

## SURFACE SHOT INDICATOR

### APPLICATION

The objective of any surface shot detection system is to provide a record of the positive firing of the TCP gun string. Various devices, from crude blow-hoses to sophisticated multi-sensor packages share this aim. In many operations, classic gun firing indicators such as tubing vibration, pressure pulses and fluid flow may not be of high enough magnitude for reliable manual detection. Analysis of a record from different sensors of the sequence of events can help decide whether the operation has been successful. It is helpful if the entire sequence, from bar being dropped to guns firing (and possibly certain last shot devices being actuated) is recorded and presented in graphical form to aid analysis, both in real time and after the event.

### OPERATION

The shot detection device will typically consist of one or more sensors, relying on different principles, sending their output to a recording and plotting unit. Accelerometers are commonly clamped positively to the tubing to record movement and vibration. Hydrophones and pressure gauges can monitor pressure variations in the tubing and/or annulus, but hydrophones need liquid to surface for reliable operation, and appropriate couplings to wellhead equipment are necessary. Outputs are recorded on to magnetic media and presented on strip recorders, p.c. screens or other suitable devices. Audio outputs are possible as a further diagnostic aid. Whatever system is used, it is important that it be set up and tested well in advance of the actual TCP operation. It should be emphasised that wells with large ratholes, high deviations and non liquid filled tubing will attenuate the effects of TCP guns firing as seen at surface.

