Slip Interlock System
System enables safety improvements on our hydraulic workover and snubbing units

The slip interlock system helps ensure that one slip bowl is completely closed and hydraulically pressured before the system allows the other paired slip bowl to open. The interlocking is achieved by means of sensors mounted onto each slip bowl. Both pressure and slip position sensors must be tripped to open the interlock.

The interlock system is designed to always fail safe. It is a fully hydraulic logic system with no electrical components to help assure maximum reliability and service life.

Slip Interlock Addresses the Following Load Control Risks:
- Operator error - it is possible for the operator to accidently open a set of closed slips against pipe weight (load) when working in the balance point zone.
- Slip bowl failure – failure of the slip bowl to fully close on pipe due to mechanical or hydraulic fault.
- Failure of slip bowl to close fully due to bowing (buckling) of pipe within the slip bowl preventing the slip bowl to fully close properly.
  The primary prevention of this hazard is the use of correctly sized slip bowl centralizer guides. Slip interlock is a secondary prevention system for this risk.
- Loss or reduced slip bowl hydraulic pressure. All slip bowls require a minimum hydraulic pressure to operate properly. The slip interlock system helps assure individual slip bowls receive the minimum operating pressure.
  Pressure can be lost or reduced due to many causes:
    - Internal leakage with the slip bowls hydraulic actuator cylinders
    - Loss of a pump pressure
    - Quick disconnect problems
    - Operator does not have slip pressure adjusted correctly on operator console.
- Closing slips on tool joint.

How the Slip Interlock System Works

4 Slip Bowl Stand Alone Unit Systems
Stand alone units are typically equipped with 4 slip bowls per unit – a pair of snubbing slip bowls and a pair of heavy slips. These units are equipped with essentially two slip interlock systems one dedicated to the snubbing slip bowl pair (inverted slip bowls) and the other dedicated to the heavy slip bowl pair. There is no interlocking across snubbing and heavy slip bowls – only pairs of bowls oriented in the same load direction.

During pipe light operations – the active pair of snubbing slip bowls (traveling and stationaries) are interlocked (i.e. one slip bowl must be closed on the pipe at all times). At this time the pair of heavy slip bowls are in the override mode which allows both heavy slip bowls to be in the open position while snubbing operations are taking place.

During pipe heavy operations – the reverse is in effect. The heavy slips (travelling and stationaries) are interlocked and the snubbing slip bowls are in override mode.

It is important to note that the slip interlock system does not prevent the operator from closing any of the 4 slip bowls at any time. The operator can close any or all of the 4 slip bowls without restriction at any time as warranted. The slip interlock system only prevents the opening of one slip bowl without its paired slip bowl from being closed on the pipe first.

Override controls and functionality
There are two override controls, one override control for the snubbing slip bowl pair and a separate override control for the heavy slip bowl pair. The two override controls are located on an override control panel that is located on a stand on the ground. Only supervisors are authorized to operate the override control.

Once either overridden slip bowl is actuated closed, the override mode is automatically terminated and both slip bowls will automatically operate again in interlock mode thereafter until override is applied again.
When Override Is Typically Needed

It is normal for the override function to be applied at specific stages of a job. For a typical snubbing job requiring pipe light and pipe heavy operations, slip bowl override control will be required at the following times:

- At the beginning of the job both snub and heavy slip bowls will require override to lower the BHA below the slip bowls.
- At the balance point going into the well, when the pipe becomes heavy, the operator will switch over to using the heavy slips (traveling and stationary). At this point the snubbing slips will need to be placed in the open position via snub override actuation.
- At the balance point when pulling out of the well, when the pipe becomes light, the operator will switch to using the snubbing slips. At this point the heavy slips need to be placed into the open position via the heavy override actuation.
- At the end of the intervention, to remove the BHA from the unit, both the snub and heavy slips (both pair) are opened via override actuation, after the well bore is shut in and BOPs is bleed off.

Safety improvements, such as the slip interlock system, incorporate equipment designs to address risks, opposed to relying on process/procedural-type solutions that require 100% human compliance to be effective. Such systems promote operational efficiency by helping prevent service-quality incidents and potential health, safety, and environment (HSE) events.

For more information, contact your local Halliburton representative or email us at production-solutions@halliburton.com.