

CIRP

Completion insertion and removal under pressure equipment

APPLICATIONS

- Rigless perforating or reperforating, which typically involves short lubricators, limiting the length of gun string deployed
- Perforation of long intervals with controlled underbalance
- Multiple perforating runs without killing the well

BENEFITS

- Safer operations due to separately deployed firing head not attached to a gun
- No formation damage from kill fluids
- Minimized production loss when reperforating
- Minimized personnel exposure with remote operation

FEATURES

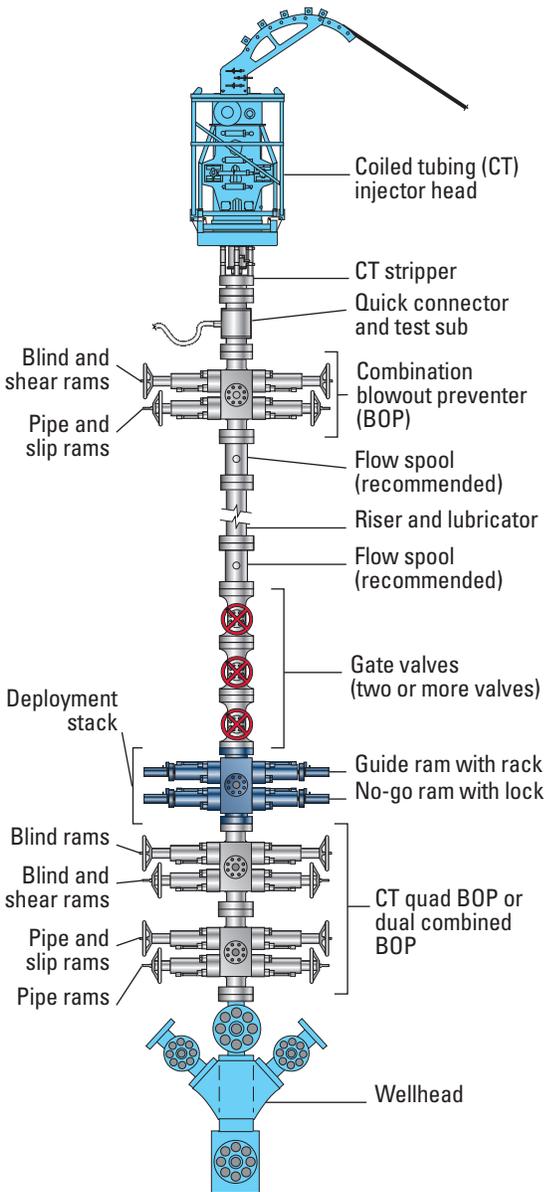
- Deployment flexibility for use in operations requiring pressure control
 - Snubbing
 - Wireline
 - Slickline
 - Coiled tubing
- Pressure control, including underbalance control, when gun strings are inserted and retrieved under pressure
- Compatibility with a variety of gun systems
- Remote operation in challenging well conditions
- Connector debris and sand tolerance

The CIRP* completion insertion and removal under pressure equipment is used to insert and retrieve long gun strings under wellhead pressure when the surface pressure control equipment, or lubricator, is shorter than the gun string. With the CIRP equipment, a long interval can be perforated under the optimum underbalance condition, and then the guns can be retrieved without exposing the formation to damaging kill fluids. Wells can also be reperforated without killing, minimizing production loss and formation damage. Multiple perforating runs can be completed without killing the well between runs.

In extended-reach wells, for example, the perforated interval may be longer than the maximum gun string that can be conveyed, mandating multiple runs. The length of the surface lubricator determines the length of the gun string interval between two connectors. The CIRP equipment is compatible with all Schlumberger hollow carrier guns measuring 2 to 4½ in.

The CIRP equipment consists of three main components:

- connectors, which tie the gun sections together and provide sealed ballistic transfer
- deployment stack, which locks and unlocks connectors under pressure and supports the disconnected string
- two gate valves, which isolate the lubricator from well pressure to contain well pressure when short gun sections are being picked up or laid down.



CIRP equipment for CT operations.

The CIRP equipment comprises conventional lubricators, two or more gate valves, and a deployment stack with dual actuators. The lower actuator is a no-go ram with a lock to position the connector. The upper actuator is a guide ram with a rack to operate the locking mechanism on the connector. The system's connector is the mechanical and ballistic link between the gun sections deployed in the lubricator. The lock and rack allow connection or disconnection of the connectors under pressure inside the lubricator assembly. Gun string segments matching the lubricator length can be installed or removed using the gate valve to close in the well before bleeding off and opening the lubricator during

each step of the operation. Closing the gate valve allows the pressure in the lubricator to be bled off. It can then be disconnected for insertion or removal of gun sections. The sealed ballistic transfers seal the loaded guns before they are shot.

The firing head is usually deployed separately, not attached to a gun, when pressure is equalized in the riser. Afterward, it is connected to the gun string with CIRP system connector. The CIRP equipment allows completely remote operations, minimizing personnel exposure.

Specifications

Gun Size, in	2, 2.25, 2.50	2.50, 2.88, 3.38, 3.50	3.38, 3.50, 4.50
Connectors			
OD, in [mm]	2.25 [57]	2.80 [71]	4.0 [102]
Temperature rating, [†] degF [degC]	400 [204]	400 [204]	400 [204]
Collapse pressure, [‡] psi [MPa]	20,000 [138]	20,000 [138]	20,000 [138]
Shot-to-shot distance, [§] in [cm]	46 [117]	46 [117]	47 [119]
Makeup length, in [cm]	33.94 [86.2]	33.70 [85.6]	35.33 [89.7]
Slick joint length, in [cm]	12.0 [30.5]	11.84 [30.1]	12.0 [30.5]
Tensile strength, [‡] lbf [kN]	60,000 [267]	145,000 [645]	245,000 [1,090]
Compressive strength, [‡] lbf [kN]	19,000 [85]	51,000 [227]	195,000 [867]
Nominal rotation of lock sleeve, °	15	15	15
Rack and Lock			
Deployment stack ID, in [mm]	4.06 [103]	4.06 [103]	5.125 [130]
Working pressure, psi [MPa]	10,000 [69]	10,000 [69]	10,000 [69]
Ram space out, center to center, in [cm]	11.5 [29.2]	11.5 [29.2]	11.5 [29.2]

[†] For 100 h, temperature rating can be increased with special seals.

[‡] Collapse pressure rating is at 67% of yield strength; tensile and compressive strengths are at yield strength.

[§] Nominal shot-to-shot distance; exact distance depends on shot density and phasing option of gun.