

ESTABLISHMENT AND QUANTIFICATION OF CORROSION-INDUCED DAMAGES OF PROTECTIVE STEEL PIPES IN OIL INDUSTRY

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ABSTRACT

In present paper, the methodological approach to establishment and quantification of intensity of corrosion-induced damages of protective pipes used for piping of the oil wells in oil industry as well as a presentation of possible damages and corrosion-induced consequences with the examples from practice have been given. The possibility of taking measures to prevent such phenomena has also been considered.

KEYWORDS

Corrosion-induced damage, Protective steel pipe

1 INTRODUCTION

The protective steel pipes for piping of the oil wells in oil industry have been exploited in a corrosive atmosphere, combined with high pressures and temperatures. That is why the protective pipes are highly susceptible to material degradation. According to the frequency of occurrence of the damages, by establishment of condition, main causes of degradation are material fatigue, fracture embrittlement, corrosion and erosion of the material. These phenomena are most frequently preceded by the project and design defects, production and assembling defects, unpredicted exploitation conditions and conditions of operating medium. All the defects, no matter whether they were already existing or they appeared in exploitation, should be registered and subjected to control by testing them in specified period of time to get a real insight into possible development of the damage. This directly affects the decrease of the number of damages and scheduling of interruption of operation of a plant, resulting in significant reduction of total costs.

2 CORROSION OF STEEL COMPONENTS OF PIPED OIL WELLS

Corrosion-induced damages reducing cross-section carrying capacity significantly jeopardize an oil well on the whole. The attack of corrosion may lead to significant decrease of the values for mechanical properties of steel that, under unfavourable conditions, can be an introduction into fracture of the steel components – sooner so in case of higher stresses. The fracture of the steel components of the oil wells may be induced and accelerated by the following types of corrosion: pitting corrosion, inter-crystalline stress-corrosion and hydrogen embrittlement. An example of corrosion-induced degradation of the pipes in the oil and gas wells has been presented on the photos in Fig. 1.

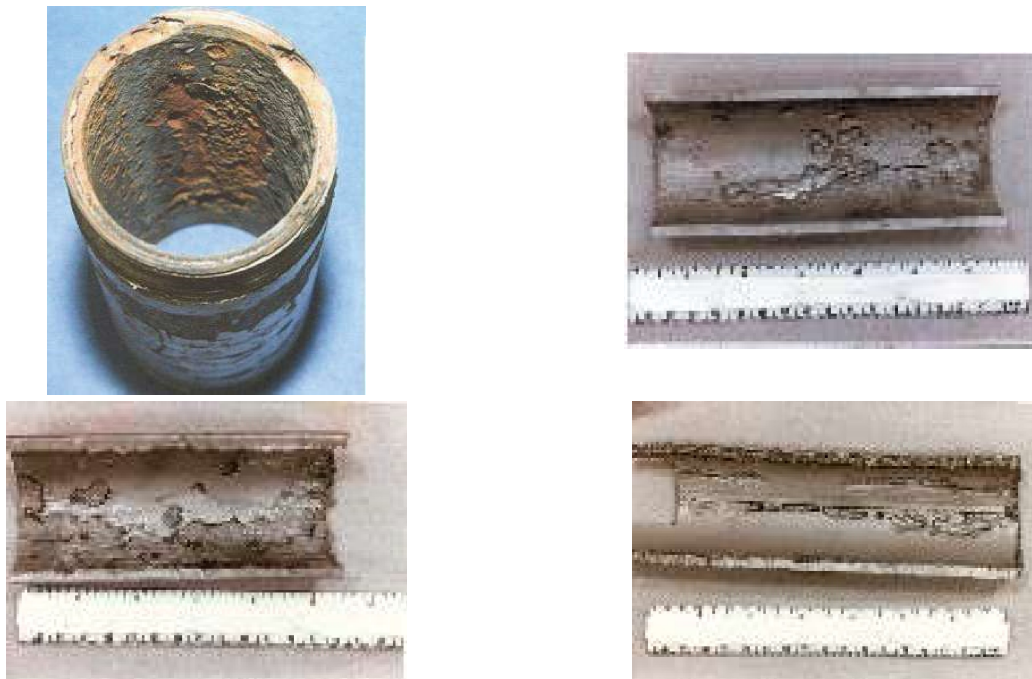


Figure 1: The examples of corrosion-induced damages in oil well [1]

of condition of such equipment in relation to exploitation conditions, with special emphasis on ISO standards 9001-9004 and safety of the plants, as well as on intensified legal measures and regulations for protection of the users and environment.

As these are the facilities of Class I, all inspection must be performed by accredited organizations with proper high-skilled personnel and with adequate equipment.

By expert assessment of the results obtained, durability and operating capacity of the equipment can be extended much above projected exploitation life.

Inadequate maintenance of oil and gas wells from the point of view of protection against corrosion imposes highly expensive recovery, so that it is necessary to examine thoroughly the problems of protection, durability and maintenance of the oil wells, especially for protective steel pipes, and the possibilities of monitoring of corrosive aggressiveness in exploitation. In this regard, an assessment of condition of the protective pipes jeopardized by corrosion after long-term exploitation, accompanied with specific testing using non-destructive testing, is necessary in order to establish a real degree of damage, and afterwards to take adequate precautions for recovery of critical corrosion-induced damages.

8 ACKNOWLEDGEMENT

Author acknowledges the financial support of the Serbian Ministry of Science, project TR 35011.

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