

CORROSION IN REFINERY INDUSTRY FAILURE ATLAS

CASE HISTORY n° 7 Date April 2012

**Process : HF alkylation
Equipment: piping**

DATE OF INCIDENT AND/OR INFORMATION: 2005

NATURE OF THE INCIDENT :

On alkylation units the preferred material is carbon steel. However, in the areas most sensitive to corrosion, Monel 400 is used. This alloy has a good resistance to corrosion by hydrofluoric acid. It also offers the advantage of removing fouling unit by iron and fluoride so it helps prevent the gradual decline of production and makes possible the extension of the runs. By 1996 the line replacements of carbon steel by Monel were massively performed on an alkylation unit. In 2005, during the reactivation of a pump, after removal for maintenance, leakage of LPG is observed on the discharge pipe made in Monel 400.

CONSEQUENCES :

MATERIAL COMPOSITION and REFERENCES

Monel 400 (N04400)

PICTURES AND SCHEMES :



ASPECT :

- The source of the leak was a crack that developed in the affected area of the weld of a flange on a pipe. The crack is transgranular.
- A media which can cause cracking of Monel 400, is the presence of HF, oxygen and moisture.
- The survey shows that for a provision of a pump, the equipment is not neutralized prior its provision. Therefore the piping remained in air with the presence of HF, oxygen and moisture. The line was cracked in the location where the residual welding stresses were maximal.

MEDIA AND OPERATING CONDITIONS:

HF, air and moisture at room temperature

TIME TO DETERIORATION :

9 years

**CORROSION IN REFINERY INDUSTRY FAILURE ATLAS****CASE HISTORY n° 7****ANSWER**

TYPE OF CORROSION : HF stress corrosion cracking

API 571 CLASSIFICATION: 5.1.1.6

CAUSES :

Stress corrosion cracking by HF containing oxygen and moisture

REMEDY :

Replacement of defective flange and heat treatment line for stress relieving.

To avoid this type of failure, it is recommended to perform a stress-relieving heat treatment of welds , and systematically neutralizing the equipment before opening for availability.

PUBLICATION - TECHNICAL REPORT:**BIBLIOGRAPHIC REFERENCES :**