STAGE CEMENTING TOOL

The stage cementing equipment allows for 2 and 3 stage cement jobs. This reduces breakdown of weak formations due to high hydrostatic pressure from a tall column of cement and allows for effective zonal isolation around lost circulation zones. It also assists in selectively placing cement over specific casing intervals. Stage collars are available in different casing grades, weights, and thread connections. Plug sets are available for each stage collar application and are ordered separately. Both hydraulic and mechanical stage collars are compatible for use with external casing packers. A combination of two stage tools can be configured for three stage cementing operations. Its technology is compact, simple and cost efficient. Opening and closing pressure of the tool can be adjusted as per requirement of casing string. Design of Stage Cementing Tool utilizes Shear Screws of specific shear rating to adjust opening and closing pressure of cementing ports. By changing no. of screws, Opening and Closing pressure can be adjusted as per requirement of casing string. Location of Stage Cementing Tool is selected on the basis of the location of lost circulation zones, location of weak formations, depth of the wells etc. Isolation below the stage cementing tool can be done by using either cement baskets (cost effective) or external casing packer (ECP).

It can be very beneficial in following situations:

- In case of long casing strings, it reduces total pressure required to pump the cement.
- In the wells having weak formations, it is required to reduce cement hydrostatic head as much as possible because high hydrostatic pressure on weak formations results in breakdown of such formations.
- Use with liners or where sectional cementing of the casing is being performed.
- In the wells having lost circulation zones, it is required to perform cementing jobs above and below the zones.
- In the wells which have requirement to place different cement blends at selective zones.
OPERATION SEQUENCE:

- Installation of Mackeral Baffle Plate (When thread connection is 8RD or Buttress) or Mackeral Baffle Collar (When thread connection is premium) along with Hydraulically Operated stage cementing tool in the casing string.
- Run the casing string to the bottom.
- Establish circulation. Mix and pump first stage cement.
- Launch First Stage Cementing Plug; it lands on Baffle plate or Baffle Collar. It displaces the cement.
- First Stage Cementing Plug seals the ID of Baffle Collar.
- Increment of pressure up to opening pressure breaks down screws, thus opening sleeve is moved downwards.
- As opening sleeve is moved downwards, cementing ports are now in open state. Establish circulation. Mix and pump second stage cement.
- Launch Closing Plug, it lands upon closing seat. It displaces cement.
- Apply closing pressure, Closing sleeve moves down and main sleeve slips down with it to close cementing ports.
HYDRAULIC STAGE CEMENTING TOOL

Product Code: MI 4101

FEATURES:

1. Hydraulically Operated Stage Cementing Tool overcomes the drawback of Mechanically Operated Stage Cementing Tool as it can be used in Horizontal wells too.
2. Hydraulically Operated Stage Cementing Plug can be converted into mechanically operated stage cementing plug by using a free fall opening plug.
3. Adjustable Opening and Closing Pressure.
4. It is featured with Anti-rotation features for reducing drilling time.
5. No fluid is trapped during any operation.

OPERATION SEQUENCE:

1. Installation of Mackeral Baffle Plate (When thread connection is 8RD or Buttress) or Mackeral Baffle Collar (When thread connection is premium) along with Hydraulically Operated stage cementing tool in the casing string.
2. Run the casing string to the bottom.
3. Establish circulation. Mix and pump first stage cement.
4. Launch First Stage Cementing Plug; it lands on Baffle plate or Baffle Collar. It displaces the cement.
5. First Stage Cementing Plug seals the ID of Baffle collar
6. Increment of pressure upto opening pressure breaks
7. Down screws, thus opening sleeve is moved downwards.
8. As opening sleeve is moved downwards, cementing ports are now in open state.
10. Launch Closing Plug, it lands upon closing seat.
11. It displaces cement.

Apply closing pressure, Closing sleeve moves down and main sleeve slips down with it to close cementing ports.
MECHANICAL STAGE CEMENTING TOOL

Product Code:- MI 4201

FEATURES:

1. Mechanically Operated Stage Cementing Tool is designed to be used in vertical wells.
2. Opening and closing pressure is adjustable by changing no. of screws.
3. Its design is featured such that no hydraulic locking is there during opening and closing phase of the tool.
4. Both Opening and Closing Seats consist of anti-rotation features which makes it easier to drill during drilling operation.
5. It is a non-welded tool.
6. O-ring Seals are provided for prevention of leakage of fluid.
7. Snap Ring is provided to lock closing seat in closing position.
8. Stage Collar is a proven design that is manufactured in sizes 4 1/2” through 20”.

OPERATION SEQUENCE:

1. Installation of Mackeral Baffle Plate (When thread connection is 8RD or Buttress) or Mackeral Baffle Collar (When thread connection is premium) along with Mechanically Operated stage cementing tool in the casing string.
2. Run the casing to the bottom at desired location.
3. Location of Cementing Tool depends upon the depth of the well, location of lost circulation zones or weak formations etc.
4. Establish circulation. Mix and pump first stage cement.
5. Launch First Stage Cementing Plug to displace cement. It sits on Mackeral Baffle Float Collar.
7. Apply Opening Pressure, Opening Seat slips down and cementing ports are opened.
8. Establish circulation, Mix and pump second stage cement.
9. Launch Closing Plug, it sits on closing seat and displaces the cement.
10. Apply closing pressure; closing seat is adjusted to close cementing ports.

TWO STAGE THREE PLUG CEMENTING

The standard two stage cementing procedure uses conventional floating equipment, either standard valve or filling float valves on the bottom of the casing string. The rubber baffle plate is installed on top of the float collar. The stage collar is installed in the casing string at the position where second stage cement is to be pumped into the annulus. If a casing packer is being used the stage collar will be located above the packer. The operation of the stage collar is illustrated in sequence.

1. Running in and First Stage Cementing, Flexible First Stage Plug will pass through stage collar while displacing first stage cement, landing on Baffle Plate located in Float Collar.
2. Second Stage Cement Opening Trip Bomb has landed in and opened Stage Cementing Collar allowing second stage cement to be displaced.
3. Second Stage Cement complete, Second Stage Closing / Displacement Plug landed in Stage Collar. Application of pressure will close the Stage Collar Ports. Two Stage Cementing job is complete.
TWO STAGE FOUR PLUG CEMENTING

Two Stage Wiper plug system is a very effective means of wiping in two stages with liner hanger & ECP Packer. Top Liner Wiper Plug is a flexible type rubber plug, which is assembled with the Top Liner Wiper Plug with the help of shear pins. The plugs have Non-Rotational features, which allow easy PDC drilling after cementing. The Bottom Liner Wiper Plug releases from the Top Liner Wiper Plug by bumping of lower releasing dart and it travels through the Hydraulic Stage. Cementing Collar without any effect and seats into the BFC Landing Collar. The pressure rises against Bottom Liner Wiper Plug which actuate ECP Packer then opens the ports of the stage tool. The upper dart bump in to Top Liner wiper plug and release the Top Liner Wiper Plug, seats in the closing seat of the hydraulic stage- cementing collar. It closes the ports by shearing the shear pin and shifting the closing sleeve after second stage cementing job.
SEQUENCE OF OPERATION:

Step-1 Stage collar in ‘running-in’ and first stage cementing position. First stage shut-off plug will pass through stage cementing collar while displacing first stage cement, landing on baffle plate located in float collar.

Step-2 HYDRAULIC opening: Opening sleeve is shifted down by applying hydraulic casing pressure, allowing second stage cement to be displaced through the ports.

Step 2 MECHANICAL opening: Opening dart is dropped (free-fall), and landed in the opening seat. Casing pressure is applied, the opening sleeve is shifted to the open position allowing second stage cement to be displaced through the ports.

Step 3 Once the second stage cement job is complete, the closing plug lands in the stage cementing collar closing seat. Application of casing pressure shears the shear screws and pushes the closing sleeve to the closed and locked position, sealing off the ports. This completes the two stage cement job. (Hydraulic operation works the same, but no opening dart will be present).
THE BASIC TWO-STAGE CEMENTING PLUG SET FOR:

Hydraulic Stage Collar:

1st STAGE CEMENTING  2nd STAGE CEMENTING

Mechanical Stage Collar:
**BAFFLE COLLAR**

**Product Code:** 4205

Baffle Collar is used for landing cementing plugs at specific points in the casing string. It is used when no float collar on shoe is being run and for linear cementing application. It is easily drillable.

**BAFFLE PLATE**

**Product Code:** 4207

Baffle Plate is used for landing cementing plugs and is designed to be installed in the center of a casing coupling. These are available in both aluminum and plastic materials, and come in threaded and flush outside diameter configurations. Baffle Plates are available in sizes 4 1/2" through 13 3/8".