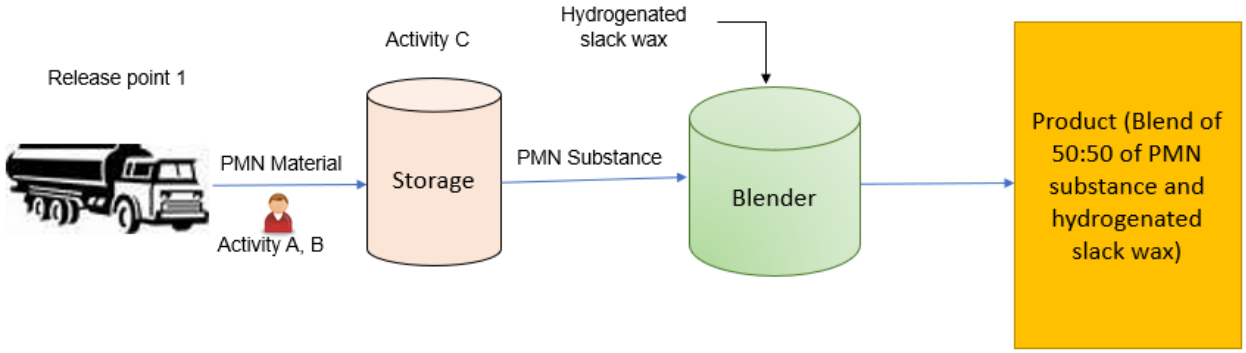
Process Description, Human Exposure, and Environmental Releases – Paraffin wax substitute for candles

Offsite Process Description

The PMN substance may be used as a feedstock in the manufacture of paraffin wax substitute for candles. It is likely blended with some paraffin wax such as hydrogenated slack wax in about a 50:50 ratio and formed into candles. No reaction occurs in this process; thus, this process doesn't chemically change the PMN substance to another compound. The final product (candles) would be wholly consumed in the combustion of the candles, which generates water vapor and carbon dioxide.

The following process flow diagram represents what Sasol believes the candle making process would be based on our experience with commercial linear and branched alcohols.



The PMN substance is shipped to the customer in tank trucks or rail cars and transferred to a storage tank. The PMN substance is transferred to the blending tank using an enclosed system of pumps and piping. It is mixed with other hydrogenated wax, e.g. slack wax to form candles. Even though the PMN substance remains in the candle, there is no human exposure or fugitive air emissions due to: 1.) the solid state; 2.) the high molecular weight; 3.) no volatility of the PMN substance. The final product (candles) would be wholly consumed in the combustion of the candles, which generates water vapor and carbon dioxide. There is the potential of particulate and soot generated, but it is not an exposure to the PMN substance. Thus, the human exposure and environmental releases are not taken into account though expected to be negligible.

Human Exposure and Environmental Releases

Tank truck unloading is typically done by one worker, usually the driver, and takes about an hour. The driver attaches the hoses between the truck and the tank and then begins unloading. Monitoring the unloading is usually done in the vicinity of the truck but with minimal vapor pressure. Due to minimal vapor pressure of the PMN substance worker (driver) and duration exposure is expected to be minimal. The driver should be wearing gloves and safety glasses during this time. Total exposure time with the PMN substance is typically only 15 minutes (hose attachment and detachment time).

Sasol experience with railcar unloading is that it is usually done by one person. A typical railcar (23,500-gallon capacity) unloads in about 3-4 hours. An employee will connect the hoses to the railcar for transfer and open a valve to allow air into the railcar as the PMN material is pump out. Exposure time is about 15-20 minutes. Sasol is seeing an increase in the use of hoses with connection valves which minimize leaks during attachment and detachment as well as decreasing exposure time. The loader monitors the transfer from the vicinity of the railcar but usually is at a minimal exposure risk during this time. When the loading is complete, the loader disconnects the hoses and closes up the railcar, again estimating 15 minutes exposure may occur.

Sasol assumes typical fugitive vapor emissions that occur during product storage are negligible. During short term storage, where the PMN material is made and transported to the blending facility, it could be stored at temperature, but the vessels are not open to the environment. Heating may occur in steam chambers. Long-term storage may occur in the form of pastilles.

Another possible human exposure potentially comes when the PMN is sampled by the purchaser. A sample may be taken while unloading the material at their site or after it has been placed in the storage tank. Either sampling method is done by one person and typically requires about 5-15 minutes. Not all purchases will be sampled because the Certificate of Analysis is provided for each shipment.

Tank levels may be taken about once a day, usually by sight glass for small tanks, or by level gauges. In this case there would be no human exposure. Less frequently, some tank levels are taken by a measuring rod. This type of tank gauging will have some human exposure to fugitive emissions when the tank is opened, probably 10-15 minutes for one person.

For the purposes of this PMN, total volumes of the PMN substance could be used for the maximum total production is 150,000 kg/year. Sasol has no specific information on the off-site tank cleaning our procedures. Sasol is not aware of customers doing tank cleaning on a routine basis. If cleaned, the smaller tanks can drain nearly all the material, leaving only a liquid film on the walls. Cleaning can be then done with detergent and water, with the resulting waste solution sent to wastewater treatment facility. Both the human exposure and fugitive emissions are expected to be minimal to none and there are negligible environmental releases.

Occupational exposure

Letter of activity	# of workers exposed	Duration of exposure (hrs/day)	Duration of exposure (days/year)	PPE/Engineering control, Physical form	% of new substance	% in formulation
(A) Sampling	1	0.25	8	Gloves, safety glasses, coveralls, liquid	100%	50%

(B) Unloading	1	0.5	2	Gloves, safety glasses, coveralls, liquid	100%	50%
(C) Tank Gauging	1	0.25	0.25	Gloves, safety glasses, coveralls, liquid	100%	50%
Cleaning tank truck/Rail Car	1	1	1	Gloves, safety glasses, coveralls, liquid	100%	<1%

Environmental releases

Release number	Media of release	Amount release	Control technology	Amount release of control technology
1- Cleaning tank truck/Rail Car	Waste water containing residual PMN	38 kg	Activated sludge unit	0.38 kg