Handling Waste Rinsate Associated With Commercial Pesticide Application Equipment

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Abstract:

The disposal of waste rinsate is a problem confronting commercial pesticide applicators. Environmental and legal issue must be addressed, and economic concerns continue to grow. In arid regions of the U.S. evaporation is a viable solution to reducing waste rinsate. This paper outlines recommendations for the construction of on-site facilities to assist in the collection and reduction of waste rinsate. A watertight concrete pad with curbing is recommended as the ideal facility for commercial applicators. Surface area as it relates to evaporation potential is discussed, and consideration is given to allowance for equipment sizes and storage capacity.

Keywords: pesticide, rinsate

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Introduction

A 1988 amendment to the Federal Insecticide, Fungicide and Rodenticide Act mandated the promulgation of regulations for the safe storage and disposal of pesticides and pesticide containers (Conference Proceedings, 1992). Many states have enacted laws and established regulations to control pesticide storage, mixing, loading, and transport. Documented cases of groundwater contamination and environmental contamination from
pesticides awakened the public’s concern to inappropriate handling and in some cases intentional mishandling of pesticides (EPA, 1991). These concerns resulted in political pressure being placed on federal and state governments to establish, adopt and enforce legislative controls regarding the handling of pesticides. At the time of this publication, Utah had not established a comprehensive set of state regulatory guidelines for pesticide handling.

The Utah Department of Agriculture (UDA) and the Utah Department of Environmental Quality (UDEQ) oversee pesticide handling and generally follow guidelines developed by the U.S. Environmental Protection Agency (1994). It is expected that Utah will enact regulatory legislation in the next five years to addresses environmental and human safety concerns specific to Utah. Commercial pesticide applicators are aware that stricter legislation will soon be in place and, as new facilities are built and existing businesses are expanded, owners are attempting to incorporate anticipated requirements into current construction practices (Allen, 1996).

Several commercial applicators in Utah requested assistance from UDA and Utah State University Extension in developing facilities for on-site handling of waste pesticide rinsate. Most of the commercial applicators currently employ management practices that significantly reduce waste rinsate, but the quantity of contaminated liquid is still significant. In some instances, commercial applicators are accumulating waste rinsate in excess of 4000 gallons annually. This presents both a storage and disposal problem. The objective of this paper is to outline recommendations for the construction of an on-site facility that will assist commercial applicators with the safe collection and reduction of waste pesticide rinsate. Although economics must be considered, of greater importance is the development of a facility that offers safe handling conditions and promotes environmentally friendly strategies for the reduction of pesticide contaminated liquids (EPA, 1993). Additionally, this facility must minimize the potential for soil and other environmental contamination.

**Background Information**

For the purposes of this paper, rinsate is the pesticide contaminated water that has been emptied, flushed or washed from spraying equipment and/or storage containers. Pesticide rinsate is less concentrated than application strength mixes and sometimes includes solids. Effective rinsate management minimizes the quantity of unused pesticide mix and reduces the amount of waste materials (Kammel et al., 1991). Thorough washing and cleaning of sprayer equipment at the site of application, removes pesticide residue and reduces the amount of rinsate that must be disposed of at the commercial applicator’s place of business (Poe, Deer and Farrell-Poe, 1994).

If rinsates are not disposed of in the field, the residual solution may be used as a diluent in the makeup of future pesticide mixtures. Rinsates utilized in this manner must be properly stored in appropriately labeled containers and are to remain segregated as to target application. Combining rinsates with different pesticides can result in a mixture
having incompatible chemicals that damage crops and/or fail to control target pests (Wilfarm, 1996).

Waste rinsate is that part of the original pesticide mixture that was (a) not applied to a crop, (b) not diluted and disposed of at an application site, or (c) not used as a diluent for the makeup of other pesticide mixtures. The applicator is responsible for the disposal of this waste in an environmentally and legally safe manner. In the past, some commercial applicators have emptied rinsate waste on the ground at the storage/mixing site. This is an unacceptable practice, and over a period of time results in contaminated soil and possibly groundwater (UDA, 1996).

Soil contamination often exists at sites where pesticide storage, loading, and mixing commonly occur. Remediation technology for the cleanup of pesticide contaminated soils is expensive and not well developed (Conference Proceedings, 1994). Existing commercial applicators that build on contaminated sites might subsequently be forced to dismantle the facility to allow remediation. Proposed sites should have the soil tested for pesticide contamination prior to beginning construction and if contamination is evident, another location should be selected.

A facility designed for the collection and reduction of pesticide rinsates should provide the maximum rate of waste reduction in a safe and economical manner. The holding capacity of the facility should handle current and future demands, while offering a margin of safety at least 25 percent greater than maximum capacity requirements (Conference Proceedings, 1992). Cleaning and maintenance requirements should be kept to a minimum, facility functionality should be high, and ease of use is very important (GCSAA, 1995). Site-specific concerns such as ground slope, traffic patterns and frequency of use are just some of the components that must be addressed. The overall design of the facility should encourage proper use while minimizing the potential for future site contamination.

**Discussion**

There are numerous solutions to the collection and reduction of pesticide waste rinsate. In instances where good rinsate management practices still yield large amounts of waste rinsate, a collection-reduction solution is needed. Since waste rinsate is primarily liquid, one practical solution is to reduce the quantity of waste material is by evaporating the water. In Utah, the normally dry conditions provide an optimum environment for waste reduction by evaporation. Utah averages less than 10 inches of normal precipitation annually with only about 10 percent of the State receiving more than 20 inches of precipitation in a given year. Utah’s dry climate provides a high pan evaporation rate, averaging in excess of 24 inches annually. Given these two climatic conditions, evaporation appears to be an effective means for Utah’s commercial applicators to reduce the liquid content of pesticide waste rinsate.
The waste rinsate that Utah’s commercial operators must collect and dispose of is contaminated with a variety of chemicals. Common pesticides include sulfur, 2-4-D, hexazinone, trifluralin, carbofuran, metribuzin, glyphosate, alachlor, metridathion, disulfoton, and azinphos-methyl, which are applied throughout Utah in quantities exceeding 25,000 lbs of active ingredients annually (Deer, 1995).

Officials at UDA and UDEQ are unsure what pesticide legislation will be enacted in Utah, however, the regulations adopted or under consideration by other States such as California (SOC, 1994), Colorado (CDA, 1994), Iowa (IDLS, 1995), Minnesota (MDA, 1995), Missouri (MDNR, 1992), Montana (MDA, 1996), and Washington (WSDA, 1994) will serve as the basis for Utah’s future legislation (Allen, 1996). After reviewing the pesticide handling regulations from these States, it is apparent that concrete is the most commonly used construction material. No doubt, concrete construction will also be accepted in Utah’s future pesticide regulations. The unique building versatility of concrete construction offers a variety of configuration options. Concrete is durable, chemically resistant, easily cleaned, and can be poured to satisfy watertight requirements. These characteristics are essential for construction materials utilized in a waste rinsate facility.

**Proposed Solution**

The proposed solution involves using a watertight concrete pad with containment curbs for collection and evaporation of water from waste pesticide rinsate. Although construction materials other than concrete will work and are likely to be accepted, the recommendation of this study is for commercial applicators to build a concrete evaporation pad where possible. A flat (level) concrete pad will promote uniform liquid distribution and provide the maximum surface area for evaporation (Jenson, 1980). The pad should be covered to prevent rain and snow from adding to the rinsate volume. Curbing around the perimeter should be of sufficient height to contain the waste liquid while preventing rain runoff and other precipitation from flowing onto the pad. The shape and size of the evaporation pad should accommodate the equipment utilized by the commercial applicator, offer adequate holding capacity, provide for ease of use, and minimize the costs. In situations where a permanent facility is not practical, other solutions such as lined evaporation pits and portable containers may be utilized (Kammel, et. al., 1991).

The evaporation pad should be square or rectangular in shape, having a size that will accommodate the maximum equipment size and provide adequate surface area to allow evaporation. Rectangular pads appear to be more cost efficient to build and Table 1 list the evaporation potential for some smaller pad sizes. The sizes listed in Table 1 are based on an annual pan evaporation of 24 inches and 10 inches of annual precipitation. When planning the construction of this type of facility it is important to limit liability exposure. Personal vehicle traffic and customer or public access to this facility should be controlled through the use of security fences or other barriers. Site selection is very important for the construction of any pesticide facility.
Table 1. Evaporation potential for concrete pads sized to accommodate standard spray boom lengths and based on 24 inches of annual pan evaporation and 10 inches of annual precipitation. Holding capacity is based on the evaporation pads being surrounded by curbs resulting in a watertight structure with a minimum six inch depth.

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<th>Pad Length ft</th>
<th>Pad Width ft</th>
<th>Surface Area ft²</th>
<th>Holding Capacity gal</th>
<th>Maximum Evaporation Potential gal/yr</th>
<th>Evaporation with 10” Precipitation gal/yr</th>
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Metric conversions: 0.0254 m/ft; 3.785 L/gal

Table 2. Evaporation potential for concrete pads sized to accommodate standard spray boom lengths and based on 24 inches of annual pan evaporation and 10 inches of annual precipitation. Holding capacity is based on the evaporation pads being surrounded by curbs resulting in a watertight structure with a minimum six inch depth.

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Metric conversions: 0.3048 m/ft; 3.785 L/gal
Commercial operations need a collection and handling facility to accommodate a variety of equipment sizes and capacities. Evaporation pad size will vary depending on the surface area needed for rinsate evaporation. Concerns regarding rinsate splash and pesticide drift, especially from the taller equipment, must be addressed when sizing pad where equipment can be parked.

Conclusions

Although the design and management alternatives discussed in this paper may be modified in numerous way to achieve desired results, evaporation appears to be the practical solution in dry climates common to Utah and other arid southwestern areas. Concrete evaporation pads when used in conjunction with pesticide rinsate reduction techniques provide an effective, environmentally safe solution to a problem common among Utah’s commercial pesticide applicators.

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