TYPICAL BOTTOM HOLE ASSEMBLY
WASH TOOL BHA
FOR CLEANOUT OPERATIONS INCLUDING TUBING, CASING, SAND SCREENS, SLOTTED LINERS, NIPPLE PROFILES, SLIDING SLEEVES ETC.

OUTLINE RUN PROCEDURE

1. PREPARE BHA: SELECT NOZZLE SIZES, CONFIGURATION AND HEAD FOR WASH TOOL ACCORDING TO FLOW RATE VS. PRESSURE DROP CALCULATIONS (OR USING TOOL SPECIFIC SPREADSHEET PROGRAM). CHECK BALL SEAT SIZES IN MHA AND INSTALL SHEAR PINS & RUPTURE DISC TO SUIT JOB. MEASURE MAKE-UP LENGTH, OD & ID OF ALL TOOLS & RECORD WITH TOOL SERIAL NUMBERS.

2. INSTALL IN-LINE FILTER BETWEEN PUMP AND CT REEL. ENSURE FLUID SYSTEM IS CLEAN & FREE OF PIPE SCALE ETC.

3. PREPARE END OF COILED TUBING (CUT AND STRAIGHTEN AS REQUIRED). MAKE UP, PULL TEST AND PRESSURE TEST COILED TUBING CONNECTOR.

4. PUMP LARGEST POSSIBLE BALL (AND/OR CLEANING PIG) THROUGH REEL TO REMOVE PIPE SCALE AND ENSURE NO OBSTRUCTION.

5. MAKE UP REST OF BHA: ONLY USE WRENCHES ON HEAVY WALL AREAS ON TOOL BODIES.

6. MAKE-UP AND PRESSURE TEST CT RISER. USUALLY FLAPPER CHECK VALVES ARE THEN TESTED BY BLEEDING BACK THROUGH THE REEL. ZERO CT COUNTER.

7. RUN IN HOLE: SLOW DOWN WHEN PASSING RESTRICTIONS AND LEDGES.

8. PERFORM WASHING OPERATION AT SLOW SPEED ACROSS REQUIRED WORKING DEPTH(S). RECIPROCATE AS REQUIRED.

9. POOH. TAG STRIPPER TO CHECK DEPTH COUNTER.

10. BREAKOUT RISER AND BHA.

11. IN SOME CASES CT CONNECTOR MAY BE RE-RUN. OTHERWISE REMOVE BY CUTTING COIL 10' ABOVE CONNECTOR.

12. DISASSEMBLE AND CLEAN TOOLS ASAP TO AVOID CORROSION. REDRESS TOOLS BEFORE RE-RUNNING.

COILED TUBING CONNECTOR
EXTERNAL SLIP
INTERNAL SLIP
ROLL-ON (OR ROLL-OVER)
DIMPLE-ON

DEPLOYMENT QUICK CONNECTOR
EG. "CARSAC"
OPTIONAL FOR SAFER MAKE-UP & BREAK-OUT

MOTOR HEAD ASSEMBLY
CONSISTING OF:
DUAL FLAPPER CHECK VALVE

HYDRAULIC DISCONNECT
ACTUATED BY DROP BALL

CIRCULATION SUB
ACTUATED BY DROP BALL
C/W RUPTURE DISC (TYPICALLY 5,000 PSI)

STABILISER
IF REQUIRED

STABILISER
IF REQUIRED

STABILISER IF REQUIRED

WASH TOOL

STANDARD ROTATING WASH TOOL
CONTROLLED ROTATION WASH TOOL
(MULTIPLE HEADS AVAILABLE)
MULTI-JET WASH TOOL
(FIELD ADJUSTABLE HEAD)
PULSATING JET WASH TOOL
(VARIOUS HEADS AVAILABLE)

SELF-ADJUSTING WASH TOOL
SELF-ADJUSTING PULSATING JET WASH TOOL
REDIRECTS ALL JET ACTION DOWNWARDS WHEN AN OBSTRUCTION IS TAGGED

OPEN POSITION
CLOSED POSITION
**TYPICAL BOTTOM HOLE ASSEMBLY**

**STANDARD MILLING BHA**

For milling plugs, scale, cement, junk & debris, damaged tubing, nipple enlargement, hard fill removal etc.

**OUTLINE RUN PROCEDURE**

1. Prepare BHA: Select motor & stator type/fit to suit job and temp. Check ball seat sizes in MHA & install shear pins & rupture disc to suit job. Measure make-up length, OD & ID of all tools; record with tool serial numbers.

2. Install in-line filter between pump and CT reel. Ensure fluid system is clean & free of pipe scale etc.

3. Prepare end of coil (cut and straighten as required). Make up, pull and pressure test coiled tubing connector. Pump largest possible ball (and/or cleaning pig) through reel to remove pipe scale and ensure no obstruction.

4. Make up rest of BHA. Only use wrenches on heavy wall areas on tool bodies. Don’t sideload motor.

5. Function test motor. Record pressure vs pump rate.

6. Make-up & pressure test CT riser. Usually flapper check valves are then tested by bleeding back through the reel. Zero CT counter.

7. Run in hole. Slow down when passing restrictions and ledges. Pump at minimum rate if required.

8. Slow down 100 ft before obstruction, tag obstruction slowly then pick-up 20 ft.


10. Start milling with low WOB. Establish milling pattern and adjust parameters as required. Aim for an off-bottom pressure differential of 50 - 80% of full load differential for the specific type of motor being run. Gage specialist will provide milling recommendations.

***** Never pick up from motor stall without stopping pump or reducing pump rate to minimum. See detailed stall procedure ***

11. After reaching target depth the wellbore may be circulated clean by high pump rate after opening circulation valve with drop ball. Pooh.

12. At surface, repeat motor function test and record.

13. Breakout BHA and remove connector by cutting coil 10" above connector. Flush motor with fresh water and suitable oil to prevent corrosion. Disassemble & clean other tools ASAP.

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**MILL**

- **BLADED JUNK MILL**
- **FLAT BOTTOM MILL**
- **CONCAVE MILL**
- **TAPER MILL**
- **BULLNOSE MILL**
- **STEP MILL**

**SPECIALIST MILLS INCLUDING DIAMOND MATRIX, PDC, BI-CENTRE, PILOT MILLS ETC. ARE ALSO AVAILABLE FROM GAGIE CORPORATION**
TYPICAL BOTTOM HOLE ASSEMBLY
WASHOVER BHAS
FOR WASHING OVER A FISH OR DRESSING-OFF TOP OF A FISH

COILED TUBING CONNECTOR
EXTERNAL SLIP (RECOMMENDED)
INTERNAL SLIP (SLIMHOLE)
DIMPLE-ON (ACCEPTABLE)
ROLL-ON (NOT SUITABLE)

DEPLOYMENT QUICK CONNECTOR
EG. "CARSAC"
OPTIONAL
FOR SAFER MAKE-UP & BREAK-OUT

MOTOR HEAD ASSEMBLY
CONSISTING OF:
DUAL FLAPPER CHECK VALVE
HYDRAULIC DISCONNECT
ACTUATED BY DROP BALL
CIRCULATION SUB
ACTUATED BY DROP BALL
C/W RUPTURE DISC (TYPICALLY 5,000 PSI)

STABILISER
or
JUNK (BOOT) BASKETS
IF REQUIRED
TYPICALLY ONLY USED IN TUBING LARGER THAN 4"

WORKOVER MOTOR
FOR MAXIMUM EFFICIENCY AND MOTOR LIFE,
OPERATE MOTOR AT 80% OF MAX FLOW RATE
AND 50 - 80% OF MAX LOAD

WASHOVER ASSEMBLY

SKIRTED MILL ASSEMBLY

DRIVE SUB

WASHPipe EXTENSIONS

WASHOVER SHOE

TRIPLE CONNECTION BUSHING (TCB)

WASHPipe EXTENSION WITH CROSSOVER (DOUBLE BOX SUB IF REQUIRED), PONY COLLARS (FOR SPACE OUT, IF REQUIRED) AND MILL (EG. CONCAVE MILL)

WASHOVER SHOE

WAVY BOTTOM (SCALLOPED)
TOOTHED (CASTELLATED)
SAW TOOTH (CASED HOLE)
SAW TOOTH (OPEN HOLE)

WHEN TO PERFORM WASHOVER OPERATIONS?

REMOVE JUNK AND DEBRIS STUCK FROM OD OF A FISHNECK AND
TO FREE STUCK BHAS AND STUCK PIPE. THE SHOE MAY NEED A
STOP SHOULDER ON THE INSIDE TO PREVENT WASHING OVER TOO
FAR. SUCCESSFUL WASHOVER IS THEN FOLLOWED BY RUNNING AN
OVERSHOT.

GOOD ALTERNATIVE TO MILLING PACKERS AND PLUGS: THE
WASHOVER SHOE SHOULD BE SIZED TO REMOVE THE SLIPS AND
ELEMENT BUT LEAVE THE BODY ("MANDREL") INTACT SO THAT IT
CAN BE FISHED WITH AN OVERSHOT AFTER WASHOVER.

CUT A FISHNECK ONTO THE OUTSIDE OF A STUCK FISH WHICH HAS
TOO BIG OF AN OD TO RECOVER WITH AN OVERSHOT

RECOVER TIGHTLY BALLED UP WIRE OR CABLE THAT CANNOT BE
FISHED WITH A ROPE SPEAR OR WIRE GRAB.

WASHOVER SHOE SELECTION & DESIGN

SINCE EVERY SCENARIO AND FISH IS DIFFERENT SHOES ARE OFTEN
BUILT AND DRESSED TO SPECIFIC REQUIREMENTS OF ID, OD,
LENGTH, CUTTING STRUCTURE AND CROWN GEOMETRY.

Cased hole WASHOVER SHOES ALWAYS HAVE A SMOOTH OD TO
PREVENT CASING/TUBING DAMAGE, WHILE OPEN HOLE SHOES HAVE
COARSE CARBIDE ON THE OD.

SMALLER SHOES RUN ON 1-11/16" AND 2-1/8" MOTORS USUALLY
HAVE A WAVY BOTTOM TO MINIMISE TORQUE & MOTOR STALLS

LARGER SHOES WITH WALL THICKNESS > 3/8" CAN BE DRESSED
WITH CARBIDE INSERTS FOR MORE EFFICIENT CUTTING & FASTER
ROP.

SKIRTED MILLS

USED TO DRESS THE TOP OF A FISH. THE SHOE CENTRALIZES THE
FISH WHILE CUTTING AWAY ANY JUNK/DEBRIS AROUND THE TOP,
WHILE THE INNER MILL DRESSES-OFF THE TOP OF FISH.

OUTLINE RUN PROCEDURE

REFER TO OUTLINE RUN PROCEDURE FOR TYPICAL MILLING BHA.

DIAMOND SHOES ARE OFTEN
CUSTOM BUILT FOR SPECIFIC
APPLICATIONS & USED FOR
WASHING OVER ITEMS SUCH AS
RETRIEVABLE PACKERS
CONTAINING HARD MATERIALS
EG. CARBIDE, INCOLLOY, HIGH
CHROME & HARDENED SLIPS:
DIAMOND GRINDS MATERIAL
SLOWLY WITH LOW WOB &
LOW TORQUE. THE CROWN IS
IMPREGNATED WITH DIAMOND
GRIT & MAY ALSO CONTAIN
EXPOSED DIAMONDS.

PAGE 3
**COILED TUBING MILLING BHA**

For milling coil or dressing-off top of coil fish

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**STABILISER or JUNK (BOOT) BASKETS**

*Boo* *tbasket typically only used in tubing larger than 4"

**DEPLOYMENT QUICK CONNECTOR**

EG. "CARSAC"

Optional for safer make-up & break-out

**MOTOR HEAD ASSEMBLY (MHA)**

Consisting of:

- **DUAL FLAPPER CHECK VALVE**
- **HYDRAULIC DISCONNECT**
  
  Actuated by drop ball
- **CIRCULATION SUB**
  
  Actuated by drop ball, C/W rupture disc (Typically 5,000 PSI)

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**STABILISER or JUNK (BOOT) BASKETS**

*If required* *boot basket typically only used in tubing larger than 4"

**WORKOVER MOTOR**

For maximum efficiency and motor life, operate motor at 80% of max flow rate and 50 - 80% of max load

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**TRIPLE CONNECTION BUSHING (TCB)**

**SKIRTED MILL**

Typically concave bottom mill, slotted skirt for circulating out cuttings

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**THROATED GUIDE OR WASHOVER SHOE**

Dressed with carbide if required

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**WHEN TO MILL COILED TUBING?**

When coiled tubing is parted downhole while in tension the top will typically be necked inwards and may prevent the passage of an e-line cutter or drop ball during fishing operations. When coiled tubing is parted downhole while it compression the top is often out-of-round or bent over deformation may also be caused by burst or collapse and when coil is cut by a shear ram or downhole severing tool in any case a skirted milling assembly can be used to dress-off the deformed section of the top of fish before fishing.

- **Milling significant lengths of coiled tubing is usually a last resort because it can be slow and often requires multiple runs**

- **If the coil fish has multiple breaks then it is likely to spin and not be possible to mill**

  - A heavily corroded coil fish may also break-up making it impossible to mill.

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**SKIRTED MILLING ASSEMBLY**

Due to the flexibility and residual bend in coiled tubing it is necessary to centralize the coil fish onto the mill face. This is achieved by having a throated guide or washover shoe with long throat of diameter slightly larger than the nominal coil size. Carbide dressing on the bottom and inside of the guide will help to get over the top of the coil fish. In case it is bent over or out-of-round as well as cutting away any debris jammed around the coil fish the guide or shoe is threaded onto the outer connection of a triple connection bushing while the mill is threaded onto the inner connection. Slots or ports are often necessary on the skirt to allow cuttings to be circulated out. The inside of the throat may also be fluted for cuttings circulation.

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**OUTLINE RUN PROCEDURE**

Usually a Lib impression is taken of the top of fish before and after milling refer to typical milling BHA run procedure.
**OUTLINE RUN PROCEDURE**

1. **MAKE DUMMY RUN WITH SLICKLINE OR COIL TO DRIFT PAST REQUIRED CUT DEPTH**

2. **PREPARE BHA: SELECT MOTOR & STATOR TYPE/FIT TO SUIT JOB AND TEMP; CHECK BALL SEAT SIZES IN MHA & INSTALL SHEAR PINS & Rupture DISC TO SUIT JOB; MEASURE MAKE-UP LENGTH, OD & ID OF ALL TOOLS; RECORD WITH TOOL SERIAL NUMBERS**

3. **INSTALL IN-LINE FILTER BETWEEN PUMP AND CT REEL; ENSURE FLUID SYSTEM IS CLEAN & FREE OF PIPE SCALE ETC**

4. **PREPARE END OF COIL (CUT AND STRAIGHTEN AS REQUIRED); MAKE UP, PULL AND PRESSURE TEST COILED TUBING CONNECTOR; PUMP LARGEST POSSIBLE BALL (AND/OR CLEANING PIG) THROUGH REEL TO REMOVE PIPE SCALE AND ENSURE NO OBSTRUCTION**

5. **MAKE UP REST OF BHA; ONLY USE WRENCHES ON HEAVY WALL AREAS ON TOOL BODIES; DON’T SIDELOAD MOTOR**

6. **FUNCTION TEST MOTOR AND CUTTER; RECORD PRESSURE VS PUMP RATE AND KNIFE OPENING; RE-PIN KNIVES AFTER TEST**

7. **MAKE UP AND PRESSURE TEST CT RISER; ZERO CT COUNTER**

8. **RUN IN HOLE: SLOW DOWN WHEN PASSING RESTRICTIONS AND LEDGES; DO NOT PUMP (OR MINIMUM RATE IF NECESSARY)**

9. **RUN 20+ FT PAST CUT DEPTH THEN PICK UP TO CUT DEPTH (AIM TO CUT AT MIDDLE OF A TUBING JOINT)**

10. **PUMP SLOWLY AND GRADUALLY INCREASE PUMP RATE TO BED THE KNIVES IN; DEPENDING ON THE SCENARIO THERE MAY BE INDICATION WHEN CUT IS COMPLETE; CUT USUALLY TAKES ONLY 5 - 10 MINUTES**

11. **STOP PUMPING AND WAIT FOR COIL TO DRAIN & MOTOR TO STOP ROTATING; PICK-UP SLOWLY FROM CUT**

12. **SOMETIMES A SECOND CUT MAY BE MADE FURTHER UP THE HOLE, DEPENDING ON KNIFE WEAR**

13. **POOH WITHOUT PUMPING (OR MINIMUM PUMP RATE)**

14. **AT SURFACE, REPEAT MOTOR FUNCTION TEST**

15. **EXAMINE KNIFE WEAR FOR INDICATION OF THE CUT QUALITY**

16. **BREAKOUT BHA & REMOVE CONNECTOR BY CUTTING COIL 10" ABOVE CONNECTOR**

17. **FLUSH MOTOR WITH FRESH WATER AND SUITABLE OIL TO PREVENT CORROSION; DISASSEMBLE & CLEAN OTHER TOOLS ASAP**

**NOTES:**

* IF A NIPPLE PROFILE LOCATOR IS REQUIRED FOR DEPTH CORRELATION THEN IT MAY BE USED ABOVE THE MOTOR AND MUST BE RATED FOR TORQUE

* A HYDRAULIC ACTUATED TUBING ANCHOR MAY BE USED ABOVE THE MOTOR AND IS RECOMMENDED IN SOME CASES, EG: ON A ‘FLOATER’ RIG
TYPICAL BOTTOM HOLE ASSEMBLY
FISHING BHA
FOR ENGAGING INTERNAL & EXTERNAL FISHNECKS

**OUTLINE RUN PROCEDURE**

- **LUBRICATOR LENGTH** = (MASTER VALVE TO CT STRIPPER PLUS LENGTH OF THE FISH)

1. PREPARE BHA: FIT OVERSHOT OR SPEAR WITH ORIFICE TO SUIT THE JOB: CHECK BALL SEAT SIZE IN DISCONNECT & INSTALL SHEAR PINS & RUPTURE DISC TO SUIT JOB: MEASURE MAKE-UP LENGTH, OD & ID OF ALL TOOLS: RECORD WITH TOOL SERIAL NUMBERS

2. INSTALL IN-LINE FILTER BETWEEN PUMP AND CT REEL: ENSURE FLUID SYSTEM IS CLEAN & FREE OF PIPE SCALE ETC.

3. PREPARE END OF COIL (CUT AND STRAIGHTEN AS REQUIRED): MAKE UP, PULL AND PRESSURE TEST COILED TUBING CONNECTOR: PUMP LARGEST POSSIBLE BALL (AND/OR CLEANING PIG) THROUGH REEL TO REMOVE PIPE SCALE AND ENSURE NO OBSTRUCTION

4. MAKE UP REST OF BHA: ONLY USE WRENCHES ON HEAVY WALL AREAS ON TOOL BODIES

5. FUNCTION TEST OVERSHOT OR SPEAR AND RECORD RELEASE FLOW RATES

6. MAKE-UP & PRESSURE TEST CT RISER: USUALLY FLAPPER CHECK VALVES ARE THEN TESTED BY BLEEDING BACK THROUGH THE REEL-ZERO CT COUNTER

7. RIH: SLOW DOWN WHEN PASSING RESTRICTIONS AND LEDGES

8. AT ~100 FT ABOVE TOF CHECK UP/DOWN WEIGHS FOR REFERENCE

9. IT IS COMMON TO CIRCULATE WHEN REACHING TOF TO CLEAN THE FISHNECK AND GET PRESSURE INDICATION: SET DOWN TO ENGAGE FISH, STOP PUMP THEN PICK-UP TO CHECK ENGAGEMENT

10. TO FIRE JAR UPWARDS SIMPLY TAKE OVERPULL AND WAIT FOR JAR TO FIRE: TO RE-COCK JAR CYCLE WEIGHT DOWN PAST NEUTRAL THEN REPEAT OVERPULL TO FIRE JAR UP AGAIN

11. TO RELEASE FROM FISH, SET-DOWN PAST NEUTRAL WEIGHT START PUMPING THEN PICK-UP: FISH CAN RE-ENGAGED IF REQUIRED

12. WHEN FISH COMES FREE, POOH WITHOUT PUMPING

13. AT SURFACE, RELEASE FISH, BREAKOUT BHA AND REMOVE CONNECTOR BY CUTTING COIL 10" ABOVE CONNECTOR

14. FLUSH JAR AND ACCELERATOR WITH FRESH WATER THEN OIL DISASSEMBLE AND CLEAN ALL OTHER TOOLS ASAP TO AVOID CORROSION THEN REDRESS BEFORE RE-RUNNING TOOLS
TYPICAL BOTTOM HOLE ASSEMBLY
VENTURI JET JUNK BASKET BHA
FOR RECOVERING JUNK AND DEBRIS

**OUTLINE RUN PROCEDURE**

1. **PREPARE BHA**: CALCULATE CORRECT NOZZLE SIZES FOR VENTURI (BASED ON PUMP RATE & CIRCULATING FLUID WT TO OBTAIN 500 - 1,000 PSI PRESSURE DROP or 300 - 400 PSI WHEN RUNNING THE VJJB BELOW A MOTOR). CHECK BALL SEAT SIZES IN MHA & INSTALL SHEAR PINS & RUPTURE DISC TO SUIT JOB. MEASURE MAKE-UP LENGTH, OD & ID OF ALL TOOLS. RECORD WITH TOOL SERIAL NUMBERS.

2. **INSTALL IN-LINE FILTER BETWEEN PUMP AND CT REEL**: ENSURE FLUID SYSTEM IS CLEAN & FREE OF PIPE SCALE ETC.

3. **PREPARE END OF COIL** (CUT AND STRAIGHTEN AS REQUIRED). MAKE UP, PULL AND PRESSURE TEST COILED TUBING CONNECTOR. PUMP LARGEST POSSIBLE BALL (AND/OR CLEANING PIG) THROUGH REEL TO REMOVE PIPE SCALE AND ENSURE NO OBSTRUCTION.

4. **MAKE UP REST OF BHA**. ONLY USE WRENCHES ON HEAVY WALL AREAS ON TOOL BODIES. BEWARE OF THIN WALL OF VENTURI COMPONENTS INCLUDING EXTENSIONS.

5. **PUMP THRU BHA TO CONFIRM NO BLOCKAGE**. IF REQUIRED, DEMONSTRATE VENTURI WITH A CUP FULL OF BALL BEARINGS IN A BUCKET FULL OF WATER. LOWER VENTURI INTO THE BUCKET WHILE PUMPING. THE FLUID AND BALL BEARINGS WILL BE SUCKED INTO THE VENTURI. STOP PUMP. AFTER TEST BREAKOUT VJJB BARREL TO REMOVE BALL BEARINGS & REMAKE THE CONNECTION.

6. **MAKE-UP & PRESSURE TEST CT RISER**. USUALLY FLAPPER CHECK VALVES ARE THEN TESTED BY BLEEDING BACK THROUGH THE REEL. ZERO CT COUNTER.

7. **RUN IN HOLE**. SLOW DOWN WHEN PASSING RESTRICTIONS AND LEDGES. PUMP AT MINIMUM RATE IF REQUIRED.

8. **SLOW DOWN 100 FT BEFORE OBSTRUCTION**, TAG OBSTRUCTION SLOWLY, FLAG PIPE THEN PICK-UP 20 FT.

9. **CIRCULATE TO ESTABLISH RETURNS**. ESTABLISH UP/DOWN WEIGHS AND PUMP/RETURN PRESSURES FOR REFERENCE.

10. **PUMP TO ACTIVATE VENTURI AND WORK VENTURI DOWNWARDS**. RECIPROCATE UP/DOWN AS REQUIRED.

11. **MONITOR DEPTH PROGRESS FROM THE ORIGINAL FLAG & POOH**. WHEN IT IS BELIEVED THE MAXIMUM AMOUNT OF DEBRIS HAS BEEN RECOVERED OR IF NO FURTHER DEPTH CAN BE MADE.

12. **WHILE POOH IT IS POSSIBLE TO CLEAN-UP ANY ‘POCKETS’** (EG: GAS LIFT MANDRELS) THAT MAY CONTAIN SETTLED DEBRIS BY PUMPING THROUGH THE VENTURI AGAIN & RECIPROCATING OVER THE AREA.

13. **BREAKOUT BHA & EXAMINE VENTURI FOR RECOVERY**. SERVICE THE VENTURI AND MAKE ANOTHER RUN IF REQUIRED.

14. **IN SOME CASES CT CONNECTOR MAY BE RE-RUN**. OTHERWISE REMOVE BY CUTTING COIL 10" ABOVE CONNECTOR.

15. **DISASSEMBLE & CLEAN ALL USED TOOLS ASAP TO AVOID CORROSION**.

**GAGIE CORPORATION’S** Venturi Jet Junk Baskets may be operated with circulating fluids, nitrogen gas or a mixture. The Venturi effect is not dependent on hole size. Eg. a 2-5/8" OD VJJB could be used inside 7" casing with the only limitation being the ID of the catchers in terms of the size of junk that can be recovered.
1. Prepare BHA: Check ball seat sizes in MHA & install shear pins & rupture disc to suit job. Measure make-up length, OD & ID of all tools. Record with tool serial numbers.

2. Prepare end of coiled tubing (cut and straighten as required). Make up, pull test and pressure test coiled tubing connector.

3. Pump largest possible ball (and/or cleaning pig) through reel to remove pipe scale and ensure no obstruction.

4. Make up rest of BHA; only use wrenches on heavy wall areas on tool bodies.

5. Make-up and pressure test CT riser. Usually flapper check valves are then tested by bleeding back through the reel. Zero CT counter.

6. Run in hole: Slow down when passing restrictions and ledges.

7. Slow down and take up/down weights for reference.

8. Circulate if necessary while running down slowly until tagging top of fish then continue to set down enough weight to get impression. Only tag once then pooh.

9. Tag stripper to check depth counter.

10. Breakout riser and BHA.

11. In some cases CT connector may be re-run: otherwise remove by cutting coil 10" above connector.

12. Disassemble and clean tools ASAP to avoid corrosion. Redress tools before re-running.

**COILED TUBING CONNECTOR**
- External Slip
- Internal Slip
- Roll-on (or Roll-Over)
- Dimple-On

**DEPLOYMENT QUICK CONNECTOR**
- EG. "CARSAC"
- Optional for safer make-up & break-out

**MOTOR HEAD ASSEMBLY**
- Consisting of:
  - Dual Flapper Check Valve
  - Hydraulic Disconnect
    - Actuated by drop ball
  - Circulation Sub
    - Actuated by drop ball C/w rupture disc (typically 5,000 PSI)

**STABILISER**
- If required

**STRAIGHT BAR**
- If required

**STABILISER**
- If required

**LEAD IMPRESSION BLOCK**
- Wireline Lib may be run on coiled tubing with a ported crossover to allow circulation

**FLAT LIB (PORTED)**

**TAPER LIB (PORTED)**

**WIRELINE LIB**

**PAGE 8**
TYPICAL BOTTOM HOLE ASSEMBLY
SLIDING SLEEVE SHIFTING BHA
USING HYDRAULIC EXPANDING BI-DIRECTIONAL SELECTIVE SHIFTING TOOL

COILED TUBING CONNECTOR
- EXTERNAL SLIP (RECOMMENDED)
- INTERNAL SLIP (SLIMHOLE)
- DIMPLE-ON (NOT RECOMMENDED)
- ROLL-ON (NOT SUITABLE)

DEPLOYMENT QUICK CONNECTOR
- EG. “CARSAC”
- OPTIONAL
  FOR SAFER MAKE-UP & BREAK-OUT

MOTOR HEAD ASSEMBLY
CONSISTING OF:
- DUAL FLAPPER CHECK VALVE
- HYDRAULIC DISCONNECT
  ACTUATED BY DROP BALL
- CIRCULATION SUB
  ACTUATED BY DROP BALL
  C/W RUPTURE DISC (TYPICALLY 5,000 PSI)

STABILSER
- IF REQUIRED
  TYPICALLY 1/8” - 1/4” SMALLER THAN TUBING ID OR NIPPLE ID RESTRICTION

BI-DI HAMMER ACCELERATOR
- ACTIVATED BY PUMPING AND APPLYING LIGHT OVERPULL OR SET-DOWN WEIGHT
  (EG. TYPICALLY 300 - 3,000 LBS & 0.3 - 1.2 BPM FOR 2-1/4” IMPACT HAMMER)

BI-DI IMPACT HAMMER
- ACTIVATED BY PUMPING AND APPLYING LIGHT OVERPULL OR SET-DOWN WEIGHT

STABILSER
- IF REQUIRED
  TYPICALLY 1/8” - 1/4” SMALLER THAN TUBING ID OR NIPPLE ID RESTRICTION

HYDRAULIC BI-DI SHIFTING TOOL
- GAGE CORPORATION’S 2.20” OD HYDRAULIC EXPANDING BI-DIRECTIONAL SHIFTING TOOL
  MAY BE DRESSED WITH KEYS TO SHIFT OTIS OR BAKER CM SSDs IN 2-7/8” TO 4-½” TUBING.
  IT CAN SELECTIVELY SHIFT SSDs BOTH UP AND DOWN IN ONE RUN.
  IT CAN PASS THRU RESTRICTIONS AND INCORPORATES EMERGENCY SHEAR RELEASE.
  THE 3.00” OD TOOL CAN SHIFT SSDs IN TUBING UP TO 5-½”

BULLNOSE

OUTLINE RUN PROCEDURE

1. PREPARE BHA: FIT SHIFTING TOOL WITH ORIFICE (CHOKE) & NUMBER OF SHEAR SCREWS FOR EMERGENCY RELEASE (BASED ON CALCULATIONS & CT PULL/PUSH LIMITS AT WORKING DEPTH).
   CHECK BALL SEAT SIZES IN MHA & INSTALL SHEAR PINS & RUPTURE DISC TO SUIT JOB.
   MEASURE MAKE-UP LENGTH, OD & ID OF ALL TOOLS: RECORD WITH TOOL SERIAL NUMBERS

2. INSTALL IN-LINE FILTER BETWEEN PUMP AND CT REEL.
   ENSURE FLUID SYSTEM IS CLEAN & FREE OF PIPE SCALE ETC.

3. PREPARE END OF COIL (CUT AND STRAIGHTEN AS REQUIRED).
   MAKE UP, PULL AND PRESSURE TEST COILED TUBING CONNECTOR:
   PUMP LARGEST POSSIBLE BALL (AND/OR CLEANING PIG) THROUGH REEL TO REMOVE PIPE SCALE AND ENSURE NO OBSTRUCTION

4. MAKE UP REST OF BHA:
   ONLY USE WRENCHES ON HEAVY WALL AREAS ON TOOL BODIES

5. FUNCTION TEST SHIFTING TOOL:
   RESIZE ORIFICE IF NECESSARY.
   RECORD ACTIVATION FLOW RATES

6. MAKE-UP & PRESSURE TEST CT RISER.
   USUALLY FLAPPER CHECK VALVES ARE THEN TESTED BY BLEEDING BACK THROUGH THE REEL.
   ZERO CT COUNTER

7. RIH:
   SLOW DOWN WHEN PASSING RESTRICTIONS AND LEDGES

8. TO SHIFT SSD UP, RUN CT PAST THE SSD, START PUMPING TO EXPAND SHIFTING TOOL:
   RECIPROCATE UP/DOWN TO ESTABLISH REFERENCE WEIGHTS THEN PULL UP SLOWLY INTO THE SSD:
   OBSERVE WEIGHT GAIN AS THE PROFILE IS ENGAGED THEN CONTINUE TO PULL THROUGH THE SSD SLOWLY.
   THE SSD WILL SHIFT AND WEIGHT WILL RETURN TO REFERENCE UP WEIGHT

9. TO SHIFT SSD DOWN, START ABOVE THE SSD, START PUMPING TO EXPAND SHIFTING TOOL:
   RECIPROCATE UP/DOWN TO ESTABLISH REFERENCE WEIGHTS THEN RUN DOWN SLOWLY INTO THE SSD:
   OBSERVE WEIGHT LOSS AS THE PROFILE IS ENGAGED THEN CONTINUE TO PUSH THROUGH THE SSD SLOWLY.
   THE SSD WILL SHIFT AND WEIGHT WILL RETURN TO REFERENCE DOWN WEIGHT

10. WHILE SHIFTING SSD UP OR DOWN THE IMPACT HAMMER WILL AUTOMATICALLY START TO CREATE A VIBRATORY ACTION WHEN FLOW RATE AND PULL/PUSH WEIGHT IS WITHIN OPERATING RANGE

11. TO DEFLATE THE SHIFTING TOOL SIMPLY STOP PUMPING.
    IN UNLIKELY EVENT THAT SHIFTING TOOL KEYS DO NOT RELEASE THEN EMERGENCY RELEASE BY SHEARING UP OR DOWN:
    AFTER SHEAR RELEASE POOH BECAUSE THE TOOL WILL NO LONGER FUNCTION UNTIL IT HAS BEEN RE-PINNED AT SURFACE

12. THE BHA MAY BE MOVED UP OR DOWN THE HOLE (WITHOUT PUMPING) TO OTHER SSDs OR RUN BACK THROUGH THE SAME SLEEVE TO CONFIRM SHIFT

13. POOH WITHOUT PUMPING

14. AT SURFACE, BREAKOUT BHA AND REMOVE CONNECTOR BY CUTTING COIL 10” ABOVE CONNECTOR

15. FLUSH IMPACT HAMMER AND ACCELERATOR WITH FRESH WATER THEN OIL: DISASSEMBLE AND CLEAN ALL OTHER TOOLS ASAP TO AVOID CORROSION THEN REDRESS BEFORE RE-RUNNING TOOLS

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GAGIE CORPORATION

REGIONAL OFFICE

BANGKOK

SUITE 1105 11th FLOOR
RASA TOWER ONE
555 PHAHOLYOTHIN ROAD CHATUCHAK
BANGKOK 10900

REGIONAL OFFICE TEL.: (66) 2 937 0421
REGIONAL MANAGER MOB.: (66) 8 7289 9904
REGIONAL ENGINEER MOB.: (66) 8 6285 7973

“Gagie Corporation offers uncompromising focus to fulfill our customer’s needs to meet or exceed their expectations”