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DELUMPER MACHINE

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Abstract : *Basically the delumper machine is used in food industry. In some cases of food product various components should be in the form of powder. If that component or ingredient is in the form of thick material then we have to convert it into powdered form. The external power supply is given to the shaft and on the shaft crusher blade is mounted. As the shaft rotates the bulk cake or the hard material is been crushed into fine powered material. A crusher is a machine designed to reduce large rocks into smaller rocks, gravel, or rock dust. Crushers may be used to reduce the size, or change the form, of waste materials so they can be more easily disposed of or recycled, or to reduce the size of a solid mix of raw materials (as in rock ore), so that pieces of different composition can be differentiated. Crushing is the process of transferring a force amplified by mechanical advantage through a material made of molecules that bond together more strongly, and resist deformation more, than those in the material being crushed do. Crushing devices hold material between two parallel or tangent solid surfaces, and apply sufficient force to bring the surfaces together to generate enough energy within the material being crushed so that its molecules separate from (fracturing), or change alignment in relation to each other*.

Fig -1: Delumper Machine

***Key Words*: Shafts, Gears, Crushing Blades, Couplings, Fabrication etc.**

1. INTRODUCTION: Manufacturing and processing companies use a delumper to reduce oversized material into the desired size without overheating the product or producing lines. These simple processing machines are found in almost every industry because they are reliable, durable and consistent. The machines are highly versatile and can be used to process wet, dry, hard , soft , brittle or sticky materials. They reduce product without further processing, break clusters apart, and eliminate the blockages. These basic processing machines are found at different stages on the production line where products need to be reduced into the more uniformed sized. Their use protects fragile equipment that cannot handle the bulk agglomerates and the materials. These simple crushers consist of a steel drum with rotor driven blades on a shaft. The blades can be customized with the teeth that will reduce the material into the required size. They are an important part of the processing industry because they produce an even and standard product that is of the highest quality and safety. In operation, the raw material (of various sizes) is usually delivered to the primary crusher's hopper by dump trucks, excavators or wheeled front-end loaders. A feeder device such as an apron feeder, conveyor or vibrating grid controls the rate at which this material enters the crusher, and often contains a preliminary screening device which allows smaller material to bypass the crusher itself, thus improving efficiency. Primary crushing reduces the large pieces to a size which can be handed by the downstream machinery.

2. Construction:

2.1: Shaft: A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power.[1] Generally, Hollow shaft is used in the machine.

2.2: Coupling: A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. Couplings do not normally allow disconnection of shafts during operation, however there are torque limiting couplings which can slip or disconnect when some torque limit is exceeded.[2]

Fig 2 -: Coupling used in the machine

2.3: GEARS: A Gear is a rotating machine part having cut teeth which mesh with each other toothed part to transmit torque. Gears almost always produce a change in torque, creating a mechanical advantage through gear ratio and thus may be considered a simple machine.

Fig 3 -: Gears used in the machine

2.4: Crushing Blades: In delumper machine the actual crushing of material is done by the movement of blades (crusher blades). In the machine screwed type crushing blade is used. Screwed arrangement of blade is mounted on the shafts inside the container. For different types of lump (material to be crushed) there are different types of blades are available with different size and shape.

Fig 4 -: Crushing Blades used in the machine

2.5: Electric Motor: An electric motor is an electrical machine that converts electrical energy into mechanical energy. An electric generator operates in the reverse direction, converting mechanical energy into electrical energy. [3]

3. Working:

Firstly the electric power will start the 3 phase induction motor. Then the motor will drive the shaft in a specific direction (clockwise or anticlockwise direction). The shaft coming out from motor is connected to the main shaft of machine by means of coupling, so it will cause rotation of main shaft. There is a another shaft (secondary shaft) inside the container. The power/motion will be transmitted from main shaft to secondary shaft by means of gears used (spur gears). Inside the container crusher blades are mounted on both shafts as per as the requirement. When the blades are rotating the material (raw material which is to be crushed) is poured into the container. Due to the opposite motion of the blades, crushing of material occurs.

4. Advantages:

1. Semi Skilled workers can use it.

2. By crushing harder material we can get fine powdered form of it.

3. It is simple in construction.

4. It can handle sticky tough or abrasive materials.

5. Design feature includes easy replaceable rotating and fix blades.

6. Robust drive components for maximum uptime.

7. Easy access for lubrication and increase life.

5. Disadvantages:

1. Need of external power supply to run the machine.
2.Need to change the crusher blade regularly.
3.Lubrication of gears is necessary.
4.Transportation is quite difficult due to size.
5.The machining process is noisy.

6. Future Scope:

1. This machine can be used in construction sites , for crushing of hard rocks.

2. This machine can also be used in the coal mines.

3. This machine crushes the harder particle into powder form.

7. Conclusion:

The prototype Delumper Machine was made and its tested to verify its technical properties. This machine can be one

among most versatile and interchangeable one in future. This machine can save cost and time of the manufacturers.

8. Reference:

1.https://en.wikipedia.org/wiki/Shaft_(mechanical_engineering)

2. https://en.wikipedia.org/wiki/Coupling

3. https://en.wikipedia.org/wiki/Electric_motor