1994

Pesticide Application and Handling Technology: Installing a Sprayer Tank Rinse Circuit

G. A. Watkins
University of Kentucky

Samuel G. McNeill
University of Kentucky, sam.mcneill@uky.edu

S. A. Shearer
University of Kentucky

UNIVERSITY OF KENTUCKY
COLLEGE OF AGRICULTURE
Lexington, Kentucky 40546

COOPERATIVE EXTENSION SERVICE

Agricultural Engineering Update


Structures & Environment


Soil & Water


Energy


Safety


Crop Processing


Power & Machinery

AEU-73

PESTICIDE APPLICATION AND HANDLING TECHNOLOGY: INSTALLING A SPRAYER TANK RINSE CIRCUIT

G. Avery Watkins, Samuel G. McNeill, and Scott A. Shearer
Agricultural Engineering Department
Cooperative Extension Service
College of Agriculture
University of Kentucky

Proper tank rinsing techniques for agricultural sprayers are very important in order to protect against cross-contamination in subsequent loads and to ensure safe disposal of any excess chemicals and rinsate (rinse water). Spray tanks and other sprayer components should be cleaned after each use. In most situations, sprayer rinsate will have to be sprayed out in the field - either onto a reserved strip, or by over-spraying in the treated area (subject to the terms of the product label).

A conventional method of rinsing the spray tank, hoses, and nozzles is to fill the tank to the lid with clean water and then spraying it out. This method does a fair job of cleaning out chemical concentrations inside the tank and plumbing system but leads to higher application costs due to a large volume of rinse water and extra time needed to refill the tank and to spray the rinsate onto the field. Wands and pressure washers have also been used to clean spray tanks but do not guarantee success in cleaning larger tanks. There is also a risk of rinsate splashing back onto the operator when using these methods.

A built-in flush system removes the risk of operator exposure and, with a clean water tank on the sprayer, allows the applicator to rinse the sprayer out immediately after spraying while still in the field. This method is very quick and easy to use because it minimizes the volume of rinsate produced. A flush system also reduces the extra costs of large volumes of water and extra refilling and spraying time that are associated with the conventional method of tank rinsing.

The most important aspect of a spray tank rinse system is the type of nozzle used to clean the inside of the tank. Several designs are available that supply different numbers and patterns of spray orifices around the nozzles periphery (see Fig. 1). This type of nozzle should be used in three repetitions in order to achieve effective rinsing. Figure 2 shows a schematic of a tank rinse circuit with this type of nozzle.

Another choice for rinsing spray tanks would be to use a rotating, angled swash plate nozzle (see Fig. 3) which was developed by the Scottish Centre of Agricultural Engineering. These nozzles rotate due to water pressure and distribute rinse water throughout the tank. The angled swash plate ensures that the inside surface of the tank receives a proper rinsing as the nozzle spins.

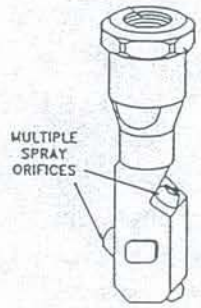

Figure 1. Multiple Orifice Rinse Nozzle

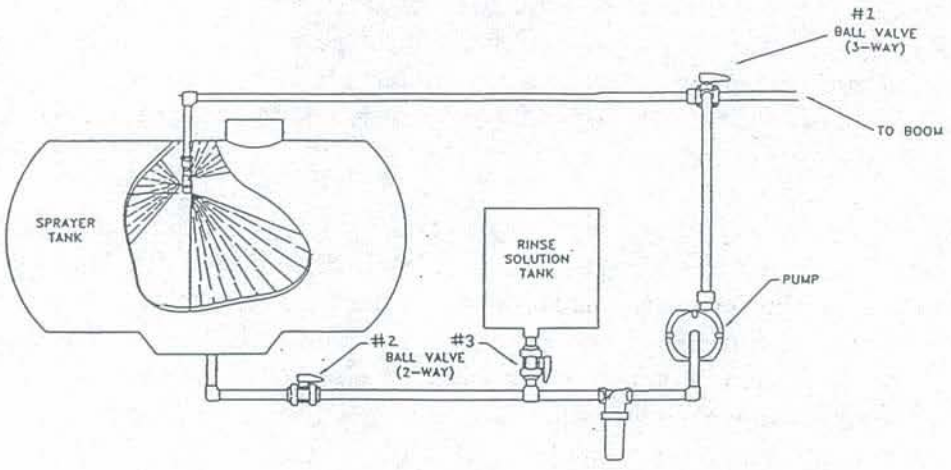

Figure 2. Tank Rinse System with Multiple Orifice Rinse Nozzle

The rotating, angled swash plate nozzle is a very effective and economical method of rinsing spray tanks. For a common 500 gallon farm sprayer, two rotating nozzles would be used. Figure 4 shows a schematic of a typical tank rinse circuit using the rotating nozzles.

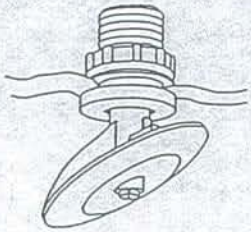

Figure 3. Rotating Tank Rinse Nozzle

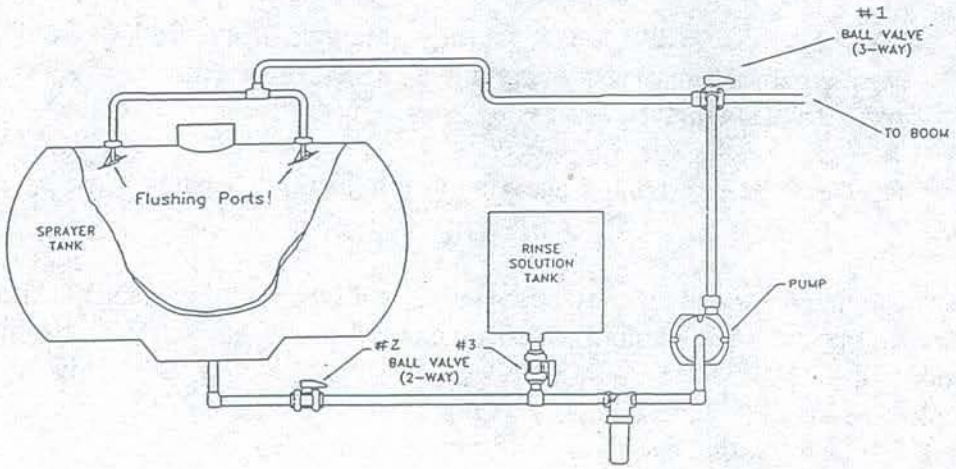

Figure 4. Tank Rinse System with Rotating Nozzles

Either system consists of a clean water storage tank that is mounted onto the sprayer, typically a 55 gallon tank for a 500 gallon sprayer. The outlet of this tank enters the main suction line for the pump. The flushing line to the nozzle(s) is connected from the outlet line from the pump. Valves are used to change the source from the main tank to the rinse tank and to change the output from the spray boom to the tank rinse nozzle(s).

For either rinse system, the main tank on the sprayer should be empty or near empty before a rinse cycle is initiated. Only clean water from the rinse tank should be used for rinsing. To accomplish the equivalent of a triple rinse, the following procedures are to be followed:

1. Turn the 3-way ball valve (#1) to direct flow to the tank rinse nozzle.

2. Turn the ball valve (#2) to shut off the main tank flow.

3. Turn the ball valve (#3) to direct flow from the rinse solution tank.

4. Start the sprayer and allow one-half of the water in the rinse tank to be pumped through the tank rinse nozzle to the main tank.

5. Turn the ball valve (#3) to shut off the rinse water flow.

6. Turn the ball valve (#2) to direct flow back from the main tank.

7. Allow the water in the main tank to circulate for two minutes.

8. Turn the 3-way ball valve (#1) to direct flow of rinsate back to the boom. Apply rinsate with the sprayer moving in the desired rinsate disposal area until the main spray tank is empty.

9. Repeat steps 1 through 8 again to accomplish two separate rinse cycles.

It has been demonstrated that a two flush cycle with the rotating nozzles is more effective than the conventional method mentioned earlier and is equivalent to triple rinsing the tank. Rinsing is done in a quick and easy way while still in the field and takes only 10-15% of the total tank volume to rinse. Tank rinsing systems on sprayers are an economical, easy way to rinse out spray tanks after application, and they're also the safest.

REFERENCES:

Jeffrey, W.A. 1991. Development of a Sprayer Tank Washing System. Brighton Corp Protection Conference.

Wills, J.B., Jr. 1990. Tennessee In-Field Sprayer Mounted Rinse System (TISMRS). The University of Tennessee Agricultural Extension Service, Knoxville, TN.