Department of Pesticide Regulation

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MEMORANDUM

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HSM-06008

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(original signed by H. Fong)

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SUBJECT: RESULTS FROM AIR MONITORING OF WELLPICT FUMIGATION FACILITY IN VENTURA COUNTY

On June 21, Associate Industrial Hygienist Frank Schneider and I traveled to Oxnard, Ventura County to conduct an air monitoring study of the fumigation procedure of Well-Pict Inc. This is a strawberry fumigation facility located on Etting Road in Oxnard. The fumigation structures consist of two intermodal-type chambers (approximate volume of 2,400 ft^3) with the control room located between them. This facility had engaged their insurance carrier (State Compensation Insurance Fund; SCIF) to conduct an industrial hygiene assessment of their fumigation procedures. This is allowed under the Suggested Permit Conditions/Methyl Bromide Commodity Fumigation of August 1994 ("Permit Conditions") in order to discontinue colorimetric tube monitoring required under the Permit Conditions.

The industrial hygienist from SCIF, Mr. Vince Moretto, consulted with Worker Health and Safety (WHS) before conducting his assessment. I had met with him at the facility in May to discuss the appropriate sampling methodology necessary to ensure that WHS could make an appropriate assessment of the potential worker exposure to methyl bromide during the application and processing cycle. The berries being fumigated are for export and are very time sensitive, with the time from harvest to loading onto an international flight running about sixteen hours. This time sensitivity had resulted in the issuance of a variance to the Permit Conditions, "Alternative Condition 14", which allowed a two-hour aeration (as opposed to four hour) and required colorimetric tube testing every 30 minutes. The Permit Conditions are designed to provide exposure below the DPR guideline value of 0.630 part per million (ppm) over 8 hours (with adjustment for time/concentration as necessary, i.e. 4 hours exposure at 1.25 ppm; 2 hours of exposure allowed at 2.5 ppm and 1 hour of exposure allowed at 5 ppm).

The two-hour aeration was used for the SCIF study. Also during the SCIF study no aeration occurred during off-loading of the chambers and loading of the chambers with 20 pallets per chamber, as opposed to the standard 18 pallets. The increase in pallets was suggested by WHS as part of the maximum throughput conditions when conducting studies to determine potential worker exposure from fumigated product. One pallet holds 3,200 lb of berries. Each chamber was treated with 8 pounds of methyl bromide. Berries were fumigated for 3 hours, aerated for

two hours, and off-loaded from the chambers to a staging area outside the cooler. As the berries are brought to the staging area, a second forklifter takes the pallets into the cooler and positions them in front of cold-air outlets, ultimately forming a tunnel of pallets, either 4 or 5 pallets long (for a total of 8 or 10 pallets forming the tunnel), a heavy tarp is draped over the tunnel formed by the two rows of pallets, forcing the cold air through the pallets. Berries stay in the cooling area for approximately 1.75 hours, after which the tunnels are disassembled and the pallets forklifted to packaging, where they are covered in an airtight plastic shroud (sleeving), the air within the covered pallet is vacuumed out and replaced with carbon dioxide, to prolong freshness. The berries then move directly to waiting truck and are driven to air transportation for overseas shipping.

A summary of the SCIF study is in Table One.

Table One: State Compensation Insurance Fund Study Results (5/11/06)

Location	Sampling Period (minutes)	Methyl Bromide Concentration (PPM)	Time Weighted Average (PPM)
Fumigation Control	200	2.5	1.04
Fumigation Control	177	ND (<0.47)	---
Forklifter	37	4.5	0.35
Cooler OBZ*	257	0.76	0.41
Cooler Floor	257	1.5	0.80
Packaging	201	1.4	0.58
Packaging	17	0.67	0.02

* Operator Breathing Zone, about 1.5 meters from floor. (ND: Non-detected)

Even calculating the Time-Weighted Averages, two of these values do not compare favorably to the DPR guideline value for methyl bromide of 0.630 ppm and most are above the target level of 0.3 ppm in the Permit Conditions: Condition 16 (Enclosed Storage Areas). If no further testing were to be done, these values would not support discontinuing colorimetric tube sampling and could potentially require the imposition of formal work-hour restrictions to employees exposed to these concentrations.

I met with representatives of Well-Pict on June 8 to discuss these results and what steps might be advisable to mitigate these potential exposures. On my advice, a second fumigation was scheduled to be monitored, with the following modifications from the previous fumigation:

- A four-hour, as opposed to two-hour aeration
- Aeration fans on during forklift off-loading

- A worker in the control room only during the actual shooting of the material (for security reasons, a worker was normally stationed within the control room during the entire fumigation cycle)
- Only 18 pallets (which is the normal load, and will be the benchmark for maximum throughput).

The retesting fumigation was scheduled for June 22, but since the local harvest season for export-quality berries had passed, a load of berries from the Watsonville Well-Pict facility had to be shipped to the Oxnard facility. These were to be shipped down and allowed to equilibrate with the ambient temperature of the Oxnard environment.

On June 22, Frank and I set up our equipment to measure methyl bromide concentrations at the facility. Additionally, SCIF was also present at the retest and collected air samples. However, SCIF collected personal air samples (on the worker) as opposed to WHS sampling procedure (area samples, not associated with individual workers). Our sampling locations were duplicates of the previous SCIF study, with samples taken in the control room, on the forklift, in the cooler and at the packaging site. A pre-application sample was also taken at a site remote from the chambers (truck loading bay) and a travel blank was also generated. All samples were stored on dry ice.

Sampling systems followed the NIOSH #2540 protocol for methyl bromide monitoring. Air was drawn by an SKC Model 222-3 Portable Pump through a charcoal matrix, with the primary charcoal (400 mg) connected to a physically separate secondary tube (200 mg) by plastic tubing. The entire tube assembly is the SKC sorbent tube #226-38-02.

Fumigation commenced in the first chamber at 1000 hrs (Cycle I). Fumigation began in the second chamber (Cycle II) at 1200 hrs. The fumigant was METABROM 100 (EPA Reg.# 8266-16). Cycle I began aeration at 1300 hrs, Cycle II at 1500 hrs. Aeration lasted 4 hours in each chamber. The Cycle I chamber was off-loaded at 1700 hrs and place in the cooler, where the berries remained for 1.75 hours. Cycle II was off-loaded at 1900 hrs and the berries placed in the cooler for 1.5 hours. At 1837 hours, the Cycle I berries were moved to the sleeving device in the packaging area and processed for shipping. By 1900 hrs, the Cycle I berries were placed in the trailer. Cycle II berries moved to the sleeving device at 2023 hrs and were on the trailer by 2046 hours.

Air monitoring was continuous through the process. Control room sampling started at 1000 hours (initial fumigation of Cycle I) and continued until one hour before the end of aeration of Cycle II (1600 hours). Sampling the last hour of aeration was deemed unnecessary, since any fugitive emissions from the chambers would have ceased when the chambers developed negative pressure during aeration. Sub samples of the actual fumigant injections (Cycles I & II), in the

OBZ of the fumigator, were taken using separate samplers. Temperature during the fumigation/aeration was in the low 20° C, with a relative humidity (RH) around 60%.

Monitoring continued on the forklift during the off-loading of the berries to the cooler staging area. The forklift that moved the berries from the staging area to the cooler was not monitored, since it spent a large portion of the time outside. Even within the cooler, the likelihood that off-gassing berries could result in detectable levels within the short period of time the forklifter was positioning the pallets into tunnels was believed to be low. Furthermore, the air monitoring in the cooler would measure that forklifter's potential exposure when he brought in the Cycle II berries. The cooler temperature was around 1° C, with an RH of 48%. The coolers volume is approximately 450,000 ft^3. Sampling was done at the OBZ-height of persons working in the cooler.

The final monitoring station was at the sleeving machine, to monitor the short period of time that the work crew would be in close contact with the pallets. This work area temperature was around 20° C, with an RH of 68%.

As they became available, the air samples were collected, capped and stored on dry ice. The temperature in the ice chest averaged below -10° C during storage and transportation. The samples were delivered to Chemistry Laboratory Services on June 23 at 1215 hours.

The analysis results are shown in Table Two.

Table Two: Worker Health & Safety Study Results (6/22/06)

Sample Number	Location	Time on-off	Total minutes	Methyl Bromide (PPM)	Time Weighted Average (PPM)
001	Background	0905-0956	51	<0.01	---
002	Fumigator OBZ C I	1001-1012	11	3.04	0.07
003	Control Room	1001-1159	118	0.44*	0.11
004	Control Room	1159-1359	120	0.06	0.02
005	Control Room	1400-1600	120	0.03	0.01
006	Fumigator OBZ C II	1159-1208	9	<0.06	<0.01
007	Forklifter C I	1700-1717	17	<0.03	<0.01
008	Forklifter C II	1901-1914	13	<0.03	<0.01
009	Cooler	1705-1849	104	0.39	0.08
010	Cooler	1903-2027	84	0.87	0.15
011	Sleeving	1837-1856	19	0.04	0.01
012	Sleeving	2023-2046	23	0.13	0.01
013	Travel Blank	Not Appl.	---------	ND	---

C I > Cycle One C II > Cycle II

*includes value from backup tube
ND: non detect
All "<" values reported as non-detect with minimum detectable = 0.4 micrograms

In general, the results support the discontinuance of colorimetric tube sampling and represent a significant improvement in exposure potential.

The highest result, from the sample taken during the actual fumigant introduction of Cycle I, in the context of the other control room samples and the second introduction of Cycle II, suggests there may have been a leak in the hardware leading from the cylinder into the chamber. The high OBZ concentration during the eleven-minute injection does not carry over into the area samples taken in the control room over the course of the fumigation. The lack of a high OBZ sample during the fumigant introduction of Cycle II further suggests that the leak may be limited to the tubing and valves associated with plumbing involved in injecting fumigant into the Cycle I chamber. Further testing of the lines is strongly recommended to identify the source of the high Cycle I OBZ value.

Control room concentrations from area sampling do not suggest unacceptable levels of methyl bromide are concentrating in the area. Sample 003 had an unusually high level of methyl bromide in the secondary tube (4.44 micrograms), greater than 25% of the amount found in the primary (12.4 micrograms). The sampling volume was within acceptable limits (9.78 liters). The reason for the high secondary tube value is not known. However, the primary and secondary were combined to calculate the air concentration, 0.44 ppm, which was higher than subsequent control room samples (0.06 and 0.03 ppm), but this could be explained as an artifact of the high concentration experienced during Cycle I injection. Uncombined with the secondary tube value, Sample 3 is 0.33 ppm. Though normally a level greater than 25% of the primary in the secondary would result in the rejection of the sample, given that all other samples of equivalent volume (Sample 001, 004, 005) were ND in the secondary, and that the result was not in wide variance to subsequent samples in the same area, the sample value will not be rejected for the purpose of assessing worker exposure. Inasmuch as workers will no longer be required to stay within the control room, other than during actual introduction of fumigant, the results from the control room do not indicate that unacceptable exposure will occur during the time involved for the injection task. Workers should not stay in the control room area longer than necessary to accomplish this task.

The forklifter's exposure has been dramatically reduced, from 4.5 ppm to non-detectable (<0.03 ppm) by the simple measure of leaving the aeration fans on during the off-loading of the chambers. With the fans off, as in the SCIF study, any methyl bromide degassing from the berries is confined in the chamber and can result in exposure to the forklifter. The two hour aeration in the SCIF study probably also contributed to the exposure potential of this situation.

With the extended 4-hour aeration and the aeration fans on during off-loading, worker exposure during off-loading becomes drastically lower.

Levels of methyl bromide found in the cooler (0.39 and 0.87 ppm) were not very different from the OBZ result found by SCIF (0.76 ppm). The 1.5 ppm value from SCIF was from floor height and, since no infants are allowed in the cooler area, is not appropriate for assessment of worker exposure. Taken together, the SCIF and DPR results suggest a potential for methyl bromide build-up in the cooling area. The samples were taken from between pallet stacks of berries and would be expected to result in the highest potential for exposure. Further monitoring of the general air space of the cooler may show a lower potential for exposure to workers within the general air space of the cooler, as opposed to the restricted air space between the pallets. Such monitoring should be done during the production season and should characterize the general air parcel defined by the structure.

DPR samples collected in the sleeving area show much lower exposure than those taken by SCIF (packaging area). This may be from the longer aeration time reducing the total methyl bromide available for degassing from the fruit, at least from the perimeter of the fruit. Methyl bromide levels in the sleeving area are easily within DPR guideline values.

In summary, the results from the DPR study support discontinuance of colorimetric tube sampling, as long as conditions sampled are not appreciably changed. Reduction in pallets fumigated, reduction in the methyl bromide application rate, and increases in aeration time are all allowable modifications. Increases in methyl bromide rates, increases in pallets fumigated or decreases in aeration time are all conditions that will invalidate the discontinuance. Aeration fans must be in operation during off-loading of the chambers. Further monitoring of the cooler general air space may be necessary to clarify the behavior of residual methyl bromide from degassing berries. The fittings and hoses from the methyl bromide cylinder to the chambers should be inspected and leak tested.

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