TECHNOLOGY RELEASED FOR COMMERCIAL BENEFIT
2009

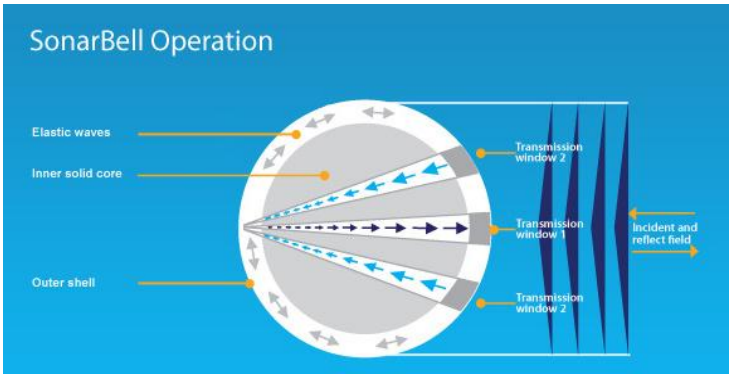
~~SECRET~~
ROYAL NAVY EYES ONLY

The Technology

Every year the UK MOD releases new technologies that have obvious commercial benefits which are spin-offs from the original military application. For many decades the UK MOD has been interested in sonar technology. One avenue of research in this area has led to the development of a new commercial product called the SonarBell. SonarBell is in effect the underwater sonar equivalent of the “Cats-eye” commonly seen on UK roads.

Each SonarBell is tuned via the mix of material densities and thicknesses chosen to provide a peak sonar response at a pre-determined frequency. The result is an echo that is easily identified at distances up to 2km, it also has applications in location and protection of burried assets.

The SonarBell is completely passive and requires no power or maintenance.

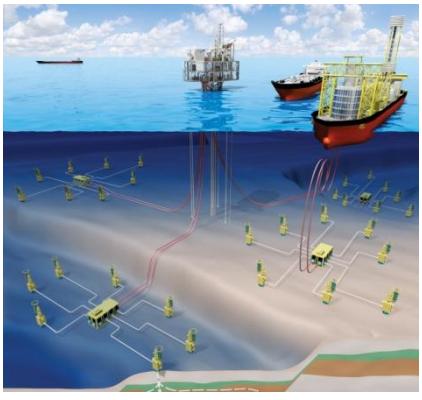


Ranging in size from 50 to 300mm in diameter, the SonarBell can be deployed on any subsea feature, natural or artificial to provide positional information.

SonarBell is omni-directional; it gives the same recognisable response from any angle and is uniquely identifiable as man-made.

Potential Applications

The bottom of the ocean can be crowded and hazardous, particularly around oilfield infrastructure. In large active facilities there is a constant risk from misplaced anchors, jack-up legs or other assets coming into contact with pipelines or other seabed infrastructure.



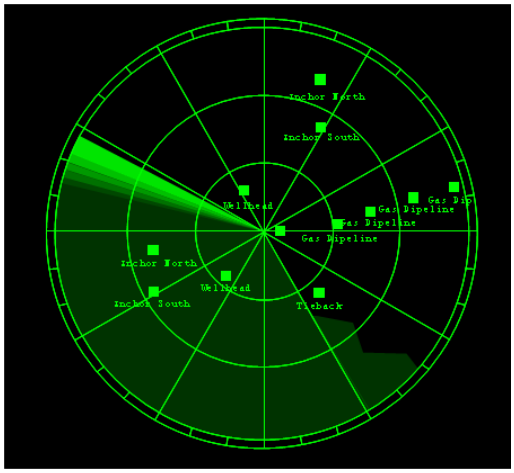
Although infrequent, the costs of such incidents in terms of shut-in production, technical assessments and repairs are usually very high.

By marking safe anchor points and jack-up locations at offshore facilities with Sonarbells, boat and lift vessel operators and drilling rig crews can use commercial sonar to safely avoid the expensive infrastructure on the seabed.

“Statistics show that whilst marine traffic damage accounts for only 14% of pipeline failures (most are corrosion), it accounts for 95% of the resultant pollution”.

Utilising the unique frequency identification allows key submarine facilities such as Wellheads, Tie-backs, Pipelines, and Processing facilities to be clearly identified for dive and ROV operations, allowing faster and cheaper intervention.

SonarBell deployed to mark critical subsea infrastructure



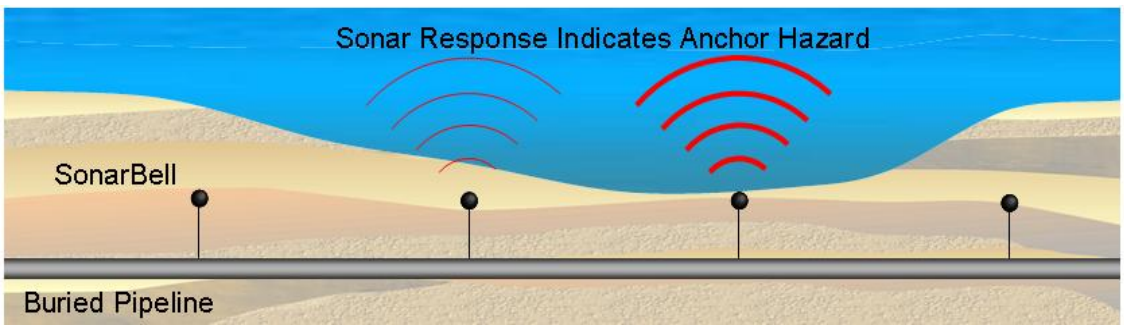
Future ?, Sonar Trace identifying key subsea features

"Of the 20,000 miles of pipeline in the waters of the U.S. outer continental shelf (OCS) there is a leak or other reportable failure about once every five days*".

It is not surprising, given geographical conditions, the density and age of pipelines and heavy marine traffic, that the US suffers many incidents involving accidental contact with oil and more worryingly gas pipelines. The Gulf shoreline is constantly shifting, rapid shoreline erosion and frequent severe storms may expose pipelines that were originally safely buried in areas where both pipelines and vessel traffic are most concentrated.

During the late 1980s, in two notorious incidents, 13 lives were lost when fishing vessels struck gas pipelines that had become partially uncovered. These incidents precipitated what is now a legal requirement in the US to ensure buried depth of working pipelines is constantly maintained.

SonarBell has the potential to not only indicate the location of pipes, cables and other infrastructure (where on the surface or buried), but to also flag to commercial vessels where safe anchor depth has been compromised by scour or erosion and buried infrastructure is no longer safely covered.



* There are believed to be over 83,000 miles of subsea pipeline globally, failure data is not available for many location but the fundamental issues are expected to be similar.

Historical Incidents

	Number of incidents	Resultant Pollution
Corrosion	50%	2%
Unknown	25%	1%
Maritime activities	14%	95%
Natural forces	12%	2%

Maritime activities	Number of incidents	Resultant Pollution bbls	
Anchor damage	61%	95%	230,357
Other	22%	0%	157
Trawls, nets	15%	2%	4,504
Vessel grounding	2%	3%	6,330

Pollution from OCS marine pipelines, by reported cause of failures. 1967-90

Typical examples of the risks and consequences around offshore facilities

Equilon Pipeline Company LLC (on Seashell Pipeline right-of-way): Failure Report, July 23, 1999 - A jack-up barge was hired to set a quarters building on Platform A. While setting its legs on the seafloor, it is believed the barge set its legs on the Cougar pipeline and damaged it.

Equilon Pipeline Company LLC: Failure Report, January 21, 2000 - The anchor of drilling rig that was being towed dragged the pipeline along the seafloor 650 feet from its original location. The pipeline ruptured and tore at the girth welds on the riser. The riser was also torn from the riser clamps.

BP Magnus Facilities: Failure Report, May 2001 - On 8 May hydraulic communication to South Magnus Well F10 was lost resulting in the loss of injection to F10. A decision was made to shut in it sister producer, F9. ROV inspection revealed trawler damage to the wellhead. Repairs were completed and the wells were back on line on 14 May. On the afternoon of 15 May hydraulic and electrical communication to Wells F9 and F10 were lost. A DSV arrived that evening and found extensive damage around the F9 wellhead. South Magnus is expected to be off-line for 2 to 3 months.

StatoilHydro pipeline connecting Kvitebjørn and Visund fields to Kollsnes near Bergen: Taken from Press Release 12 July 2007 – StatoilHydro has inspected and carried out a technical evaluation after an inspection in October showed that the pipeline had shifted out of position and sustained external damage. It is likely that a ship's anchor has moved and damaged it. A planned shut down in Kvitebjørn has been extended and Gas export from Visund has also been shut down during inspection work. StatoilHydro has concluded that a repair of the line is necessary. Work is underway to find the best possible solution and timing for fixing the damage. Consequences for StatoilHydro's production are described in a separate stock exchange announcement on forecasts for 2008.

Some of the fatalities near shore

The *Sea Chief* accident. In July 1987, while working in shallow coastal waters off Louisiana, the menhaden purse seiner *Sea Chief* struck and ruptured an 8-inch natural gas liquids pipeline operating at 480 psi. The resulting explosion killed two crew members. Divers investigating found that the pipe, installed in 1968, was covered with only 6 inches of soft mud, having lost its original 3-foot cover of sediments (Joint Task Force on Offshore Pipelines, 1990).

The *Northumberland* accident. October 1989 saw a strikingly similar accident, with even greater consequences. The menhaden vessel *Northumberland* struck a 16-inch gas pipeline in shallow water near Sabine Pass, Texas. The vessel was engulfed in flames; 11 of the 14 crew members died. The pipeline, installed in 1974 with 8 to 10 feet of cover, was found to be lying on the bottom, with no cover at all (National Transportation Safety Board, 1990).

"The most significant pipeline failures, are those that result from damage by vessels and their gear. Impacts of anchors, nets, trawl boards, and hulls of cargo, fishing, and offshore service vessels and mobile drilling rigs can lead to major pollution incidents, costly repairs and replacements, and even injuries and deaths."

"No available sensor technology allows moving vessels to detect pipelines at a distance in time to avoid them."

Committee on the Safety of Marine Pipelines
National Research Council, Washington, D.C.1994

Next Steps

SALT welcomes discussions with any interested parties, especially owners and operators that might wish to participate in trials of this military proven technology.