

B. PATERSON
G. COMFORT
M. PUNT
FLEET TECHNOLOGY LTD.
FLEET TECHNOLOGY LTD.
ENVIRONMENT CANADA

ABSTRACT

A high pressure waterjet barrier is a concept that has shown promise as a means for oil spill containment in cases where a high water current is present, such as in rivers or tidal estuaries. A number of projects have been conducted over the past decade to develop a system of this type for field use. As the barrier's performance has been limited significantly by its flotation system during past deployments, recent work has been directed toward an improved low drag flotation system. This work included a review of the past performance of the barrier and a redesign of the barrier's general arrangement and flotation system. Towing tank tests were performed using full scale models of two alternative float designs. The current-induced drag of these floats was significantly reduced, to 30% and 60% of the original disc floats. A prototype system with boom arms 12m (40 ft.) long was constructed and a preliminary deployment took place in the St. Lawrence River at Prescott, Ontario during August 1991. A comprehensive series of deployments has been planned for the summer of 1992 at the same location.

BACKGROUND AND OBJECTIVES

Currently available oil containment booms are unable to function effectively at sites where the water current exceeds about 0.5 m/s (1 knot) and/or the wave conditions exceed about Sea State 3. There is a need to contain oil spilled in higher currents and sea states such as may occur in rivers and harbours. In recognition of this need a series of projects have been sponsored by Environment Canada and the U.S. Minerals Management Service (MMS) to develop a high pressure waterjet barrier for oil spill containment. Laboratory tank tests (Meikle, 1983; Meikle et al., 1985; Hebron, 1985; Phillips et al., 1987; and Lapierre et al., 1987) and trial field deployments (Lapierre, 1985; Punt, 1990) have been conducted. These tests have shown that the waterjet barrier has promise as a means for oil spill containment in high current or more severe wave situations.

However during past deployments the performance of the waterjet barrier has been limited by the effectiveness of its flotation system. As a result, Fleet Technology Limited (FTL) was contracted by Environment Canada and the U.S. Minerals Management Service to redesign the flotation system and to produce a prototype for testing (Comfort and Paterson, 1991). The objective of this work was to produce a flotation system that would improve the manoeuvrability, directional control, and the stability of the waterjet barrier in the presence of high velocity water current.

REVIEW OF EXISTING SYSTEM AND PROBLEMS DURING PAST DEPLOYMENTS

Conceptually, the waterjet barrier consists of a large capacity, high-pressure pump connected to a series of nozzles that are elevated above the water surface and which are arranged to produce a horizontal spray pattern that opposes the spread of the oil on the water surface.

The "original" (i.e. pre-1991) system used flexible hydraulic hoses to feed water to the nozzles; disc-shaped floats supported the nozzles and the hoses. There was no rigid structure joining individual floats or nozzles. The waterjet barrier has been deployed in two general configurations:

- a) In two arms as a "Vee", which confines the oil at the apex of the "Vee" (see Figure 1 and Plate 1); and: