NON–DESTRUCTIVE INSPECTION TO EVALUATE WELDING "CASE STUDY"

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Introduction

Non destructive examination has been carried out on some elements of pipe lines and some joints of steel structures that already installed, to evaluate the welded joints and its quality.

PROCEDURES

1– For The Pipe Lines

During the review of x–ray films for some pipe lines, some dark spots have been noticed in the base material (pipe body) near the welded joints, therefore a decision was made to evaluate the defects of the base material, incidentally detected during the execution of the x–ray films on the welded joints, So , it was required to investigate the "dark spots" with a proper method and a judgment of acceptability with the reference to the acceptance criteria stated in the acceptable standard/s and project specification/s.(1)

Objectives

1– To execute the proper investigation, if required, on the material with the proper equipment.

2– To describe with the appropriate technical terminology the type of defects detected.

3– To determine the severity level of this defects as per related code/s and criteria.

4– To illustrate the remedial action required in acceptance to the related acceptance criteria (if applicable).

So, in the light of the above mentioned points, it is expected that these dark spots could be nonmetallic inclusions that are present in all steels as a result of steel making practices, which could be oxides, nitrides, sulfides or carbides (2). But at the site and by grinding the surface defects and rechecking using X–ray and UT examination,

the dark spots disappeared completely.

Conclusion

All the investigated films have been accepted, i.e. all the specified pipe surfaces have no defects and have no inclusion. Whereas the dark spots that appeared on the x–ray films were due to the "Pitting corrosion" on the inspected pipe lines and the fittings. And it was found by using UT thickness meter that the reduction on the thickness related to the above mentioned pitting, after grinding, was within the tolerance with reference to the project specifications. So, the dark spots (pitting corrosion) have no severity because they all have been removed by grinding surface. Fig. 1 and Fig. 2.

Fig.1: Pitting surfaces.

Fig. 2: After removing pitting.

Recommendations

– Routine observation should be done periodically (visual inspection, dye penetrant, MT, UT, and RT) in order to avoid any damage or leakage in the future.

– The supplied materials should be checked before receiving and installation to avoid pitting surface due to poor and long storage.

2– For the Steel Structures

Visual examination checks were carried out on the visible parts of the steel structures. The examination revealed the following external defects (3): weld cracks Fig. 3; lack of fusion Fig. 4; incomplete penetration Fig. 5; porosities Fig. 6; and undercut Fig. 7. Therefore, due to the above mentioned visual defects, it is not necessary to proceed with further investigations using other nondestructive methods.

Conclusion

In light of the previously mentioned defects in the steel structures, we conclude that the welding is not acceptable.

Recommendations

– It is not recommended to work with those defected steel structures.

– Documents should be obtained from the manufacturer (quality and traceability).

—The fabrication of such steel structures should normally be inspected at workshop during fabrication by a qualified inspection body.

Fig. 3: Weld cracks.

Fig.4: Lack of fusion.

Fig.5: Incomplete penetration.

Fig. 6: Porosities.

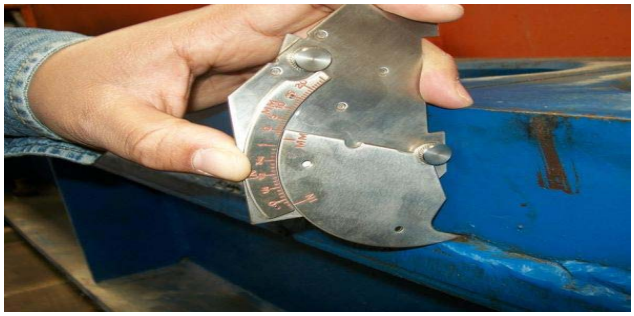

Fig. 7: Undercut.

References

1— NUOVO PI GNONE

a— General specification for high steel yield strength carbon steel pipes.

b— General specification for high strength Carbone steel wrought fitting.

2— Metals Handbook Vol. 11 manufactured components and assemblies, P.504.

3— AWS D1.1—98, p176