TO: John Q Public – Safety Manager, Super OSB
FROM: Cindy Leu, MSPH, CIH, CSP - Director Industrial Hygiene & Safety
DATE: February 19, 2015
SUBJECT: INDUSTRIAL HYGIENE EXPOSURE ASSESSMENT

REPORT NO. TDOSB2015IH01

The attached subject report contains results from an employee exposure assessment conducted at the True Design (TD) Super Oriented Strand Board (OSB) facility in Super, FL. Cindy Leu, Director Industrial Hygiene & Safety, ACME Services, conducted this assessment.

Executive Summary

An employee exposure assessment was conducted at the TD Super OSB (“Super”) facility from February 11-12, 2015. Select job titles were monitored for wood dust (as total dust), titanium dioxide and formaldehyde. Additionally, area samples were conducted for wood dust, titanium dioxide, and formaldehyde. The exposure profile for formaldehyde on the selected job title was found to be below the OSHA PEL as a time weighted average (TWA) of 0.75 ppm and the short term excursion limit (STEL) of 2.0 ppm. Exposures profiles for total dust were all below the OSHA PEL of 15 mg/m³ for all job titles sampled. The exposure profiles for titanium dioxide on paint employees were found to be below the OSHA.

This monitoring partially satisfies the requirements of TD’s corporate compliance standards for Employee Exposure Assessment and demonstrates Super’s commitment to the goal of 100% compliance with all safety and health regulations. Recommendations include notifying employees of their exposure results and maintaining a copy of this report as an exposure record for 30 years. Employee notification forms are provided in this report to assist the facility in satisfying the OSHA notification requirements.
I. INTRODUCTION

Cindy Leu, Director of Industrial Hygiene & Safety for ACME Services, LLC, conducted employee formaldehyde, total dust, and titanium dioxide exposure assessments at the True Design (TD) Super Oriented Strand Board (OSB) facility in Super, FL from February 11-12, 2015. Timothy Leu, Industrial Hygiene & Safety Technician for ACME Services, LLC, assisted with monitoring activities. This exposure assessment was conducted as part of the TD Employee Exposure Assessment Program.

The facility operates on 12-hour work shifts (7-7). Eight hour samples for total dust and titanium dioxide were collected on selected job titles on Wednesday, February 11, 2015 from 7AM-3PM. Observation and employee interviews determined that work tasks across the shift do not vary a great deal; therefore, the 8 hours sample is presumed to be representative of the entire shift. During the time of sampling on Wednesday, February 11, 2015, the line was operating the full shift at approximately 90-95% normal run speed. Employees performed routine equipment checks and clean up throughout the shift. Samples are indicative of a routine operating day. On Thursday, February 12, 2015, the plant had only 10 minutes down time with the line running the entire day at normal run speed. The total dust monitors and titanium dioxide monitors were placed on the workers lapel near their breathing zone. Formaldehyde badges were also placed on the workers within their breathing zone. Employees have National Institutes for Occupational Safety and Health (NIOSH) approved dust masks available for use on a voluntary basis for their own personal comfort. Other required personal protective equipment includes safety shoes, safety glasses, hard hats, hearing protection, and gloves (used on an as need task specific basis).

Discussion of Appendices

The attached appendices contain the following information:

   Appendix A -- Health Hazard Information/Sampling and Analytical Methodology

   Appendix B – IH Stat Spreadsheet


II. RESULTS

A. Formaldehyde

We conducted follow-up personal exposure time weighted average (TWA) and 15-minute short term excursion limit (STEL) monitoring for formaldehyde on the Press Support person at the Super facility that previously showed higher levels of formaldehyde during particular tasks. Formaldehyde exposure includes off-gassing from the urea formaldehyde (UF) resin and from the thermal decomposition of resin and wood during the press process. The press support person performed his respective tasks in a specific area of the facility. Therefore, an average formaldehyde exposure profile can be established for the job title assessed.

The exposure profiles for formaldehyde on the press support employee were found to be below the OSHA PEL of 0.75 ppm TWA and 2.0 ppm STEL (see Table 2). Formaldehyde levels were above the ACGIH Ceiling Limit of 0.3 ppm for the Press Support blow down task. The ACGIH Ceiling limit is a recommend not to exceed level due to eye, nose and throat irritation experienced by most people at this concentration. Area samples collected showed lower levels of formaldehyde. These samples were taken on the third level of the press structure in a centralized area where employees walk to perform blow downs. Personnel do not remain in the press area for greater than 15 minutes. Employee exposures while working near the press are captured by the STEL sample.

<table>
<thead>
<tr>
<th>Formaldehyde Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA PEL-TWA</td>
</tr>
<tr>
<td>OSHA STEL</td>
</tr>
<tr>
<td>OSHA Action Level</td>
</tr>
<tr>
<td>ACGIH Ceiling</td>
</tr>
</tbody>
</table>
Table 2
Formaldehyde Personal Monitoring

<table>
<thead>
<tr>
<th>Department/Job Title</th>
<th>8-hour Time Weighted Average (TWA) in ppm</th>
<th>15-minute Short Term Exposure Limit (STEL) in ppm</th>
<th>Date and Time of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press Support ***</td>
<td>0.026</td>
<td></td>
<td>February 12, 2015 07:02 to 14:56</td>
</tr>
<tr>
<td>Press Support/ Morning Blow Down Levels of Press Structure **</td>
<td></td>
<td>0.465</td>
<td>February 12, 2015 09:43 to 09:53</td>
</tr>
<tr>
<td>Press Support/ Afternoon Blow Down Levels of Press Structure **</td>
<td></td>
<td>0.455</td>
<td>February 11, 2015 15:55 to 16:08</td>
</tr>
<tr>
<td>3rd Level Press Structure North Side</td>
<td>0.128</td>
<td></td>
<td>February 12, 2015 06:57 to 14:57</td>
</tr>
<tr>
<td>3rd Level Press Structure South Side</td>
<td>0.106</td>
<td></td>
<td>February 12, 2015 06:57 to 14:59</td>
</tr>
<tr>
<td>Central Walkway Across Press Positioned in Breathing Zone North Corner of Press Enclosure</td>
<td>0.196</td>
<td></td>
<td>February 12, 2015 07:21 to 14:57</td>
</tr>
</tbody>
</table>

- All results are below the OSHA limit. Press Support blow down was above ACGIH Ceiling limit.
- STEL results were not adjusted for the blank. Blank for STEL samples had detectable formaldehyde however amount detected was low and does not impact the overall analysis of the results even when blank adjusted (Blank adjusted results are 0.454 ppm and 0.447 ppm respectively).
- ** Previous results in 2008 for this blow down tasks were 0.235 ppm. Results from 2012 were 0.462 ppm. Results from 2014 were 1.07 ppm.
- *** Previous monitoring in 2008 for Press Support results were 0.088ppm and 0.059 ppm. Results from 2012 were 0.204 ppm and 0.05 ppm. Results from 2014 were 0.047 ppm and 0.059 ppm.
B. Total Dust

We conducted personal exposure monitoring for total dust on two key job titles at the Super facility. Area samples were taken locations selected as having the highest potential for higher levels of dust. Depending upon the job title, employees generally perform their tasks in well defined areas of the facility. Therefore, an average total dust exposure profile can be established for each specific job title assessed.

We selected the Press Support and Dryer Support for this survey. Personnel sampled performed routine duties during the shift to include equipment blow down and instrument checks. Area samples were located throughout the plant in key locations near the dryers, blender, and forming structure. Samples were taken while sonic fans were operational blowing dust from higher levels of structures. Exposures profiles for total dust were well below the OSHA PEL and ACGIH TLV of 15 mg/m³ and 1 mg/m³ respectively, for all positions and areas monitored (see Table 3).

Total dust levels were also measured throughout the facility utilizing a PDR-1500 hand held direct reading dust monitor to create a map of dust levels for the facility. A table with dust levels and associated map of locations is located in Appendix C.

<table>
<thead>
<tr>
<th>Department/Job Title</th>
<th>Time Weighted Average (8 hr TWA) in mg/m³ February 11, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press Support*</td>
<td>0.512</td>
</tr>
<tr>
<td>Dryer Support***</td>
<td>0.271</td>
</tr>
<tr>
<td>Area- forming structure 2nd level near TSF</td>
<td>0.985</td>
</tr>
<tr>
<td>Area- Mezzanine outside Administration</td>
<td>0.386</td>
</tr>
<tr>
<td>Area- Dryers East End Baghouse</td>
<td>0.273</td>
</tr>
<tr>
<td>Area- Blending Structure 1st level near core blender</td>
<td>0.401</td>
</tr>
</tbody>
</table>

- Results are below the Total Dust OSHA PEL for the Press Support and Utility.
- * Sampling Results from 2008 sampling event were 0.945 mg/m³ and 0.639 mg/m³. Sampling Results from 2014 sampling event were 0.782 mg/m³.
- ***Sampling Results from 2012 sampling event were 0.149 mg/m³ and 0.999 mg/m³. Sampling Results from 2014 were 1.028 mg/m³.

D. Titanium Dioxide

We conducted personal exposure monitoring for titanium dioxide on a paint booth operator at the Super facility. Area samples were also taken to evaluate potential exposures to paint aerosol throughout the paint booth area. Paint booth operators work near the paint booth at the control station and in the surrounding area moving pallets of finished product. Operators work to move boards from the paint booth to the banding station and then to storage locations.
We selected one paint booth operator employee to perform air monitoring for titanium dioxide during routine operations. The employee selected spent the majority of the day operating the forklift moving completed boards to storage locations, but was working in and out of the paint booth area throughout the day. He spent approximately 1 hour actually stationed at the paint booth control station. Area samples were taken on either side of the paint booth to determine general area samples and a sample was also taken at the control booth in the operator breathing zone. Exposure profiles for titanium dioxide were below the respective OSHA PEL of 15 mg/m³ and ACGIH TLV of 10 mg/m³ (see Table 4).

<table>
<thead>
<tr>
<th>Department/Job Title</th>
<th>Time Weighted Average (8 hr TWA) in mg/m³ February 11-12, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint Booth Operator</td>
<td>0.009</td>
</tr>
<tr>
<td>Area- Paint Booth Control Station</td>
<td>0.014</td>
</tr>
<tr>
<td>Area- North Side of Paint Booth</td>
<td>&lt;0.006</td>
</tr>
<tr>
<td>Area- South Side of Paint Booth</td>
<td>0.024</td>
</tr>
</tbody>
</table>

### III. DISCUSSION

#### A. Press Support

**Potential Exposure:** The Press Support employees are potentially exposed to formaldehyde and total dust during the blow down of the forming structure and press, changing of UF super sacks, and maintenance of the press or other equipment.

**Findings:** The Press Support result was below the OSHA PEL of 0.75 ppm and STEL of 2 ppm for formaldehyde (See Table 2). The STEL sample taken during the press blow down showed levels above the ACGIH ceiling limit of 0.3 ppm. While exposures are below the PEL, best management practices would encourage controlling exposures below the ACGIH TLV.

**Description:** The Press Support position maintains and cleans the forming structure and press, and is responsible for changing the UF resin super sacks. Each day the forming structure is blown down using compressed air and then the waste is swept and shoveled to prevent wood dust and debris buildup. This process takes about 1 hour. The press is also blown down on a daily basis using compressed air which takes approximately 15 minutes to 30 minutes. On a typical day 5-8 UF resin super sacks are changed during a 12 hour shift.

On February 12, 2015, the TWA sample included the press blow down, the forming structure blow down, and resin super sack changes. The press blow down was sampled for a short term exposure during both the morning and afternoon blow down. Press Support (Mr. Sinco) did not
utilize the NIOSH approved N-95 dust mask while doing blow downs. A description of each activity is as follows:

UF Super Sack Change- The resin room is cooled to keep the resin from solidifying. The sack is kept in place with an air filled bladder. Once the sack is empty the air is released from the bladder and raised out of position. A vacuum is used to remove the over spill. Then the empty bag is lowered, removed from the lift and a new bag is attached to the hoist and placed into position. The new sack is placed over the air bladder and the string is opened. The empty sack is taken out of the resin room and placed on the ground. The bag is then compressed to remove the air from the empty resin sack. The sack is then folded and placed in a receptacle.

Press Blow Down- This process takes approximately 15 minutes to 30 minutes. Each side of the press is cleaned from the 3rd level to the first level. The STEL sample was collected while compressed air from a 6ft. wand was used to blow the press down from both sides of the press structure on both February 11th and 12th, 2015.

Forming Structure Blow Down- This process takes approximately 30 minutes to 1 hour. The forming structure is cleaned on each side. The TWA sample collected included the task of utilizing compressed air from a 6 ft. wand to blow the forming structure down on February 12, 2015.

B. Dryer Support

Potential Exposure: The Dryer Support employees are potentially exposed to total dust during the monitoring of the dryer, ID fans, performing log counts, and other housekeeping assigned tasks.

Findings: The Dryer Support employee results were below the OSHA PEL of 15 mg/m³ for total dust (See Table 3). The continued voluntary use of a NIOSH approved dust mask respirator is encouraged.

Description: The Dryer Support monitors the dryers, ID fans, the general mill area, and performs log counts. Additionally, the dryer support employee performs housekeeping to include blow down of the dryer structures and general floor housekeeping. Activities during the sampling included performing log counts, general walk down of the mill areas, and blow down of ID fans.

C. Paint Booth Operator

Potential Exposure: The Paint Booth Operator is potentially exposed to paint aerosol during work at and around the paint booth control panel. The paint utilized is a latex based paint with titanium dioxide as the single component of concern.
**Findings:** Titanium dioxide sample result for the paint booth employee was below the current OSHA PEL for titanium dioxide of 15 mg/m³. Area samples taken also reflected exposures below the current OSHA PEL.

**Description:** Operators move finished boards through the paint booth and banding station then operate forklifts to move finished boards to storage locations. Operators may remain an entire shift at the control station but typically rotate on and off the platform with other operators spending time in and out of the paint area. Paint operations on February 11, 2015 included a great deal of manual painting of boards due to the paint booth operating inconsistently and causing more overspray. Samples taken February 12, 2015 represented a more consistent operation of the paint booth and less overspray from the booth.

**IV EXPOSURE RATINGS**

Appendix E contains a Bayesian Decision Analysis (BDA) report. This report provides an alternative means for assessing compliance with the OSHA permissible exposure limit (PEL). The BDA tool was used to determine the probability that the exposure data for the Super employees came from exposure profiles that could be given AIHA exposure ratings of category 0 through 4. BDA statistical techniques allow the industrial hygienists to assess and manage exposures by predicting where the true 95th percentile point estimate falls within one of the five AIHA exposure categories. We ran BDA for formaldehyde and total dust exposures. Both reports strongly suggest that workplace exposures to formaldehyde and wood dust would be less than ½ of the OSHA PEL 95% of the time, which reflects an AIHA Category 2 exposure profile (see the AIHA Exposure Control Categories below). We also ran BDA for formaldehyde short term exposures. The report shows a medium certainty that workplace exposures to formaldehyde would be at 50-100% of the STEL 95% of the time, which reflects an AIHA Category 3 exposure profile.

### Management and Exposure Control Categories

<table>
<thead>
<tr>
<th>SEG Exposure Control Category**</th>
<th>Applicable Management/Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (&lt;1% of OEL)</td>
<td>no action</td>
</tr>
<tr>
<td>1 (&lt;10% of OEL)</td>
<td>procedures and training, general hazard communication</td>
</tr>
<tr>
<td>2 (10-50% of OEL)</td>
<td>chemical specific hazard communication, periodic exposure monitoring,</td>
</tr>
<tr>
<td>3 (50-100% of OEL)</td>
<td>required exposure monitoring, workplace inspections to verify work practice controls, medical surveillance, biological monitoring,</td>
</tr>
<tr>
<td>4+ (&gt;100% of OEL, Multiples of OEL: e.g. based on respirator APFs)</td>
<td>implement hierarchy of controls, monitoring to validate respirator protection factor selection,</td>
</tr>
</tbody>
</table>

*Upper Tail Decision statistic = 90th, 95th, 99th percentile*
A. Formaldehyde BDA Analysis

Based on the analysis run on both the data from this sampling event and the sampling conducted in 2008, 2012 and 2014, we can state that there is a greater than 92% probability that the worker exposure profile to formaldehyde at the Super plant is a Category 2. This means that 95 percent of the time worker exposures to formaldehyde would be less than ½ of the OSHA PEL. (see Appendix E)

Based on the analysis run on both the data from this sampling event and the sampling conducted in 2014, we can state that there is a greater than 44% probability that the worker exposure profile to formaldehyde at the Super plant is a Category 3. This means that 95 percent of the time worker exposures to formaldehyde would be at 50%-100% of the OSHA STEL. (see Appendix E)

B. Total Dust BDA Analysis

Based on the analysis run on both the data from this sampling event and the sampling conducted in 2008, 2012 and 2014, we can state that there is a greater than 90% probability that the worker exposure category to total dust is a Category 2. This means that there is a 95% probability that 95 percent of the time worker exposures to wood dust would be less than ½ of the OSHA PEL. (see Appendix E)

V. RECOMMENDATIONS:

1. Notify employees of exposure results to formaldehyde, titanium dioxide, and total dust and complete the enclosed exposure notification form.

2. Maintain a copy of this report for 30 years in accordance with 29 CFR 1910.1020.

3. Perform additional monitoring within 90 days if there is a significant process change, new equipment is introduced to the plant, or a new job title is created.

Investigation Limitations

The observations are limited to the conditions observed at the time of the sampling campaign. This information presented herein was prepared on behalf of, and exclusively for, the TD Safety Department and its authorized representative(s). This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party or be used or relied upon by any other party without the written consent from TD or its authorized representative(s).
APPENDIX A

HEALTH HAZARD INFORMATION
AND
SAMPLING METHODOLOGY
**Formaldehyde**

Repeated and prolonged exposure to formaldehyde has been associated with lung and nasal passage cancers in humans. It is also highly irritating to the upper respiratory tract and eyes. Skin contact with formaldehyde, even at very low levels, can cause allergic contact dermatitis. Symptoms of this include skin redness, swelling and formation of vesicles or hives. Once an individual is sensitized, they can suffer skin reactions by being in environments where there are very low concentrations of airborne formaldehyde.

**Monitoring Equipment**

The formaldehyde TWA and STEL concentrations were monitored using SKC UMEX Aldehyde PM 500-100 badges. The passive diffusion badges sampling rate is 0.1LPM. The starting and stopping times were noted to give the total exposure for the badges. The samples were analyzed by NIOSH Method 2016M. STEL samples were taken utilizing silica gel sorbent tubes at a sampling rate of 0.8 lpm. The badges and sorbent tubes were clipped to the employee’s shirt collars to get near the employee’s breathing zone, which in turn gave us the most accurate results. Samples were closed and placed in the freezer until they could be shipped. The samples were analyzed by NIOSH Method 2016M and 2016.

SKC UMEX Aldehyde PM 500-100 badges were used on February 12, 2015, to perform area monitoring. Badges were placed for a total of 8 hours on each side of the press on level 3 at a breathing zone height within the general walk area of the platform.

**Wood Dust/Total Dust**

Both the skin and respiratory system can become sensitized to certain types of wood dust (primarily hard woods). When a worker becomes sensitized to wood dust, he or she can suffer a severe allergic reaction (such as asthma) after repeated exposure or exposure to lower concentrations of the dust. Other common symptoms associated with wood dust include eye irritation, nasal dryness and obstruction, prolonged colds, and frequent headaches. Certain types of hardwood- such as oak, mahogany, beech, walnut, birch, elm, and ash- have been reported to cause nasal cancer in wood-workers. This is particularly true when exposures are high. The American Conference of Governmental Industrial Hygienists (ACGIH) recognizes certain forms of wood are carcinogenic, and recommends a limit of 0.5 milligram per cubic meter (mg/m³) for western red cedar and 1 milligram per cubic meter (mg/m³) for all other woods. At this time, OSHA regulates wood dust as a nuisance dust; however, OSHA strongly encourages employers to keep exposures to a minimum and to adopt the ACGIH levels. The maximum permissible exposure for nuisance dust is 15 mg/m3, total dust (5 mg/m3, respirable fraction).

**Monitoring Equipment**

Total dust for wood dust were monitored using an SKC AirChek 52 sampling pumps that were calibrated on-site using a BIOS DC-Lite, serial number 7651. The flow rate was set to an initial
flow rate of 2.0 L/min. The sampling was done through a 37 mm, 5 μm PVC filter. The samples were analyzed by Analytics (AIHA accredited laboratory) NIOSH 0500 method. The pumps were pre and post calibrated.

Total dust levels were also measured throughout the facility utilizing a PDR-1500 (SN 0820631097) hand held direct reading dust monitor to create a map of dust levels for the facility. The dust monitor was utilized to walk the facility and take measurements at specific locations. The meter was allowed to stabilize at each new location and the highest reading detected recorded.

**Titanium Dioxide**

Titanium dioxide is a mild pulmonary irritant causing irritation to the nose and throat at high concentrations. It may also cause mild skin irritation. Ingestion is not harmful. At this time, OSHA has established a permissible exposure limit of 15 milligrams per cubic meter (mg/m³) for an eight hour time weighted average. The American Conference of Governmental Industrial Hygienists has established a TLV of 10 mg/m³ for titanium dioxide.

**Monitoring Equipment**

Titanium Dioxide aerosol particulates were monitored using SKC AirChek 52 sampling pumps that were calibrated on-site using a BIOS DC-Lite, serial number 7651. The flow rate was set to an initial flow rate of 1.5 L/min and later adjusted to 2.0 L/min. The sampling was done through a 37 mm, 0.8 micron MCE filter. The samples were analyzed by Analytics (AIHA accredited laboratory) using OSHA ID 125 method for titanium dioxide. The pumps were pre and post calibrated.
APPENDIX C

Isopleth Map Showing Dust Levels in the Plant
APPENDIX E

BDA Analysis for Select Environmental Agents
(list names here)