Run-N-Seal® H_2S
Metal-Free Thread Compound

DESCRIPTION

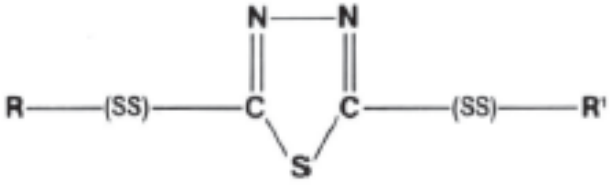
JET-LUBE® offers a variety of thread compounds that are treated to inhibit hydrogen sulfide corrosion. We utilize a nontoxic additive technology that allows our products to withstand corrosive attacks from hydrogen sulfide. With **JET-LUBE's Run-N-Seal® H_2S**, protection is now available at an additional charge for most of our products.

How The Additive Works
All of the **JET-LUBE** compounds that are produces with the inhibitor act to "capture" the sulfur compound and neutralize them into harmless compounds. This is much like the reaction between a strong acid and a strong alkali to form a neutral salt. This continual process of sulfur neutralization assures that constant protection against sulfur corrosion and hydrogen embrittlement is available.

The process of sulfur passivation is not completely understood by research scientists. It works, however, and certain predictable results occur when certain criteria are met. It is known that compounds containing large amounts of bound sulfur will in turn bind up and passivate large amounts of free sulfur. **JET-LUBE** has chosen additives that will be effective against sulfur and still protect against wear, maintain high water displacement and keep corrosion protection at maximum levels to concentrations of hydrogen sulfide up to 80,000 ppm.

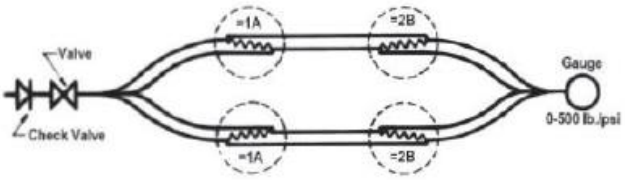
Extensive testing has proved the effectiveness of JET-LUBE thread compounds.
JET-LUBE's research department conducted accelerated exposure tests using a concentration of 74% hydrogen sulfide. After the equivalent of 10 years of exposure at 80,000 parts per million or casing compounds, hydrogen sulfide penetration was remarkably low. Penetration was held within the first full thread beyond the initial point of thread engagement.

Record of tests conducted between inhibited and uninhibited thread sealing compound
The general formula for the hydrogen sulfide inhibitor used in the tests and in the **JET-LUBE** compounds currently available is as follows:



Testing data:

1)Testing period: Six months
2)Testing Device: 2-3/8" EUE tubing joints with attachments. See illustration below.
3)Testing pressure: 4800 lb./sq.in±200 lb./sq.in.
4)Testing temperature: 72°F ± 2°F
5)Compounds tested:
Compound "A" – KOPR-KOTE® with no inhibitor
Compound "B" - KOPR-KOTE® with sulfur inhibitor.



Testing procedure.
The male and female threads of joint "A" (left) were coated with Compound "A" which contained no inhibitors. The male and female threads of joint "B" (right) were coated with Compound "B" which did contain the inhibitor.

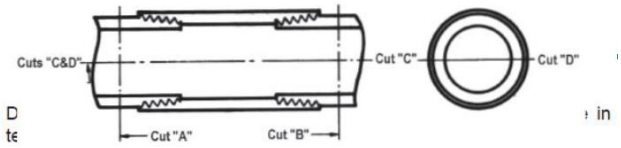
The joints were then assembled. Joint "A" was tightened to 900 ft./lb. of torque. Joint "B" was tightened to 1700 ft.lb. of torque. The torque used on joint "B" was equal to 1 ½ turns after hand-tight. The reason for this difference in torque was increased the stress in the "inhibited" joint. A valve and check valve were connected to the device at one end and marbles were inserted through the other end to act as a filler material. A pressure gauge was attached to this second end.

A mixture of hydraulic light oil (10 weight) and water was pumped into the device. The remaining air was replaced with hydrogen sulfide to achieve the proper testing environment.

The internal pressure of the device was increased to 500lb./sq.in., with a hydraulic pump. No leakage occurred at joint "A" or joint "B" during the test.

Internal pressure was kept within the limits specified in the testing data above, generally in the upper half of the limits.

Six months later.



At the end of the testing period, the check valve was removed and the main valve was opened to release the pressure. A small sample of the liquid and excess compounds from inside the device were collected for further study.

The main coupling assembly was cut at each end (Cut "A" and Cut "B") to remove the end caps without disturbing the threaded connections.

Two partial cuts were then made (Cut "C" and Cut "D") along the longitudinal axis of the device, on opposite sides. This was done to expose the male threads, but the cuts were not made completely through the male joints.

The test results.
The male threads were microscopically examined and the following results were noted:

1) Male threads of joint "A" – The hydrogen sulfide reacted with the metallic copper in the compound to form Cu_2S and CuS. There were no significant signs of cooper left on the first seven full threads. This indicated hydrogen sulfide encroachment on the first thread that was noted in this first thread. All fully engaged threads were unaffected.

Conclusions

1)H_2S will react preferentially with metallic cooper instead of with other metals present.
2)The encroachment of H_2S in a thread connection can be more accurately observed by looking for the formation of Cu_2S than by looking for reaction with steel.
3)Where encroachment occurs, H_2S will react with all metals present.
4)It is possible to stop hydrogen sulfide encroachment with the inhibitor used.
5)**JET-LUBE's Run-N-Seal® H_2S** contains this same corrosion inhibitor that has proven effective.

Significance of the results achieved in the JET-LUBE test.
Hydrogen sulfide does not have to be considered a threat if **JET-LUBE** compounds containing the H_2S inhibitor are used.