MSDS for Asphalt Flux

Restrictions/Concerns:

1. The asphalt flux needs to be **200 F (93 C)** to remain in a base liquid form.
2. The flash point of asphalt flux (when things automatically ignite) is **425 - 525 F (218 - 173 C).** However, fumes that come off the pressure relief valve can be combustible under this point. It is imperative that the atmosphere be monitored for LEL (lower explosive limit) and heating operations be established up-wind of the pressure relief valve. The auto-ignition temperature of asphalt flux is **640 F (338 C).**
3. The maximum pressure design for a low pressure rail car is **100 psi [690 kPa]** (with most transportation done at 25 psi [172 kPa]).
4. 50 HP boiler maximum; ideally a low pressure steam generator. These are low pressure vessels that would not be able to support a 100 HP boiler.
5. Limited entry points for product placement or agitation.
6. Liquid load lines appear to extend downwards and limit useability.
7. The hatch appears to be our only option, but it is centralized and a placement of chemical in the middle would have an ineffective clean radius without agitation.
8. Tank cars have a 9-10 foot diameter, 55 - 60 foot length, single access point at surface (manway entry).
9. Toxic gases/oxygen deficient environment while working at heights.
10. Pressure build up potential and need to regulate pressure.
11. Minimizing confined space entry for the worker in heats/toxic/fumed environment.
12. **Desire to minimize water usage/contamination.**
13. The asphalt flux is highly viscous and needs a lot of heat to remain mobile.
14. Standard steam coil heat additions are incredibly inefficient.
15. The process below assumes **22,000 gallons** of residual fluid to remove from each rail car.

Given restricted inputs/valves in the tank, we are forced to heat with steam until the asphalt flux begins to move (likely 175-190 F), then we have three options to induce mixing:

(1) a bottom fed bubbler which reduces us to stirring and the slow process of heating with steam coils,
(2) using steam in combination with a ‘suck and blow’ method whereby we load a truck from the bottom and discharge it back into the tank multiple times, or
(3) **the optimal solution, of using a hot oiler** to pull from the bottom and reinject into the top of the tank.

Option (3) will mix the entire tank by depositing hot fluid on top of the stationary asphalt flux so that the entire tank is rapidly warmed.

Proposed Solution (Step #1: Draining the car of 22,000 gallons of asphalt flux):

1. To minimize heat dissipation, 24-hour operations are required with steam. The rail car must be brought up to temperature such that the asphalt flux can be mobile enough to feed the hot oiler (~195 - 200 F or 90 - 93 C).

2. Tend to company HSE requirements regarding supplied air, fall arrest equipment, atmospheric monitoring and establish a drop zone radius for dropped products from the top of the rail car. Ensure all personal protective equipment is worn per Company policy. Ensure the atmosphere is continuously monitored for LEL with personal or stationary monitors.

3. Confirm the maximum treating temperature for cleaning the rail car [the internet searches suggest 300 F or 149 C]. Also confirm the maximum steam coil pressure of the rail car [typically 100 - 150 psi (or 690 – 1030 kPa)].

4. Bring the temperature of the rail car up to 175 - 195 F through conventional heating through the steam coils. The base fluid will need to be pumped before a hot oiler can be used. Continue steam operations while hot oiling.

5. Move in a hot oiler and place same upwind of the operation.

    1. Company policy and regulatory requirements would dictate placement and hose length from the rail car, with **165 feet (50 meters)** being a recommended minimum distance given a hot oiler is an ignition source.

6. Rig in a hot oiler such that it sucks from the bottom load line and discharges through a tee'd manifold consisting of a 2" side ball valve, swaged down to a 0.5" bushing and fitting system to accept a transfer pump with which to inject chemical.

    1. The through port side of the tee is to be connected to the top rail car liquid valve. This will essentially suck the asphalt flux, allow heating, allow chemical injection, and cycle it back into the rail car. This will bringing the overall temperature of the rail car asphalt flux up to temperature quicker, add agitation/mixing/chemical, and minimize water injection.

7. From the 90 degree tee, tie in a transfer pump capable of adding **3.0 gal/min [11 L/min]**. We are recommending **3 totes (792 gallons) of concentrated CG-100** for the original treatment (3% by volume). The chemical would be added over **6.5 hours** of hot oiler

heating. The volumes would be optimized as a function of performance and field observation.

FUEL LOGISTICS FOR THE HOT OILER: Given the propane limitation of 4.5 hours, the pump was upsized from 2.0 gallons/minute to 3.0 gallons per minute. We can revert back to a 2.0 gallon per minute pump if the hot oiler brings propane recharge pigs (be it 100 or 120 gallon capacity), or if a propane refueling truck is made available.

8. Confirm operation of the pressure relief valve and ensure it continues to vent throughout. The top manway hatch may be crack and held open with a 2x4 or 2x6 piece of wood to that pressure will not build and continuously vent to atmosphere.

9. Load the hot oiler's suction line with CG-100 (~27 gallons or 100 L assuming a 2" line). As the lines will serve as radiators, it is imperative to maintain heat application from the boiler on the line such the prime can be established from the bottom of the rail car. Also, maintain heat on the discharge line until circulation is established. Once circulation is established, the boiler can move to rail car #2. The hot oiler should not need to take on any product in its tank; rather serve as a circulating medium that draws, heats, and discharges flux back to the liquid valve on the top of rail car #1. The hot oiler is essentially serving as an over to suck asphalt flux from the rail car, 'bake' the asphalt flux and add heat, then discharge it back to the rail car in a closed loop manner. Maintaining and prime is paramount, with circulating rates progressively increasing as the viscosity is reduced.

10. Initiate chemical injection into the tee and initiate suction/discharge from the oil oiler.

11. Continue heating and circulation until the temperature of the rail car builds to **235 - 240 F [113 - 115 C].** This will assist with loading, two hours transportation to the refinery, and offloading. Once circulation is established and maintained, steam application can be diverted to rail car #2. The 'shoe polish' consistency must be preheated to a point (~195 F or 90 C) whereby it can flow before the hot oiler is redeployed to rail car #2.

    During the heating process, a hot oiler uses applied flame to cook the asphalt flux. The operator of the unit should be aware of the flash points **425 - 525 F (218 - 173 C) and the autoignition temperature (640 F or 338 C)** and confirm there is not open flame-asphalt flux contact to limit ignition of the product. Minor flame from liberated light ends can be expected. Continue to monito the pressure relief valve for vacating steam from the product and any liberated light ends.

    Should the pressure relief valve fail, pumping is to immediately stop. As a fail safe, the manway can be cracked before pumping and pried open with a 1" x 6" or 2" x 4" block of wood (and secured in place with straps) so that the system remains at atmospheric pressure.

12. Discontinue hot oiling, purge the asphalt flux from the load/discharge lines with a durometer pig suited for the diameter of the proved lines and chase with pig with 205-210 F (96 - 99 C) water [or, if the hot oiler operator is open to it, use pressurized steam to vacate the asphalt flux from the suction/discharge lines], and redeploy the lines to the next rail car. Continue adding steam to rail car #1 to assist with unloading (a second boiler is recommended to avoid losing the heat in the rail car). This way, once the product is removed for transport, tank cleaning (as itemized below in steps 1 - 8 can immediate commence).

13. Commence load out operations to the refinery. While accepting or discharging load product, ensure that transport trucks are grounded/bonded to limit ignition potential.

    With this highly viscous product, heat is essential. As soon as the temperature decreases below 200 F, be ready for the asphalt flux to redeposit on the inside of tanks and gum up pumps. All pumps should be thoroughly drained before moving product on the highway.

At this point the Operator has the ability to conduct manual clean or additional cleaning as so required.

1. Through the manway hatch, insert one of the following units [or equivalent]. We are awaiting a price from TJ Technologies [630-665-5983 X 1021] and Ryan Wolf [317-460-0012]). https://tankcleaningmachines.com/products/tank-cleaning/model-180?category=large, MODEL 360 Triple Nozzle — Cloud-Sellers. TANKMAN Tank Cleaning Machine — Cloud-Sellers. All units have a 40' cleaning radius (30' required), have a 40 gallon per minute minimum rate, and require manual rotation, so a hallow T-bar fabricated from Schedule 40 pipe, with pressure connector is required; along with a manway seal (which could be as simple as plywood with necessary slot cut outs).

2. Install a **4.5 gal/min [17.0 L/min]** transfer pump connected to the hotsie feed stock [or blend **one tote of CG-100** to 2,900 gallons (11.0 m3) of fresh water in a supply truck].

3. Activate the surface applied gamma jet through tie in to a hotsie pressure truck at a temperature of 185 - 195 F (85 - 90 C).

4. Pump at **40 - 50 GPM [150 - 190 L/min] over the course of an hour** while slowly rotating the jets from the top of the rail car at 360 degrees.

5. Discontinue the pumping treatment and close the manway, but do not lock it down this partial close is required to prevent pressure build up in the event of the pressure relief valve failing. Confirm the pressure relief valve is functioning.

6. Insert a steam discharge line into the liquid valve to aid with steam application while bubbling and heating the tank coils.

7. Return the boiler and hot oiler to service and cycle the water to **235 F [113 C].** Close and secure the manway while heating. This will apply a vapor phase/steam treatment. Once at temperature, discontinue hot oiler application and continue steaming. Allow the vapor phase to sit for a period of **two hours**.

8. Drain the rail car, haul washing effluent to disposal, and inspect for results.

Should there be residual volumes, manual tank cleaning crews can enter the tank under the protection of supplied air and treat the internals per conventional practise and their own rail car site operating procedures.

Please discuss with your field staff and advise of any critiques. There will undoubtedly be some operational concerns to address real time; the most serious being (1) establishing/maintaining prime until circulation is established, (2) vacating the lines of asphalt flux before advancing the hot oiler to the next rail car, (3) logistical supply of propane to keep the hot oiler firing, and (4) complications with cooling during transportation.

Prior to commencing this operation, safety risks of light end release, equipment positioning, heating with a hot oiler, and overall worker safety should be discussed and mitigated; with acceptance of risks and the agreed upon risk mitigation strategies being acknowledged and accepted by all on site staff and their management.