



Research Article

PHARMACEUTICAL STUDY OF LIQUID DOSAGE FORM USING THE JACKETED ELECTRIC VESSEL (CERAMIC HEATER)

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ABSTRACT

In Ayurvedic pharmaceuticals, liquid dosage form occupies a large area. To produce these liquid dosage forms, various traditional and modern instruments are being used. In present study, an instrument has been designed and named Jacketed Electric Vessel - Ceramic Heater for the heating purpose of liquids. In this instrument, heating of the liquid in the Vessel is done electrically through the ceramic heaters fitted in it. A thermocouple has been connected to this machine which indicates the inner temperature of the liquid. It has been found to be more economic and cost effective as compared to the traditional heating appliances, non-polluting, noise free, durable and a maintenance free instrument. Continuous attendant is also not needed while using this instrument. It can be helpful in the in-process standardization of the liquid dosage form.

Keywords: Dosage form, Jacketed Electric Vessel, Thermocouple, Heating appliances

INTRODUCTION

In Ayurvedic pharmaceuticals, various dosage forms of medicines like solid, liquid and semisolid are seen. In liquid dosage form, Kwath¹ (Decoction), Syrup, Siddha Taila and Siddha Ghrita² (Medicated oil and medicated Ghrita), etc. are found to be included. For the production of these liquid dosage forms, various heating media are being used. In present study, an instrument has been designed and named Jacketed Electric Vessel - Ceramic Heater (used for heating purpose). In this instrument, heating of the liquid in the Vessel is done electrically through ceramic heaters fitted in it. This machine has been designed having the capacity of 250 litres. Dosage forms like Kwath, Syrup, Siddha Tail, Siddha Ghrita and Ghana are being prepared using this machine. A thermocouple has been connected to this machine, which indicates the inner temperature. While preparing medicine, the required temperature can be set as per the requirement.

Standardization is the process of making any drug or other preparation conforms to a type or standard.³Standardization of the medicine includes three steps i. e. raw material, in-process and final product standardization. Among these, the in-process standardization includes the standardization of the procedure, which obviously includes the specification of the instrument used during the preparation of the medicine. The Jacketed Electric Vessel can be very helpful for the in-process standardization of the liquid dosage form.

The jacketed Electric Vessel has been prepared at Mahavir Electricals, Pune⁴ having following structure.

This machine contains ceramic heaters fitted in the jacket of container at three levels -

1. Lower Heater - at the bottom of container
2. Middle Heater - slightly above the bottom
3. Upper Heater - middle part of container

Depending upon the level of the liquid in the container, the heaters can be used i.e. if the level of liquid is low, only the lower heater can be used for heating. As per the requirement, the above two heaters can be used. Thus it avoids the excess and unwanted expenditure of the fuel i. e. electricity.

Specifications of Jacketed Electric Vessel - Ceramic Heater: (Figure 1)

It has been prepared having capacity of 250 litre. Movable, Easy for washing having Outlet - 2", Inner and outer part is of steel: SS 304 - 2 mm, Inner Diameter 36" and Height 24"

Three Ceramic Heaters - Lower, Middle and Upper

Three phase supply, 4 kW X 3 = 12 kWh

Insulation - Ceramic Fibre Blanket (Figure 2)

Thermocouple, Digital Temperature Control Panel, MCB Switch with Pilot indicator lamps

Temperature

While using this machine, the required temperature can be set e.g. 95⁰c, 100⁰c, etc. When the pre-set temperature is reached, automatically control panel of the machine stops raising the temperature above it by tripping the electric supply, thus the required temperature is maintained continuously.

Table 1: Approximate cost required for different heating media for heating 200 litre of liquid

Sr. No.	Heating Media	Approx. requirement of Fuel / Day	Approx. rate of Fuel	Approx. Cost of the Fuel / Day
1	Chulha	100 kg Wood	5 Rs./kg	500 Rs.
2	Traditional Stove	10 lit. Kerosene/Diesel	60 Rs./lit.	600 Rs.
3	Gas Burner	8 kg LPG	1000 Rs./19 kg	420 Rs.
4	Jacketed Vessel - Oil heater	60 kW	7 Rs./kWh	420 Rs.
5	Jacketed Vessel - Steam (Boiler)**	100 kg Wood	5 Rs./kg	500 Rs.
6	Jacketed Vessel - Ceramic Heater	50 kW	7 Rs./kWh	350 Rs.

** Steam Jacketed Vessel could be inexpensive when used for large scale continuous production, more investment, maintenance etc.



Figure 1: Jacketed Electric Vessel



Figure 2: Insulation of Ceramic Fibre Blanket

Recording the cost of the fuel

Approximate fuel cost required per day for the different heating media was calculated for heating 200 litre of liquid. It has been found that the Jacketed Electric Vessel is more cost effective than the other heating media. It is shown in the Table 1.

Jacketed Electric Vessel is found very useful for the preparation of liquid dosage form.

Required temperature can be pre-set to the thermocouple.

Continuous attendant is not required while the preparation of medicine.

It is found to be cost effective as compared to the other heating media.

It is helpful in the standardization of liquid dosage form.

DISCUSSION

While preparing most of the Ayurvedic medicines, heating is required. Heating media differ according to the quantity and type of the medicine to be prepared. Fuel required for heating process adds the cost of the medicine.

For the preparation of dosage forms like Kwath, Syrup, Siddha Tail, Siddha Ghrita and Ghana, heating media like Traditional Stoves, Chulha, Gas burners, Diesel Burners, Oil or Steam Jacketed Vessel etc. are used. However, these media are found expensive than this Jacketed Electric Vessel - Ceramic Heater.

Traditional Stoves require Kerosene or Diesel for heating, which are found expensive⁴, they create noise and air pollution. Vessels become blackish externally after use. There are chances of contamination to the liquid while filling of the fuel.

Chulha requires large amount of wood for heating, also maintenance of the heat and temperature is difficult. It creates air pollution; availability of dried wood in rainy season is quite difficult.

Gas burner requires commercial LPG gas cylinders, which are also found economically expensive.

Another advanced instrument named Jacketed Vessel - Oil heater also can be used for heating purpose. However, its maintenance is more and cost is quite more than that of Jacketed Electric Vessel - Ceramic Heater.

Use of Steam Jacketed Vessel is also seen for heating purpose in large industries. For the use of Steam Jacketed Vessel, we need a Boiler unit. It requires boiling of water for longer duration which requires a large amount of fuel. It proves costly when less number of Steam Jacketed Vessels are being run using the boiler. Use of Steam Jacketed Vessel is found to be cost effective only when more units of Steam Jacketed Vessels are working. However, monitoring and maintenance of this Boiler unit requires skilled labour. Therefore, its use also gets expensive.

Use of our designed Jacketed Electric Vessel (Ceramic Heater) found to be more economical and cost effective⁵, Non-polluting, Noise free, Durable and maintenance free instrument. It could be designed as per our requirement e.g. Change in size, Shape of the container; we can convert it in Single phase electric supply also for portable small Vessel which is required for Small scale production or R & D Unit.

With this cost efficacy, one more advantage of this Jacketed Electric Vessel - Ceramic Heater is that it doesn't require full time attendant while preparing the medicine especially Sneha Kalpana. As the temperature is pre-set, there are no chances of Kharapaka or spoiling of the medicine due to overheating.

Standardization of drugs means confirmation of its identity and determination of its quality and purity.⁶ While using the jacketed Electric vessel, the required temperature, required total time, etc. for the preparation of specific quantity of medicine could be recorded while preparing the medicine, which can be applied to the next batch. Thus, use of Jacketed Electric Vessel - Ceramic Heater also can be helpful in the in-process standardization of the liquid dosage form.

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