

## F-500 Encapsulator Agent Neutralizes Hai An 16 After an Onboard Gasoline Explosion



### Overview

On September 21, 2017, a Vietnamese tanker ship exploded while loading gasoline in Hai Phong Harbor. There was one fatality and several injuries. At the time of the explosion the ship contained about 4 million liters of gasoline. The explosion was confined to the pump room, where the explosion occurred. The pump room and engine room, were submerged in about 30 feet of gasoline, up over the second level generators and estimated to be about 100,000 liters (26,400 gallons). Hai Phong Harbor immediately sequestered the ship in case of subsequent explosions, fire or fuel spills.

While anchored a half mile from port, the Fire Police of Vietnam directed the gasoline be pumped off the ship. This operation continued for eleven days. The gasoline, mixed with water, was pumped from the engine room, pump rooms, paint storage and pipelines. Most of the ship had alarming levels of fumes. After pumping, the ship was returned to port.



### The Solution

Authorities realized the number one priority was safely mitigating the gasoline vapors, and that foam was not an answer. The Fire Police of Vietnam invited Hazard Control Technologies (HCT) to provide a solution.

HCT recommended the use of a 3% solution of F-500 Encapsulator Agent applied with fire hoses. With F-500 EA, they would be prepared to extinguish fires and to encapsulate the gasoline and vapors in each area of the ship. This would encapsulate the remaining gasoline and vapors, rendering them nonflammable. Local authorities and the fire police agreed this solution would be the most feasible, safe and effective method to mitigate the hazards on the ship.

## Implementation

Operations began on October 26, 2017 and took five days (due to pumping encapsulated solution and venting). A technical expert from HCT- USA oversaw the operation as "Incident Commander," to advise on safety procedures and utilizing Encapsulator Agent Technology. Most of the time consisted of setting up the hoses, connectors, air monitoring, and later, pumping out the encapsulated gasoline and ventilating compartments.

The encapsulation process took about 16 hours to mitigate the engine room, storage tanks, pump room, four gasoline holding tanks and piping. The actual time on the hoses, spraying F-500 EA was only 5-6 hours. A 3% solution of F-500 EA was educted using two hose lines, two inline 125 gpm eductors and 125 gpm nozzles. Salt water was drafted from Hai Phong Harbor. The goal was to encapsulate the gasoline, removing the vapors from the ship so it could be inspected. Vapors were also encapsulated from the piping for inspection and subsequent repairs. To remove vapors from the pipes, they pumped encapsulated gasoline from the engine room through the pipes, emptying into previously cleaned storage tanks.

An "Encapsulator Agent" has amphipathic molecules with one end attracted to water and the other end attracted to hydrocarbons. In water, they form "micelles" that totally envelope the hydrocarbons into cocoons. The encapsulated micelles render the hydrocarbons nonflammable. Encapsulator Agents are now listed in NFPA 18A Section 7.7.

Chart 1 shows Lower Explosive Limit (LEL) readings, hydrogen sulfide (H<sub>2</sub>S) and carbon monoxide (CO) levels taken in the pump room during the five days the operation took place. The first three days were set-up and on October 29, the treatment with F-500 EA began. The application was completed on October 31 and the LELs, H<sub>2</sub>S and CO had already dropped dramatically. As the encapsulated gasoline solution was safely pumped out, all levels were down to zero. Similar readings were observed in the storage tanks, pump room and the four gas tanks.

To be sure, readings were taken over the following week after the vapors were removed. A final walk-through confirmed the hazard was completely mitigated and the ship was safe for repair crews to board.

## Summary

Since they couldn't find a solution to safely remove the gasoline and vapors in Vietnam, the ship owner estimated cleaning the ship would take 2-3 months and cost more than one million dollars. HCT and HCT Vietnam removed the gasoline and vapors in 5 days, with 16 hours for actual encapsulation. 6,080 liters (1,606 gallons) of F-500 EA were used to encapsulate the estimated 100,000 liters of gasoline. The entire project cost a fraction of the estimates, with only a portion of the cost attributable to Encapsulator Agent.

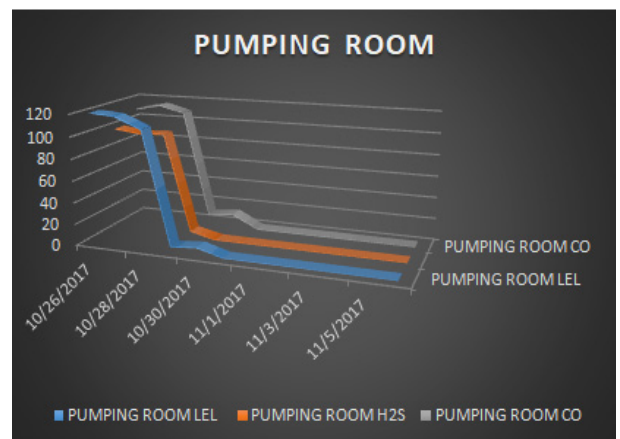


Hoses and Connectors are set up to educt F-500 EA



The Team of HCT EEUU and HCT Vietnam with the Authorities of the Fire Police of Vietnam

Chart 1



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