

A SIMPLIFIED TEST PROCEDURES FOR KNAPSACK (OPERATOR- CARRIED) SPRAYERS

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ACKNOWLEDGEMENTS

- The guidelines are adapted based on the format and content of a series of other FAO sprayer guidelines developed by :
- T. L. Wiles and D. G. Sharp, of T L Wiles and Associates Limited, Chichester, UK
- with the assistance of Professor G. A. Matthews, IPARC, Imperial College London (FAO , Rome 2001).
- The design and performance requirements were also informed by the findings of two FAO workshops (FAO, 1994 and FAO, 2002), which evaluated Desert Locust spraying equipment.
- Further references were also made on the sample test procedures provided by ENAMA on Technical Instructions for simplified tests of horizontal boom sprayers

I. INTRODUCTION

- Specifies requirements & technical specifications verification (design & performance of knapsack sprayers:
 - lever operated knapsack (LK),
 - motorised knapsack sprayer (MK),
 - compression sprayer (CS),
 - motorised mistblower (MB) and
 - rotary atomizer sprayer (RA).
- Main objectives : operator safety, ensure efficiency & durability of the sprayer purchased by users and to min. the potential risk of environmental contamination during use, including misuse. (appropriate, practical and consistent quality assurance knapsack sprayer for all major crop in the developing world)
- Specifications verifications & test procedures - knapsack sprayer compliance
- Adapted from the various FAO test procedures
- Based on existing international, European and national standards and other published references as mentioned in the various FAO sprayer guidelines developed.

II. ANTAM (ESCAP -CSAM) APPROVED STATUS

- Proposed that the future implementation this system, several accredited, ANTAM Test Centres in the Asia Pacific regions will be appointed by ANTAM (**ESCAP -CSAM**).
- These centres will all use the finalised methodology in this document and consistency and uniformity between centres will be monitored by ANTAM (**ESCAP -CSAM**).

III. GUIDELINES ON STANDARDS AND TEST PROCEDURES

- The guidelines on standards are more demanding than the minimum requirements and provide more precise safety targets for spray equipment.
- Detailed specifications & requirements, supported by test procedures to measure compliance with the FAO standard, for the major types of agricultural pesticide sprayers manufactured or used in FAO member countries.
- These standards reflect current manufacturing practice, other national and international standards and the practical reality in the field in member states.
- Both the minimum requirements and the standards guidelines is to provide manufacturers and governments with a practical and consistent quality assurance system.
- Each member country can then decide on the form and speed of introduction of the respective guidelines into national practice and into legislation where appropriate.

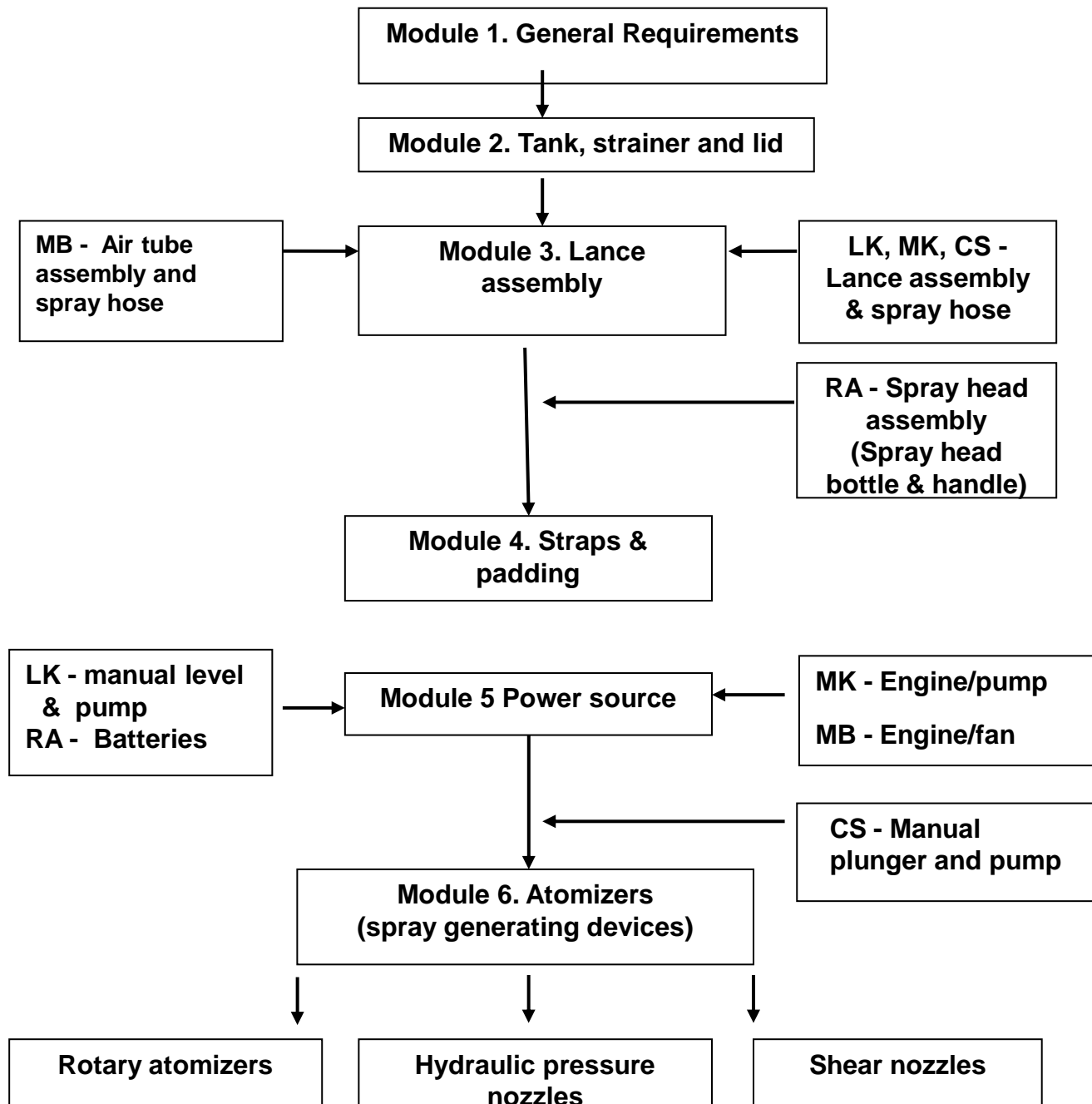
IV. COMPLIANCE

- Proposed system - a simplified knapsack sprayer test procedures
- Similar to the FAO method - compliance with a simple YES/NO system
- Numerical values are based either on accepted norms in published standards or on the judgement of the authors and their advisers (must relate to the needs of the practical field and factory situation).
- Actions in four categories: **Check, Measure, Test and Test Procedure:**
- **CHECK** - a simple observation or action to establish whether the sprayer complies or not. e.g. "All hoses should be durably marked to indicate the rated pressure".
- **MEASURE** - a simple measurement e.g. volume, thickness, length, pressure. Please indicate measurement
- **TEST** - simple tests and do not warrant a written test sequence, e.g. "The sprayer should be stable and stand upright on slopes of 1 in 10, irrespective of the amount of liquid in the tank."
- **TEST PROCEDURE** - A sequence of step by step actions that should be followed as described in Part VI.

V. VERIFICATION OF SPECIFICATIONS

- Modular format - "FAO Guidelines on standards for agricultural pesticide application equipment and related test procedures; Volume 1 2001".
- Module - a functional group of components. Five (5) types of knapsack sprayers are shown in Figure 1. - divided into numbered clauses each addressing a separate specification or requirement.
- Specifications define functional or operational requirements and should not restrict the innovative engineering design of the manufacturer.
- Wherever requirements or procedures are the same, then the same modules, clauses and wording have been used.
- Eg. - basic hydraulic nozzle module is used for knapsack sprayers and the assessment of spray quality applies to all sprayers

LK - lever operated knapsack
MK - motorized knapsack
CS - compression sprayer
MB - motorised mistblower
RA - Rotary atomizer



LEVER-OPERATED KNAPSACK SPRAYERS (LK)

1. LK Module 1 - GENERAL REQUIREMENTS

Lever-operated knapsack sprayers should be safe, reliable and capable of working efficiently under practical field conditions. They should be robustly constructed from strong, durable materials, which will not obviously be prone to undue deterioration during field use, thereby adversely affecting safety and lowering efficiency due to corrosion, rust, distortion or premature wear.

To meet the FAO standard, a lever-operated knapsack sprayer should comply with the following requirements.

TO CHECK

1. The manufacturer should provide with the sprayer a clear, simple, illustrated manual in the language of the country of manufacture and in English. YES/NO

2. To facilitate the accurate identification of replacement parts, the sprayer should be clearly and durably marked to indicate; the manufacturer's name and address and the sprayer name and model. YES/NO

TO MEASURE

1. Total mass when filled to nominal (manufacturer's recommended) maximum capacity should not exceed 25 Kg. MEASURE . _____ . YES/NO

TO TEST

1. The sprayer should be stable and stand upright on slopes up to 15% (1 in 7), irrespective of the amount of liquid in the tank. TEST YES/NO

2. A safety device should be incorporated into the sprayer to prevent the maximum pressure exceeding 5 bar in any part of the sprayer. Vented liquid should be discharged inside the tank.

TEST YES/NO

1. The sprayer should not leak. TEST PROCEDURE 1 YES/NO

VI. KNAPSACK (OPERATOR-CARRIED) SPRAYERS: TEST PROCEDURES

- Associated with these standards concern safety, principally in relation to the operator but also to the environment.
- The main hazard in the use of agricultural pesticide sprayers is the effect of the pesticides applied through the equipment.
- In many developing countries, faulty and unsafe application equipment, increase pesticide hazard.
- Procedures address the reliability and durability of the sprayer and in some cases the implications for operator safety may not be immediately obvious.
 - Eg. test procedure 14 - requirement for mistblower performance. When droplets are not propelled far enough away from the spray outlet of the equipment, there is a danger that the droplet cloud will contaminate the operator.
 - Test procedure 15 verifies the reliability of starter mechanisms on engine-driven equipment. Field surveys show that due to breakdown these mechanisms are often removed; resulting in the exposure of rapidly moving engine-driven parts creating a hazard.

Testing sequence

- The order in which the tests are conducted may differ.
- One approach - begin with Test procedure 1, the leakage test. If the sprayer fail to comply even when it is new, then the other tests need not be conducted and this can save time and expense.
- Alternative – Do the durability-related tests first, treating them as a series of “pre-condition tests”, before embarking on the more critical leakage tests.
- To fully comply with the standard, a sprayer must meet ALL the requirements in the numbered Sections and associated tests for each of the modules.

Test conditions

- Unless otherwise stated in a specific test procedure, the tests should be conducted at a temperature of $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and at a relative humidity of $60\% \pm 5\%$.
- All test reports should record the actual temperature and humidity during a test.

Points for Considerations

1. Objectives of evaluation and certification: International trade, national certification requirement, Financial requirement, R&D, others
2. Adoption of an agreeable overall Standards – harmonization
3. Testing, Verification, Certification and Regulation Process and responsibility
4. Priority in the implementation of Standard Testing on knapsack sprayer
5. Agreement on a harmonized standards – Sprayers
6. Modus of operandi - Testing Center (s) for Sprayer among member countries
7. Formation of TWG on Knapsack Sprayer and its ToR
8. Role of ANTAM – certification of Test Report (regional level)
9. Role of Regulation at the national level