

EMISSION CONTROL:

Control Methods for Vinyl Chloride

Some tips on how PPG handles sample collection and analyses of VCM, and on how it handles the tricky aspects of loading operations.

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Vinyl chloride monomer (VCM) is hazardous not only because it is highly flammable, but also because of its toxicological effect on human beings. Consequently, the design and operating procedures of our vinyl chloride facilities at Lake Charles, La., and Caribe, P.R., provide that the release and exposure of VCM to personnel be minimal. This article describes two procedures that we have adopted, which have contributed to improved VCM confinement and employee exposure control.

Sample collection and analyses

The first of these techniques involves sample collection and analyses. In our process, quality control sample collection is achieved from different points in the system by attaching the sample cylinder or bomb to a small fitting in a closed loop system, Figure 1. The sample bomb is installed vertically in the system with its stand leg fitting in the top position to prevent overfilling and bomb overpressurization. The bomb is equipped with a safety relief valve as further protection. To assure that the bomb is inserted properly, its fittings are of different sizes. The sample collection lines are small diameter stainless steel tubing. Valves are located as close as possible to the sample bomb connections to minimize the quantity of vinyl chloride in the tubing. Before the bomb is removed, the small amount of vinyl chloride trapped between the valves is released to a remote location, and the tubing between the valves is purged with nitrogen.

The storage of sample bombs within the main or plant laboratories is prohibited, and although these sample bombs were capped between use, a storage rack or cabinet similar to a gun rack is provided, Figure 2. All vinyl chloride bombs must be stored in the cabinet while not in use, and all analyses of samples must be accomplished within a laboratory hood. A flexible line is installed on the gas chromatograph back into the laboratory hood.

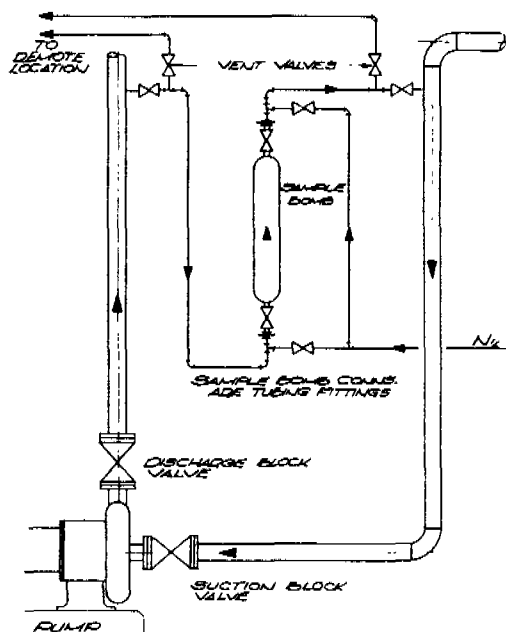


Figure 1. Sampling system.

After the analysis, there is from 600 to 700 ml. of vinyl chloride remaining in the bomb. The sample bombs are capped and returned to the plant where the bomb and its residual contents are inserted during the next sample collection round, returning the unused vinyl chloride to the process.

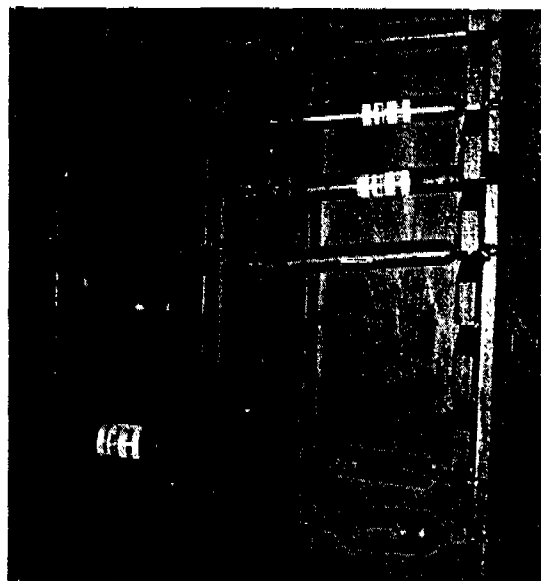


Figure 2. Storage rack for sample bombs.

The bomb valve integrity is checked periodically using a Century organic vapor analyzer. All laboratory hoods where vinyl chloride is used or analyzed have been checked for adequate capture velocity. A baffle has been installed across the front lip of the hood to prevent any vinyl chloride vapors, which are heavier than air, from exiting the hood. The levels of vinyl chloride are routinely monitored.

Loading operations

The second procedure involves loading operations for tank cars, tank trucks, barges, and ships. The potential problem areas are sampling, vehicle emissions, vehicle gauging, and loading line clearing. The oxygen content of empty transportation vehicles is determined prior to loading, and the oxygen analyzer is vented remotely so that personnel exposure is avoided. There are equalizing lines so that vehicle vapor content may be displaced during loading. See Figure 3 for tank car loading. The vapor space material is equalized with the storage tank from which the vehicle is being loaded.

There are a number of ways to determine when a tank car or tank truck is full. The vinyl chloride may be scale loaded (for trucks and cars), or a flow meter may be used. A magnetic level indicator is used by some producers. Special procedures are required so that personnel exposure may be avoided. Exposure may be prevented by using a flexible hose to connect the gauge rod to a bull's eye. Liquid can be observed in the bull's eye when the car is filled. The bull's eye must be vented remotely to an incinerator or tall stack, as shown in Figure 3.

The final problem of loading operations is the clearing of the loading hose so that the hose may be disconnected without allowing exposure. The liquid in the loading hose

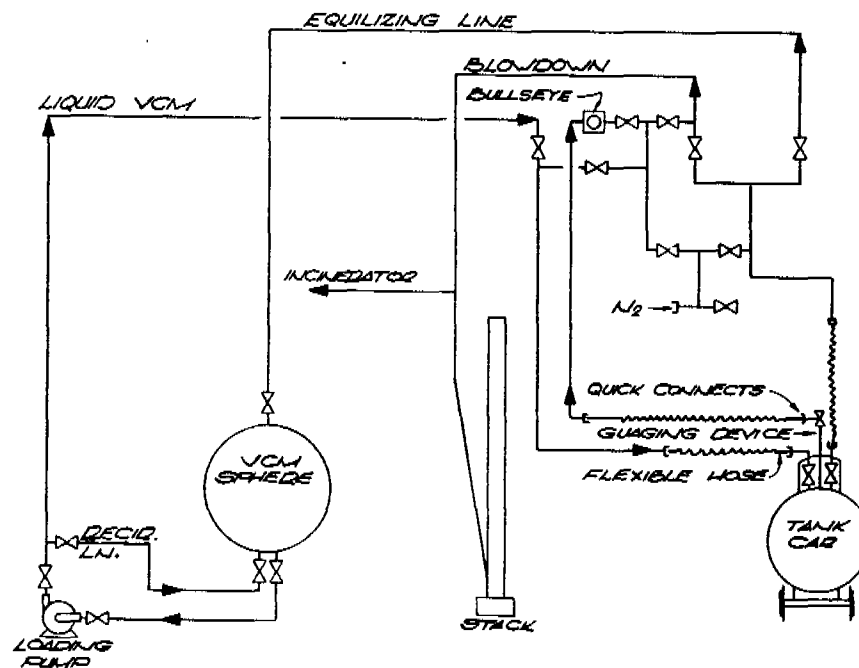


Figure 3. Piping diagram for tank car loading.

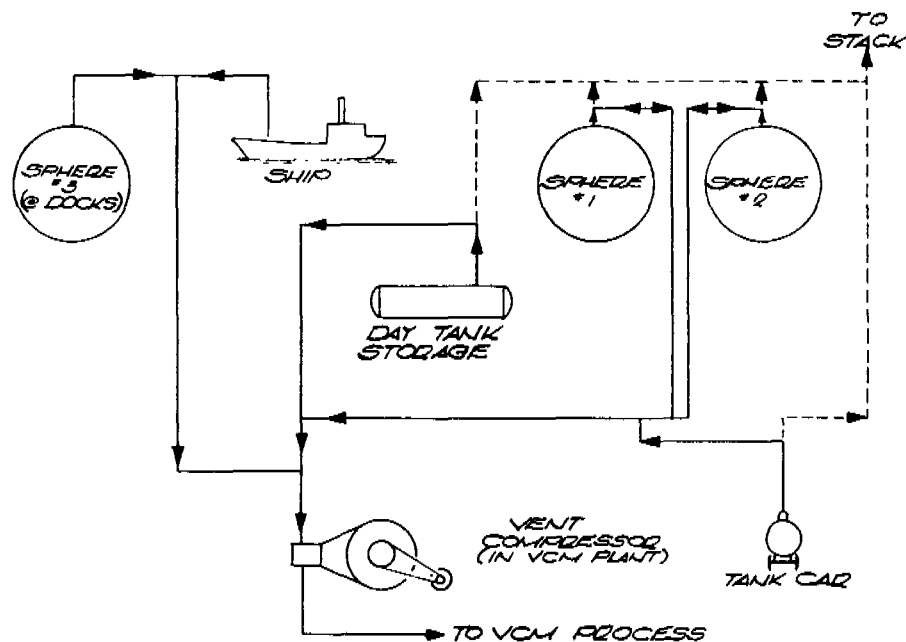


Figure 4. VCM storage vent recovery.

must be pushed (with nitrogen) into the transportation vehicle. The loading line is then nitrogen-purged to an incinerator or tall stack so that vinyl chloride vapors are removed before the hose is disconnected.

The displacement of inerts to the storage tank from transportation vehicles during loading operations will cause the storage tank pressure to be excessive, as the tank is refilled unless a recovery system is provided. If a refrigerated vent recovery system is used, some vinyl chloride must be vented to the atmosphere or to an incinerator. A viable alternative is to compress this stream and feed it to the plant process where the VCM is recovered and the inerts, normally nitrogen, accompany the byproduct HCl stream, Figure 4.

Clearing a filter

There are other procedures that may be followed so that equipment can be cleared for maintenance work, or made ready for service without exposing personnel to VCM. In order to do this, some high pressure nitrogen must be used and a sufficient amount of nitrogen must be available for purging. The procedure for clearing a filter for element replacement will provide an example of how most process equipment and piping may be cleared, Figure 5.

The first step is to push the filter liquid into the process piping with high pressure nitrogen. The filter is then blocked and the filter depressurized through a hose to a vent system. The final step is to continue a small nitrogen purge through the filter until VCM is removed. After the elements are removed and replaced, the filter is nitrogen purged to remove air and a leak check is made. The filter is then depressurized and filled with vinyl chloride. When the filter is completely filled, a nitrogen purge is used to clear all hoses to the vent system prior to disconnecting. #

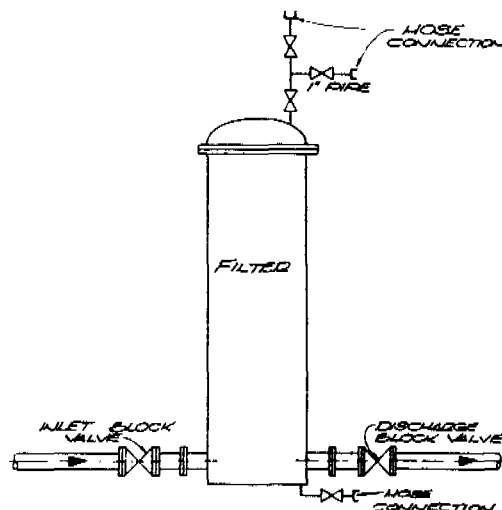


Figure 5. Connections for clearing filter.

