

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460



OFFICE OF  
CHEMICAL SAFETY AND  
POLLUTION PREVENTION

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MEMORANDUM

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THRU: Sheila Canavan, Acting Director  
Risk Assessment Division

TO: Mark Hartman, Deputy Director  
Office of Pollution Prevention and Toxics

SUBJECT: Review of Sun Chemical PV-29 Industrial Hygiene Report

The Risk Assessment Division (RAD) has reviewed the final industrial hygiene report of PV-29 exposures at Sun Chemical dated June 23, 2020, in reference to the test order requirements for occupational monitoring data. RAD finds that the study performed by Sun chemical does not meet the requirements of the Order, for the following reasons:

1. The approved study plan included a total of 43 samples, 30 worker Occupational User (OU) samples and 13 Occupational Non-User (ONU) samples. Instead, 23 OU samples and six ONU samples were collected. The submitted monitoring report did not meet the number of samples specified in the test order and study plan, Specific deficiencies are described further below. During the call with Sun on July 21, 2020, they reported that there were challenges getting their sample numbers up to what they planned to do per the test order study plan due to their production schedule because of COVID-19 and that they lost three OU samples to pumps turning off when the sample tubing became kinked while the employee being sampled was seated on a fork-lift truck.
2. The samples were collected in a sub-optimal manner such that results are not representative of OU exposures and ONU exposures.
  - a. Samples were collected for short periods of time back to back instead of collecting each sample for a longer period of time to better represent the full duration of the PV29 tasks performed. Sun stated that they did this to achieve a higher number of samples and to not contaminate the PV29 samples with other particulates that were also being handled by the same workers.
  - b. EPA approved the Sun-requested modification to use a Parallel Particle Impactor (PPI), although the flow rate was not specified. The lowest flow rate PPI was used for the sampling, which resulted in most samples being below the limit of detection. Based on the low measured concentrations; a higher flow PPI should

have been used to collect a higher volume of sample and result in a better characterization of the worker and ONU exposures. Sun stated that they thought they would not have an issue being below the Limit of Detection (LOD) of 0.05 mg using the lower flow rate and acknowledged in hindsight that a higher flow rate PPI should have been used. Additionally, if Sun had reviewed the results in the April 17th and May 5th sampling and noted that the results were below the LOD, they may have been able to make a course correction of using a PPI with a higher flow rate for the next sampling period at the end of May.

- c. Area samples were collected right next to open bay doors, which was not representative of exposures to ONUs. One would not expect ONUs to be paid for standing next to open bay doors for a full shift; also, bay doors might not always be open in less optimal weather conditions. Sun stated that they monitored in that area with bay doors open because that was the best representation of ONU exposures.
- d. There were three instances of pump failures which resulted in samples being lost. Standard industrial hygiene practice is to have extra pumps and replace failed pumps with working pumps to complete the sample collection. Sun stated that the pumps did not fail but automatically turned off when the sample tubing became kinked for the worker who was seated on the fork-lift truck. It is unclear whether the failed pump alarm went off.
- e. One ONU was incorrectly sampled/identified based on the sampling report; it appeared that this person was handling PV29 and wearing a respirator. Based on the Sun call, this ONU worker was not handling PV29 and wore the respirator while handling a different chemical in the area.

As shown in Table, 1, there are several instances where the results did not include the number of samples specified in the study plan (see highlighted cells in Table 1 below). In addition, the sampling results indicated sub-optimal approaches for measuring OU and ONU exposures to PV29, as described below.

**Table 1. Sampling in Study Plan and Final Report**

Similar Exposure Group	Date Sampled	Occupational User # Samples - Study Plan	Occupational User # Samples - Final Report	Occupational Non-User # Samples - Study Plan	Occupational Non-User # Samples - Final Report	Number of Duplicate Samples Collected	Number of Blanks Analyzed	Sampling Notes
1	26-27 May-20	10	11	0	0	1	2	Visible dust emissions, OU wore respirators
2	26-May-20	10	1	0	0	0	2	1 sample pump failure, visible dust, OU wore respirator
3	17-Apr-20	4	2	6	5	1	2	2 ONU sample pump failures, OU

								wore respirators
4	5-May-20	1	3	1	0	1	2	Local exhaust ventilation
5	6-May-20	5	6	6	1	1	2	Visible dust emissions, OU and ONU wore respirators

Highlighted cells indicate sampling events which did not meet study plan requirements.

The sample results contained in the report are based on sub-optimal sampling with almost every sample result being below the limit of detection (LOD) of 0.05 mg of respirable particulate. Only two of the 29 OU and ONU (columns 4 + 6) personal breathing zone results (7%) were above the limit of detection. The remaining breathing zone samples were below the LOD. Overall, the results are quite limited for characterizing exposures to OU and ONU workers. The Sun study plan, which was approved by EPA, stated that they would collect more breathing zone samples than was provided in the final report. The approved study plan included 30 OU samples, of which 23 were provided. Only one of 10 required samples were provided for SEG 2. The approved study plan included 13 ONU samples; six were provided. Only one of six samples were provided for one ONU, and one ONU was not sampled (see above table).

Upon assessment of the sampling for the five similar exposure groups (SEGs), RAD has the following findings (these are in chronological order):

SEG 3 (April 17, 2020): One occupational user (OU) worker was sampled twice for short periods of time back-to-back. These samples could have been combined into one longer term sample; Sun reported that these workers were handling other chemicals in addition to PV29 and sampled only during handling of PV29. Three occupational non-user (ONU) workers were sampled for a total of five results. They also lost two sample results due to a pump failure. The ONU samples could have been combined into longer duration samples. Sun reported that these workers were handling other chemicals in addition to PV29 and sampled only during handling of PV29. RAD also had concerns with calling these workers ONUs because they appeared to be handling PV29 wet press cake; Sun reported the wet press cake was for a different chemical. Workers also did housekeeping activities but the report it is not clear if Sun sampled those workers while doing this housekeeping work. One duplicate and two-blank results are also reported per the study plan. All of the breathing zone results for SEG 3 were below the LOD.

SEG 4 (May 5, 2020): One OU worker was sampled for three short periods of time in close succession. The three short-term samples could have been combined into one longer duration sample. Sun reported that these workers were handling other chemicals in addition to PV29 and sampled only during handling of PV29. The results were all below the LOD. One ONU worker was in the area but was not sampled as was stated in the EPA-approved study plan. One duplicate and two blanks were also reported as required by the study plan.

SEG 5 (May 6, 2020): Two OU workers were sampled three times for short periods back-to-back. These samples could have been combined into one longer sample. Sun reported that these workers were handling other chemicals in addition to PV29 and sampled only during handling of

PV29. Two of the six results were above the LOD. One ONU was sampled one time although the study plan stated that there would be six samples taken. RAD has concern that this worker is not an ONU because the worker was handling PV29 and was wearing a respirator. Sun stated that this worker is an ONU and was wearing the respirator to protect against exposure to a different chemical in the area.

Three area samples were taken for SEG 5. The samplers were located right next to open bay doors which is not an optimal place for locating area sampling devices per standard industrial hygiene practices which promote collecting samples which are representative of likely exposures. In addition, bay doors may not always be open during inclement weather.

SEG 1 (May 26 & 27, 2020): OU workers were sampled two or three times for short periods of time in close succession. These samples could have been combined into one longer duration sample for each of these four workers. Sun reported that these workers were handling other chemicals in addition to PV29 and Sun sampled only during handling of PV29. All results are below the LOD. One duplicate and two blanks are reported per the study plan.

SEG 2 (May 26, 2020): One OU worker was sampled one time. A second sample had a pump failure and was excluded from the report. The EPA-approved study plan stated that 10 samples would be collected for this SEG. One result is not representative of this SEG. Two blanks were analyzed. Zero duplicates were taken for SEG 2.

The greatest concern RAD has from the breathing zone results is that monitored workers were sampled for very short periods of time. It appears that workers were in the PV29 areas over multiple samples. The sample results are for such short periods of time and do not appear to represent the full duration of the PV29 tasks performed. Sun reported that the production of PV29 was reduced due to COVID-19, and these workers were handling other chemicals in addition to PV29. Sun reported that they sampled workers only while handling of PV29.

The Parallel Particle Impactor (PPI) was used by Sun Chemical. This is a modified NIOSH method for the 0600 respirable dust method, and the use of a PPI for this monitoring was approved by the EPA. The flow rates for the PPI of 2, 4, or 8 liters per minute (lpm) are recommended by the PPI manufacturer based on the amount of sampling time and anticipated air concentrations as referenced in two (one peer-reviewed and the other not) SKC studies included at the end of the report. Sun utilized a modified NIOSH 0600 method by using the PPI, for a 2 lpm flow rate. This PPI was likely not adequate for the very short sample durations and the potentially low PV-29 air concentrations. The PPI at the higher air flow should have been considered by Sun to address this issue and provide results which are representative of actual exposures to workers and ONUs. Sun acknowledged that a higher flow rate PPI should have been used.

The purpose of the test order is to reduce uncertainties in assessing PV29 occupational inhalation exposures. Based on the Employee Shift Activity tables, Sun chose to collect many short-duration samples instead of combining them into longer duration, full shift samples. Although longer sampling could result in the inclusion of other dust sources, PV29 could persist in the workplace air even after the handling of PV29 stops. The employee activity tables indicate that

the workers do not necessarily leave PV29 work areas and thus, the sample collection device would not have been exposed to other respirable dust sources. The samples should have been combined over the full shift as a single sampling event in most cases.

Several pump failures occurred during sampling which created gaps in results for certain workers. This was especially critical for SEG 2 where there is only one other breathing zone result for one OU worker. Good industrial hygiene practice dictates to have back-up pumps to ensure that sampling is not compromised due to pump failure.

Finally, it is very difficult to interpret Sun Chemical's breathing zone sampling results because different pieces of information were spread across several different final report tables and other documents instead of being combined into one table or spreadsheet. Additionally, some sample results which are duplicates were not clearly labeled as such and are included in some tables as actual sample results. Duplicate samples are collected for QA purposes, and should not be used for estimating exposures. In reporting the results, Sun did not clearly label the four duplicates, the ten blanks, the twenty-nine breathing zone results and the three area samples. It is also important to remove the names of employees from report tables as personal information need not be provided to the Agency.

In summary, the sampling conducted by Sun Chemical did not meet the terms of the test order. The sampling was conducted in a sub-optimal manner such that only 29 of the 43 required samples were collected, and almost every sampling result was below the LOD. In addition, the samples that were collected are not representative of OU and ONU full shift exposures due to the manner in which the samples were collected.