"Design and Fabrication of Cyclic Operated Milking machine"

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ABSTRACT

Modern milking machines extract milk from the dairy cow by applying a vacuum to the teat creating a pressure difference that results in milk flowing from the teat. Vacuum is applied by placing the teat into a cup in which the interior of the cup is subjected to a vacuum. The vacuum must be periodically reduced or removed to provide the teat with a rest period. The rest period is required because the vacuum causes the fluids (blood and other fluids) to accumulate in the teat causing congestion. Modern conventional milking machines attempt to provide this rest period by periodically applying a higher pressure (atmospheric) to the exterior of the cup causing the cup to collapse toward the teat. The typical conventional milking machine will thereby reduce the vacuum level on the teat. The periodic liner action created by the pulsing of higher pressure on the exterior of the liner is provided by a pulsates.

***Key Words*:** *milking, dairy, pressure, vacuum, pedal, teat, pressure difference..*

1 INTRODUCTION

Milking is most critical work in dairy farming. When done manually, milking a cow, which yields 15 Litre milk is very tiresome. People who milk 2 or more cows in a day may suffer stiff shoulder and weakness. Milking machines make milking easier. There are different models and various makes of milking machines available in the market. Some milking machines can support 10 to 15 milking clusters simultaneously. Small formers having less than 6 cows cannot afford to buy and use these machines. So we are developing a simple, easy-to-use, low-cost, manually-operated machine for milking dairy cows. The machine consists of a powering unit and teat cluster assembly. A bicycle arrangement enables the user to sit on it and start pedalling. The vacuum generated by pedalling draws milk from the teat and massages the teat by squeezing the rubber liner. The pulsating system stimulates the udder to eject milk in three to four minutes. The variable vacuum produced in the machine results in low residual milk and high quality of milk constituents. "The machine is unique because no electricity or power source is required and also clean and hygienic milk production is possible. It is both animal-friendly and user-friendly. It is cost-effective". "This machine enables the milk to be drawn completely, something even the most popular electrical versions in the market cannot do".

While electrical milking machines cost up to Rs.75,000, including installation, and run up a recurring operational cost on electricity charge, the machine developed by the us costs only Rs.15,000, including the milking can and teat cluster assembly. On mass production, it is expected that the machine can be marketed at a price lower than Rs.10, 000

The milking machine plays an important role on the dairy farm as1 an efficient means of milking cows; however, it must be equipment or techniques may lead to injury or mastitis remembered that this machine is one of the few devices which have direct contact with living animal tissue. A milking operation which results in discomfort to the cow and is consequently, before a person attempts to milk cows he/she should thoroughly understand the basic operation of the milking equipment and fully realize the significance of maintaining the equipment in good condition at all times and of employing good milking techniques. This factsheet describes the basic operations involved to help give a better understanding of milking machines.

1.1 PROBLEM STATEMENT

The severe shortage of skilled labor for milking cows is a problem faced by dairy farmers throughout the State. Occupational problems like pain in the back, shoulder, and knee joints; figure fatigue; and allergic reactions have forced many a skilled milkier to turn to other jobs. Imported milking machines are unaffordable for small dairy farmers and also injure the cow's mammary tissue and teats, resulting in diseases like mastitis. Initially observes the failure in a nearest small dairy farmers and farmers homes uses electric milking machine. After that start study the literature. From studied the different literature and also visiting small dairy farmers and farmers home. This project is a solution to dairy problem and farmer need. Because, this will solve the problem of electricity, can milk one cow in about five minutes and allow the farmer to milk faster and to keep everything cleaner and more sanitary

1.2 OBJECTIVE

1 To ensure complete milking and safe health of the cow.
2 To improve quality and quantity of milk
3 To reduces incidences of mastitis
4 To provide comfortable milking facility

1.3 FUTURE SCOPE

Advances in technology have introduced several new innovations to milking machines. Automatic detacher units that connect loosely to the milking claw allow cows to move and shift freely during milking. Based on the rate of milk flow, the detacher can also detect the end of milking, shutting the vacuum and actually removing the claw from the cow. Milking machines are used to harvest milk from cows when manual milking becomes inefficient or labour-intensive.

2 DESIGNS OF ALL COMPONENTS

In our attempt to design a pneumatic train we have adopted a very careful approach. Total design work has been divided into two parts mainly,

1. System Design
2. Mechanical Design

System design mainly concern with the various physical concerns and ergonomics, space requirements, arrangements of various components on the main frame of machine, number of controls, positions of this controls, ease of maintenance, scope of further improvements, height of machine components from the ground etc. In mechanical design, the components are categorized into two parts.

1. Design Parts
2. Parts to be purchased

For design parts, detailed design is done and dimensions thus obtained are compared to next highest dimensions which are readily available in the market. This simplifies the assembly

as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawing. The process sheets are prepared and passed on to the manufacturing stage. The parts are to be purchased directly are specified and selected from standard catalogues.

- Design of chain
- Design of Bearing
- Design of Shaft
- Design of Lever
- Design of Lever Arm
- Design of Fulcrum Pin

3 MODELLING AND FABRICATION

3.1 GENRAL LAYOUT OF MILKING MACHINE

Fig3.1-Milking machine

The basic layouts of milking machines as shown in fig. include Milk collection in a bucket placed next to the cow; Pipeline systems in which cows are milked in a cowshed and the milk flows to a central collection tank; Parlor systems in which all the equipment is centralized and cows come to the parlor for milking. Despite the great diversity of milking installations, milking machines work on the same basic principle: milk is collected from the cow by vacuum (suction).The basic components of milking machine include: A bicycle arrangement, vacuum piston cylinder assembly and reserve tank, vacuum pressure gauge, pipelines. Cycling that alter the vacuum level around the teat so that milking occurs without fluid congestion and edema of the teat tissues Milking units or cluster assembly of four teat cups connected to a claw and mounted with a valve that admits and cuts off the vacuum to the unit; Milk removal systems that transport the milk away from the milking unit toward a storage unit: the milk tube and receiver (bucket, recorder jar, milk pipelines, milk pump, etc.). All these components require a high degree of coordination for the milking machine to function properly.

3.2 MAIN COMPONENTS OF MILKING MACHINE

3.2.1 Chain Drive

Fig-3.2.1 Chain drive system

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles. Most often, the power is conveyed by a roller chain, known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The sprocket is turned, and this pulls the chain putting mechanical force into the system. Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects. In other situations, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear. Though drive chains are often simple oval loops, they can also go around corners by placing more than two gears along the chain; gears that do not put power into the system or transmit it out are generally known as idler-wheels. By varying the diameter of the input and output gears with respect to each other, the gear ratio can be altered.

3.2.2 Foot Pump

Fig-3.2.2 Foot pump

The foot pump is a device used as a piston and cylinder assembly which is positive displacement pump. The foot pump is used to produce partial vacuum in the tank to suck the milk from the cow teat. The vacuum pump

is connected to the tank at one side and another side is open to atmosphere by using a small port. The vacuum pump is actuated by applying force by means of chain drive through linkages. When piston in the cylinder moves upward it removes the air from tank means it creates the vacuum in the tank and releases that air to the atmosphere.

3.2.3 Teat Cup and Cluster Assembly

Consists of four teat cup assemblies each having a rubber liner and connected to vacuum by rubber tubes and claw. The air admission hole to stabilise the vacuum must be kept clear. The cluster which attaches to the cow, consists of four teat cup assemblies a claw, a long milk tube. Teat cup shells are normally made of stainless steel, Plastics or a combination of plastics and metal are also used. The liner is a flexible rubber sleeve having a mouthpiece, and when assembled in the shell under tension, forms an annular space between the liner and shell. The teat cup assemblies are connected by short to stabilise the vacuum in the teat cups during milking, the claw has a small air admission hole, Sabout 0.8 mm in diameter, which admits approximately 7–8 litres of air/min into the bowl of the claw. This air helps to carry the milk away, preventing flooding and violent vacuum fluctuations. The claw is made of plastics, and usually weighs about 0.25 kg and the total all up weight of a milking cluster is about 0.5 kg. The weight of a milking cluster is important and the correct weight relates to the design of liners. Too little weight gives incomplete milking because of high levels of stripping, too much weight will result in milking units falling off during milking. The bore of the rubber short milk tubes should not be less than 8 mm and the short pulse tubes not less than 5 mm, and the long milk tube should not be less than 12.5 mm. The effective claw bowl volume should not be less than 80 ml.

Fig-3.2.3 Teat cup and cluster assembly

3.2.4 Piping

It is used to carry the milk from teat of cow to tank. It is transparent in nature and also provides better flexibility. The piping is used to convey the fluid from one place to another place. The piping's are generally made up of wood, fibreglass, glass, steel, plastic, concrete etc. The piping system are documented in piping and instrumentation diagram. If necessary, pipe can be clean by the tube cleaning process.

Fig-3.2.4 Pipe

3.2.5 Storage Tank

A storage tank is used to store the cow milk. The tank is made of aluminums material which is soft and light in weight. The aluminums material does not has any effect on milk. The storage tank is made air tight i.e. air sealed by using 'O' ring.

A milking machine with four teat cups is attached to the cow teat. When particular amount of vacuum is created in the tank and due to the pressure difference in the cow's udder i.e. above atmospheric pressure and vacuum pressure in the tank i.e. below atmospheric pressure, the milk is extracted from the udder and stored in the tank.

Fig-3.2.5 Storage tank

3.2.6 Non Return Valve

A non-return valve allows a mediuSm to flow in only one direction. A non-return valve is fitted to ensure that a medium flows through a pipe in the right direction, where pressure conditions may otherwise cause reversed flow. A non-return valve allows a medium to flow in only one direction. The flow through the non-return valve causes a relatively large pressure drop, which has to be taken into account when designing the system. There are different types of non-return valves, such as spring-loaded, swing type, and clapper type valves. Non-return valves are e.g. used with mixing loops in heating and cooling systems to ensure proper operation, and with domestic water systems to prevent backflow.

Fig-3.2.6Non-return valve

4 CONCLUSION

In installation, and run up a recurring operational cost on electricity charge, the machine developed by the us costs only Rs.12, 680, including the milking can and teat cluster assembly. On mass production, it is expected that the machine can be marketed at a price lower than Rs.10, 000.this project we have learnt the

development of new idea and technique of ejecting the milk from cow effectively and economically which quite difficult and costly task was by using another milking machine.

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