

PNEUMATICALLY OPERATED FUEL REFILLING MACHINE

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Abstract - In this paper a concept is designed for fuel refilling device which is operated on pneumatic system with the help of centrifugal pump. In recent days computerized petrol pump is used to leads to breakdown during operation due to improper lifting of oil also some fuel leakage problem is occurred. Which results in blades or obstacle to flow of fuel this similar kinds of problems are overcome with the new designed system. In addition to that temperature is gets controlled because of provision of coolant that gives safety to operator and efficiency also gets improved.

Key Words: refilling, centrifugal pump, new designed, safety to operator.

account balance is low and it will show on the display. GSM system is interfaced to the microcontroller via UART (Universal asynchronous receiver transmitter) through which customer can access the accurate information about the balance availability and status of the smart card. LCD display is used to show up the information. Relay Driver is used to driving the electromagnetic relay and relays act as an electromagnetic switch for the Pump and motors. Overall Automation has added a new look to petrol pump which is very attractive with zero rushes as there is no serviceman. There are so many profits for the customers and the owners of the petrol company after installing the automated petrol pump with accuracy and security services. It blocks the black selling of petrol and minimizes the human involvement.

1. INTRODUCTION

The 21st century is aptly known as the internet age because of the increasing use of internet in the day to day activities. Examples of these applications include online banking and brokerage, cash management, tax filing, computerized petrol pump, medical field. As far as computerized petrol pump is concerned, a lot has already been done in this field. Each and every data is being inserted with the help of the computers. But as far as the safety of Fuel pump is concerned we are still in the world. Leakage of petrol or any oil leads to a blast and stealing of petrol may lead to a debacle. The aim of the system is to provide an authentication to the user & control the opening or closing of the tank valve according to the amount demanded. We will use GSM technology for this purpose. This project is fully automated with the help of various electronic devices, components, and circuits. Mainly this project is featured on the microcontroller and smart card in which microcontroller acts as an active device while smart card act as a passive device. Automatic petrol pump provides the feature of instant recharge. The smart card is added to an account which has a specific amount of money and it is necessary to have a smart card for this service. Only by the help of smart card, a customer can access this service. It is a type of self-service system. After dispensing, an exact amount of balance is deducted from the smart card with a receipt date and time. It gives the accurate information about selling and control over any adulteration. There is no dispensing takes place when the

2. METHODOLOGY

1. Centrifugal pump operated on pneumatic system.
2. Type of pneumatic system.
3. Conceptual design
4. Proposed working.
5. Expected overcome.
6. High effectiveness.
7. High durability and reliability.

3. DESIGN CONCEPT

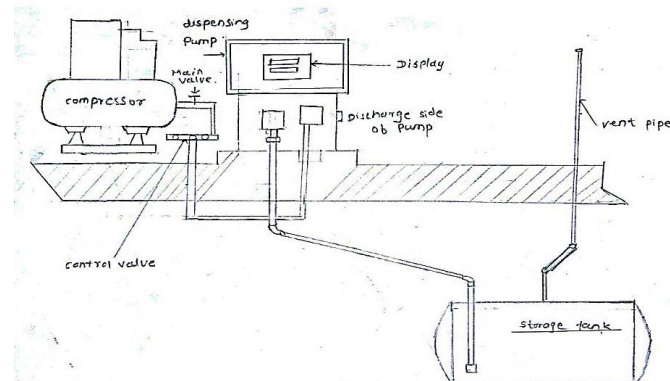


Fig -1: Proposed Design Set-Up

4. PUMPS

In plant protection equipment, a pump is necessary for the atomization of the spray Fluid. It is the most important and expensive part of a sprayer. A sprayer may be equipped with one of the following type of pump:

1. Air Pump (Pneumatic Pump)
2. Positive Displacement Pump
 - a) Piston or Plunge type
 - b) Rotary
 - c) Diaphragm Pump
3. Centrifugal Pump

1. Air Pump: Used in compression sprayer. They force air into the airtight spray tank and not pump the liquid directly. The compressed air exerts pressure on the spray fluid which is then pushed out into discharge line.

2. Positive Displacement Pump: This pump takes definite volume of liquid from inlet and transfers it without any escape into outlet. They required especially in power sprayer, automatic (spring loaded) bi-pass valve to control the pressure and protect against damage.

a)Piston Pump: Also known as reciprocating pump. Liquid is positively displaced by a piston moving up and down in a cylinder or a barrel. Thus output is proportional to the speed of pumping and is virtually independent of pressure. Since they are totally immersed in spray fluid, they should be non-corrosive materials. Unidirectional valves and sleeves are required. Amount of liquid pumped is proportional to the number of strokes. High pressure up to 70 kg/cm^2 . A compression chamber or air bottle is required to even out pulses of pressure and for uniform discharge. These pumps are suitable for high pressure equipments such as orchard sprayers and multipurpose sprayers (designed for both low and high pressure spraying). These are less suitable for viscous liquids. The capacity of the pump depends upon the number of cylinders, their diameter, length of stroke, the number of strokes per unit time and volumetric efficiency. For a good pump, the volumetric efficiency is above 90%. Volumetric efficiency is the actual volume of the spray fluid discharged divided by thePlunger displacement.

b) Rotary Pump: They can couple directly to the driving shaft of the power source. The most common type of rotary pumps is gear pump or roller vane pump.

i) Gear Pump: It is very small and compact. It consists of two meshed gear turning in a closely fitted housing (cover). The spray fluid is trapped between the gear teeth and the housing and

is carried to the outlet by both the gears. It is made of brass, bronze, nylon or high carbon and stainless steel. They cannot withstand abrasive materials and hence wettable powder cannot be sprayed with sprayers equipped with these pumps. The whole unit is to be replaced when efficiency reduced beyond 2economic level and dry running is to be avoided. Since they develop only less power (4kg/cm^2), they are used in low pressure spraying.

ii) Roller Vane Pump: These pumps superseded gear pumps in many aspects. They require less force. Roller vane pump slotted eccentrically mounted rotor which runs in a housing. Rollers are fitted in the slots and are thrown out against the housing by centrifugal force. The liquid enters through the inlet port is trappedbetween the rollers, and then carried to the outlet port. This is also a simple and compact pump, but more expensive than gear pumps, but develops high pressure(8 kg/cm^2). It can be used for spraying suspensions too,nylon is the most suitable material for this kind of pump.

c)Diaphragm Pump: It consists of a diaphragm stretched across housing. The diaphragm is moved up and down a short distance by means of a rod which helps creation of vacuum. The main advantage is that the only moving parts that come into direct contact with the spray fluid are inlet and out let valve. The valves are disc or flap type, which are cheap and easy to replace. The flexible diaphragm usually made out of synthetic/ nylon reinforced rubber is also cheaper than pistons and cylinders and hence easy to replace, if necessary. They are simple and reliable, but bigger in size and require less energy for operation and need minimum maintenance. This can spray abrasive materials too. But these pumps are not common in sprayers due to low discharge rate and pressure.

3. Centrifugal (Impeller) Pump: In these pumps, which are fitted in many sprayers, the droplets are carried by a blast of air. So pressure is not required as in the case of hydraulic sprayers. It consists of a cylinder, inside which a multi bade impeller rotates at a high speed around a central axis. The pump takes in the liquid at the axis andthrows it by centrifugal force to the periphery where it is collected by the casing and is directed to the outlet. At constant RPM of impeller, the output of the pump reduces with increase in the delivery pressure. So when nozzles are shut off, pressure will increase into a pre-determined safe level when a 100% slip occurs and a pressure relief valve is not

required. Advantage is that no risk as in the case of a displacement pumps in such situation. The pump has only one moving part, impeller. However, due to high rpm, wear and tear of the bearings may occur. Since continuous flow of large quantity is there, no pulse effect is seen and discharge is even. Centrifugal pumps works well up to 7 kg/cm², but are not suitable for high pressure. They are suitable for handling abrasive material and viscous liquids satisfactorily. But they are more expensive than gear and roller vane pumps.

5. FUTURE SCOPE

As mentioned above, one of the important parameters that affect fuel atomization is its viscosity. For liquid fuels, viscosity is determined experimentally due to different properties resulting from non-homogeneity of raw materials. In Figure 2, the dynamic viscosity coefficients versus temperature for four selected fuels are presented. The capacity measurements were performed for moderate pressures of 0.5 to 1.0 MPa in three independent measurement series. Then, the results were subjected to a statistical analysis. The liquid stream was measured volumetrically and the result was converted into the mass flow rate. During the investigations, temperature and pressure were controlled and maintained at stable levels.

Measurements of the liquid flow rate, \dot{m} , and the atomizer outlet diameters enabled determination of experimental flow number, μ , using the equation:

During the investigations on liquid fuel combustion, a beneficial effect of the fuel temperature on reduction of hazardous substance emissions was observed. However, the temperature rise results in lower atomizer capacity. To determine the range of changes, three series of atomizer capacity measurements were performed for three different fuel temperatures: 20 °C, 65 °C and 115 °C.

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