Mechanical Cleaning and Pigging

Standard Protection Procedure

Internal corrosion is one of the most prevalent causes of premature failure in used coiled tubing. To reduce the incidence of failures and prolong the life of the tubing, regular cleaning and treatment of the string with the appropriate combination of wiper balls, wire brush pigs, biocides, inhibitors, and high-quality nitrogen is needed to store strings between jobs.
The following procedure outlines the general steps for mechanically cleaning and inhibiting coiled tubing.

1. Attach pig / ball catcher to the outside pigtail (field pig catcher design will vary).

2. Knock off 2'' 1502 plug

3. Insert brush pig

4. Insert 2'' foam ball and push past port (tee) leading to the swivel and reconnect cap.

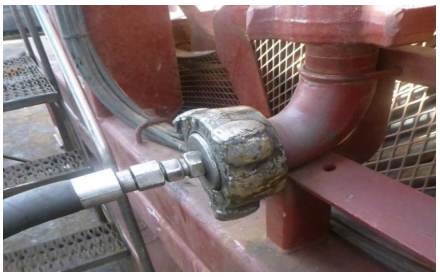
5. Attach inhibitor/biocide fill line, then pump desired volume of mixture.

6. After inhibitor/biocide mixture is injected, remove all pressure on reel plumbing/ manifold.

7. Knock off 2'' 1502 Plug

8. Insert second foam ball and push past tee.

9. Attach Nitrogen line to reel manifold.



10. Make sure all valves are open for the path of the nitrogen then turn on nitrogen to begin the pigging process.

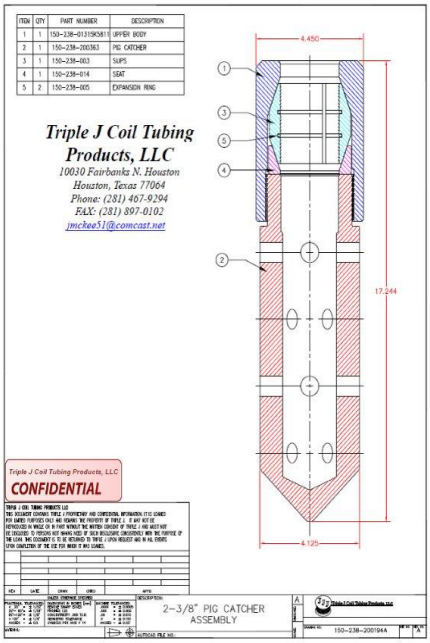
11. After blow down, bleed off all nitrogen before removing any lines or pig/ball catcher. Verify both brush pig and ball are received in catcher.

Procedure Timeline Example

- 17:49 PM: Filling process complete (CT full of water).
- **17:53 PM: Brush pig and foam ball inserted.**
- **17:58 PM: Pump in Biocide/inhibitor mixture.**
- **18:08 PM: Insert foam ball.**
- **18:10 PM: Nitrogen turned on.**
- 18:41 PM: Nitrogen turned off and verified retrieval of brush pig and foam balls.

BOLD font indicates time added to normal operations

Sample Materials



Schematic of a pig catcher assembly. Drawing presented with permission from Triple J Coil Tubing Products, LLC.

Foam pigs for various CT sizes.

Brush pigs before (below) and after (above) pumping through CT.

Frequent pigging of the coil will reduce scale buildup and limit ponding corrosion by breaking up biofilm and allowing chemical treatments to penetrate to the surface of the tubing rather than the rust film.

Pigging results and ID surface improvement

Close up of the internal surface of the CT prior to pigging, with considerable amounts of scale and rust present.

Residue collected (iron oxides) after pumping brush pig and inhibitors.

Close up of the internal surface after pigging with the scale removed, reducing the occurrence of corrosion pitting beneath the scale.

Note small colonies of corrosion with preferential pitting are reveal after pigging. Frequent removal of scale will reduce the amount of localized bacteria growth.

Coiled Tubing Best Practices

- **Examples of ponding type corrosion where pigging and drying is designed to eliminate this type of damage**