Wireline Operations

Learning Objectives

- You will learn various activities suitable for wireline operations.
- You will learn best practices and techniques for conducting wireline operations.
- You will learn the types of wireline components, tools, and BOPs.
- You will learn how to handle common problems confronting wireline operators.
- You will learn wireline fishing techniques.
- You will also learn well control.
Tools are run on wireline units to avoid the use of more costly larger rigs whenever possible.

Wireline units can rig up/down in a fraction of the time of conventional, workover, or even coiled tubing or small tubing units of similar capability for the specific job in hand.

Wireline units are used as support for larger rigs to set packers, plugs, or install valves, etc.
Wireline Operations

- Wireline Unit Components and Accessories
  - Types of Units
  - Surface Pressure Control Equipment
  - Stuffing Box
  - Lubricator
  - Wireline BOPS
  - Tree Connections
  - Downhole Tools

- Preparing for Wireline Operations

- Special Topics and Problems
Wireline Applications

- Set/retrieve flow control devices, plugs, safety valves, etc.
- Provide access to the tubing/casing annulus
- Clear obstructions from tubing (sand, paraffin)
- Fish for tools and/or wire
- Run BH pressure and temperature surveys
- Tubing caliper surveys
- Run Cased hole logs
- Perforate casing
- Temporary tubing repair in the way of pack-offs
- Detect fluid level depth
- Setting packers
- Install/service side pocket GL valves, dummies
- Locate TD of production tubing
- Assist in P&A operations
Wireline Hot Tips

- The aim of wireline is to complete the prepared program as quickly and safely as possible without getting the tools stuck or breaking the wire.

- Tips toward accomplishing the wireline program –
  - Check and maintain equipment regularly.
  - Check for proper shear pins.
  - Check that the inner parts are made up tight and correctly.
  - Check that tools are not rusted up on the inside and or functional.
Wireline Hot Tips

- Function test hydraulic jars and equipment to be run.
- Always make a gauge run before running standard wireline tools.
- Experienced wireline operators making a gauge run will run the wire in the hole at a moderate speed. The wireline operators will utilize a slower running speed until they locate the fluid level.
Wireline Hot Tips

- Always run a tool with a O.D. larger than the rest of the tool string below the jars.
- Do not over pull on the wire. Know limitations of the wireline unit.
- Keep the wire oiled to reduce wear and friction.
- Avoid kinking the wire.
- Check depth counter is correctly threaded and zeroed.
- Keep the hydraulic pressure relief valve correctly adjusted.
- Use proper jars for fishing or working in different sizes of tubing
Wireline Hot Tips

- Use the correct equalizing prong when removing wireline mechanical plugs and wait until plug is completely equalized before you start to retrieve it.
- Try to visualize what is occurring downhole. (Think downhole!)
- Concentrate on what you are doing.
- Ask for assistance if you don’t know how the equipment functions.
- Think ahead – Prepare for the unexpected.
Wireline Hot Tips

- Know how far the wire will fall down hole if broken at surface.
- Do not let the wire rub against anything.
- Use the proper size hay pulley based on the size of the wire.
- Check the well records for previous problems encountered.
- Fishing jobs will still occur no matter how careful you are.
Wireline Hot Tips

- The practical skills of fishing are the most difficult, but the most important thing is that you learn these skills.
- Discuss the fishing job with your supervisor. Consider all possible results of a run and plan for varied possibilities in case of failure.
- If fishing for wire, recheck the wire fallback calculations before running too far past the end of the wire in the wellbore.
Wireline Hot Tips

- After checking the wire fallback calculations. Always start looking for the wire a minimum of 50 ft. above the calculated depth.

- The older the wire the less flexibility it has, so less fallback per 1000 ft.

- When retrieving wireline it is imperative that the top of the wire first be located and balled up with a wire finder before running a wireline spear.
Wireline Hot Tips

- Always run a wire spear attached to a rope socket, latched into a shear up pulling tool. If the spear becomes entangled and can not be retrieved. The shear up pulling can be sheared off and the tool string returned to the surface.

- Tubular jars are useful additions to the tool string when fishing wire, as there is less chance of tubular jars becoming jammed with a loose end of a piece of wire than “spang” type mechanical jars.
Wireline Hot Tips

- When wire has broken at the surface and falls down hole, and a cutter bar, or side wall cutter is planned to be run past the wireline to cut off the wire above the rope socket down hole, then use a releasable rope socket knot. (Easy Knot)

- Remember that conventional pulling tools latch 50% of the contact area of the fishing neck, where heavy duty pulling tools have a 95% contact area with the fishing neck.
Types of Wireline Units

- Double drum skid mounted unit
  - Slick and braided line operations.
- Truck mounted single & double drum units.
  - Diesel engine and hydraulics units.
- Skid mounted single drum units.
  - Diesel engine and belt drive.
- Skid and truck mounted electric line units.
Major Components (Offshore)

Components
A. Grease & hydraulic Control Unit
B. Pressure test unit
C. Power pack
D. Wireline unit
E. Pressure control equipment
F. Wireline Mast unit
G. Hay Pulley
H. Weight Indicator
Surface Pressure Control Equipment

- Surface pressure control equipment on Wire Line units –
  - Wireline Control Head - braided & electric line - stuffing box – to 15M WP.
  - Grease Control Head - braided & electric line – stuffing box – uses grease/viscous oil to seal - 15M WP.
Surface Pressure Control Equipment

- Swabbing Stuffing Box - stuffing box - use with braided line in low pressure operations.
- Lubricator – pipe sections w/ unions on either end – house tool string before & after well entry/retrieval – 8 ft long, 15M WP.
- Tree Connection - flanged connections (for high pressure work), to15M WP, hammer union, and 8-round pin with quick union.
Slickline Stuffing Box

- Allows wire entry into wellbore.
- Seals around the wire.
- Sheaves - 0.072” to 0.125” wireline.
- Stuffing box for 15,000 psi WP.
Slickline Stuffing Box

• Plunger (blowout plug) prevents well flow when:
  ▪ Wireline pulled out of rope socket.
  ▪ Line breaks, or blown from hole.

• If packing nut has tightened all the way down to the bearings, then packing need replacement.
Bowen Manual Control Head
The packing nut is manually tightened to effect a seal around the wireline.

Wireline Stuffing Box & Control Head
- Upper Bush
- Upper Gland
- Line Rubber Spacer
- Packing
- Upper Gland
- Flow Tubes
- Injection Check Valve
- Use Additional Flow tubes and Injection Coupling Assembly when greater pressure reduction is required
### Slick and Braided Wireline Data

<table>
<thead>
<tr>
<th>Wire Size:</th>
<th>0.092”</th>
<th>0.108”</th>
<th>0.125”</th>
<th>0.187” (dye form)</th>
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<td>Bright Steel HS</td>
<td>1960 Lbs (891 Kg)</td>
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<td>3203 lbs (1453 Kg)</td>
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<tr>
<td>Bright Steel HS</td>
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<td>13 in (33cm)</td>
<td>19 in (948 cm)</td>
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<tr>
<td>SUPA 70</td>
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<td>22.69 Lbs (10.31 kg)</td>
<td>22.69 Lbs (10.31 kg)</td>
<td>22.69 Lbs (10.31 kg)</td>
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</table>
• Grease Control Head for Braided and Electric Line
• Multi-strand wireline under full wellbore pressure.
• Grease/heavy oil injected into hydraulic packing nut
• Injection forces line onto rubber affecting a seal.
• Additional sealing provided in flow tubes by grease/heavy oil as it fills spaces between strands.
Slick and Braided Wireline Data

- Excess oil/grease vented through flow hose.
- Grease/heavy oil acts as a lubricant.
- Additional sealing using hand pump applies pressure to sealing rubber in the stuffing box.
Flow Tubes

- Flow tubes located below stuffing box.
- Grease injected under pressure into grease injection collar, affects a seal around the wireline.
- Grease exits at the grease drain hose at atmospheric pressure.
Ball Check Valve

- Controls pressure at surface if wireline breaks and gets blown out of hole. Seal lost if wire blown out!
- Check to see if valve is located at the bottom of the grease injection head.
Ball Check Valve

- Wire pushes ball aside.
- If cable removed well flow pushes upward against piston, ball, and against seat, so making a seal.
Flow Tubes

- The flow tubes used varies with -
  - Surface pressure.
  - Type of produced fluids that enter and travel through the flow tubes.
- The following chart is for number of flow tubes for a particular pressure situation.
<table>
<thead>
<tr>
<th>Well Pressure</th>
<th>Fluid Type</th>
<th>No. of Flow tubes</th>
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<tbody>
<tr>
<td>0 to 5000 psi</td>
<td>Liquid</td>
<td>3</td>
</tr>
<tr>
<td>0 to 5000 psi</td>
<td>Gas</td>
<td>3</td>
</tr>
<tr>
<td>5000 to 10000 psi</td>
<td>Liquid</td>
<td>4</td>
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<td>5000 to 10000 psi</td>
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<td>10000 to 15000 psi</td>
<td>Liquid</td>
<td>6</td>
</tr>
<tr>
<td>10000 to 15000 psi</td>
<td>Gas</td>
<td>6 or more</td>
</tr>
</tbody>
</table>
Grease Injection Units

- The grease Supply System is –
  - A skid-mounted unit capable of delivering 15,000 psi.
  - A unit that delivers considerable amounts of either grease or oil.
  - A unit normally powered by a small diesel engine.
Swabbing Stuffing Box

- Swab stuffing box seals around the multi-strand wireline with a low pressure seal.
- Swab initiates well flow by reducing wellbore hydrostatic pressure.
- Seal takes place around wire by adjusting packing nut.
Wireline Lubricator

- Lubricator acts as barrier when adding or removing wireline tool strings.
- 8 ft sections are made up to M/F Quick unions at top & bottom respectively.
Wireline Lubricator

• Before pressuring up the lubricator –
  ▪ Check seal faces and O-rings.
  ▪ Check lubricator pressure rating.
  ▪ Pressure test to a minimum of SITP (IWCF).
  ▪ Pressure test to maximum anticipated surface pressure (MMS).
Wire Line Clamp

• Clamps wire to lubricator –
  ▪ Use while raising or lowering lubricator.
  ▪ Use when weight has to be taken off wireline unit.
  ▪ Use when re-zeroing the weight indicator.
  ▪ Use when hanging off tools for long periods.
  ▪ Use correct size clamp for wire in use.
  ▪ Attach with chain to hold wire line tools.

Apply downward pressure here to release
Wireline Sheaves

- 7” Hay Pulley
- 13” Hay Pulley
- 15” Hay Pulley
- 19-25” Sheave For Braided Flange Type
Wireline Blowout Preventers

- Wireline BOPs: secondary barriers – to contain and control the well.
- Manual, or hydraulic with manual back-up and ram locking capability.
- Rams can be closed to allow repairing leaks in stuffing box, lubricator, or needle valve.
- Two BOP’s may be used for braided wireline work.
Wireline Blowout Preventers

- Lower BOP has rams inverted to hold grease pressure from above.
- Single BOP’s configurations hold pressure from below only.
- Generally mounted directly above tree for easier access.
- Equalizing valves allow same pressure above and below rams.
- Multiple BOP’s used for -
  - Fishing operations.
  - Removing back pressure valves.
Bowen Dual Manual/Hydraulic Wireline Valve
Wireline BOPs

- Equalizing valve opened w/ LH turn of Allen wrench.
- Pressure below rams flows through the equalizing valve assembly, the through connector tube, and above the ram.
Wireline BOPs

- Install gauge on lubricator to monitor pressure change and ultimate equalization.
- After pressure equalized across ram, ram may be opened without damage.
• EOT makes single and double models for slick and multi-strand line service.

• The double sealing surface seals above and below the ram block - used in grease seal applications where injection of grease between ram blocks effects a seal.

1. Ram lock
2. Ram block
3. Internal collar for ram change and service
4. Ram guide
5. Ram locking stem
6. Equalizing Valve
7. Union
Eastern Oil Tools (now Varco)

The Equalizing Valve, at left: is used in slick and multi-strand line operations - allows grease injection to ram cavities while the rams are closed and locked to assist in sealing.

1. Ram lock
2. Ram block
3. Internal collar for ram change and service
4. Ram guide
5. Ram locking stem
6. Equalizing Valve
7. Union
8. Unibody design.

Dual Wireline Rams
Triple Wireline BOP

- Fail-Safe High Pressure Wireline Valves
  - HP wireline valve works like an annular preventer.
  - Hydraulic pressure is applied to a piston which travels upwards.
• Pressure acts on the three rubber sealing segments which seal around slick or multi-strand wireline.
• This wireline valve has an equalizing valve which can pressurize the lubricator while the valve is closed.
Triple Wireline BOP

- A relief valve can be used if the needle valve on the lubricator becomes non-operational.
Tree Connections

- Left, top, threaded tree cap, < 5,000 psi WP.
- Left, bottom, swedge connection - surface trees, < 5,000 psi WP
- Flange conn. for WP > 5,000 psi.
- Both equipped with QU top connectors onto which wireline valve can be installed.
Pressure Testing Wireline Equipment

- Visually inspect all O-rings and ram sealing elements before pressure testing.
- Function test wireline valve before installing on tree
- Function test grease seal unit before installation, if using braided or electrical wire.
When all components assembled and made up to tree:

- Perform a body test by opening well and subjecting all equipment to full wellbore pressure.
- Or, use a test pump.

If a test pump is used, a master valve on the tree below the wing valve can be shut, the top master valve opened and pressure applied through the wing valve to all components.
• If either method is not desired, apply pressure through needle valve or the pump-in sub.
• If master valve does not hold pressure from the top side, then a full bore two way sealing valve is installed.
Pressure Testing Wireline Equipment

- Lower a rope socket attached to the wireline into the ram body then close ram on the wireline to test a single ram.
- Apply pressure below closed ram to test ram.
- A gauge in the needle valve of the lubricator monitors pressure buildup.
Pressure Testing Wireline Equipment

- This tests ram and equalizing valve.
- If no leaks, open equalizing valve to determine its reliability.
Pressure Testing Wireline Equipment

- Test double rams individually
- Test double rams as a unit.
- Apply pressure to the cavity between the rams, especially for multi-strand wireline and grease injection units.
- Test pressure can be applied to this cavity thru the equalizing valve.
• Rope Socket secures wireline to the tool string.
  - A knot is tied around a circular “button” in the rope socket or a wedge type rope socket is used.
• Stem, or Sinker Bar, provides weight to counteract force of surface pressure acting on area of wire in use and also the buoyancy factor.
Standard Tools - Slick & Braided Line

- Mechanical or Spang Jars provide impact to set and pull downhole tools.
- Knuckle Joints - flexible tool joint sections placed anywhere in string where the WL operator feels the string needs to be flexible.
  - Used in highly deviated wells and
  - Used where tubing is cork-screwed.
Rope Sockets for Slick and Braided Line

Spring and Disc Type

Pear Drop Wedge Type

Braided Clamp Type
Wireline Stem (Sinker Bar)

- 5 ft lengths, also 3 ft, and 2 ft
- 1.5” diameter, also 1.25 and 2.5
- Weighted leaded cores also available.
- Common sinker bar – Fig. 1.
- Roller stem with Teflon wheels held by pins in machined grooves – Fig 2.
  - Wheels aid tool string travel.
  - Wheels enhance jarring action in highly deviated wells.
Determining Stem Length

STEP 2 - Determine the Stem Length Required

Required Stem Length  = (Force, lbs) ÷ (Stem Weight, ppf) = 13.3 ÷ 5 = 2.66 or 2.7 feet

▪ Although 3 ft of stem will overcome the wellbore force, at least one 5 ft. section would be used.

▪ Stuffing box packing friction is NOT considered which can be considerable. Nor is gravity on directional wells, or the possibility of having to jar.

▪ All things considered, a single 5 foot section, although adequate to overcome the force present, may not be sufficient to do any work downhole. Experience is important in this situation.
Determining Stem Length

- **Effect of Hole Angle**
  - Given the SITP is 2,000 psi, the weight of the stem is more than adequate to overcome the wellbore force, even when immersed in the oil. Now take into account the average angle to arrive at an estimate of the weight of the stem down hole.

  Buoyancy Stem Weight in Hole Angle
  - \[ \text{Stem Weight} \times \cos(\angle) \]
  - \[ 45.3 \times \cos 55^\circ = 25.98 \approx 26 \text{ lbs} \]
  - While the weight of the stem is still enough to get the tool string moving in a downward direction, the adjusted weight for buoyancy and hole angle may prove to be inadequate to get the job done downhole.
Knuckle Joint

• Knuckle joints are beneficial in -
  ▪ Highly deviated wells.
  ▪ Wells known to have corkscrewed tubing.

• Joints placed between -
  ▪ Jars and running and pulling tools.
  ▪ Between sections of work string in long tool strings for flexibility.
Mechanical Wireline Jars

- **Mechanical slick line jars** -
  - Spang-type jars are shown at left. They, with the sinker bar above them, provided the impact to jar up or down.

- **Tubular jars are used** -
  - When jarring down on a fish:
    - Sand or paraffin is in the tubing.
    - Fishing slick line.
    - Fishing inside tubing larger than 2-7/8”.

- **Bottom opening tubular jars foul less than those that open from the top.**
Nipples, Mandrels, Running/Pulling Tools

• Tubing Nipples –
  - Short tubulars with machined inner profiles allowing their matching locking devices to be set and retrieved.
  - Nipples are placed anywhere in tubing string where a flow control device might be needed.
Flow control devices –
- Plugs, standing valves, subsurface safety valves, downhole chokes, etc.

Classifications
- Selective as to the nipple profile.
- Selective as to the running tool.
- Wire line operator selects which nipple a flow control device is to be installed.
- Type S and T equipment are selective by the nipple profile.
- The 5 “positions” of S nipples are based on machining of locator profile in nipple and matching machining on locator keys.
Nipples, Mandrels, Running/Pulling Tools
Nipples and Mandrels

- Description of Profiles and Locators Keys
  - The illustration at right shows the Position 1 S locator mandrel and the locator profile in the Position 1 S nipple.
Nipples and Mandrels

- The position of the right angle shoulder on the locator keys and the right angle shoulder of the locator profile is what determines the “position” of the nipple and locking mandrel.
- Position 2 has the right angle shoulders machined a little higher up on the locator profile and the locator keys. This continues to Position 5.
Nipples and Mandrels

- Description of Profiles and Locators Keys
  - While the drawing below is not entirely to scale, it does indicate the approximate positions of the right angle surfaces on the locator key for the various positions available.
  - Naturally the nipples would have matching machined profiles in the locator profile section of the various position nipples.
Nipples and Mandrels

- In the case of S and T locator mandrels, position 1 is the lowermost nipple with the other positions progressing in order up the tubing.

- Theoretically, The S locator mandrel will pass through all type S nipples until it locates the nipple with a matching locator profile.

- The locking portion of the S and T equipment would remain the same regardless of the position of the locator mandrel and the nipple it in which it is designed to locate and lock.
Nipples and Mandrels

- The NO-GO type nipple has a slight restriction in which the NO-GO Ring of the lock mandrel seats.
- The locator portion of the mandrel is not needed because of the NO-GO feature.
- The NO-GO nipple is often the lowest in string.
Nipples and Mandrels

- The T (left) and J (right) running tools provide a place for an equalizing prong.
- Both set the mandrel after the locator keys have found their correct position nipple.
- Setting is accomplished by downward jarring.
- Shearing is accomplished by upward jarring.
Nipples and Mandrels

• The J running tool joins the running neck of the lock mandrel by a shear pin allowing the locking keys to “float freely” as the device is lowered into the hole.
• The T running tool is attached to the pulling neck by means of the dogs, which retracts the locking keys of the lock mandrel.
Pulling Tools

• Type R Pulling Tool
  ▪ Pulls an S or T lock mandrel.
  ▪ Tool engages pull neck of mandrel after pressure equalization takes place across flow control device.
  ▪ Jarring down allows dogs to latch pulling neck and retracts locking keys of mandrel.
Pulling Tools

- Upward jarring retrieves locking mandrel and flow control device from its nipple.
- The R pulling tool must have the correct pulling core to pull different types of locking mandrels.
• Type S and BB Pulling Tools
  ▪ Both can carry equalizing prongs.
  ▪ S pulling tool is a shear-down tool, releasing with downward jarring.
  ▪ BB tool is a shear-up tool – upward jarring shears the pin and releases the dogs from the pulling neck of the lock mandrel.
JDC and JUS Pulling Tools
Cores for Pulling Tools

< Reach
< Dog Position
Pinning Tool

Releasing Tool

Pinning Tool
Selective Tools - Nipples and Mandrels

- The nipples and mandrels are selective per running tool.
- The R equipment sets flow control devices for R and RN equipment. This is for high pressure equipment.
- X nipple and locking mandrel, a lower pressure model.
Selective Tools - Nipples and Mandrels

- The profile of NO-GO ring at the bottom of the locks are matched to the nipple profile in the nipple profile.
- This nipple is usually the lowermost nipple of its kind and size in the tubing string.

NO-GO counterparts: XN and RN nipples and mandrels.
Selective Tools - Nipples and Mandrels

• The NO-GO restriction will allow only a NO-GO locking device to be set into it.
Selective Tools - Nipples and Mandrels

- The X/R Running Tool Sets X and R Locks
  - Locator keys on running tool locate the nipple.
  - When desired nipple located, tool string is lowered below nipple and then pulled back through and above the nipple.
  - Lowering tool string then locates the mandrel in the nipple.
  - Downward jarring sets the mandrel.
  - After mandrel secure in the nipple, upward jarring shears a pin and releases the running tool from the lock mandrel.
Selective Tools - Nipples and Mandrels

- GR and GS Pulling Tools
  - These tools are available for -
    - The GR tool can be pinned incorrectly.
    - Retrieving X and R locks – the GS and GR pulling tools.
    - GS tool is a shear-down tool
    - GR is a GS pulling tool but with a shear-up adapter.
  - Equalizing prongs can be installed at the end of the core of the tool.
Mandrels and Nipples

- Slip Type Mandrels
  - Used in wells completed without flow nipples
  - Can install flow control devices at specified depths.
  - Set by picking up on the running tool, or slacking off fast with jar down releasing tool.
  - Action engages slips and expands cups and elements against tubing wall.
  - Mandrels hold pressure from below.
  - Mandrels set with W Running tool, as seen in next slide.
Mandrels and Nipples

• Collar Locks
  ▪ A well, completed w/ 8 rd tubing and completed without tubing nipples, a collar lock, left, can carry flow control devices.
Mandrels and Nipples

- The running tool, right, is inserted into collar lock and the two are pinned through the outer mandrel of the collar lock.
- The collar lock is run to a depth just below the desired collar and the tool string is then raised.
- Upward movement of the tool string expands the element, jarring shears the pin in the running tool and releases the running tool from the collar lock.
Mandrels and Nipples

- The dogs locate in the next collar recess.
- Upward movement of the tool string expands the element, jarring shears the pin in the running tool and releases the running tool from the collar lock.
Mandrels and Nipples

- Sliding Sleeve
  - Allows access to tubing / casing annulus.
  - Production from prior unproduced zone.
  - SS is a “window,” can be opened or closed.
Mandrels and Nipples

- May include a nipple profile to install other down hole flow devices.
- Differential pressure may exist behind a closed sliding sleeve.
- Install a gauge on the lubricator as a back-up for shifting indication.
• Sliding Sleeve Shift Tool
  - Keys of shift tool locate in shift profile of sleeve.
  - Jarring action, up or down, moves the sleeve to the opposite position.
  - Once sleeve shifted, this allows keys to travel under the top sub, thus collapsing keys and freeing tool from shifting profile.
• Impression Block
  - The impression block detects the nature of junk in the hole.
  - On the first run in the hole, the operator may notice the tool string did not get down as deeply as needed, in spite of repeated attempts.
  - The next trip in the hole has an impression block to determine “what was looking up,” and to see what might have been left in the hole.
Special Topics and Problems

- A “wedge” shaped bottom to the lead core would indicate collapsed tubing.
- Also inspect the sides of the lead core for damage.
Special Topics and Problems

- Hole in the Tubing
  - The upper and lower packoffs provide a seal above and below a hole in the tubing.
  - A collar or tubing stop is installed below the hole in the tubing. A upper and lower pack off assembly are joined together by a spacer tube. Installed and then an anchor stop is set on top.
• The lower portion of the spacer is ‘stung-in’ to the lower packoff.
• The lower packoff, in this case, is screwed directly into the lower packoff assembly.
• The lower packoff assembly can be anchored with another slip stop, or with a collar stop that lock in the collar recess of 8-round tubing.
Both upper and lower packoff assemblies have seals which, when set, form a seal against the tubing wall.

Test pack-off by pressuring up on the tubing if the casing pressure does not build up, the pack-off is holding.
Special Topics and Problems

- **Stuck Tool String**
  - A tool string is stuck that cannot be removed from the well bore.

- **A tool string can become stuck because of** -
  - Collapsed tubing.
  - Presence of sand.
  - Paraffin or other deposited solids on the tubing wall.
  - Wireline operator error.
  - Wireline or tool failure.
  - Tools being blown up hole.
  - Extreme deviation, etc.
Safety Head Shear Samples

- Shear Tests Include:
  - 0.108” Slick Line w/o Tension, 1 strand
  - 0.108” Slick Line w/o Tension, 10 strands
  - 0.438” Cable w/o Tension, 1 strand
  - 0.438” 5 Core Cables w/o Tension, 10 strands
  - 1.25”, 0.109” Wall Coiled Tubing 10 strands
  - 3 Parallel Strings of Heavy Wall 1.5”, 1.75”, & 2.0 CT w/ 7/16” Cable inside
  - 2 Parallel Strings of Heavy Wall 2.38” & 2.88” CT w/ 7/16” Cable inside
  - 2” Sinker Bar, ANS 4230 Steel
  - 3.5” Drill Pipe S-135, 226.2 N/m (15.5 lbs/ft)
  - 4” Tubing 13 Chrome L-80
  - 4.5” 184.0 N/m (12.6 lbs/ft) tubing
  - 4-5/8” Gravel Pack Screen w/ 2-3/8” Wash Pipe inside
Fishing Under Pressure

- If tool string gets stuck in hole and jars are ineffective in freeing string. If the tool string gets blown up the hole it may become necessary to cut and retrieve wire. Secure well and make ready for wire-cutting and fishing operations.
Fishing Under Pressure

- A cutter bar, at the right, is a simple tool made up of a rope socket, a section of stem, and a blind box.
- Close wireline valve on the wire and bleed pressure from the lubricator.
- Install and drop cutter bar.
- The cutter bar is usually ineffective if the tools have been blown up hole.
Fishing Under Pressure

- Procedure for Dropping the Cutter Bar
  - Shut-in the wireline valve
  - Bleed pressure from lubricator.
  - Raise the lubricator sufficiently to insert the cutter bar into the lubricator. Then rest it gently on the closed wireline valve
Fishing Under Pressure

- Open the equalizing valve on the wireline valve.
- Allow the pressure to equalize across the closed rams of the wireline valve.
- Install a pressure gauge on lubricator for this purpose.
Fishing Under Pressure

- Ensure no tension bind on the wire while cutter bar is falling.
- Wire will likely be cut on the locator lugs on the side pocket mandrels if:
  - Tension is held on the wire,
  - The well is deviated, and
  - Has side pocket gas lift mandrels in the tubing string.
- Attempts to pull wireline should not be made until the cutter bar has sufficient time to reach fish.

Open the wireline valve.
Let the cutter bar fall.
Fishing Under Pressure

- Ensure no tension binds on wire
- If ineffective, possibly drop a Go-Devil.
- If the well is highly deviated or tools are stuck, the cutter bar may be ineffective. Install a kinley wire cutter around the wire and drop.

Open the wireline valve.
Let the cutter bar fall.
Fishing Under Pressure

- Cutter bar dropped to cut wire at the rope socket.
- If first cutter bar is unsuccessful, a second or third can be dropped.
- Cutting the wire at rope socket leaves minimal wire in hole.
Fishing Under Pressure

- Kinley Wire Cutter
  - Wire is inserted into the Kinley Wire Cutter, the tool is inserted into the lubricator and dropped like a Go devil.
  - The cutter has a cylindrical knife and slipper that move in unison when they make contact with rope socket.
Fishing Under Pressure

- If wire cutter doesn’t cut the wire when dropped, a cutter bar can be dropped on the wire cutter.
- The Kinley Wire Cutter’s removable bottom can be changed out with one that has a fishing neck on it.
Fishing Under Pressure

• Wireline-Fishing Kinley Wire Snipper
  - The Kinley wire cutter is placed around the wireline at the surface.
  - The wireline valve is closed and the Kinley wireline cutter travels down the wire, hits the rope socket to cut the wire.
Fishing Under Pressure

- Sometimes you have a side pocket gas lift mandrel in the well bore.
- Sometimes you have wireline balled up above the fish.
Fishing Under Pressure

- To keep the wire from cutting at the gas lift mandrel, and to cut the wire above the balled up wire in hole, how must the Kinley wire snipper be installed to accomplish these feats?
Fishing Under Pressure

- The Kinley wire cutter’s removable bottom can be changed for one with a wireline fishing neck.
- The cutting part of the Kinley cutter is run upside down.
- A cutter bar is then dropped to cut the wire from the top side, not the normal bottom side.
Fishing Under Pressure

- Wire cutter dropped as cutter bar.
- After giving cutter time to reach tool string and cut the wire, operator picks up on wire and pulls it out of the hole.
- Cutter has a standard rope socket outer profile and fishing neck, retrievable with standard pulling tool.
- Cutter comes attached to end of wire, after making cut.
Fishing Under Pressure

- After wire cutter has been pulled from hole, a short length of wire remains above rope socket.
- No problem if a pulling tool is used to engage fishing neck of the rope socket.
- Downward jarring will be required to latch the fishing neck.
Fishing Under Pressure

- Tool String Blown up the Hole
  - If the tools have been blown up the hole and by-passed the wire there may no “clean” access to the rope socket.
  - Dropping a cutter bar would be useless.
  - Tools are designed to cut the wire in these situations – a go devil-wire cutter.
Fishing Under Pressure

• Use of the Go-Devil
  ▪ Go-Devil has a body and an inner sleeve.
  ▪ Filler plate removed by removing retaining pins.
  ▪ Wire inserted into slot machined over length of Go-Devil. Filler plate reinstalled, pinned in place.
Fishing Under Pressure

- Insert Go-Devil in lubricator. Make up lubricator and equalizing valve on wireline. The wireline valve is then opened and the Go-Devil is allowed to fall.
- After the Go-Devil has been dropped, a Cutter Bar can follow and hopefully the wire will be cut.
- Install a muleshoe type bottom to the Go-Devil to cut the wire.
- Use caution in dry tubing.
Fishing Under Pressure

- As seen on right, the tool string is caught by sand or other debris and the jars have become inoperable.
- On the far right, tool string has been blown up the hole.
- After the cut, the wire is retrieved from the hole.
- The operator then begins a fishing job as he has a clean rope socket looking up.
Fishing Under Pressure

- Cutting Wireline Down hole - Side Wall Cutter cuts wire at any point.
  - SWC is pinned to a Type C Running Tool and run alongside wire that has parted in the hole.
  - When cutting depth is reached, a lowering the tool string causes mandrel to wedge, overlapping the cutters against tubing wall. This traps the wire to be cut.
Fishing Under Pressure

- Downward jarring cuts wire and shears the pin in the C Running Tool.
- Tool string is POOH and a wire finder follows a next a wire grab is run to ball-up the wire.
- Finally a spear can be run and the wire is pulled from the hole, the side wall cutter is then retrieved.
Fishing Under Pressure

- Never pull side wall cutter before cut wire is removed from hole.
- Run tubular jars in string used to convey the side wall cutter.
- A releasable rope socket is used when cutting wire.
Fishing Under Pressure

• Wireline Finder
  ▪ Tool finds broken wire in tubing, balls it up for a wire grab to catch.
  ▪ Made of a thin, flexible metal w/ flared ends to hug the tubing walls to funnel wire into finder.
  ▪ The wire finder balls-up the wire then a wire spear is run to retrieve the wire.
Fishing Under Pressure

- While pulling up and through bypassed wire, wire can become bunched around and on top of finder making it difficult to retrieve.
- Place section of “spacer stem” between wire finder and the jars to minimize wire becoming tangled in the jars. Run tubular jars.
The Expandable Wirefinder

- Locates broken wire and debris while preventing the fishing string from passing through it.
- The wire finder is made up and pinned to a sleeve with a NO-GO shoulder, which is then run and positioned in a suitable restriction or nipple in the well.
Fishing Under Pressure

- Downward jarring shears the retaining pins and allow the finder to move down through the nipple and expand out into the tubing below.
- On the way out, the finder collapses back into the nipple and picks it up for recovery at surface.
Fishing Under Pressure

• Wireline Spears
  - Wireline spears are run into a wire bundle after a run by a wire finder.
  - The overshot wire grab recovers wire that has wrapped around a tool string, such as when the tool string has been blown up the hole.
Fishing Under Pressure

- The tool is run over the fish and latches onto the wire that has settled around the rope socket of the lost tool string.
- Always run these tools with a releasing tool.
# Rule of Thumb For Wire Fallback

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Wireline OD</th>
<th>Ft per 1000’</th>
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<tbody>
<tr>
<td>2-3/8”</td>
<td>0.082”</td>
<td>8</td>
</tr>
<tr>
<td>2-3/8”</td>
<td>0.092”</td>
<td>10</td>
</tr>
<tr>
<td>2-7/8”</td>
<td>0.082”</td>
<td>10</td>
</tr>
<tr>
<td>2-7/8”</td>
<td>0.092”</td>
<td>12</td>
</tr>
<tr>
<td>3-1/2”</td>
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<td>16</td>
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<tr>
<td>3-1/2”</td>
<td>0.108”</td>
<td>15</td>
</tr>
<tr>
<td>3-1/2”</td>
<td>3/16”</td>
<td>20</td>
</tr>
<tr>
<td>4-1/2”</td>
<td>0.108”</td>
<td>27</td>
</tr>
<tr>
<td>4-1/2”</td>
<td>3/16”</td>
<td>35</td>
</tr>
<tr>
<td>5-1/2”</td>
<td>0.108”</td>
<td>40</td>
</tr>
<tr>
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<td>50</td>
</tr>
<tr>
<td>7”</td>
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<td>90</td>
</tr>
<tr>
<td>7”</td>
<td>3/16”</td>
<td>100</td>
</tr>
</tbody>
</table>
Tools will Pass thru KBUG

Pull up to align tool and activate kickover function

Latch into side pocket. Jar down. Jar up to shear running tool

Shear trigger pin and pull out of hole.

Upward jarring shears trigger pin and permits tool to be pulled out of hole.

Shear pins in arms will be sheared.

Latch

This pin does not need to be sheared at this time.

Lower knuckle now in line with pocket.
Gas Lift Valves and Latches
Gas Lift Valves and Latches

Dummy Valves

1-1/2” RD

1” RD

1” RED

1-1/2” RED
Wireline Operations

Learning Objectives

- You learned the various activities that were suitable for wireline operations.
- You learned the best practices and techniques for conducting wireline operations.
- You learned the types of wireline components, tools and BOPs.
- You learned how to handle common problems confronting wireline operators.
- And you learned wireline fishing techniques.
- And you have learned pressure control.