TEDDER'S TECHNICAL FACTS

Winter 2007 Page 1

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Hampton Tedder Electric

Rides High Seas to Repair Submerged Cable and Restore Power at "Platform Hillhouse"

Over the past 50 years, Hampton Tedder Electric (HTE) has successfully accomplished unusual repairs in many places including Platform Hillhouse, located seven miles off of Santa Barbara's coast. **HTE is very familiar with the Hillhouse oil rig since it has made repairs on it many times.** Right after New Year's Day in 2005, Jerry Penny at PXP/Arguello Inc. called us asking HTE's help. The entire platform had lost power. **We knew that the rig was powered with an aging 1970s vintage submarine cable** and suspected a dead short between the shore and the rig.

HTE made an immediate assessment visit to the site. Shore-side substation inspection revealed no problems. That switch was opened and everyone boarded a boat out to Hillhouse. Inspection of its incoming cable found everything in order out there too, so that switch was opened and cable testing began. A dead short revealed itself somewhere along the almost 37,000' cable which lies in depths reaching up to hundreds of feet under the Pacific Ocean. We used a time-domain reflectometer (TDR) to determine that the short was located about 13,000' out. See box at right for TDR details. A similar test performed out at the rig indicated a fault about 24,000' out from the rig. These footages totaled to the 37,000'

A **time-domain reflectometer** (TDR) transmits a fast rise time pulse along the tested conductor. If the conductor is of uniform impedance (resistance) and properly terminated, the entire transmitted pulse will be absorbed in the far-end termination and no signal will be reflected back to the TDR. But where impedance irregularities exist, each irregularity creates an echo that is reflected back to the TDR. Increased impedance creates reinforced echoes of the original pulse and decreased impedance creates opposed echoes of the original pulse. The resulting reflected pulses can be plotted as a time function and read as a function of cable length. This permits a position of increased or decreased impedance to be pinpointed, locating the irregularity in the cable.

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cable length so we knew we were close on location. **"In the end, we were able to pinpoint the fault within 10' of its location along the 7-mile cable,"** reported Jim Brenton, VP, HTE.

It took a couple of weeks to procure a two-man sub. The sub followed the cable along the ocean bottom to where we expected to find the fault, but lost sight of the cable after arriving at 13,000' out. HTE "thumped" the cable from the shore to help the sub locate both the cable and the fault. (Cable thumping is the sudden application of dc voltage from a large capacitor, which causes transients and voltage doubling at the end of the open cable, to locate a fault)

As HTE thumped the cable the men in the sub, which was at a depth of nearly 300,' reported that mud began to stir with bubbles rising and electrical arcing. The fault's exact location had been found. A marker was secured to the cable at the fault and sent on a line up to the surface for ease of relocation.

About three weeks later and after resolving environmental issues, the way finally cleared for the repair so a five-man HTE crew, the two-man sub, and a 200' barge with a crane all met at the jobsite and motored out to find the marker.

Cable secured to barge for repair.

The surface marker we'd left enabled us to easily relocate the fault. The sub followed the line down as a hoist was lowered into the water by a crane off the barge. After thumping the cable again to make certain we had the correct spot, we secured the cable 20' on each side of the break with fiber belts to minimize possibility of damage. The 4/0, 15kV, 220mil, interlocked armor-clad cable was slowly hoisted to the surface under the sub's supervision.

Cable similar to that HTE repaired.

Once on the barge, an 80' section was cut out of the cable (40' on each side of the fault) and a new 80' length was spliced in. Each splice took about 20 hours. This required peeling armor back, breaking everything out, and splicing each of three conductors. After splicing, we placed a heat shrink jacket over all three splices and placed the conductors into a 6' cast iron housing. The housing was filled with resin, tested as it cured, and bolted closed. We repeated the procedure on the other side. While there, we performed routine switchgear and transformer maintenance too. The cable repair proved successful and "Hillhouse" rides the high seas again, bringing that black liquid gold to shore.

This submarine cable repair exemplifies how Hampton Tedder brings value-added specialty services to its clients. Whether you need high voltage contracting services or NETA Certified testing, we provide super-quick emergency response, are always happy to help, and are only a phone call away at 909-628-1253. Please visit our website to explore our capabilities, contact us for a line card, or ask for our Qualifications Summary.

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