4.125 TripSaver

Adjustable Wireline Jar (AWJ)

TimeSaver
Downhole Products, LLC

Wireline Jars Overview

Wireline Jars Evolution History

- Drilling and Slickline jars were standard tools for many decades before the first wireline jars were successfully introduced to the USA Offshore market in 2001.
- The economic case for adding jars to openhole logging and fluid testing and sampling strings popular in 25,000 ft or longer wells drilled with heavy muds was evident; the risk of the tool string becoming differentially stuck was high and the cost of the wireline fishing operation and the possible loss in hole of expensive logging tools added up to several million dollars and major project delays.
- The first generation of wireline jars included a "mechanical" latch/release mechanism. The tension at which these jars fire, the "lock load setting", needs to be physically set at surface and could not be changed once in the well.
- The second generation of wireline jars introduced in 2003 had a "hydraulic time-delay" functionality integrated with a "mechanical" latch/release mechanism. The tension at which these jars fire is controlled by the wireline winch operator by pulling and holding on the jar any tension higher than the "lock load setting" value set on the jar before running in hole; after an elapsed time of 30-40 seconds the jar will fire with an intensity proportional to the tension held on the jar.
- All wireline jars can be fired multiple times, they include a spring mechanism that re-cocks the jar when the tension on the wireline cable is slacked off.
- Over the 2004-2015 period, the use of wireline jars became popular in all markets, and it was listed as "must have" service in large wireline service tenders/contracts.
- The TripSaver jars introduced in 2019 offer a simpler and enhanced proprietary integration of the "hydraulic time-delay" functionality with a "mechanical" latch/release mechanism.

Wireline Jar Types

- Although earlier wireline jar designs were only intended for large OD multi-conductor logging tool strings, today there is a wider variety of other jar types such as
  - 2-1/8" to 2-3/4" multi-conductor jars for slim logging tool strings
  - 1-11/16" to 2-3/4" single-conductor jars for well intervention and perforating strings
- Wireline jars are available with a wide range of BHT and BHP ratings up to 500 F and 35,000 psi.

Wireline Jar Operational Considerations

- The optimum jar "lock load setting" should be determined using downhole forces simulations. The jar should be run in hole already "open" if the weight in air of the tool string is close or higher than the jar maximum possible "lock load setting".
- The wireline jar should be inserted within the top section of the tool string and standing off the borehole wall preferably supported by low-friction rollers. This is to ensure the jar, or any tool above it, cannot get differentially stuck and to facilitate re-cocking the jar after an unsuccessful jarring event.

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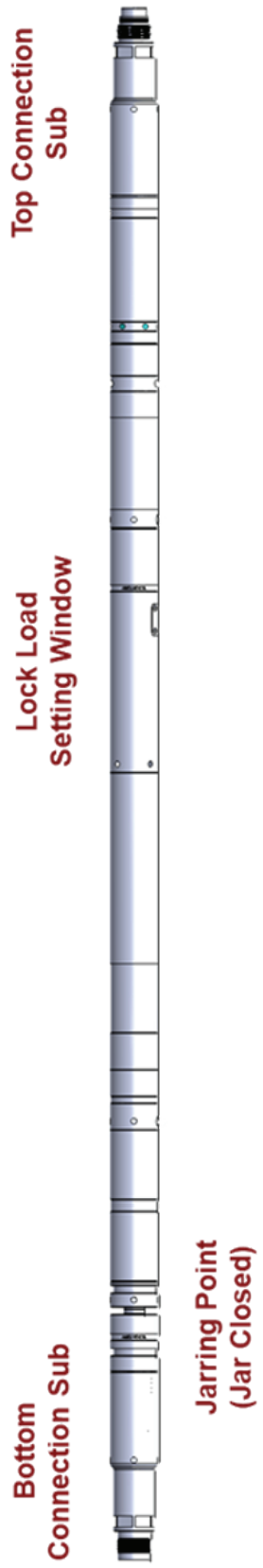
Application

- The 4.125 AWJ is a tension-driven jar designed for wireline logging and sampling operations performed with large OD tools deployed with multi-conductor wireline cables.
- Using a proprietary hydraulic time-delay/mechanical release system, the AWJ offers an unlimited number of jar firing events, each with a firing tension selected by the winch operator over the largest range possible.
- The AWJ has been designed to exceed the long operating life and reliability that the most demanding tool strings and hostile environments require.

Benefits and Advantages

- Being able to select the jarring event intensity by controlling the wireline tension at the surface enhances the operational flexibility of the AWJ tremendously.
  Jars with no time-delay/mechanical release functionality fire at a pre-defined tension set in these tools before they are run in the well. The following are common and notorious disadvantages of using this type of jars:
  - The high tension required to fire the jar cannot be achieved because the frictional forces on the wireline cable resulting from the well trajectory, formations or drilling mud properties are larger than anticipated – a fishing job is now required!
  - The jar firing tension was set low to ensure it can be easily achieved. This could cause the jar to unnecessarily fire when the tool string runs over a mild sticking zone easily overcome by small tension increases; these unwarranted activations can damage the tools and result in unjustified jar "activation charges" to the customer. The major problem low jar firing tensions cause is that the intensity of the jarring events when managing a true stuck tool condition will not be adequate to free the stuck tool – a fishing job is now required!
  - The jar firing tension was set intentionally high and after a couple of jarring events the tool string become free, however several of the critical tools were damaged by the excessive jarring impulses – the tools can now be retrieved; however, the logging data and fluid/formation samples were not acquired!



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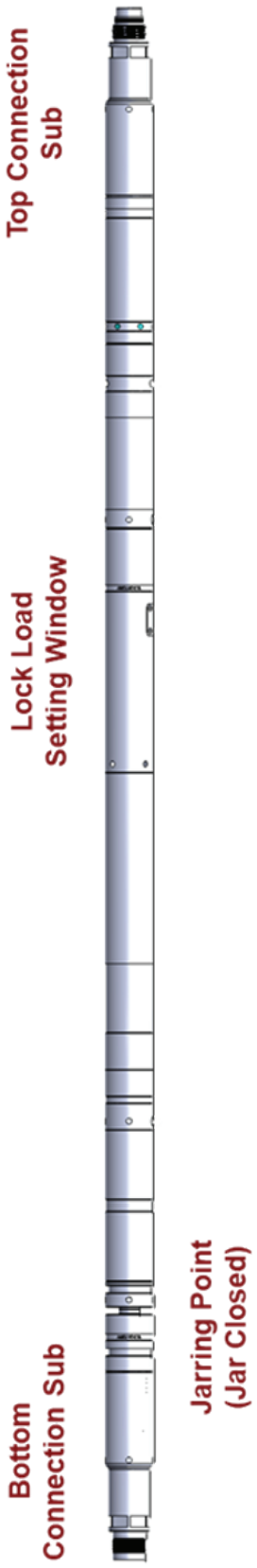
- It is a widely adopted best practice, to set the AWJ lock setting with a relative low tension and follow these steps when the tool string becomes stuck in the well:
  - Fire the AWJ with a tension just above the AWJ lock setting a couple of times.
  - If the string is still stuck, make two more jarring attempts with a tension half-way between the AWJ lock setting and the highest achievable tension on the AWJ jar.
  - If the string is still stuck, then make subsequent jarring attempts with the maximum achievable tension on the AWJ jar.

Other Key Features

- The AWJ functionality is implemented within a single tool; the image at the right shows its key sections.
- The AWJ is easily re-cocked after firing by slacking off the tension on the jar, the weight of its parts above the jar point, and the force exerted by an internal spring-mechanism make this possible.
- The AWJ can be run in the well "open" or "closed". When used with extreme heavy tool strings it is a common practice to run the AWJ jars "open" and set with the lowest possible lock setting tension. To fire the AWJ jars, it will need to be first re-cocked and then follow the jarring best practice documented in the previous section.
- The AWJ can be ordered and supplied with testing, servicing parts/instruments and a safety rig up sleeve.
- The process to set up the lock setting tension in the AWJ is simple and done through a dedicated port – refer to the Lock Load Setting Window section in the AWJ image.
- The conductors feed-through components are usually provided by the logging company using the AWJ jars and can be removed/serviced without involving any other section of the AWJ jar.
- The AWJ can be fitted with different top and bottom connection subs to perform as a cross-over adapter for a tool string of one wireline services vendor deployed using the winch, wireline cable and cablehead from a different wireline services vendor.



SPECIFICATIONS

Environmental Specifications

Temperature/Pressure Operating Limits [1]	400° F (204.4°C) @ 30K psi (Multiple Runs) 500° F (260.0°C) @ 30K psi (Need redressing after each run)
Make-up Temperature [2]	Minimum: – 20° F (– 28.9°C)
Storage Temperature [3]	Maximum: 200° F (93.3°C) Minimum: – 40° F (– 40°C)

1. The temperature range of the environment in which the instrument will operate at its specified performance.
2. The temperature range of the environment in which the instrument can be assembled (lab or field joints) without damage to or impedance from seals or other components susceptible to temperature extremes.
3. The temperature range of the environment that the instrument can withstand in a non-powered state and still meet its specified performance once the instrument has returned to its operating temperature range.

Physical Specifications[4]

Maximum Outside Diameter	4.125 in
Make-Up length (Jar Cocked)	11.33 ft (varies with the wireline tools vendor)
Make-Up Length (Jar Fired)	11.79 ft (varies with the wireline tools vendor)
Instrument Weight in Air	387 lb. (varies with the wireline tools vendor)
Weight in Air Above the Jar Point	310 lb. (varies with the wireline tools vendor)
Calculated Tensile Strength	130,000 lb.
Calculated Compressive Strength	130,000 lb.

4. The AWJ can be delivered with the top and bottom connection subs and the conductive path components (feedthrough wiring, bulkheads, and connector blocks) compatible with the target tool string already fitted.

Example of the Conductive Path Specification

Number of Feedthrough Conductors	10
Conductors Maximum Current	7.0 A (Limited by the pressure terminals)
Conductors Maximum Voltage	500 Vac (Limited by the pressure terminals)

Operational Specifications

Combinability	Configured for the wireline tools vendor specifications
Hole Size	Maximum: No Limit Minimum: 5.125 in (for a “1.0 in” clearance)
Standard Configuration Lock Load Setting Range	6,000 to 10,000 lb.
Land Configuration Lock Load Setting Range	3,500 to 7,500 lb.
Cross-Over Configuration	It can be configured as a cross-over adapter between two different wireline vendors tools and cableheads.

TimeSaver
Downhole Products, LLC

www.timesaverdhp.com
info@timesaverdhp.com

Homero Castillo - Business Development VP
Ph: +1 346-842-8700

Chet Brame - Operations VP
Ph: +1 713-203-7434

18918 Freeport Dr.
Montgomery, Texas 77356, U.S.A.