction control the height of the material layer (i.e. set to the allowable height of the material layer).

As shown in Figure 1, there are rotating shafts in each fabric groove, which run through and are rotationally connected to the upper and lower horizontal plates; The lower end of the rotary shaft is fixedly connected with a material flow flap, which is blocked in the fabric groove. The rotary shaft drives the material flow flap to rotate at different angles to control the material flow in the corresponding fabric groove; Connect the fixing piece to the upper end of the rotating shaft to fix it at the set angle. The upper end of the rotating shaft is welded with a fixed piece set radially, and the outer end of the fixed piece is provided with a through hole, which is positioned at different positions on the upper horizontal plate through the fixed piece; The fixed part includes connecting bolts, with multiple corresponding arc-shaped slots in the upper horizontal plate that are suitable for the rotation path of the fixed piece through hole. The connecting bolts pass through the fixed piece through hole and the arc-shaped slot, and the screw head end and nut are respectively pressed against the upper side of the fixed piece and the lower side of the upper horizontal plate, fastening the fixed piece to different positions of the arc-shaped slot, achieving fixation at any angle; The fixed part can also be a pin, and the arc-shaped groove can be replaced with multiple arc-shaped circular holes. After the pin passes through the through-hole of the fixed piece, it is inserted into the corresponding circular hole to position the fixed piece at different positions on the upper horizontal plate, making it more convenient for the material flow flap to rotate to a fixed angle.

## 4. Conclusion

Our proposed solution involves modifying the front feeding port of the vibrating distributor, forming several different length distribution grooves through long and short guide plates, allowing the material to flow to various areas of the furnace bed[4]; The fixed plate rotates, driving the shaft to rotate, thereby driving the material flow turnover plate to rotate and control the material flow of each material slot. After the fixed plate rotates in place, connecting bolts are inserted to fix the material flow turnover plate. Each fixed plate can rotate independently to control the material flow in different areas. The combined effect of the material flow trough, material flow turnover plate, and lower horizontal plate formed by the guide plate can effectively control the height of the material layer entering the furnace, thereby achieving the effect of uniform distribution.

## References

[1] Huang Fayuan, Ding Hui, Liu Fengchao, et al. Technical Progress in the Dezincification System of Zinc-containing Dust and Mud Rotary Bottom Furnace at Ma Steel [N] Beijing: World Metal Herald, 2015.

[2] Shi Guoxing. Production Practice and Development of Rizhao Steel's Rotary Bottom Furnace [J]. Reduced Iron Forum, 2014.

[3] Peng Ji. Research on the formation mechanism of stainless steel smelting dust and the basic theory and process of direct recovery [D]. Changsha: Central South University, 2007.

[4] Li Zhifu. Japanese expert Nishida introduces the rotary hearth furnace process [J] Changsha: Sintered Pellets, 2000.