

# Preliminary Damage When Using Enhanced Oil Recovery Methods

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**Annotation:** The results of testing of steam injection and steam treatment for enhanced oil recovery in various conditions are presented. Two technological schemes of steam supply to the seams were proposed and it was found that the most protective effect of the seams is observed during water deoxidation.

**Keywords:** solution injection, in situ combustion, micellar solution, corrosion inhibitor, soda solution, steam generator

Currently, thermal and chemical methods, as well as mixed gas displacement, are used to improve oil recovery. The most efficient thermal processes are steam injection and steam treatment. Interplastic incineration is also widely used. Of the chemical methods, the most commonly used is riveting a micellar solution pushed through a polymer solution, or seducing a polymer. Gaseous hydrocarbons and CO<sub>2</sub> are used for mixing gas displacement. The latter method is rapidly gaining popularity. However, it should be noted that the use of CO<sub>2</sub> has a significant impact on the corrosion activity of mineralized waters accompanying oil production. Factors affecting the corrosion state of stopped workers under the influence of various factors, both in the laboratory and in the field, have been studied. The corrosion rate in both cases was measured using linear and potentiodynamic polarity, comparing it with data from direct mass tracking cameras of reference samples. To study the corrosion processes when injecting CO<sub>2</sub> into the reservoir in laboratory conditions, two test cycles were conducted using two types of salt solutions: a 3.5% NaCl solution and a 5.5% solution simulating effective geological conditions. These solutions were synchronized with argon saturation, and different amounts of hcl, NaOH, and NaHCO<sub>3</sub> were added to the CO<sub>2</sub> to provide different pH levels and different concentrations of HCO<sub>3</sub><sup>-</sup> - dissolved CO<sub>2</sub>. Passing current through these solutions (electrodes made of AISI 1020 steel), we built the potential-dynamic polarity of these solutions. curves. In field, potentiodynamic polarization curves were calculated using AISI 1020 electrodes at 12 US oil fields. The chemical characteristics of mineralized waters were also determined here. No influence was observed in any place. The study of the process of increasing corrosion during riveting in polymer plastics was first carried out in the laboratory on the example of a 3.5% solution of NaCl saturated with SO<sub>2</sub>, and various amounts were added Na<sub>2</sub>S, an acrylamide polymer and petroleum sulfonate. The corrosion rate was pickled after 24 hours using linear polarization at 23<sup>0</sup>C. A number of inhibitors were tested: containing cations, anions, or a mixture of anions and cations. Field tests were conducted on several fields where a rivet made of micellar solution was used, pushed out by a polymer solution or polymer bait. As a result of this test, the effectiveness of corrosion inhibitors was determined by the mass of samples and potential-dynamic polarity curves, as well as by the content of dissolved CO<sub>2</sub>, sulfides, bicarbonates and polymers in mineralized water. Based on the results of field tests, additional laboratory tests were performed, during which the concentrated acrylamide was dissolved in 2l of a mixed salt solution containing NaCl, CaCl<sub>2</sub> MgCl<sub>2</sub> and Na<sub>2</sub>SO<sub>4</sub>. An inhibitor of Na<sub>2</sub>S·9H<sub>2</sub>O, FeCl<sub>2</sub>·4H<sub>2</sub>O and HCl was introduced into this composition (up to pH=5.8-5.9), after mixing the mixture was saturated with CO<sub>2</sub> to a homogeneous state. The final composition of the test medium is 360 sulfides, 400 bicarbonates, 120 dissolved CO<sub>2</sub>, 70 iron and 750 active polymers. Air was slowly blown through this mixture. The amount of inhibitor administered was varied to determine the concentration at which corrosion was slowed down within 24 hours.

The study of corrosion control problems when using methods of intra-layer combustion for oil production intensification has been thoroughly tested in industrial conditions. Gorenje made numerous measurements at various distances from the combustion front of the pH value, temperature, amount of dissolved CO<sub>2</sub>, etc. Due to the fact that the problems of corrosion arising from the use of steam are well understood, no additional research has been conducted. When studying the corrosion processes that occur when CO<sub>2</sub> is injected into the formation, the composition of the plastic platoon determines which inhibitors are necessary for pre-atomization of corrosion. In the waste under consideration, the rate of corrosion (V) is determined by the dependence:  $V=K_1 (CO_2 + 1/10 H^+HCO_3^-)$  (1)

where K<sub>1</sub> is the size that depends on the composition of the salts in the solution, CO<sub>2</sub> is the amount of dissolved carbon dioxide, and HCO<sub>3</sub> is the number of angular acid ions. This dependence is compensated for at pH=3.5-8 and a temperature no higher than 230C. if the concentration of chemical substances is expressed in M-1, and the rate of corrosion in mm / year, then K<sub>1</sub> =0.001 for the compound solution and 0.002-for 3.5% NaCl solution/ Laboratory studies have provided some additions to the well-known fact that the risk of corrosion increases with increasing concentrations of CO<sub>2</sub> in a salt solution in a neutral environment, cathodic reduction of NCO and CO<sub>2</sub> occurs faster than anodic reduction of no\_ and N -. The conclusions obtained in the laboratory were confirmed by short tests at the mouth of 12 wells. The calculated size of the corrosion rate does not correspond to the actual measurements at 3 wells, which can be explained by an increase in temperatures that are not taken into account in the proposed formula. The increase in the concentration of CO<sub>2</sub> (Co<sub>2</sub>u) in the salt solution (M-1) observed after injection depends on the composition of the solution and can be determined by the formula:

$$CO_2 = SO_2 * K_2 / T, \quad (2)$$

where  $K_2=1900$ ; T is the sum of  $CO_2$  concentrations,  $HCO_3^-$  sec. - and S before the  $CO_2$  hook. Due to the fact that  $HCO_3^-$  ions, the amount of  $CO_2$  can be determined by changing the corrosion rate according to the following relationship

$$V_2 = V_1 K_2 / T, \quad (3)$$

where  $V_1$  and  $M_2$  are the corrosion rate before and after the latch, respectively. Both laboratory and field tests have shown that a large number of inhibitors provide 99% protection against corrosion. If 5mn-1 sulfides are present in the salt solution, then corrosion may be preferred for almost any indicators; including for smaller amounts of sulfides, only inhibitors containing nitrogen, phosphorus and sulfur are suitable. Considering the corrosion processes associated with the use of polymers, it should be noted that in deposits where there is little sulfur, it is easier to ensure corrosion control; in the presence of a number of salt solutions, these deposits leave a black gust on the surface of the metal. Polymers reduce the protective effect of inhibitors, and different components (for example, iron and copper ions, as well as oxygen) act differently. The corrosion activity in the first approximation is proportional to the amount of FeS and  $O_2$ , therefore, the choice of an inhibitor indicates a set of substances that effectively act against oxidized iron sulfide. The polymer itself is necessary to protect against the destructive action of bacteria. In rivet systems, polymer corrosion problems do not occur in a complex and complex manner, i.e. iron and copper ions are practically absent, and oxygen is removed by chemical methods. A cationic inhibitor is more effective for working with a polymer.

Due to the fact that inhibitors of this type lose their activity over time, it is recommended to conduct inhibition continuously. Gorenje corrosion damage is covered by the presence of combustion products and oxygen when using reservoir combustion methods. The increase in temperature that occurs when the fire front is directly approaching the well also exacerbates corrosion. If the fire front passes directly through the production well, it is impossible to control the corrosion. However, in other cases, during a period of intensive mining, the corrosion process can be controlled. Corrosion activity during this period naturally increases: when the concentration of dissolved  $CO_2$  and  $H^+HCO_3^-$  increases, the pH increases. In addition, the salt solution shows the appearance of soluble sulfide (its exact form is not possible in the process of industrial research). The choice of inhibitors in the daytime case is due to the oxidative effect of the medium. Steam injection is the oldest method of increasing oil recovery, so no detailed studies have been conducted. The pair can be used according to two technological schemes: the first pair is coordinated by connecting to the production well, so the binding and production periods alternate, each period lasting several weeks; the second includes similar special injection wells. In both cases, conventional inhibitors are used to prevent corrosion, since the temperature of the extracted oil is slightly different from the temperature in the tank before the steam rivet. The chemical composition of the salt solution does not change, but its corrosion activity increases with the unchanged nature of the corrosion damage. A necessary condition for successful corrosion protection in this case is the termination of the water that acts in the steam generator (water can be not only tap water). After deoxidation, a small amount of soluble indicator is introduced into the water. It performs two more ways to increase oil recovery-water treatment with a soda solution (which is used in all modes) and the intensification of oil production with the help of microorganisms. This method is still not used due to lack of knowledge about the problem of corrosion.

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