odfjell technology

OPERATING MANUAL

DOUBLE ACTING HYDRAULIC DRILLING JAR

Reviewed And Approved By: Signature: _____ *Initials:* _____ *Date:* _____

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The OWS-OWS-Wenzel Double Acting Hydraulic Drilling Jar installed in the drilling string is immediately available to apply jarring action and release the stuck portion of the drilling string.

The OWS-OWS-Wenzel Double Acting Hydraulic Drilling Jar is designed for use during drilling operations to apply an impact force either up or down against a stuck portion of the drilling string. It can be used in deviated or high friction well bores where a minimum latch setting (for mechanical latch) would negatively impact jar performance.

The force or overpull required to free a stuck drill string must be applied in addition to the load already supported by the drilling rig and the drill pipe. This combined force often exceeds the safe tensile strength of the drill pipe, and sometimes the hoisting capacity of the drilling rig. This usually results in a costly and time consuming fishing operation.

The OWS-OWS-Wenzel Double Acting Hydraulic Drilling Jar will jar in both directions, with the impact force controlled by the operator. The jar employs a special metering device, ensuring constant delay times over the full range of operating temperatures.

Hydraulic time delay allows the operator to vary the overpull applied and then apply the drum brake on the draw-works. The jarring force is therefore easily controlled and damage to the hoisting equipment is prevented.

2. OPERATION

2.1. GENERAL

- Never stand the jar in the pipe stand without the Safety Clamp properly installed on the jar mandrel.
- Do not remove the Safety Clamp until the jar is safely in tension.
- The Safety Clamp must remain installed until the tool is ready to be run into the hole.

Always apply thread compound meeting the requirements of API Specifications 7, on the end connections.
Protect the sealing surface of the jar mandrel from possible damage during handling and storage. Never apply tongs, slips, chains, slings or strapping to this area.

Rig tongs should be applied immediately adjacent to the top and bottom connections to avoid breaking or torqueing the body connections on the jar. All body connections are torqued to specification at the service centre. Avoid breaking these connections at the rig.

When running in the hole, stop and start slowly to keep the jar in the fully extended position to prevent cause the jar to enter hydraulic delay. Run through any tight spots and dog legs slowly.

When the bit reaches bottom, lightly compress the jar to avoid damaging the bit and allow the jar to trigger downwards, and then continue slacking off to drill weight.

Each time the string is picked up off bottom, the tool will extend to the open position and will need to be lightly triggered down before slacking off to the drilling weight.

The OWS-Wenzel Double Acting Drilling Jar is operated by the simple up and down motion of the drill string. The intensity of the up-jarring force is directly proportional to applied tension. Jarring upward is achieved by applying and overpull sufficient to overcome the hydraulic seal. The hydraulic delay allows the operator to adjust the applied overpull to vary the jarring intensity. After the time delay, the jar mandrel is suddenly released and accelerates to the fully extended position. After the impact, apply set down load sufficient to close the jar to neutral position.

Down jarring action is accomplished by slacking off the the required load. After the impact, pick up load sufficient to open the jar to neutral position.

When bringing the jar out of the hole, and it is suspected that the jar has compressed closed, suspend the drill pipe in the elevator and allow the weight of the collars below the jar to open the jar before hanging it in the slips. Allow at least 5 minutes for the jar to trigger open. Replace the Safety Clamp while the jar is open.

Under normal drilling conditions, the recommended rotating hours before servicing the jar is 400 hours; provided that the jar has only been used for a brief periods of light jarring. The jar should be completely serviced as soon as possible, following any prolonged periods of heavy jarring.

2.2. PLACEMENT

Determining the ideal jar position in the bottom-hole assembly is a complex problem, where several factors must be considered. Some of these factors are:

- Anticipated type of sticking; differential or mechanical
- Hole condition, trajectory and inclination
- Configuration of bottom hole assembly
- Pump pressure
- Buoyancy factor of drilling fluid
- Planned range of weight on bit
- Overpull available
- Safe working strength of the drill pipe

Although each situation and combination of factors is unique, there are some general guidelines that can be used to select the location of the jar:

- In zones where differential sticking is anticipated, locate the jar relatively high in the BHA to minimize the chance of becoming stuck above the jar.
- Where mechanical sticking is more common, the jar may be located lower in the BHA for increased jarring efficiency.
- To avoid any unexpected jarring downhole, the jar should be kept in tension located above the neutral point of the drill string.
- A sufficient number of drill collars and/or heavy weight drill pipe should be run above the jar to provide the necessary mass to jar down.
- To avoid becoming stuck above the jar, the drill string above must not exceed the jar diameter.
- Avoid locating the jar across over between BHA components of different diameters such as drill collars and heavy weight drill pipe. The jar should be placed a minimum of two joints above or below a cross over.

2.3. JARRING FORCES

Pump Open Force

If circulation is maintained while jarring, the pressure drop across the bit creates a pump open force tending to extend the jar. The pump open force must be considered in the following calculations since it reduces the force required to jar up and increase the force required to jar down. The pump open force is calculated by multiplying the pressure drop across the bit by the pump open area.

Pump Open Area

Jar size	Area (Inches^2)	Area (mm^2)
3,375"	5,9	3 800
4,25"	8,9	5 740
4,75"	11,8	7 610
6,25"	19,6	12 640
6,5"	23,7	15 290
6,75"	23,8	15 350
8"	30,7	19 800
9,50"	41,3	26 650

Example: *4,75" Jar with 1,000 psi Bit Pressure Drop*
Pump Open Force = 11,8 in² x 1,000 psi = 11,800 Pound Force

Wall Drag

Additional force may be required to compensate for wall drag, especially in deviated holes. The amount of compensation should be determined from the weight indicator readings during tripping before the drill string became stuck.

Free String Weight

The free string weight is the weight of string above the jar. To determine the free string weight, subtract the weight below the jar from total string weight.

2.4. JARRING UP

The maximum overpull applied to the jar, must be less than the recommended maximum load during hydraulic delay.

To determine the maximum overpull above the free string weight, subtract the pump open force from the desired jarring force.

Example: *4,75" Jar with 1,000 PSI (6894 kPa) Bit Pressure Drop*

	(lbs.)	(daN)
Maximum Load During Hydraulic Delay	= 85,000	= 37,800
Maximum Allowable Overpull during delay	= 85,000 - 11,800 = 73,200	= 37,800 - 5,250 = 32,550

To jar upward, apply the calculated overpull and set the draw-works brake. The delay sequence will begin. After the time delay of approximately 50-150 seconds, the jar will fire. If further jarrings is required, lower the drill string until the weight indicator reads less than the free string weight. The jar is ready for another jarring cycle.

2.4. JARRING DOWN

To determine the slack off required from the free string weight, add the pump open force to the desired force to jar.

Example: *4,75" Jar with 1,000 PSI (6894 kPa) Bit Pressure Drop*

	(lbs.)	(daN)
Pump Open Force	= 11,800	= 5,250
Required Slack-off force (from free string weight) for Example	= 30,000 + 11,800 = 41,800	= 13,350 + 5,250 = 18,600

To jar downward, lower the drilling string until the calculated weight is slacked off and set the drawworks brake. After the time delay of approximately 50-150 seconds, the jar will fire. Raise the drill string until the weight indicator shows an increase above free string weight indication the jar is in tension. The jar is now ready for another jarring cycle.
To continue normal operations, support the drill string off-bottom until the jar has fully extended.

3. MAINTENANCE AND STORAGE

Never handle the Double Acting Hydraulic Drilling Jar without the Safety Clamp properly installed on the Jar mandrel

On each round trip the jar should be visually inspected for any indication of damage, unusual wear, or leakage.

Refer to the applicable service manual for complete workshop repair and inspection procedures.

New tools are shipped painted. The threaded ends are chem-plated with iron-phosphate and coated with rust preventative coating. Thread protectors are installed to eliminate mechanical damage. The rust preventative coating must be removed using petroleum base solvent and a stiff bristle brush before the jar is installed into the drill string.

When the jar is to be laid down, the following should be done:

1 Flush the bore of the tool with fresh water to remove all drilling fluid and solids
2 Wash external surfaces of the tool
3 Apply thread compound and protectors to the end connections

Tools stored horizontally should be rotated to a new position occasionally to prevent seals from setting and resultant fluid leakage.

4. APPENDIX

Product Specification Table

Metric Values

Series Reference	Nominal OD (inch)	Length (ft)	Thru Bore (inches)	Tensile Yield (lbs)	Torsional Limit (ft lbs)	Pump Open Area (in^2)	Max Pull During Delay (lbs)	Free Stroke Up (inches)	Free Stroke Down (inches)	Total Stroke (inches)	Approx Weight (lbs)
HJDA33-S4	3.38	14.3	1.50	234,900	9,000	5.9	50,000	7.0	7.0	21.0	300
HJDA42-S4	4.25	16.9	2.00	300,800	16,300	8.9	70,000	8.0	8.0	25.0	520
HJDA47-S6	4.75	17.4	2.25	370,600	21,500	11.8	85,000	8.0	8.0	25.0	670
HJDA47-S9 *	4.75	17.4	2.25	470,000	21,500	11.8	85,000	8.0	8.0	25.0	670
HJDA62-S8	6.25	17.9	2.25	938,900	50,700	19.6	160,000	8.0	8.0	25.0	1,320
HJDA65-S5	6.50	18.1	2.75	1,220,000	63,700	23.7	175,000	8.0	8.0	25.0	1,410
HJDA67-S4	6.75	17.9	2.75	1,220,000	66,600	23.8	190,000	8.0	8.0	25.0	1,540
HJDA80-S8	8.00	18.2	2.81	1,293,900	133,500	30.7	240,000	8.0	8.0	25.0	2,280
HJDA95-S2	9.50	19.0	3.00	2,106,900	189,300	41.3	300,000	8.0	8.0	25.0	3,350

Metric Values

Series Reference	Nominal OD (mm)	Length (m)	Thru Bore (mm)	Tensile Yield (daN)	Torsional Limit (N·m)	Pump Open Area (mm^2)	Max Pull During Delay (daN)	Free Stroke Up (mm)	Free Stroke Down (mm)	Total Stroke (mm)	Approx Weight (kg)
HJDA33-S4	86	4.3	38	104 500	12 200	3 800	22 200	180	180	530	140
HJDA42-S4	108	5.2	51	133 800	22 100	5 700	31 100	200	200	640	240
HJDA47-S6	121	5.3	57	164 800	29 100	7 600	37 800	200	200	640	300
HJDA47-S9 *	121	5.3	57	209 100	29 100	7 600	37 800	200	200	640	300
HJDA62-S8	159	5.4	57	417 600	68 700	12 600	71 200	200	200	640	600
HJDA65-S5	165	5.5	70	542 700	86 400	15 300	77 800	200	200	640	640
HJDA67-S4	171	5.5	70	542 700	90 300	15 400	84 500	200	200	640	700
HJDA80-S8	203	5.5	71	575 500	181 000	19 800	106 800	200	200	640	1030
HJDA95-S2	241	5.8	76	937 100	256 700	26 600	133 400	200	200	640	1520

Specifications are subject to change without notice Torsional Limit is based on a coefficient of friction .12 *S9 Proposed High Strength Version (not available yet)