IES
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Re: Smoke Test Report
Darling International Inc., Fresno

Test Purpose

Darling International Inc. (Darling) operates a food processing byproduct recycling (rendering) operation at 795 West Belgravia in Fresno, CA. Integrated Environmental Services (IES) was retained to conduct smoke testing within the subject facility to evaluate how effectively air is captured and delivered to the scrubber system and to provide recommendations for correction of any issues identified during testing.

Test Methodology

Smoke testing was conducted using Superior #3C (3 minute, 40,000 cubic feet of smoke volume) smoke generators strategically placed in the primary operating areas of the plant including the raw material receiving area, the main rendering area, and the mill room. In each location a minimum of two (2) smoke generators (80,000 cubic feet of smoke volume) were used to assure effective smoke loading of the areas being evaluated. During smoke generation the conditions inside and outside the plant were observed to evaluate how smoke moved to the scrubber system and whether or not there was any evidence of smoke leaking out of the facility. The time required to evacuate the smoke from each of the areas tested was recorded to help evaluate potential impacts to system from a lack of make-up air.

Test Results

1. **Raw Material Receiving Area**

    - Area ≅ 80Lx60Wx35H ≅ 168,000 cubic feet
    - Smoke generated ≅ 80,000 cubic feet (two generators)
    - Smoke effectively moves out of the area to the East, see Attachment A, away from the main raw material receiving area bay doors and toward the scrubber inlets A and B (feeding the 100,000 cfm scrubber), and the scrubber inlet C (feeding the 75,000 cfm scrubber). Inlets A and B are located at the peak of the roof, and inlet C is located approximately 10 feet off the floor.

- There appears to be some limited staging and concentrating of smoke in the space directly above West wall bay doors before it moves out of the space.
- The smoke evacuated from the area in approximately 3 minutes following the end of smoke generation.
- There was no smoke observed leaving the facility for the area being tested based on an exterior survey conducted during the smoke test.
- Observations of the air movement during the test appeared to show that some of the air in the area moved slower and concentrated before getting to the scrubber inlets. This condition can be potentially improved by modifying the supply of make-up air to the system to unify the overall airflow through the space and limit any staging of the smoke before evacuation. To further evaluate this conclusion a second test was run providing additional make up air to the scrubbers by fully opening one (1) of the bay doors. During this test the area was evacuated with less staging and within approximately 1 minute following the end of smoke generation. A significant improvement over the first test.
- The negative pressure airflow rate into the facility at the bay door opening during this second test was in a range from 650-800 feet per minute.

2. Rendering Area

- Area ≅ 130Lx50Wx25H ≅ 162,500 cubic feet
- Smoke generated ≅ 80,000 cubic feet (two generators)
- Smoke effectively moves out of the area toward the scrubber inlets B (feeding the 100,000 cfm scrubber) and C (feeding the 75,000 cfm scrubber). Inlet B is located at the peak of the roof, and inlet C is located approximately 10 feet off the floor.
- There appears to be some limited staging and concentrating of smoke in the space directly along the North wall.
- No smoke was observed migrating back into the raw material receiving area.
- The smoke evacuated from the area in approximately 3 minutes following the end of smoke generation.
- There was no smoke observed leaving the facility for the space being tested based on an exterior survey conducted during the smoke test.
- Observations of the air movement during the test appeared to show that some of the air in the area moved slower and concentrated before getting to the scrubber inlets. This condition can be potentially improved by modifying the supply of make-up air to the system to unify the overall airflow through the space and limit any staging of the smoke before evacuation. To further evaluate this conclusion a second test was run providing make up air to the scrubbers by fully opening one (1) man door on the East wall, one (1) pass through door from the mill room, and one (1) man door on the West wall of the mill room. During this test the space was evacuated with less staging and within approximately 1 minute following the end of smoke generation. A significant improvement over the first test.
- The negative pressure airflow rate into the facility at the openings used during this second test ranged from 500-1,250 feet per minute.

3. Mill Room

- Area ≅ 40Lx50Wx20H ≅ 40,000 cubic feet
- Smoke generated ≅ 80,000 cubic feet (two generators)
- Smoke effectively moves out of the area toward the scrubber inlet D (feeding the 100,000 cfm scrubber) and through the North wall pass through opening leading primarily to scrubber inlet B (feeding the 100,000 cfm scrubber). Inlet D is located at the peak of the roof in the mill room, and inlet B is located at the peak of the roof in the rendering area.
- There appears to be some limited staging and concentration of smoke in the space above the curing bin and along the South wall of the mill room.
- The smoke evacuated from the space in approximately 2 minutes following the end of smoke generation. Make-up air was provided on and off during the 3 minute smoke generator burn and the added make-up air was found to improve the smoke evacuation significantly.
- There was no smoke observed leaving the facility for the space being tested based on an exterior survey conducted during the smoke test.
- Observations of the air movement during the test showed that modifying the supply of make-up air to the area will potentially unify the overall airflow through the space and limit any staging of the smoke.

4. Observations

- In general the scrubber system is performing well and it appears to be exceeding the industry standard of 10-20 air changes per hour.
- There were three areas where the airflow to the scrubbers appeared to stage and concentrate before flowing to the scrubber inlets. These areas include the West wall of the receiving area above the bay doors, the North wall of the rendering area toward the roof, and the South wall above the curing bin in the mill room.
- There did not appear to be any smoke leaving the facility based on exterior observations of the facility during the smoke tests.
- No leakage was observed from any of the facility doors while open or closed. The building is under a significant amount of negative pressure to the point that many of the doors are difficult to open and several doors have been deformed inward. Additional makeup air is needed to improve system performance.

5. Recommendations

- To address boiler room airflow issue: 1) Install a separate filtered outside air intake from the roof down to the blower, 2) Install a new boiler room roll up door with a tracked door that includes louvered panels, and 3) Balance air through boiler room to scrubber system.
- Review duct size and extend scrubber inlet D further into the Mill Room area to improve capture.
- Size and add make-up air louvers in the following locations: 1) Above the bay doors on the West wall of the receiving area, 2) Along the North wall of the

rendering area in place of several of the existing windows, 3) Replace the East wall man door in the rendering area with a louvered man door, 4) Above the curing bin in the mill room, and 5) Replace the West wall man door in the mill room with a louvered man door.

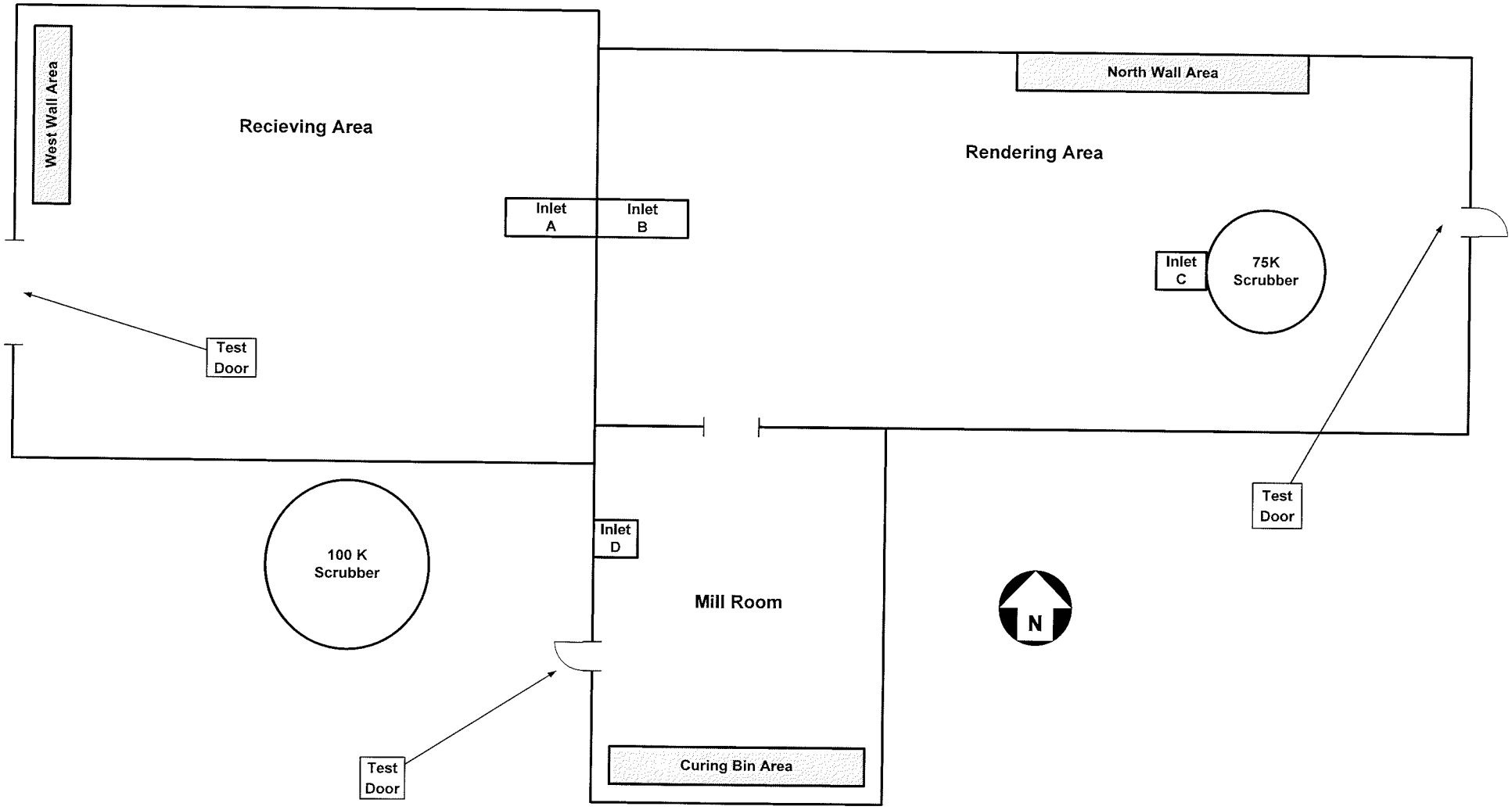
- It is recommended that barometric pressure type louvers be used that will only open when enough negative air pressure is placed on the louver. This will help the system balance itself and prevent louvers from remaining open unnecessarily. It will also address the issue of make-up air starvation and help prevent slow evacuation of air from the areas mentioned in this report.

IES appreciates the opportunity to provide these services to Darling. If you have any questions regarding the report please feel free to call me at (763) 784-6726.

Respectfully,

Glen Buss
Integrated Environmental Solutions

Enclosure



Attachment A