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## **New Electro-Mechanical Perforating Technology Reduces Cost and Increases Safety in Workover Operations**

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### **Abstract**

Saudi Arabia wells, onshore and offshore, often require workovers as a result of the corrosive environment to which the downhole equipment is subjected. When the workover jobs required a single hole to be punched in “soft” tubing using traditional methods, high failure rates and inherent delays in mobilizing explosives often severely compromised job economics.

This paper presents several case histories in which a new slickline-deployed electro-mechanical tubing punch was used for the first time worldwide. Although the workover requirements in each well were different, and the jobs were conducted in both onshore and offshore environments, all required a single hole to be drilled.

The case histories will discuss the advantages provided to the operator through use of the new electro-mechanical tubing punch. These included:

- 100% perforating reliability
- Reduced rig time by eliminating mobilization of explosives and other equipment, if failures occurred.
- Reduced costs, since electro-mechanical perforating is more cost effective than electric-line “soft-shot” methods
- Applicability to deployment on slickline, E-line, or coiled tubing
- Simplicity in use of the electro-mechanical perforator
- Enhanced personnel and environmental safety from:
  - a. Elimination of explosives
  - b. Use of alkaline or lithium batteries
  - c. Use of mono-conductor line
  - d. Use of CTU pressure-switch adapter

The new method was 100% successful and resolved the problems experienced with all previously used conventional mechanical perforating methods. Although run in highly corrosive downhole conditions, the perforating tool had 100% success in perforating the “soft” tubing. A thorough follow-up inspection of the tool showed that it had sustained no damage of any kind.

An in-depth discussion concerning the electro-mechanical perforator design, its application in Saudi Aramco wells, its operational advantages, and its significant impact on safety and economics will be presented.

### **Introduction**

Improved well completion methods in Saudi Aramco have enabled safe, efficient, and economical production from oil and gas wells. However, as the fields matured, the wells often required workovers due to several factors, which included:

- Corrosion
- Reduced production
- Need for conversion to water injector wells
- Sidetracks
- Integrity of the well head
- Increased safety concerns.

Once a well completion had been designated as a candidate for a workover, the first step for Aramco was to determine a safe, economical procedure to successfully perform the workover.