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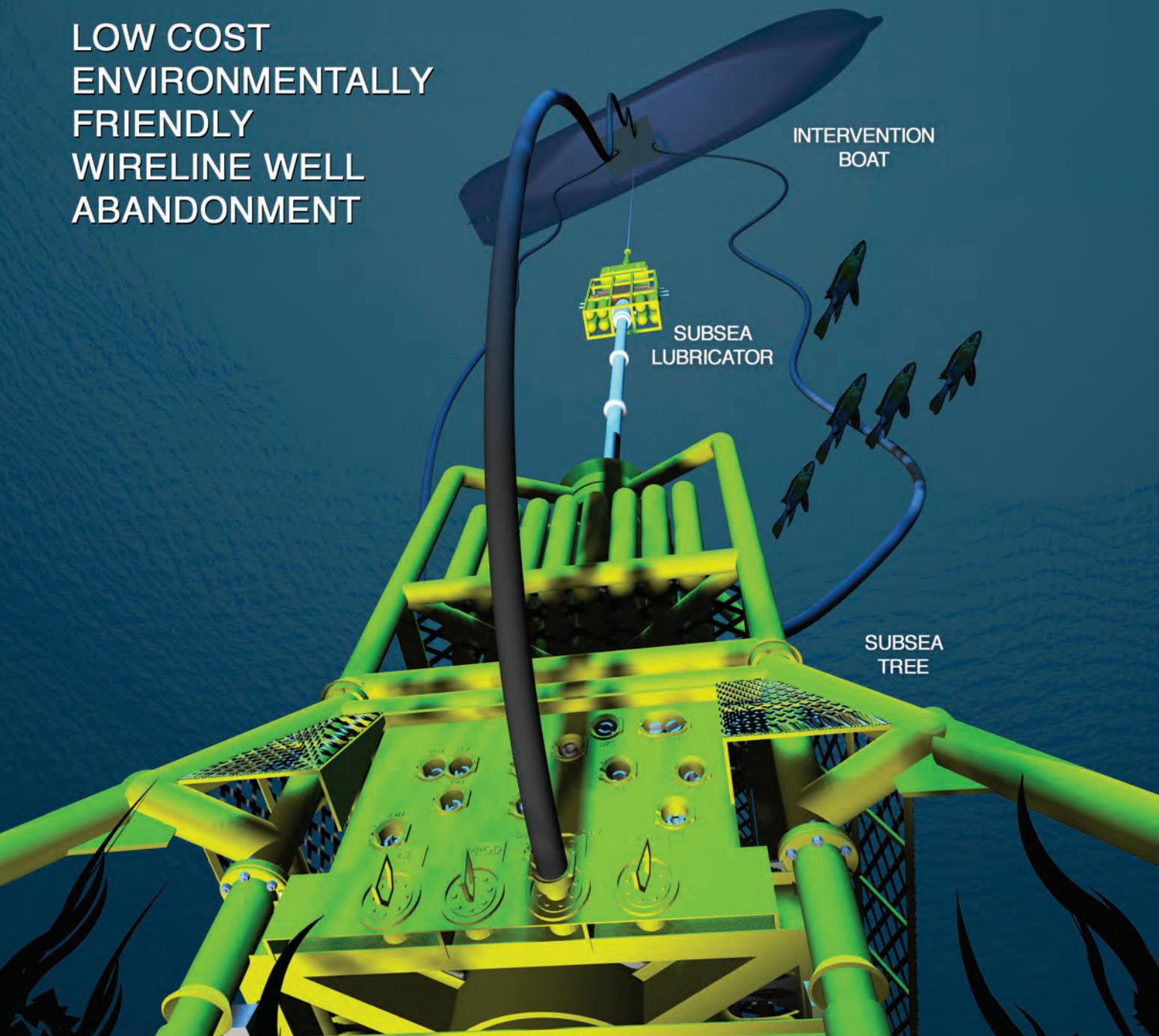
SUBSEA INTERVENTION

OILFIELD INNOVATIONS

LOW COST
ENVIRONMENTALLY
FRIENDLY
WIRELINE WELL
ABANDONMENT



WELL CONTROL AND INTERVENTION

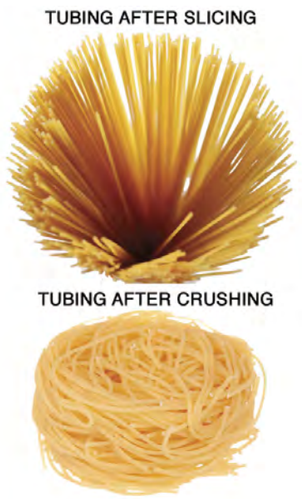
Advertising Feature

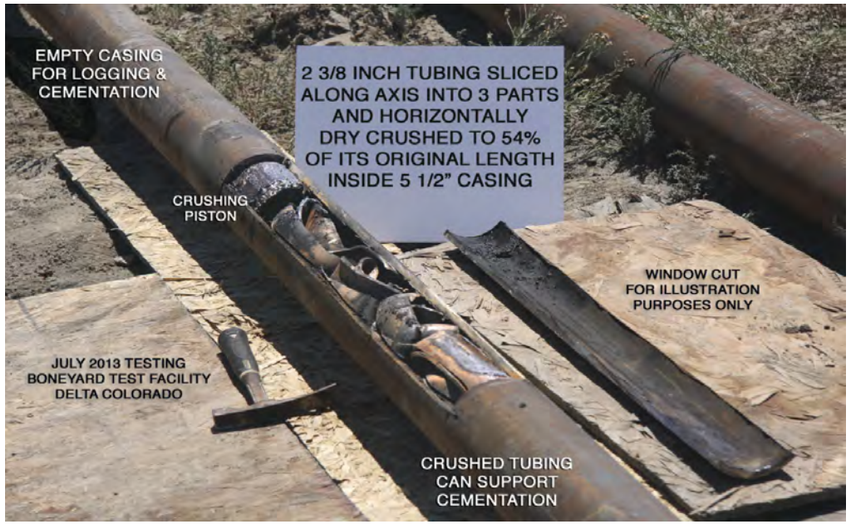
SUBSEA AND SURFACE WELL INTERVENTIONS AND ABANDONMENTS WITH A WIRELINE LUBRICATOR

Oil and gas well intervention operations, particularly subsea interventions, are expensive and can take rigs away from more productive exploration and development work. Intervention suspension and abandonment operations can also impact our environment through their carbon foot print and by bringing pollutants, like naturally occurring radioactive material, into our environment.

In response to the high cost, waste, and environmental issues surrounding suspension and abandonment, the Scottish company Oilfield Innovations Limited has developed a cheaper, safer, and more environmentally friendly wireline method, which could displace drilling rigs and pulling units from the vast majority of onshore, offshore and subsea well suspensions and abandonments.

Additionally, drilling rigs and pulling units involve significantly more risk because existing well barriers must be removed during abandonment whereas non-intrusive and field proven wireline tools may be used without disturbing existing wellhead barriers during rig-less wireline intervention, which can comprise logging and plugging of wells through an existing completion.





Similar to the picture on the left, Oilfield Innovations' method slices tubing into spaghetti like strands that can then be severed with a conventional cutter and crushed with a conventional inflatable packer acting as piston, which is placed through the tubing and inflated between the severed and shredded ends.

The patented method: 1) cuts the lower end of the tubing vertically into spaghetti-like strands, 2) severs the tubing above the shredded portion, 3) places a piston within the casing above the severed tubing and 4) uses hydraulic pressure to 5) crush the tubing so that the primary cement behind the casing can be 6) logged prior to 7) placing a cement plug in the unobstructed space by using the remaining uncut upper portion of the tubing.

The method may use new or proven wireline tools. For example, a conventional cutter can be used to cut and an inflatable wireline packer, with its anchoring slip segments removed, may be used to form a crushing piston.

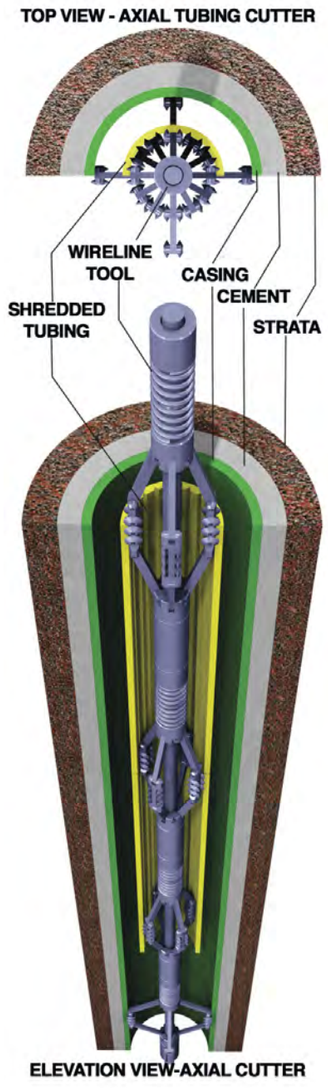
As shown in the above picture, Oilfield Innovations has tested the method to demonstrate its viability. Tests placed tubing within a horizontal casing string and crushed the tubing in a dry state, which represents the worst case scenario because the weight of the tubing is not transferred to its lower end as is the case within vertical or inclined wells where liquid also adds lubrication to lower friction and make crushing easier.

The "dry" horizontal test arrangement demonstrated how easily tubing that is shredded into thirds can be crushed, wherein the tubing was crushed to 54% of its original length despite the friction associated with splaying, helical buckling, and the weight per linear foot of tubing that acted against the crushing test piston in a horizontal arrangement.

A wireline tool, shown on the right, can be placed through an intervention lubricator into the tubing and expanded to shred the tubing into spaghetti-like strands. As shown, the angular orientation, or phasing, of multiple expandable vertical cutters can be used to form vertical cuts in the tubing and, thus, turn it into spaghetti-like strands of minimal compressive strength.

As both the casing and tubing are hollow, a crushing piston occupying 100% of the cross sectional area within the casing can force shredded tubing or completion components occupying only 10% to 20% of the area into the 80% to 90% of the liquid filled area within the casing's internal diameter. The spaghetti-like strands of the shredded tubing become eccentric and helically buckle within the casing, easily collapsing under tens to hundreds of tonnes of crushing force hydraulically applied by the piston area.

Advertising Feature



As shown in the graphic on the right, modern subsea intervention lubricators can be used to access subsea wells and deploy tools to carry out Oilfield Innovations' suspension and abandonment method.

Subsea intervention operations comprise using a boat to suspend a subsea lubricator in the water and latch it onto a subsea tree. Like the surface version, the subsea lubricator latches a blowout preventer (BOP) and riser section containing wireline tools onto the production subsea tree. The subsea tree is then opened via a control umbilical to deploy wireline tools suspended from a winch on the boat. Two circulation hoses can communicate between the well tubing and annulus via the boat's pumps. The wireline tools shred and cut the tubing to place the piston while the circulation hoses are used to pressure the piston to crush the tubing and place new cement.

Logging of existing cement behind the casing occurs between crushing the tubing and placing new cement downhole. If logging shows that a drilling rig is required, plugs can be set to lower rig based costs; or if a rig is not required, the tubing and associated naturally occurring radioactive materials can be left downhole.

Presently, light wireline intervention is possible in subsea wells, but only drilling rigs with total spread costs up to $1million/day can be used for abandoning subsea wells. Because wireline is, by conventional definition, the lowest cost and safest means of intervening in a live well, the market for such a low cost and low risk well plugging technology is enormous.

Presently, well plugging continues to use higher cost and higher risk well abandonment alternatives, thus leading operators and governments to pay more than they should. Oilfield Innovations has successfully tested a wireline method, which can use existing field-proven technology to provide rig-equivalent well abandonment that is safer and more environmentally friendly at a fraction of the cost. The only question is: how much will operators spend and governments lose on well plugging before the method is used worldwide?

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