

**REMOTE OPERATED VEHICLE (ROV) DESIGN, CAVERN SURVEY  
AND GEL PLUGGING AGENT APPLICATION  
TO REPAIR LOUISIANA OFFSHORE OIL PORT (LOOP) CAVERN 14**

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**Abstract**

A remote operated vehicle (ROV) was developed in 1997 to apply an aqueous polymer gel sealing agent to a cavern wall. The ROV was designed to enter the cavern through a 24 inch (610 mm) I.D. vertical casing and operate in saturated salt brine at depths to 2800 feet (850 meters). Poor visibility forced the design to use sonar for navigation and a clear water cone / color video to verify gel application. A swinging keel maximized gel nozzle separation from the thrusters. Auto-pilot features and high-power thrusters ensured near-wall extrusion of partially crosslinked gel. The 1,100 meter umbilical cable included fiber optics to provide quality video and audio to the surface without interference from digital control signals.

The ROV was field deployed during March - April 1998. Cavern geometry as determined by video recordings of the color video camera and color sonar screens proved to be more complex than shown by conventional wireline-based sonar. Color camera video through the clear water cone clarified high resolution sonar images. Material samples brought up on the ROV supported the anomaly development and model for brine loss. Equipment problems prevented a complete cavern repair but provided items to address for increased reliability and contingency operations. The ROV applied 600 bbls of gel (less than 10% of the planned volume) in a cumulative 24 hours over 16 days. A 30% reduction in cavern leak rate was obtained, proving the validity of the project concept.