**Bureau of Indian Standards**

**(Haryana Branch Office)**

Our Ref : HRBO/R/5:2/AR-0089 20-10-2020

**Subject: Progress report on Action Research Project ' Battery operated knap sack sprayer’**

This is with reference to PRTD note Ref: PRTD/R/5:2/AR-0089 dated 09-07-2020 vide which Action Research Project proposed byundersigned for ' Battery operated knap sack sprayer’ was approved in-principle. A proposal has been prepared to modify the existing IS 3906:1995 Crop Protection Equipment Hand Operated knap sack sprayer piston type by incorporating the provisions and requirements for battery operated versions of the product.

This sprayer has normal working pressure 300 kPa and isoperated by hand and is used for spraying pesticides.Owing to the technological upgradation over a period of time, hand operated knap-sack sprayer are becoming obsolete and being increasingly replaced by battery powered sprayers.

Battery powered spraying devices offer enormous advantages such as ease of operation, enhanced efficiency, reduced dependence on manual manpower and low maintenance as compared to hand operated versions.

The purpose of this Action Research Proposal (ARP)is to incorporate battery cum hand operated Knap Sack Sprayers in the existing scope of IS 3906 as a new variety. For the ARP the available product data with our licensees and test reports issued by various institutes/labs, provisions of IS 11313 and other online information was analyzed. After the in-depth analyses and research on product requirements, its components and its performance parameters, following draft document for considering incorporation of new variety in existing IS 3906 has been proposed.

**DRAFT DOCUMENT FOR CONSIDERATION**

**Title and scope of Standard**

1. The title of IS may be revised as ‘Crop Protection Equipment - Knap Sack Sprayers’.
2. Scope of the standard may also include battery/hand operated Knap Sack Sprayers in addition to only hand-operated models.

**Product description**

Battery cum hand operated Knap Sack Sprayers having capacity 16 Litre and working pressure 1 to 4.5 kg/sq. cm.

**Component specifications**

1. **Motor:** Motor used shall be DC motor with operating voltage 12 volt and maximum current 2.2A of rating 20 to 30 Watt and rated speed 3000 RPM.
2. **Battery:** Battery type shall be sealed lead/acid battery, 12 volt, 7.2 Ah which shall be conveniently located preferably below chemical tank.
3. **Battery charger:**It shall have input voltage 220-240 volt AC for 50 Hz having output 12 volt DC with output current 1.7 ampere.
4. **Pump:**Shall be diaphragm type directly connected to motor, working pressure 1 to 4.5 kg/sq.cm, rated pressure 4.0 kg/sq. cm, rated speed 3000 rpm, discharge capacity at rated pressure = 1.5 l/min.,mounted near the battery preferably below the chemical tank.
5. **Overall weight:** 8 kg maximum.
6. **Material of construction:** Proposed to be same as IS 3906:1995. Photos of Motor, Battery and Charger are enclosed for reference please.

**TESTS:**

1. **Test for discharge rate of the Pump:**

Discharge rate per minute shall be measured at maximum & minimum working pressures, specified by the manufacturer by suitably collecting the test liquid from delivery outlet and by-pass outlet. The discharge rate shall be measured in at least 4 equal steps between the lowest and the highest pressure. The discharge of the water from delivery spout and by-pass outlet is to be collected into a receiving vessel. The measuring period should be at least 60 seconds.

At each pressure setting, the test shall be repeated for a minimum of four times.

The average value of discharge for each pressure shall be obtained and recorded as ml per minute.

Pump shall be capable of discharging/sucking a minimum of 1300 ml water per minute at its rated speed and rated pressure. The discharge rate and suction capacity shall be declared by the manufacturer.

1. **Test for Volumetric Efficiency:**

Volumetric efficiency in percentage shall be calculated by the following formula:

**nv = Q xN1 x 100**

**Q1 N**

Where

N1 = volumetric efficiency

Q = discharge of water at rated pressure, in litre/min;

Q1 = discharge of water at no-load, in litre/min;

N1= pump speed at no-load, in rev/min; and

N = pump speed at rated pressure, in rev/min.

Volumetric efficiency shall be minimum 80 percent

1. **Power Requirement**

Power requirement of DC motor fitter on the sprayer shall not exceed the value declared by the manufacturer. For power measurement, sprayer shall be operated at specified speed with tolerance of 5 percent and at four pressure stages covering maximum and minimum. The liquid shall be collected in the receiving vessel for a period of 60 ± 1 second. The energy meter reading and pressure gauge reading shall also be taken during the collection of liquid.

Average observed motor power requirement at rated pressure shall be collected.

1. **Pressure Adjustment Test:**

The sprayer fitted with pressure gauge shall be operated at four stages of pressure covering the minimum and maximum and at specified speed for minimum of 30 minutes. At every pressure setting, the fluctuation of the pressure shall be recorded.

1. **Endurance Test of the Sprayer**

The sprayer shall be operated at a specified normal working pressure and speed continuously for a period of minimum 50 hrs. The discharge shall be collected for a period of 1 minute after 15 minutes of running for the first time. After first collection, subsequent collection of the discharge shall be done for the period of 1 minute after every 8 hrs run. After the test the sprayer shall conform to the following requirements:

1. The sprayer shall not show any leakage, deformation or breakdown and any undue knocking or rattling sound.
2. Variation in discharge rate between first and last observation shall not be more that ± 5 percent.
3. **Test for hose and hose connection**

The hose and hose connection shall withstand the test prescribed in 7.2 of IS 10134.

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