

A Research Paper on Planetary Mixer with Strainer

Ashish Panchgatte, Datta Kharsade, Sandesh Panale, Harshvardhan Patil, Prof. Manoj Jadhav

Abstract— The stirrer of conventional machine rotates in one direction only which creates a particular flow pattern in the fluids hence the particles tend to stick to the walls of container owing to the centrifugal force rather than mixing thoroughly in mixture of paint, ultimately results into poor quality mixture of paints there by poor quality output of paint. In order to have a through mixing of metal oxide powder it would be appropriate to have a stirrer that rotates such that rotates about own axis as well revolves about another fixed axis which helps it reach all parts of the container. This ensures that turbulence required for thorough mixing is provided all over the container. It would be advantageous to change pattern of flow, which avoids vortex formation, i.e. motion of particles in a spiral path. Also if a wiper is added that brings the particles adhering to walls of container back into main flow or mixing area, good quality mixture will be ensured. The planetary mixer with strainer is an ideal solution that has all the above mentioned features. This machine involves a rotating stirrer that revolves about the fixed container axis as well as incorporates a strainer that changes the flow pattern and also acts as a wiper. Machine has variable mixing speed feature at the same time delivers heavy torque to the stirrer for proper mixing.

Index Terms— Rotating stirrer that revolves about the fixed container axis, The multi-spindle mixing machine

I. INTRODUCTION

In case of process industries, process of mixing and stirring forms an integral and the important part of the total manufacturing process. Mixing is the process which determines uniformity and overall quality of product. Process industries like chemical plants, food processing plants, paint industry etc, largely employ mechanical mixers to carry out mixing of powders, semisolid jelly fluids etc. Mixing is a process where powder or jellies are mixed together through in the form of uniform mixture where stirring is the process to mix the fluid and powder to dissolve the powder thoroughly in given mixture and form a uniform product or output. In either of above cases thorough mixing of material is desirable to give a good and uniform quality output. Mixing of powders of different material in order to form a uniform product or a powder mix is quite easy but when it is desirable to mix powder in a fluid matter specially when the density of powder is high the problem occurs due to heavy weight of particles of powder has a tendency to settle down., financial aspects, labour costs etc. So, it is important of all the tasks in construction.

CASE STUDY

Ashish Panchgatte, Datta Kharsade, Sandesh Panale, Harshvardhan Patil, Prof. Manoj Jadhav, Pune University, JSPM's Rajarshi Shahu College of Engineering, Tathawade, Pune- 411033, Maharashtra, India

Let us study the following example '*PREPARATION OF IONIC PAINTS*'. In this case it is required to mix the heavy density metal powder in the fluid mixture and pigment base together called as in vehicles. Vehicle is a low density evaporative fluid which when mixed with metal oxide powder thoroughly is applied by spray painting on to automobiles silencer to form an anticorrosion particle layer. In order to have good quality and uniform layer of paint on the job it is necessary that the oxide powder is thoroughly mixed with vehicles

CONVENTIONAL METHOD

In conventional method of mixing the metal oxide powder and vehicle mixing is carried out on '*UNDIRECTIONAL STIRRING MACHINE*'

In this machine the motor is driven on reduction gear box through coupling the output shaft of gear box is coupled to stirrer shaft to which the blades are connected, when the motor rotates output shaft of gear box rotates at slow speed. There by driving the stirrer. The stirrer rotates in one direction to agitate the mixture to prepare paint.

II. CONSTRUCTION AND WORKING

A. CONSTRUCTION

The multi-spindle mixing machine consists of the following parts:

1. Motor The motor is a single phase AC/DC motor, meaning that the speed is infinitely variable from 0-6000 rpm. The motor is mounted on the base plate and is connected to the worm shaft of the worm gear box by means of open belt drive.

2. Main Pulley The main pulley is V-belt pulley mounted on the input worm shaft by means of a socket head grub screw.

3. Worm gear box The worm gear box is 1:80 ratio gear box. The input worm is a right hand single start worm held in ball bearings at either ends, and carries the reduction pulley at one end. Worm gear is 1.5 module 80 teeth gear mounted on worm gear shaft held in ball bearings at either ends, and carries the muff coupling at one end by which it is coupled to the input shaft of machine.

4. Input shaft & stirrer bracket The input shaft is held in ball bearing mounted in bearing housing which holds the fixed spur gear from the spur gear pair used for planetary motion of stirrer. The stirrer bracket is mounted on the lower end of input shaft carries the stirrer shaft at one end and the strainer shaft at other.

5. Spur gear pair for planetary motion The spur gear is 1.5 module 44 teeth gear, one gear is fixed and is mounted on the input shaft bearing housing where as the other is mounted on the stirrer shaft.

6. Stirrer The stirrer arrangement comprises of blade carriers mounted on stirrer shaft that hold blades for stirring purpose on their periphery. Two sets are mounted on the stirrer shaft.

7. Strainer The strainer arrangement comprises of a perforated sheet mounted on the strainer shaft and a wiper sheet bolted on the sheet.

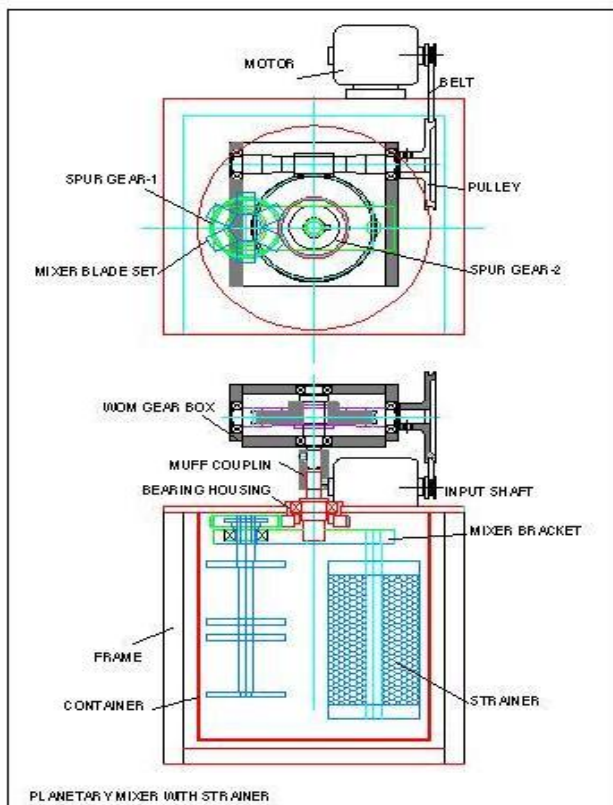
8. Base plate The base plate is the base member that supports the bearing housing.

9. Container The container is in the form of an cylindrical drum mounted below the base plate.

10. Frame Frame is an fabricated structure that supports the entire mixer assembly.

B. WORKING

When motor is started the motor pulley rotates the main pulley via the V-belt. The main pulley rotates the worm shaft or the gear box which in turn gives 1:80 ratio reduced speed at output shaft which is connected to the input shaft of the machine. The input shaft carries stirrer bracket which carries the spur gear-1 which is constant mesh with spur gear-2 mounted on the bearing housing. When the stirrer bracket rotates it makes the spur gear -1 to revolve around the input shaft as well as it rotates about its own axis. The spur gear -1 carries the mixer blade sets at its lower end. The other end of the stirrer bracket carries an strainer arrangement which helps break the raisins.



III. METHODOLOGY

A. DESIGN OF PLANETARY MIXER MACHINE:-

In our attempt to design a special purpose machine we have adopted a very a very careful approach, the total design work has been divided into two parts mainly;

- System design
- Mechanical design System design mainly concerns with the various physical constraints and ergonomics, space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement; height of m/c from ground etc.

In Mechanical design the components are categorised in two parts.

- Design parts
- Parts to be purchased.

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawings. The process charts are prepared & passed on to the manufacturing stage. The parts are to be purchased directly are specified & selected from standard catalogues.

System Design:-

In system design we mainly concentrate on the following parameter

1. System selection based on physical constraints: While selecting any m/c it must be checked whether it is going to be used in large scale or small scale industry In our case it is to be used in large scale industry So space is a major constrain. The system is to be very compact. The mechanical design has direct norms with the system design hence the foremost job is to control the physical parameters.

2. Arrangement of various components:- Keeping into view the space restriction the components should be laid such that their easy removal or servicing is possible moreover every component should be easily seen & none should be hidden every possible space is utilized in component arrangement

3. Components of system:- As already stated system should be compact enough so that it can be accommodated at a corner of a room. All the moving parts should be well closed & compact A compact system gives a better look & structure.

Following are some example of this section

- Design of machine height
- Energy expenditure in hand operation
- Lighting condition of m/c

8. Chances of failure:- The losses incurred by owner in case of failure of a component are important criteria of design. Factor of safety while doing the mechanical design is kept high so that there are less chances of failure. Periodic maintenance is required to keep the m/c trouble free

9. Servicing facility:- The layout of components should be such that easy servicing is possible especially those components which required frequent servicing can be easily dismantled.

10. Height of m/c from ground:- Fore ease and comfort of operator the height of m/c should be properly decided so that he may not get tired during operation .The m/c should be slightly higher than that the level also enough clearance be provided from ground for cleaning purpose.

11.Weight of machine:- The total wt of m/c depends upon the selection of material components as well as dimension of components. A higher weighted m/c is difficult for transportation & in case of major break down it becomes difficult to repair.

IV. ADVANTAGES & APPLICATIONS

A. ADVANTAGES

1. Strainer helps break the raisins effecting good quality mixture.
2. Strainer also acts as a wiper preventing depositions on wall of container
3. Quality of mixing is very high
4. Low cost of production because it does not require an gear box.
5. Fast production rate

B. APPLICATIONS

1. Mixing of multi color paint in paint industry .
2. Mixing of metallic powders in pigment in preparation of ionic paints.
3. Can be used as skimming machine.
4. Dairy applications with suitable change in stirrer material.
5. Mixing applications in pharmaceutical industry.

V. CONCLUSION-

Mixing is a process where powder or jellies are mixed together through in the form of uniform mixture where stirring is the process to mix the fluid and powder to dissolve the powder thoroughly in given mixture and form a uniform product or out put. In either of above cases thorough mixing of material is desirable to give and good and uniform quality output.

Planetary mixer brings out both the results which makes it most advantageous mixing machine for the process industries, paint industries, pharmaceutical industries & dairy applications. It makes it valuable because of high quality of mixing, low cost of production & very fast production rate.

REFERENCES-

- [1] I A CHIRONIS, MECHANISMS & MECHANICAL LINKAGES
- [2] ERDMAN & SANDOR, ENGG. MECHANISM
- [3] R S KHURMI, MACHINE DESIGN
- [4] V B BHANDARI, DESIGN OF MACHINE ELEMENTS
- [5] P S G DESIGN DATA
- [6] www.sseengineers.com.
- [7] www.feedscraws.com

Author Profile-



Guided By Prof. Manoj Jadhav, professor in civil department of JSPM's Rajarshi Shahu College of Engineering.



Ashish Panchgatte, student of JSPM's Rajarshi Shahu College of Engineering.



Datta kharsade, student of JSPM's Rajarshi Shahu College of Engineering.



Sandesh Panale, student of JSPM's Rajarshi Shahu College of Engineering.



Harshvardhan Patil, student of JSPM's Rajarshi Shahu College of Engineering.