Best Practices for the Safe Loading and Unloading of Black Liquor Soap Skimmings

Scope

The scope of this best practice consists of guidelines that a facility could use to develop their own detailed and specific procedures, checklists, or work instructions for the loading and unloading of black liquor soap skimmings (BLSS) when utilizing tank trucks and/or railcars. These best practices primarily focus on the environmental, safety, and health aspects of this activity. A facility's detailed work instructions shall be evaluated for safety using a job safety/hazard analysis protocol.

Key Points

- Loading/unloading procedures shall be documented and evaluated using a Job Hazard/Safety Analysis. A checklist used with each loading/unloading activity is best practice.
- Best practice is to use adequate fall protection if accessing the top of the railcar or tank truck, such as a personnel access ramp or using a harness and lanyard attached to an approved anchor point.
- Due to the potential for total reduced sulfur compounds in the BLSS vapor space, loading and unloading activities must be conducted in a well ventilated area with the use of hydrogen sulfide monitors.
- If using positive displacement pumps for this activity, be fully aware of the special operating features of this type of pump.

Hazards Associated with BLSS and this Activity

The safety data sheet shall be reviewed prior to handling BLSS. Hazards include the following:

- Can cause severe skin burns and eye damage
- Skin sensitizer
- Vapor space can contain toxic TRS (total reduced sulfur) compounds

In addition, the following hazards of loading and unloading activities include:

- Fall and ergonomic hazards
- Line of fire hazards when connecting and disconnecting hoses
- Slip hazards associated with soap residue

General

The following general guidelines apply to both loading and unloading of BLSS, both by tank truck and by railcar.

- All loading/unloading inspections shall be properly documented through a procedure, checklist or similar method.

- In addition, a Job/Safety Hazard Analysis shall be performed on the procedure or checklist.
- Use independent verification to ensure the valves are aligned to/from the proper tank(s) for loading and unloading.
- The loading/unloading area should have adequate lighting and be free of obstacles or unnecessary equipment.
- Verify that safety equipment such as safety showers and eyewash stations are present and operational before conducting loading/unloading activities.
- Ensure that proper tools are used for loading and unloading operations. They must be clean and in good condition at all times.
- Be aware of "line of fire" hazards when connecting and disconnecting hoses.
- Be aware of ergonomic hazards, particularly when in awkward positions and when handling heavy hoses.
- To avoid spills and housekeeping issues, ensure loading/unloading hoses are pumped or drained clear of any residual material (soap/black liquor) after use during the loading or unloading process.
- Be aware of tripping hazards caused by slippery soap on the ground, on hoses, and other objects.
- Verify any vessel inspection stencils prior to loading. Verify no inspection dates on the vessel have not expired; this is especially applicable to railcars.

<u>Tank Truck Unloading</u>

- Verify all applicable paperwork for unloading tank truck of BLSS.
- Don PPE (See the PPE Recommendations section below).
- Spot truck. Spotted area to have spill protection, not necessarily full containment.
- Chock wheels in both directions.
- Bleed off pressure in the tank truck, then close the vent.
- Connect unloading hose. Use self-locking hose fittings or secure the ears on hose fitting using a pin, wire, or high visibility Velcro straps.
- If unloading by pump, open dome lid while using adequate fall protection, such as a personnel access ramp or using a harness and lanyard attached to an approved anchor point. Take precautions for the potential presence of toxic TRS vapors. See the TRS Safety section, below.
- If unloading by pump, a positive displacement pump is recommended for pumping soap. See the section below, Positive Displacement Pump Safety.
- If unloading using air pressure, ensure air pressure is regulated to prevent over pressurization of the tank truck.
- Align valves and pump/pressure off black liquor. Align valves and pump/pressure off soap. Measure quantities of black liquor and soap unloaded. Use independent verification, as appropriate, for proper valve alignment to prevent misdirection.
- Visually inspect container to make sure it is completely empty.

- Close dome lid accessed by personnel access ramp or by using adequate fall protection and secure all bolts.
- Close outlet valve(s).
- Replace outlet cap.
- Install valve seals/car seals.
- Wash up area, hose, and fittings with water.
- Remove wheel chocks.

Railcar Unloading

- Check all applicable paperwork for unloading the railcar of BLSS.
- Don PPE (See the PPE Recommendations section below).
- The area where the railcar is spotted shall have spill protection, not necessarily full containment.
- Put a caution sign, commonly known as a blue flag, into place. If the car can be approached from either direction be sure to put up a sign at both ends.
- Prevent entry into the track by locking the switch and/or locking derailer.
- Check the hand brakes to make certain they have been applied. Do not assume that someone else has set them.
- Chock wheels in both directions.
- Bleed off pressure, then close the vent.
- Verify that the bottom valve is closed and remove boot/belly cap. Be aware of product. Carefully remove the belly cap, ensuring that no/minimal liquid (black liquor or soap) flows out as the cap is loosened. There have been cases where the bottom valve was defective and appeared to be in the closed position but allowed significant quantities of fluid to escape when the belly cap was removed. Use an Aluminum pipe wrench which is more lightweight.
- Connect unloading hose. Use self-locking hose fittings or secure the ears on hose fitting using pins, wire or high visibility Velcro straps. Note that this step must be done with care, due to ergonomic hazards working underneath a railcar.
- If unloading by pump, open dome lid, using adequate fall protection, such as a personnel access ramp or using a harness and lanyard attached to an approved anchor point. Take precautions for the potential presence of toxic TRS vapors. See the TRS Safety section, below.
- If unloading by pump, a positive displacement pump is recommended for pumping soap. See the section below, Positive Displacement Pump Safety.
- If unloading using air pressure, ensure air pressure is regulated to prevent over pressurization of the railcar.
- Align valves and pump/pressure off black liquor. Measure quantity of black liquor unloaded. Use independent verification, as appropriate, for proper valve alignment to prevent misdirection.
- Heat contents with direct steam injection or indirect heating coils to facilitate pumping off the soap. Alternatively, soap can be sluiced out with water or black liquor. Monitor

the temperature of the contents if heating with steam to prevent overheating / boilover.

- Align valves and pump/pressure off soap. Use independent verification as appropriate to prevent misdirection. Measure quantity of soap unloaded.
- Visually inspect container to make sure it is completely empty
- Close dome lid accessed by personnel access ramp or using adequate fall protection and secure all bolts.
- Close all valves, disconnect unloading hose, and re-install boot/belly cap.
- Install valve seals/car seals.
- Wash up area, hoses, and fittings with water.
- Remove wheel chocks, blue flag, and derailer.

Tank Truck Loading

- Don PPE (See the PPE Recommendations section below).
- Verify that the tank truck is empty or only has BLSS residue. If the tank truck isn't in dedicated BLSS service, ensure that a washout ticket is provided.
- Ensure the tank truck is not of aluminum construction. Refuse to load an aluminum tank truck due to chemical incompatibility with BLSS.
- Spot truck. Spotted area to have spill protection, not necessarily full containment.
- Chock wheels in both directions.
- Open dome lid while using adequate fall protection, such as a personnel access ramp or using a harness and lanyard attached to an approved anchor point.
- Load BLSS, ensuring adequate ventilation for displaced vapors. Take precautions for the potential presence of toxic TRS vapors. See the TRS Safety section, below.
- During the loading/unloading process, the tank truck must be attended by trained personnel or monitored by an approved monitoring system, e.g. video monitoring, level switch, etc.
- Close dome lid accessed by personnel access ramp and secure all bolts using star pattern.
- Install valve seals / car seals.
- Prepare shipping papers. Install placards if required.
- Wash up area, hose, and fittings with water.
- Remove wheel chocks.

Railcar Loading

- Don PPE (See the PPE Recommendations section below).
- Verify that the railcar is empty or only has BLSS residue. If the railcar isn't in dedicated BLSS service, ensure that a washout ticket is provided.
- Put a caution sign, commonly known as a blue flag, into place. If the car can be approached from either direction be sure to put up a sign at both ends.
- Prevent entry into the track by locking the switch and/or locking derailer.

- Check the hand brakes to make certain they have been applied. Do not assume that someone else has set them.
- Chock wheels in both directions
- Open dome lid while using adequate fall protection, such as a personnel access ramp or using a harness and lanyard attached to an approved anchor point.
- Load BLSS, ensuring adequate ventilation for displaced vapors. Take precautions for the potential presence of toxic TRS vapors. See the TRS Safety section below.
- During the loading/unloading process, the railcar must be attended by trained personnel or monitored by an approved monitoring system, e.g. video monitoring, level switch, etc.
- Close all valves and caps. Prepare shipping papers. Apply placards, if required.
- Close dome lid and secure all bolts using star pattern.
- Install valve seals / car seals.
- Wash up area, hose, and fittings with water.
- Remove wheel chocks, blue flag, and derailer.

PPE Recommendations

Safety glasses
Face shield when connecting and disconnecting hoses
Work gloves
Chemical gloves when connecting and disconnecting hoses
Long pants
Long sleeved shirt
Safety shoes

TRS Safety

As indicated in the Hazards section, black liquor soap skimmings may contain toxic total reduced sulfur (TRS) compounds including hydrogen sulfide (H_2S), methyl mercaptan, dimethyl sulfide and dimethyl disulfide in the vapor space. These may be present when a filled tank truck or railcar is opened or when displacement vapors exit a tank truck or railcar during loading. Always ensure that loading and unloading occur outside in a well ventilated area. Also, best practice is to use hydrogen sulfide monitors, either fixed area monitors or personal monitors.

Positive Displacement Pump Safety

A positive displacement pump has a progressive cavity to move the fluid. A positive displacement pump operated against closed discharge valves or a plugged pipeline continues to produce flow or pressure until the pressure in the discharge line is increased to the point of rupture, or the pump is severely damaged, or both. An internal or external pressure safety/relief valve must be provided with the pump, with the discharge of the relief valve routed back to the pump suction. Never depend on this safety device for normal operational purposes.

Positive displacement pumps will wear out quickly if they are operated dry, i.e. without fluid in the cavity. Provide automation, such as a flow switch, pressure switch, ammeter, etc. to ensure the pump stops when fluid is no longer being pumped.

Positive displacement pumps are typically operated at lower speeds than centrifugal pumps. To accomplish this, a gear reducer is often used to reduce the rotational speed from the motor to the pump. Therefore, never blow steam/air/nitrogen backwards through a positive displacement pump. Doing so will cause the positive displacement pump to rotate higher than designed, which in turn, will cause the gear reducer to rotate the motor and its coupling higher than design, potentially resulting in a catastrophic failure of the coupling or motor, or both.

DOT Classification of BLSS

This subject is one of much discussion. Black liquor soap skimmings can vary in its composition and hazard level based on variability in the source of the tree, pulping process, and the quality of its separation from black liquor. Although most BLSS is shipped as non-hazardous, it is the responsibility of each shipper to determine whether the corrosivity of their black liquor soap skimmings meets the definition of corrosivity (Class 8) per 49 CFR 173.136 and the packing group assignment criteria for corrosive (Class 8) materials in 49 CFR 173.137. DOT regulated BLSS is shipped under the following UN Numbers, and there may be others:

UN1719 - Caustic alkali liquids, n.o.s.
UN1760 - Corrosive liquids, n.o.s.
UN3266 - Corrosive liquid, basic, inorganic, n.o.s.