VISCOUS OIL PUMPING TECHNOLOGY AND SHIP SALVAGE;

Preliminary Results from the (JVOPS) Workshop in Houma, Louisiana USA
Recent Case Histories of Oil Removal Technology used in Submerged Ship Salvage

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1: Preliminary test results from the Joint Viscous Oil Pumping System (JVOPS) Test and Workshop conducted at the CENAC Barge Co. facility in Houma Louisiana December 2003

2: Recent case histories of oil removal technology used in submerged ship salvage. Pumping Technology with regards to oil removal from sunken ships. Based on personal case histories of:

- Cleveco Barge – Lake Erie, USA 1996
- Yuil NO. 1 - Korea - 1998
- USS Jacob Luckenbach - California- 2002
- USNS Mississinewa Ulithi Atoll,- Micronesia- 2003

1. JVOPS Preliminary Test Results

The Joint Viscous Oil Pumping System (JVOPS) Workshop/Test was conducted at the CENAC Towing Co. shore facility in Houma, Louisiana in December of 2003. More than 100 representatives attended this full scale, highly successful, multinational effort from government and industry. The project was primarily co-developed and sponsored by the US Coast Guard and Canadian Coast Guard with funding and assistance by numerous industry participants including USN SUPSALV who donated time, equipment and personnel or provided direct financial support for the project. The test plan was written by flemingCo of Denmark. Test planning and execution was coordinated by a core group of individuals from US Coast Guard Headquarters, Hyde Marine, USCG District 8, Canadian Coast Guard Maritimes, SAIC Canada, and the USN ESSM Contractor GPC. Test results and lessons learned from this workshop have already begun to assist project sponsors with their ability to use their existing equipment inventories successfully.
The major test objectives that were successfully completed are listed here:

- Two high viscosity distance limits were accomplished…The distance limit target of 457 meters (1500 feet) was reached pumping Canadian Tarsand bitumen oil in the range of 200,000 cSt., as well as a distance of 152 meters (500 feet) pumping chilled 500,000 cSt bitumen oil.
- New AWI flange design comparison tests were conducted.
- Hot vs. Cold water injection techniques into AWIF's at Inlet and Outlet.
- Quantitative as well as qualitative AWI tests were conducted to determine the optimum AWI techniques.
- The effect of local bulk heating (heating oil at pump inlet only) on water injection effectiveness was determined.

?? The effectiveness of trying to re-establish a flow rate in a long hose run after a period of extended system shut down was tested was determined.

2 Recent Case Histories of Oil Removal Technology use in Submerged Ship Salvage Operations

Cleveco Barge Lake Erie, USA 1996
Performed by Global Diving-Donjon Marine Salvage and PCCI

The *Cleveco Barge* oil recovery project was conducted during summer time conditions on Lake Erie USA. The oil was heavy number 6 oil (Bunker C). The bottom temperature was (9?) Celsius. A barge that had overturned and sank in a storm many years before had been leaking for some time and the USCG needed to have the oil off-loaded. The operation took the skill of salvage teams and pumping teams and utilized a 'hot tap' system and pumps that were '70's technology. The use of large hydraulically operated tapping machines is cumbersome and outdated for many projects today. The pumps used were large centrifugal pumps weighing 135 Kg. Max off loading rates was in the range of 15 gpm (.06 M^3/hr).
The lecture will include one or two slides and will discuss the assets utilized in this recovery as compared to some later discussed later on in the lecture.

Yuil. No. 1 Pusan Korea 1998 Operation performed by; Framo and the Korean Pollution Federation, Smit Salvage, Equipment on loan from USN SUPSALV

The *Yuil. No. 1* and a second vessel the *Osung No. 1*. were barges that sank off the coast of Pusan Korea. Both were loaded with heavy bunker oil. A new diver-less Remote Operated Vehicle driven pumping device was used to drill, tap and off-load the oil from these two vessels. The system used a combination of injected steam and heavy duty, heavy oil rated centrifugal pumps. *The lecture will discuss the lessons learned from that project with respect to heavy oil pumping. One or two slides will be used.*

Jacob Luckenbach 2003 Salvage operation performed by Titan Maritime LLD, Global Diving and Salvage, PCCI Inc.

At 0440 on July 14th, 1953, the C3 Cargo/Oil Carrier *SS Jacob Luckenbach* was struck by the *SS Hawaiian Pilot* about 31 km (17 miles) west of the Golden Gate Bridge, San Francisco, CA. The Luckenbach sank with no loss of life, but sustained massive structural damage from the collision, which caused the sinking. The Luckenbach was bound for Korea via Japan and was carrying a cargo of military vehicle and railroad parts. She was also topped off with heavy # 6 residual oil in deep and double bottom tanks.

Problems encountered included extended cold-water saturation diving at depths to 55 m, strong reversing currents, extremely adverse weather, and poor sub sea visibility. The heavy residual oils in the deep tanks and double bottoms also proved to be a pumping challenge, since some tanks contained oil that was far more viscous than normal #6 fuel oil. With viscosities of well over 200K cSt at 6? C, the tanks had to be hot-tapped and heated to more than 78?C with special steam lances and 'purpose-built' heat exchangers. This was necessary in order to bring the oil to a liquidity level that would allow adequate migration to the pump suctions at the side shell of the vessel. Annular

Water Injection (AWI) techniques were used to cool the pumps and lubricate the internal periphery of the discharge hoses in order to pump the oil to the surface.
At the completion of the project, more than 460 metric tons of heavy fuel oil and emulsified water-in-oil product were off-loaded, thus mitigating the potential for catastrophic oil release from the leaking tanks of the vessel. *The lecture will touch on the tools used to find and recover the oil and to minimize leaks in the wreck. Two or three slides will be used.*

USS Mississinewa AO59 2002/2003 - US Navy- GPC/PCCI- Global-Seacor Marine (Asia)-IRC Corp
The *Mississinewa* was sunk by a Japanese manned torpedo, a *"Kaiten"* on 20 November 1944. She was carrying a full load of Navy Special Fuel Oil (NSFO), diesel fuel and a small amount of aviation fuel.

In February 2003 a joint US Navy team consisting of fleet units, SUPSALV (ESSM/GPC) and contractor personnel removed approximately 2 million gallons of light black oil from the leaking World War II oiler *USS Mississinewa*. She was located in 40 meters (130 feet) of water in the Ulithi Atoll, Yap Federated States of Micronesia. The significance of this operation is the level of detail planning that took place and the resultant operation was successfully conducted with very little leakage, or spilled oil during the recovery. *The lecture will briefly describe the equipment and methods used to recover this oil. Several slides will be used.*