iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VII **Month of publication:** July 2021

DOI: https://doi.org/10.22214/ijraset.2021.36968

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

Double Helical Spiral Mixer

Mr. Shaikh Mosin. K[1], Mr. Patel Tanveer. N[2], Mr. Wagh Sagar.K[3], Mr. Chavan Bhimraj. R[4], Mr. Yeole Vikas.B[5]
[1]*Asst. Prof., Department of Mechanical Engineering, P.R.E.C College of Engg., Loni , India*
[2, 3, 4, 5]*Student, Department of Mechanical Engineering, P.R.E.C College of Engg. Loni , India*

Abstract: Recently in advance mixer and blender designs have contributed to the growing success of food companies, meeting their requirement for consistency and developing new products, with lowering production costs. This paper discusses both traditional and new specialty mixing technologies available to food manufacturers today. Phases and viscosity are used to classify different mixing categories. Sample applications are presented as well to illustrate certain processing challenges and the mixing technologies used to resolve them. In conventional method of mixing the metal oxide powder and vehicle mixing is perform on 'Unidirectional Stirring Machine'. The stirrer of conventional machine rotates in only one direction 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.
Keywords: Spiral Blades, Bidirectional Motion, Pneumatic Ram, Planetary Mixer

I. INTRODUCTION

Process industries like chemical plants, food processing plants, paint industry etc. largely employ mechanical mixers. To carry out mixing of powders, semisolids. The Mixing is a process in that powder, jellies or semisolids 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 above cases by mixing of material it gives good and uniform quality mixed output product. Mixing of powders of different material is easy to form a uniform product but it is hard or desirable to mix powder in a fluid matter. The density of powder is high the problem occurs due to heavy weight of particles of powder has a tendency to settle down, to avoid this we make bidirectional mixer which move opposite direction in one cycle. For this operation to motion we used the crank and fork mechanism, which form the disorganization in mixer and make homogeneous mixture. At the heart of transforming raw ingredients into food for human consumption is the mixing operation. One of its main tasks, which other food processing steps also share, is to establish consistency.

II. PROBLEM STATEMENT

Whether a food product requires small-scale mixing by hand or high volume mixer of multiple ingredients. Even with the right amount of mixer and flavors, and we have to make the components are well-mixed. Taste, texture, color, appearance – these are all important parameters intimately influenced by the mixing process. Consumers expect or experience that the food products they patronize will be exactly the same as that of one they had last. It is easy to understand that within the food industry a high level of consistency is required not just batch- to-batch but facility-to-facility. In this market, consistency is the backbone of consumer loyalty. To mixing of various equipment having types and styles of mixing are utilized within the food industry. Their use and application are define by the phases being mixed (liquid-liquid, solid-liquid, or solid-solid) as well as physical characteristics of the end product (like viscosity and density). Now a days many mixing technologies overlap there function such that certain applications can actually be successfully produced by two or more types of mixing systems. In these situations, economics rule out the more costly initial investments, but differences in efficiencies must also be taken into account. Proper mixer selection is important

A. Objectives

1) To make a double helical spiral mixer which is applicable to all industries such as pigment, dye, pharmaceuticals, chemical, food, cosmetics, battery, pesticide, construction material, and plastics granule manufacturing.
2) To make a double helical spiral mixer for different raw material.
3) Excellent processing time.
4) To design and manufacture double helical spiral mixer for low energy consumption.

III. TYPES OF MIXTURE

A. Conical Screw Mixer

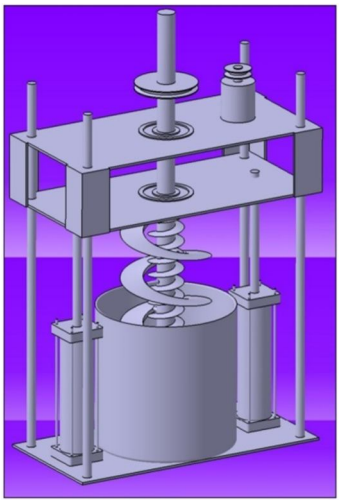
Conical screw mixer is low energy consumption and highly efficient vertical mixer for powder and granule mixing applications. In conical screw mixer different particle size materials can be mixed. The screws and screw arms driven by input source (motor) and reducer, both independently move at different speed. Screws revolve on its own axis driven by a bevel gear, which elevates the raw materials upwards direction from the mixer bottom causing that same material to fall downward by gravity. At the same time, the screw arm revolves around the central shaft to keep the materials rotating in the mixer. The whole mixing forms a three-dimensional action; where raw materials are sheared and diffused repeatedly in the vessel.

B. Planetary Mixer

A planetary gear system will not assemble unless the number of teeth for each gear is selected properly. Let's say the desired gear ratio is 5:1. This means the sun gear must make 5 revolutions for each revolution of the output carrier (Note: this assumes that the sun gear is the input, the planet gears drive the output carrier, and the ring gear is stationary. Other configurations are possible depending on the application). Another design is required to define remaining calculations. Let's say the sun gear must have 24 teeth. We find that the required number of teeth on the ring gear is 96. We can now begin to solve for the number of teeth on the planet gear. Plugging in the known values, we find that the required number of teeth on the planet gear is 36. This is independent of how many planet gears are used. Note that the pitch of the gears is not specified. These equations hold true regardless of the pitch, but a pitch will ultimately need to be selected when designing a planetary gear system. Either the pitch itself will be a design requirement, or size limitations will be a factor, and the pitch can be selected accordingly. A planetary gear system, also referred to as epicyclical gearing, consists of three elements – a sun gear, one or more planet gears, and a ring gear. The sun gear is located at the center, and transmits torque to the planet gears that orbit around it. Both are located inside the ring gear. The tooth formation of the sun and planet gears is external, while the ring gear is internal. Planetary gear systems can vary greatly in size and configuration to produce a broad range of speed ratios and meet various design requirements. They are used in many different applications such as clocks, lunar Calendars, car mirrors, toys, gear head motors and turbine engines.

IV. CONSTRUCTION AND WORKING OF DOUBLE HELICAL SPIRAL MIXER

Chemical mixer is being designed which consist of a container, impeller spiral blades, electrical motor, pair of pulleys, pedestal bearings, pneumatic rams, timer, solenoid valve and drive shafts. We are using the container made up of stainless steel; it is placed at about 6inches from ground, so that it is easy to pour the material for the workers preparing the chemical solution. The motor is placed vertically in order to mount the pulley and belt assembly on the motor shaft. This machine is designed to mix the cleaning solution used for cleaning the floors. In electrically powered system an electrical motor is used to run the motor shaft. As the motor shaft rotates, the pulley mounted on motor shaft also rotates. The power transmission will be takes place from motor to impeller shaft. As the impeller shaft rotates the spiral impeller blades also rotate along the direction. Simultaneously the arrangements of pneumatic rams move up & down the head of driver to maximize the agitating performance as per operation of timer. Hence the mixing of chemical ingredients is obtained. The concept model of mixer.



CAD Model

A. Advantages and Limitations

1) Advantages

a) Optimal mixing homogeneity
b) Short mixing time
c) Excellent reproducibility of batch production
d) Minimum wear and low maintenance
e) Easy access to mixer/ Easy to cleaning
f) Excellent mixing at any product level
g) Low power consumptions

2) Limitations

a) The machine develop by us is having capacity only 20 liters, which can be made only to prove model's reliability or change in functionality for model synthesis. It is not an actual production model, but fulfills all basic requirements.
b) The machine develop by us is having small capacity of motor, so that it cannot be use large quantity of chemicals or liquid.

3) Applications

a) Chemical Industry
b) Pharmaceuticals Industry
c) Food Industry
d) Animal Feed
e) Metallurgy
f) Construction Material
g) Ceramic Powder
h) Mining Industry

V. CONCLUSION

The Model Develop by us used 60rpm motor for 20liter capacity of mixer. In this mixer two helical spiral blades are used for mixing hence time required for mixing is less as compare to existing models of mixers. This mixer is used for liquid and semisolid product mixing. These models fulfill the required objectives that it reduces human efforts & time in mixing operations. Similarly it maintains the accuracy in chemical mixing process. It performed the most rigid operation with high speed chemical mixing in any types of liquids. After some modifications in this machine develop automation unit for the mixer so that machine can easily be adopted in today's automated plants.

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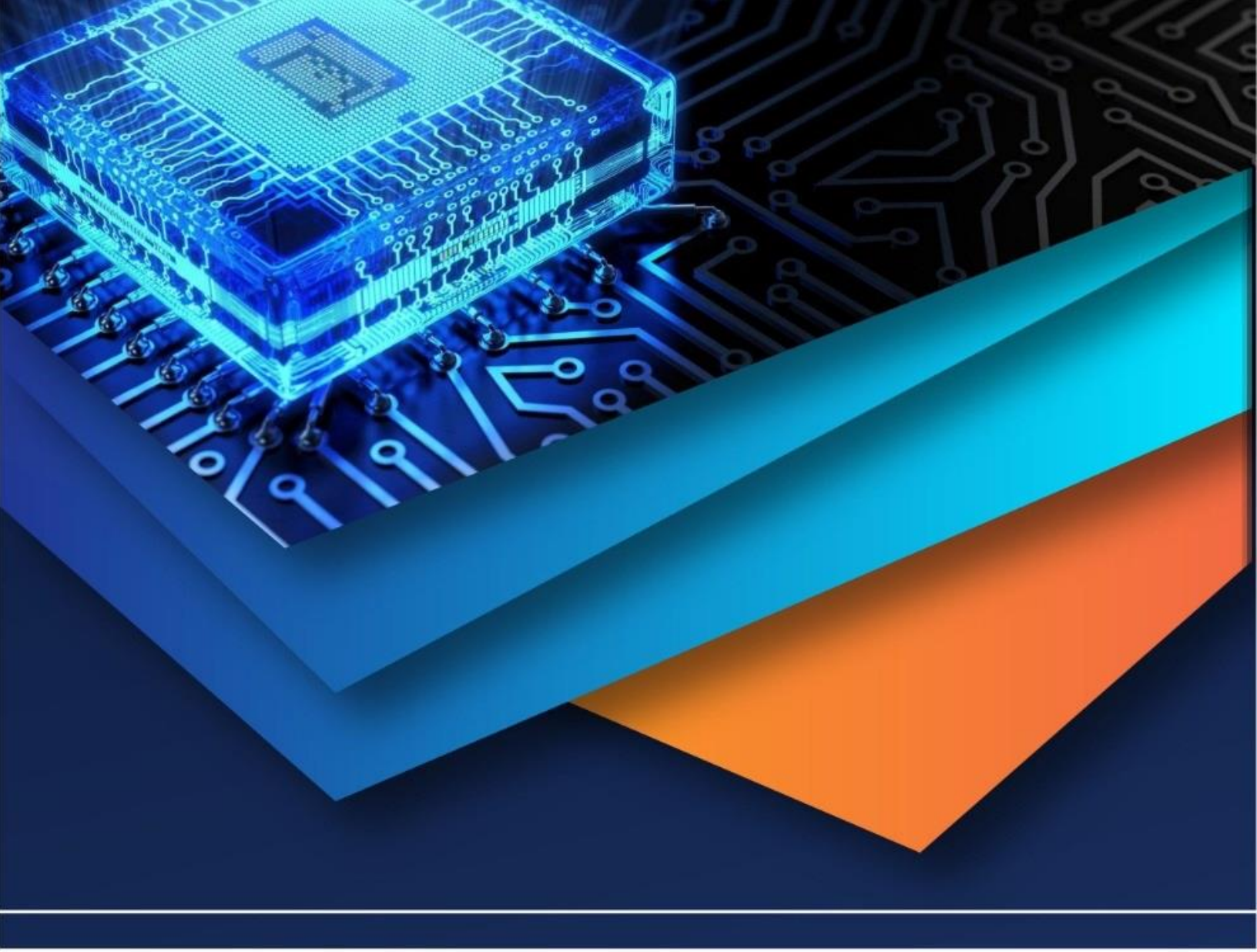

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