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"REVIEW ON DESIGN AND FABRICATION OF COATING POWDER FILTRATION MACHINE"

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Abstract: The paper is about fabrication of coating powder filtration machine. Coating powder is mainly used to coat the job in various manufacturing industries. After coating the job some amount of powder has been wasted, while it is necessary to prevent this powder for further reused. So the powder coating filtration machine is mainly focused on the reused of coating powder and save some amount of powder which leads to cost effective. After that the amount of powder which is save filter by using sieving process This mechanism is based on cyclone and sieving process which plays an important role in mechanism. Cyclone is one of the simplest and cheapest type of separator. Cyclone has high efficiency and relatively economic in power. Cyclone have been widely used in industrial process. The literature review that the cyclone efficiency is depends upon the size of the particle of powder. The input velocity of air directly impact on the fan energy and powder collection. This paper have discussed the process of powder extracting from manual powder spray booth in the first chamber with a cyclone recovery system. The cyclone cleaned air drawn from pre filter section by fan. The pre filter section further separate powder from cyclone air. Collection of powder without loss of coating powder and filter the coating powder by using sieving process with less time consumption.

[1] Introduction

Onkar furniture is one of the industry which is situated in hingana, Nagpur .This industry works for coating the equipment's required in hospital like bed, cabinet etc. They used coating powder cyclone to save powder but they have faces some problem regarding the powder filtration process which is done by manually. So they require some automatic process for the filtration of waste coating powder to save capital, labour cost and time. So observed the problem and decided to do this process of sieving by automatically.

The powder coating is a coating which is applied on the job in the powder form it does not require any liquid carrier while the paint. It is dry paint which gives almost good finished product or material. The powder may be a thermoplastic or a thermo set polymer. It is usually used to create a hard finish that is tougher than conventional paint powder coating mainly used for coating of metals, such as household appliances, aluminium extrusions, drum hardware and automobile and bicycle parts. There are so many industries where coating powder get waste during operation of spraying powder and after operation this powder get mixes with the foreign particles, dust, dirt, and various impurities. For this workers are needed for the filtration of powder which leads the labour cost and time consumption. To overcome this problem it is needed to design and fabricate such a mechanism which will do the above operation automatically.

Figure 1.1 :- Manually sieving process

[2] Literature review

M.O. Besenhard, E. Faulhammer, S. Fathollahi, G. Reif, V. Calzolari, S. Biserni, A. Ferrari, S.M. Lawrence, M. Llusa, J.G. Khinast.

It deals with the paper describes a powder dosing system with a vibratory sieve mounted on a chute that doses particles into a capsule. Vertical vibration occurred with a broad range of frequencies and amplitudes. During dosing events, the fill weight was accurately recorded via a capacitance sensor, covering the capsules and making it possible to analyse filling characteristics, that is, the fill rates and their robustness. The range of frequencies and amplitudes was screened for settings that facilitated reasonable (no blocking, no spilling) fill rates for three lactose powders. The filling characteristics were studied within this operating space. The results reveal similar operating spaces for all investigated powders. The fill rate robustness varied distinctly in the operating space, which is of prime importance for selecting the settings for continuous feeding applications. In addition, we present accurate dosing studies utilizing the knowledge about the filling characteristics of each powder.

B. H. Kaye and N. J. Robb

It deals with the effect of non-ideal aperture distribution of sieving surface on the sieve residue has been the object of many experimental studies. Unfortunately the sieving kinetics of many sieving technique do not result in a simple probability relationship between the size distribution function of the powder and sieve aperture distribution function. If one specific a certain type of sieving kinetics, then one can apply probability theory to the rate of movement of powder through the sieve and the size apertures distribution function of the sieve. Under such specified sieving condition it can be shown that it is possible to deduce a size characteristics parameter of the powder being sieved which in this publication is described as a kinetic residue of the sieve. Ana algorithm for automatic computation of the kinetic residue from the rate of powder sieving is described. The possible implementation of this algorithm to automate sieve analysis is explored.

Atsuko Shimosaka, Shigenori Higashihara and Jusuke Hidaka

It deals with the computer simulation of sieving behaviour of powders was performed to estimate the sieving rate by the particle element method. The simulated time residue curve of sieving agreed well with the experimental curve. Furthermore, the simulation can well represent the sieving behaviour of cohesive powders. On the basis of the simulation results, the equation to estimate the sieving rate was proposed. The equation involves three engineering parameters newly defined in this study. The relationship between the engineering and operating parameters in the sieving, such as the vibration amplitude and frequency of the sieving surface, is obtained by the simulation. The applicability of the proposed equation is confirmed by experimental sieving of silica sand.

Qing Huang, Hui Zhang, Jesse Zhu

It deals with the three types of nanoparticles and their combinations were blended into a fine powder, which has been used in the powder coating industry. To study their effects on flow properties, the modified powder samples were characterized using a variety of techniques that tested the powder under different powder states ranging from dynamic to static. It was found that all three nanoparticles improved the flow properties of the powder to some degree, though the amounts of the nanoparticles needed were different depending on their physical properties. Secondly, inconsistency among these powder characterization techniques was also found. This is attributed to the different states of the powder samples during a measurement including dynamic, dynamic-static and static states. It was confirmed that characterization techniques test the flow properties of a powder under all three states are needed to fully describe the flow properties of the powder. Finally, the effects of combinations of nanoparticles were explored, and it was found that combinations of nanoparticles can intensify, weaken or combine the effects of their component nanoparticles. The effects of nanoparticle combinations are not a simple summation of the effects of their component nanoparticles.

G.S. Patience, M.G. Rigamonti, and H. Li

It deals with the particles and powders are a fixture of our daily lives and a cornerstone of chemical engineering and industry-pharmaceuticals, agriculture, chemicals, construction, cosmetics, and food technology, to name a few. The granulometryof flour changes the texture of bread and pastry and is distinct from sugar, salt, pepper, spices, and Cheerios'. The activity of pharmaceuticals ingredients depends on their shape and size: Farmers spread less herbicides in their fields with Nano-sized particles. The particle size of cement, concrete, and asphalt vary from micron-size to centimetres.

[3] Research gap :-

The process of filtration of coating powder is time consuming since it is done by manually. Due to manual process, time is consumed, other major disadvantage is the labour problem and by using the external devices there may be a chance of accidents takes place. In order to avoid such kind of difficulties we go for the machining process.

- These are laborious, time consuming, cost intensive and Involve various processing activity.
- In local methods hygienic conditions are not maintained.
- Sometimes manual filtration of coating powder is harmful to human body.

[4] Conclusion

From the study and analysis of different papers, it is observed that, the pressure drop and cyclone efficiency varies with inlet velocity. The efficiency of cyclone increases with the decrease in dimensions of cyclone body diameter, cyclone width, operating temperature and cyclone width inlet. The pressure drop increases with the increase in inlet velocity; but pressure drop decreases significantly with the rise in temperature. Comparison of performance, between symmetrical inlet cyclone and single inlet cyclone shows that, symmetrical inlet cyclone is optimum than the conventional cyclone with single inlet.

Manually operated sieving process of coating powder is now done automatically by using D.C motor and sieve. Coating powder easily filtered by sieve mechanism it resulting into the less time consumption. So the labour cost also reduced and enhance the productivity by the use of powder again and again. Wastage of coating powder also prevent by using this mechanism and this complete automatic machine save more time and cost.

[5] Schematic diagram of proposed mechanism

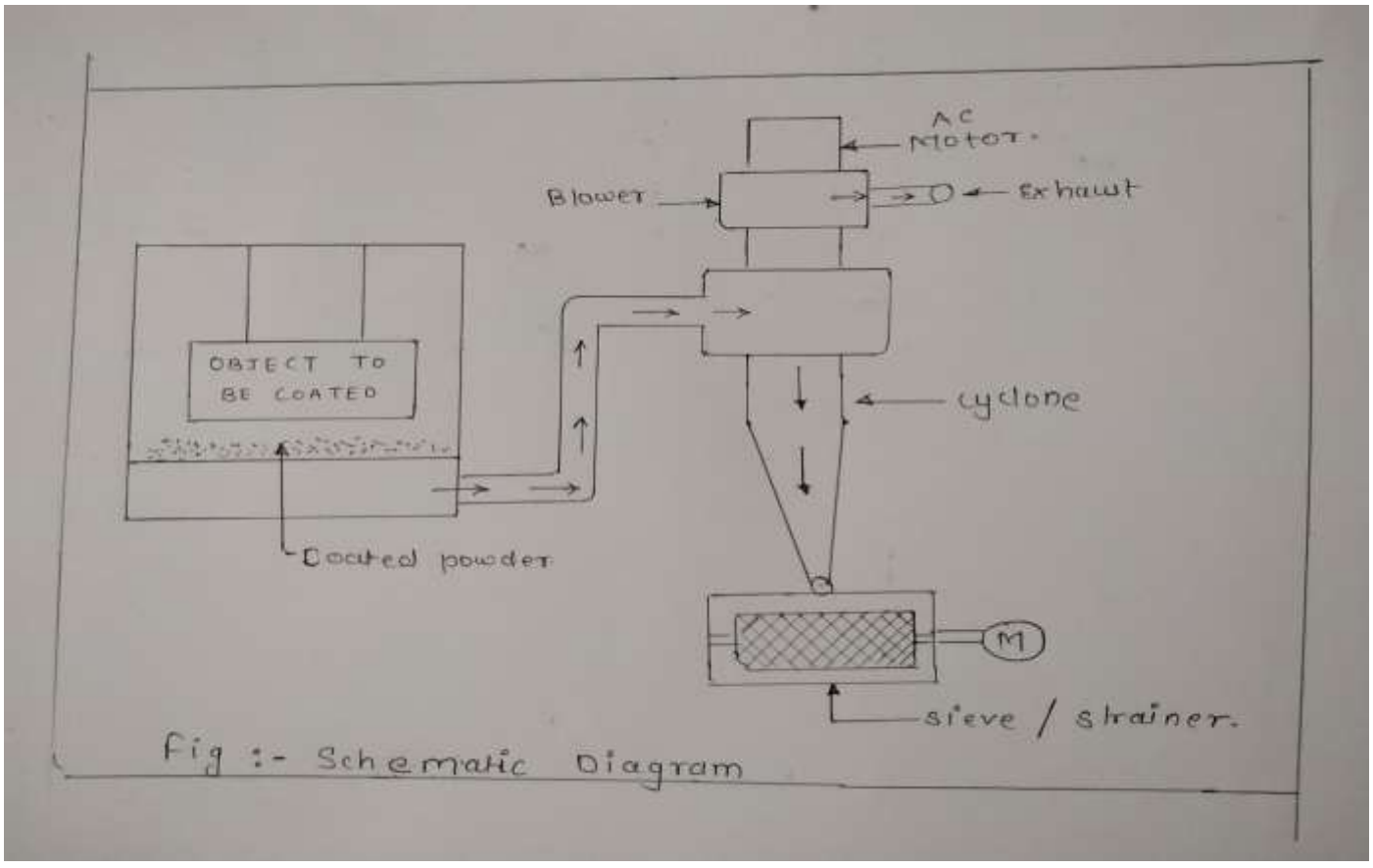

Figure 2.1 :- Schematic diagram of coating powder filtration machine

[6] Working principle

The input to the cyclone is connected to the booth while the output is connected to a suitable exhaust fan. The overspray powder arrives at the cyclone inlet.

On entering the cyclone chamber tangentially the air/powder mixture is given a rotary motion which creates a centrifugal force on the particles. The larger and heavier particles tend to be ejected to the outside walls of the chamber and fall to the bottom where they are collected. The lighter fractions will stay suspended in the air stream which on reaching the bottom is deflected by a conical tail air/powder mix into a rising spiral which is then carried through the central stack to a filter collector. The recovered powder is then pass through the sieve mechanism to remove any foreign particle or dust. This process of sieve mechanism is done after the collection of coating powder and then filter. After researching one conclusion is made in which other model has no filtration system only they separate the powder or dust so the filtration system in cyclone unique and should be implement.

[7] Fabrication

The cyclone design made up in cooper and alloy. The shape of cyclone is design by Scientist Lapple known as Lapped model this model has several problem but some engineers considerable to be acceptable. First of all develop the dimensions which mainly used while fabrication process. Considering cyclone inlet velocity for optimum cyclone performance also calculate number of turns, flow direction, overall efficiency. The function of cyclone barrel diameter is equivalent to principle dimensions which is provide by cyclone. With this all given standard data we have to fabricate the model in step by step manner. While fabricating the model of cyclone always consider accurate dimensions, efficiency and size of particle (i.e. powder size).

Fig :- Actual photograph of fabrication of coating powder filtration machine

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