Department of Pesticide Regulation

Brian R. Leahy
Director

MEMORANDUM

Edmund G. Brown Jr.
Governor

TO: Randy Segawa
Environmental Program Manager I
Environmental Monitoring Branch
916-324-4137

FROM: Bruce Johnson
Research Scientist III
Environmental Monitoring Branch
916-324-4106

Original Signed by

DATE: May 8, 2014

SUBJECT: HOW TO CALCULATE THE APPLICATION FACTOR FOR NEW 1,3-DICHLOROPROPENE APPLICATION METHODS

The current suite of application factors and relevant definitions and related guidance can be found in Subsection C.7.1 of Appendix C in "Pesticide Use Enforcement Program Standards Compendium Volume 3, Restricted Materials and Permitting (Pesticide Use Enforcement Program, 2013).

Briefly, pounds of applied 1,3-dichlropropene active ingredient are 'adjusted' by a use factor, which in the permit conditions is called "Application Factor". For a proposed application of a 1,3-dichloropropene formulated product, this results in an "Adjusted Total Pounds" of 1,3-dichloropropene for the application.

Table 1 from Section C.7.1. (Pesticide Use Enforcement Program 2013) lists the application factors for various combinations of locations, months and applications methods. For example in the San Joaquin Valley, December or January deep applications (shank injection 18" or greater depth), the application factor is 1.9. Thus a proposed application of 1,3-dichloropropene which contained 1000 pounds of the active ingredient would result in 1.9 x 1000 = 1900 adjusted total pounds for this application. In Table 1, the tarp type 60% credit generally refers to tarps with low permeabilities and hence, low cumulative volatilization fractions.

The original aim of the adjustments was to account for different masses loading into the atmosphere which would result from (1) different application amounts (either differing rates or different sized fields) and (2) different cumulative flux fractions (for example, greater flux into the atmosphere from shallow applications than from deep applications). An underlying notion was that annual air concentrations would be proportional to the amount of 1,3-dichloropropene mass which volatilized into the atmosphere over a year. In addition, the regulatory strategy was to restrict the yearly amount of adjusted pounds in each township. This is sometimes called the 'township cap' for 1,3-dichloropropene. The scheme for purely accounting for volatilized mass was muddied with the attempt to account for seasonal differences; that is, meteorological impacts in Jan and Dec in contrast to the rest of the year. Johnson (2013) discusses some of these issues.

The net result of this history is a set of use adjustment factors which are partly based on the results of flux studies and partly based on assumptions, judgments and management directives. Thus it is not possible to provide a single algorithm for creating a use adjustment factor for a new type of application. However, I will describe generally how I would proceed to determine a use adjustment factor and attempt to make the factor consistent with those factors currently being employed.

To start, assume that a new application method is developed and a flux study is conducted for this new method. The resulting cumulative flux is F, which represents the fraction of the applied active ingredient which volatilized into the atmosphere over, say, a two week period.

The characteristics of this application method needs to be assessed. Is this a drip method or a shank application method or something else? If it is a drip method, then management has predetermined a factor of 1.16. This decision was announced in an email (Okumura 1999) which mistakenly listed the factor as 1.6. All subsequent mentions of the factor in permit condition documents were 1.16, regardless of time of year or location. Probably some effort to compare F to the historical drip studies should be made. Knuteson et al. (1999) with VIF tarp found 0.289 and Wesenbeeck and Phillips (2000) found 0.292. There may be other 1,3-dichloropropene drip studies available. If F is significantly different than 0.29, then some factor which varies from 1.16 should be considered.

If the new method is more like a shank application, then as a first step, the cumulative fraction, F, from the new method can be divided by 0.35 in order to give a factor for Feb-Nov applications. The origin of the 0.35 factor is Calhoun et al. (2004), an exposure assessment performed by DowElanco. This represented a use-weighted average of a presumed 40% summer time application mass loss and a 25% spring time mass loss. This kind of adjustment is not made for the drip applications. Then some adjustments should be made for Dec/Jan applications. Outside of SJV, that adjustment has been 1.2. Inside SJV, that adjustment was 1.9 for deep shank applications. And shallow shank applications are not permitted.

Table 1. Application factors for 1,3-dichloropropene (from Subsection 3.7.1 in Pesticide Use Enforcement Program (2013).

Location	Tarp Type	Months	Fumigation Method	Application Factor[1]
Within SJV	non-60% credit	Dec or Jan	Shallow	Prohibited
			Deep	1.9
			Drip	1.16
		Feb-Nov	Shallow	1.9
			Deep	1.0
			Drip	1.16
	60% credit	Dec or Jan	Shallow	0.6
			Deep	0.6
			Drip	1.16
		Feb-Nov	Shallow	0.3
			Deep	0.3
			Drip	1.16
Outside SJV	non-60% credit	Dec or Jan	Shallow	2.3
			Deep	1.2
			Drip	1.16
		Feb-Nov	Shallow	1.9
			Deep	1.0
			Drip	1.16
	60% credit	Dec or Jan	Shallow	0.6
			Deep	0.6
			Drip	1.16
		Feb-Nov	Shallow	0.3
			Deep	0.3
			Drip	1.16

References

Calhoun, L.L., D.D. Fontaine, B.L. Stuart and B.D. Landenberger. 1994. 1,3-Dichloropropene (1,3-D): An assessment of implied exposure and risk for the proposed commercial reentry of TELONE soil fumigant into California. Dow Chemical Company, Midland, MI.

Johnson, Bruce. 2013. Memorandum to Randy Segawa on "CALCULATION OF USE ADJUSTMENT FACTORS FOR 1,3-DICHLOROPROPENE (WITH THE USE OF TOTALLY IMPERMEABLE FILM FOR BROADCAST SHANK APPLICATIONS" dated April 26, 2013.

Knuteson, J.A. and S.C. Dolder. 2000. Field volatility of 1,3-dichloropropene and chloropicrin from shallow drip irrigation application of Telone C-35 (InLine) to strawberry beds with VIF tarp. April 27, 2000. Global Environmental Chemistry Laboratory - Indianapolis Lab, Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, Indiana. 46268-1054. Laboratory Study ID 980070.01. [50046-0140]

Okumura, Doug. 1999. Email to Nancy Grussing dated 10/14/99 on Re: Fwd: Permit condition - wording of addendum.

Pesticide Use Enforcement Program. 2013. Pesticide Use Enforcement Program Standards Compendium Volume 3, Restricted Materials and Permitting. Section C.7.1 of Appendix C. (http://www.cdpr.ca.gov/docs/enforce/compend/vol_3/rstrct_mat.htm, last accessed February 3, 2014).

Wesenbeeck, I. Van and A. M. Phillips. 2000. Field volatility of 1,3-dichloropropene and chloropicrin from surface drip irrigation application of In-Line to vegetable beds under polyethylene tarp. Global Environmental Chemistry Laboratory B Indianapolis Lab, Dow AgroSciences LLC, 9330 Zionsville Rd., Indianapolis, Indiana 46268-1054. Study ID 990072. [50046-152]