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Procedure for Measuring Sprayer Nozzle Wear Rate

American Society of Agricultural and Biological Engineers

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Keywords: Nozzle, Sprayer, Test procedure

1 Purpose and scope

1.1 This Standard establishes a test procedure for measuring and reporting the wear rates of agricultural sprayer nozzles used with abrasive materials.

1.2 This Standard pertains to agricultural nozzles that use hydraulic energy to atomize the liquid. The Standard is primarily for nozzles with flow rates up to 3 L/min.

2 Essential elements of a test

2.1 It is essential to specify certain equipment and procedures for nozzle wear tests in order to satisfactorily compare the results of various tests. A standard reference nozzle is necessary in order to compare various nozzle wear test systems and different nozzles used in the systems.

2.1.1 Standard reference nozzle. Three, SAE 303 series stainless steel, flat-fan-pattern nozzles with an 80 ±5 deg spray angle when measured at 275 kPa shall be included in each test. So that all nozzles produce about the same amount of wear on the abrasive particles, the mean flow rate of the reference nozzles should be within ±25% of the mean flow rate of each other type of nozzle at all times during the test. When the mean flow rate difference between the reference nozzles and any other type of nozzle approaches 25%, the nozzles (reference or test) with greater flow rate should be replaced. The test can then be continued to determine the effect of time on flow rates delivered by the other nozzles.

2.2 At least three nozzles of each type shall be included in all tests. All nozzles should have initial flow rates within ±5% of the mean flow rate of all nozzles of the same type. Each nozzle should be randomly selected from all nozzles for position on the test stand. Each nozzle should contain the strainer as recommended by the nozzle manufacturer. When testing fan-pattern and flooding-type nozzles, at least one test should be made with 275 kPa pressure at the nozzle. For cone-pattern nozzles, at least one test should be with either 275 or 500 kPa pressure. Select the pressure closer to the pressure at which the nozzle is generally used. All tests should be long enough to achieve at least 10% increase in the mean flow rate of the nozzle being tested or of the standard reference nozzle.

2.3 Tank. The tank size will be determined by the flow rate and number of nozzles to be used during a test. The spray from all nozzles should be protected from wind and returned to the tank. The temperature of the liquid in the tank should never exceed 50°C during the test.

2.3.1 Agitation. The tank shall have a shape and agitation system such that a uniform mixture of water and abrasive is ensured throughout the tank for the duration of test. Excessive agitation which causes air to be incorporated into the tank mixture shall be avoided. Mechanical, rather than hydraulic, agitation is recommended. The agitation system shall be started long enough before flow through the nozzles to ensure a uniform mixture at start of flow through the nozzles.

2.4 Pump. The pump shall not cause excessive wear on the abrasive particles. A diaphragm-type pump with pulsation dampener is recommended. Roller and centrifugal-type pumps should not be used. Excess flow from the pump that is returned to the tank should not pass through small orifices.

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