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Project Summary

Demonstration of Vapor Control Technology for Gasoline Loading of Barges

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The objective of the program was to demonstrate a safe cost-effective way to control gasoline vapors emitted during barge loading. Refrigeration, carbon adsorption, oil absorption, and incineration were reviewed in terms of their safety, economics, and performance. Two barge terminals were used as the design basis for extending their existing truck loading vapor control systems (oil absorption and incineration) to include the barge loading facilities. Although fabrication drawings were prepared for both terminals, the barge vapor collection system was installed only at the terminal using incineration. Arrangements were also made to lease a barge with vapor collection piping and add additional equipment to reduce the likelihood of barge explosion or overfill. However, before start-up of the demonstration, the program was curtailed. The system is still in place and could be considered for future field demonstrations.

This Project Summary was developed by EPA's Industrial Environmental Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Vapors emitted during the loading of gasoline into cars, trucks, and barges contribute to the formation of smog. Equipment is available which can control these vapors at truck loading facilities, as well as at larger gasoline retail outlets.

However, gasoline vapor emissions are not controlled at barge loading terminals because it has not been demonstrated that the more complex safety and design considerations have been adequately addressed.

This report discusses various vapor control technologies and their application to barge loading of gasoline. Two vapor control technologies were selected from the review: one, based on an oil absorption system, would recover the gasoline; and the other, based on incineration has lower installation and operation costs, but no recovery.

Two existing terminals were used as the design basis for projected demonstration of the two control technologies. Both terminals had existing vapor control systems at the truck loading area. One terminal had an installed oil sorption system, with an additional uninstalled scrubber; the other had an installed incinerator. Each vapor control system had enough excess capacity to handle the vapors from the barge loading facilities.

The terminal with the incineration system was selected as a demonstration site. The on-shore vapor collection system was connected to an existing incineration system with the corresponding safety and flow control equipment. A barge with vapor collection piping was leased. Equipment such as overflow alarms and flame arrestors were also purchased for installation on the barge to reduce the risk of overfill or explosion. Quality assurance and quality control plans were submitted to the EPA for approval. The QA/QC plan detailed the

sampling, data collection, and handling procedures.

Just before start-up, the program was curtailed.

During the study phase, 80 mg of hydrocarbons/L was considered the level achievable using reasonably available control technology (RACT). This standard was applied to bulk loading at gasoline truck terminals. Subsequently, EPA issued a new source performance standard (NSPS) of 35 mg/L. The actual emission level that may be chosen for barge loading will be based on performance and cost considerations, not necessarily the 80 (or more recently 35) mg/L standard used at truck loading. The 80 mg/L standard that existed at the time of the study was chosen only as a base line for cost and performance considerations and does not reflect EPA's attitude toward a standard for barge loading.

Conclusions

Of the vapor recovery systems, calculations showed that oil absorption was the most economical, followed by carbon adsorption and refrigeration. However, selection of a particular vapor control technique depends on site-specific conditions.

While calculations indicated a possible payback with a vapor recovery system, often the payback period is longer than the expected life of the recovery equipment.

Generally, users felt that vapor recovery systems at truck loading facilities are not significantly more economical than incineration because of their higher capital and operating costs.

Prior EPA reports cite 80 mg of hydrocarbon/L of gasoline loaded as the level achievable with reasonably available control technology (RACT) at truck loading. This is about a 90% control. Because of the lower efluent concentrations at barge loading, a 90% control level may be significantly below 80 mg/L. Existing vapor recovery systems can meet the 80 mg/L emission level. However, if the emission concentration is reduced significantly, major upgrading of the vapor recovery equipment may be necessary.

Incineration may be the lowest cost (equipment and operating) approach to vapor control, especially at smaller terminals. However, no payback is possible, and there are additional safety considerations.

For the two installations discussed here, passive safety equipment (e.g., pretested and/or approved flame arrestors) would provide an adequate level of safety. Because of the short vapor lines and prior testing of the flame arrestors, active safety systems (e.g., inerting, vapor saturation, and dilution) were not used since they did not improve the overall safety of the system. However, in some cases (e.g., long vapor lines), active safety systems should be strongly considered.

Equipping a barge with a vapor collection system when constructed is significantly less expensive than a later retrofit.

Because the terminal operator may not own or operate the barge, legal questions concerning safety and cost liability remain to be answered.

Recommendations

If the control of gasoline vapors at barge loading facilities is desired by the EPA, a field demonstration will be valuable for safety and economic analysis of an operational vapor collection and control system.

Vapor control systems were examined for two gasoline terminals: one used vapor recovery; the other, incineration. Demonstrations at both would aid in comparing the two vapor control technologies.

The actual benefits of a vapor recovery system are difficult to measure because of the small fractions of gasoline recovered compared to the volume transferred. Continuous monitoring of the influent and effluent hydrocarbon concentrations would help the user realize the possible payback advantages of a vapor recovery system. In any case, the use of continuous monitoring instruments on the exhaust of the vapor control units could be considered. The performance of the units is unknown, unless monitored more than occasionally.

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The complete report, entitled "Demonstration of Vapor Control Technology for Gasoline Loading of Barges," (Order No. PB 84-239 425; Cost: $10.00, subject to change) will be available only from:
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