

## Safety Systems for Working with Pesticides<sup>1</sup>

Frederick Fishel<sup>2</sup>

*This EDIS publication provides a description of the following pesticide safety systems: closed mixing and loading systems, enclosed cabs, and containment systems.*

### Introduction

Closed systems for working with pesticides are excellent safety investments for pesticide handlers who handle large quantities of pesticides or who handle pesticides that are very hazardous to humans or to the environment.

### Closed Mixing and Loading Systems

Closed mixing and loading systems are designed to prevent pesticides from coming in contact with handlers or other persons during mixing and loading. Label instructions for some pesticides, usually products with a high risk of causing human health effects, may require the use of a closed mixing and loading system under certain circumstances.

There are two primary types of closed mixing and loading systems. One type uses mechanical devices to deliver the pesticide from the container to the equipment. The other type uses water-soluble packaging.

Mechanical systems typically consist of a series of interconnected equipment parts that allow for the safe removal of a pesticide from its original container (Figure 1). These systems minimize exposure when rinsing the empty container and also when transferring to the application equipment wash water that contains pesticide residues.



**Figure 1.** Closed Mixing and Loading System for Delivering Pesticide to the Application Equipment Credits: UF/IFAS Pesticide Information Office

Closed systems for mixing and loading are often custom-made with components from several commercial sources. Because the openings of

1. This document is PI-168, one of a series of the Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date, August 2008. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

2. Frederick Fishel, associate professor, Department of Agronomy, Institute of Food and Agricultural Research, University of Florida, Gainesville, FL 32611.

pesticide containers vary in size and shape, no single closed system can be used with all containers. Closed systems are available for containers as small as 2.5 gallons. Mechanical systems are available to remove the pesticide concentrate from the original container, either by gravity or by suction.

Some closed systems are available commercially for safe loading of chemicals into spray tanks (Figure 2). In such systems, all crop-protection materials are mixed at ground level, thereby eliminating the need for operators to climb on and around machines while handling chemicals. As a result, operator exposure to slips, trips, and falls is reduced. The potential for chemical spill is also reduced, and potential for exposure of operator and environment to the pesticide is minimized.



**Figure 2.** Commercial Loading System for Delivering Pesticide to the Spray Tank Credits: UF/IFAS Pesticide Information Office

**Mechanical Systems:** A mechanical loading system is often used with mini-bulk containers. Mini-bulk containers range in volume from 40 - 600 gallons and are adapted to closed systems. The applicator can use the closed system to attach the mini-bulk tanks to the sprayer without exposure to the chemical. Typically, pump-and-drive units deliver the product, and a meter allows accurate measuring from the mini-bulk tank to the sprayer. These meters require frequent calibration to be accurate. Mini-bulks must be returned to the dealer for refilling. This process eliminates the need to triple-rinse or pressure-rinse multiple small containers. This process also includes an environmental-safety benefit; it reduces the volume of used plastic containers, which must be properly disposed. If not disposed properly, the used

containers can place liability on the handler for environmental hazard.

**Water-Soluble Packaging:** Water-soluble bags are a simple type of closed mixing and loading system. The premeasured pesticide is contained inside a water-soluble bag or package (Figure 3). This pesticide bag is placed unopened into the mixing tank and dissolves in water or liquid fertilizer. Few manufacturers, however, provide water-soluble bags for small-volume applications.



**Figure 3.** Pesticide Contained in Water-Soluble Packaging Credits: Virginia Tech University

## Enclosed Cabs

An enclosed cab -- such as a tractor cab (Figure 4), cockpit, or truck/vehicle cab -- surrounds the occupant(s) and may prevent operator exposure to the pesticides being applied as long as any doors, hatches, or windows are kept closed at all times during the application. Enclosed cabs are considered a supplement to personal protective equipment (PPE), as required by the federal Occupational Safety and Health Administration (OSHA). Enclosed cabs are not a replacement for PPE.

While working inside the enclosed cab, operators should wear all PPE specified on the pesticide label and keep in mind that outside surfaces of the application equipment and cab are contaminated. Operators should be especially careful to wear appropriate PPE when getting in and out of the cab and conducting maintenance.

## Pesticide Containment Systems

If you often use the same location to mix and load pesticides or clean equipment, a pesticide-containment pad may be necessary. These



**Figure 4.** Enclosed cab of a tractor surrounds the pesticide applicator. Credits: UF/IFAS Pesticide Information Office

pads are designed to contain spills, leaks, overflows, and wastewater, whether for reuse by the applicator or for disposal by a commercial waste-management contractor (Figure 5).

If the spray tank contains pesticides, keep the tank on the pad. These pads make spills easier to clean up. The pads may also reduce pesticide waste by allowing the rinse water to be reused. The pads also help prevent environmental contamination.



**Figure 5.** Containment Pad and Tank for Holding Wastewater Credits: UF/IFAS Pesticide Information Office

Where large quantities of pesticides are handled or stored and where large equipment exposed to pesticide is cleaned, use a permanently installed containment pad for mixing, loading, and equipment cleaning (Figure 6). The containment pad must be made of an impermeable material, such as sealed concrete, glazed ceramic tile, welded steel, synthetic liners, or no-wax sheeting. Construct a concave pad or one having curbs, berms, or walls high enough to hold the largest amount of spill, leak, or equipment wash water likely to occur at the site. The permanent containment pad also must be equipped with a system for removing and recovering spilled, leaked, or otherwise released material by either an automatic

pump system or a manually operated pump. Smaller, portable pads and lightweight trays made of heavy duty plastic may be used when mixing and loading at the application site.



**Figure 6.** A Permanently Installed Containment Area for Large Quantities of Pesticides Credits: UF/IFAS Pesticide Information Office