

RECOMMENDATION PCRA 007

January 2009 – Rev.0

Assessment of the effect of mechanical protections on the cathodic protection of buried pipelines

DISCLAIMER: The present recommendation has been consensually established by the members of the committee “Cathodic protection and associated coatings” of CEFRACOR. It reflects the general opinion in the trade and might be used as such as a basis representing at the best the state of art at the date of issue. Nevertheless, it shall not commit in any manner the CEFRACOR and the committee members by whom it was established.

1 INTRODUCTION

The ministerial order of August 4th 2006, published in the « Journal Officiel » of September 15th 2006, regulates the safety of pipelines for the transportation of natural gas, liquid or liquefied hydrocarbons and chemical products.

Among others, it defines the new rules for the class location of pipeline sections depending on the environment that is being crossed (category A, B or C) and the new requirements to comply with for each of the three defined categories.

The articles 14 and 19 of the order of August 4th 2006 introduce the concept of « compensatory provisions which enable rendering the pipelines compliant with the new regulation, without the need for replacing them.

Reinforced concrete slabs or steel sheets are typical « constructive » protection measures which are presently accepted by the authorities on a case by case basis and in short term approved in the frame of the Professional Guidelines referred to in the order of August 4th 2006 (particularly the Guidelines GESIP 2008/01 « *Performance of a safety study related to a transmission pipeline* » and 2008/02 « *Transmission pipelines – Compensatory provisions* »). According to the final content of this GESIP Guideline, the implementation of these constructive provisions may concern important lengths of the networks (several hundreds of kilometers).

The requirements being new, beyond the classical reinforced concrete slabs, other solutions of the type of constructive protections appear and are therefore deemed to be submitted to the authorities (PE or PVC sheets, high strength geogrids, casing mattress, ...).

It is therefore important to have knowledge of the effect of these “constructive protections” on the operation of the cathodic protection in order to adapt, if necessary, the specifications of these protections as well as the operating conditions of the new composite structure (pipeline with constructive protections)

The purpose of the present Recommendation is to synthesize the experience feedback on this subject and shared by the members of the committee PCRA.

This Recommendation may be revised according to newly acquired experience feedback.

It must be noted that the content of the present Recommendation may apply to any buried metallic pipeline under cathodic protection, whether it is for distribution or transportation of any fluids (natural gas, liquid or liquefied hydrocarbons, chemical products, water, ...).

2 INITIATION OF THE PROCESS OF SHARING EXPERIENCE FEEDBACK

The compensatory provisions which ensure a mechanical protection may have an effect on the operation of the cathodic protection; possible effect which must be assessed in order to adapt, if necessary, the adjustment of the equipment and measuring devices as well as the interpretation of the newly obtained measurements.

In order to analyze the effect of these compensatory provisions on the effectiveness and the verification of the cathodic protection of a structure, the following have to be considered:

- The detection and localization of the pipeline,
- The coating fault detection,
- The cathodic protection measurements in order to assess its effectiveness.

The members of the PCRA committee, who have participated in preparing this Recommendation, have consensually implemented a process for the analysis of the effects of these compensatory provisions, in the respect of the specific good practices of each network operator. Based on this tool, two types of provisions (see §3) have been the object of exchanges of results which have been synthesized in the following chapter.

It must be noted that tests are still being carried out by certain operators in order to progressively improve the common experience feedback.

3 RESULTS ACQUIRED AT THE END OF 2008

Two types of compensatory provisions have been or are still being tested by certain network operators, members of the Committee:

- Concrete slabs with metallic or other reinforcements,
- Plastic sheets (of PE or PVC).

Conditions of the tests carried out

All the tests performed until now have been carried out with a minimum distance of 40 cm between the insulating sheets (PE or PVC type) or concrete slabs and the upper generatrix of the pipeline. The width of the employed PE sheets was between 1 and 1.2 m and that of the concrete slabs 1.4 m maximum. Complementary tests have still to be carried out by certain operators, in order to acquire a complementary experience feedback, especially by reducing the distance between the insulating sheets and the pipeline or also with sheets of a different width than those that have been tested.

Effect on the effectiveness of the cathodic protection

- The presence of concrete slabs or insulating sheets (PE or PVC type) may sometimes reduce the amount of current received by the pipe located beneath the shield that they compose. It is recommended to verify by means of suitable devices that the level of protection under the concrete slabs or insulating sheets (PE or PVC type) is in compliance with the applicable standards; eventually an adjustment of the cathodic protection installation may be required.

It must be noted that the PE sheets do not impede from reaching the cathodic protection criteria.

- The presence of concrete slabs or insulating sheets (PE or PVC type)) increases the ohmic voltage drop during the E_{ON} potential measurement, especially just over the centerline of the pipeline.

Effect on the detection of the pipeline and on the depth measurement

- The presence of concrete slabs or insulating sheets (PE or PVC type) has no or very little influence on the detection of a buried metallic pipeline, when implementing the electromagnetic detection method. The same is true for the measurement of the depth.

Effect on coating fault detection

- The presence of concrete slabs or insulating sheets (PE or PVC type) may cause localization errors in the range from several centimeters to several tens of centimeters.
- The presence of concrete slabs or insulating sheets (PE or PVC type) decreases the intensity of the potential gradients at grade during the search for insulation defects, especially right over the PE sheets. Coating fault detection shall therefore be carried out with the highest care.

General conclusion

Concrete slabs or PE sheets laid above a buried pipeline have an effect on the cathodic protection. However this effect appears to be limited and not redhibitory with respect to what was expected by the subject matter experts. However, complementary tests are required, especially with regard to the minimum distance between the slabs or sheets and the upper part of the pipeline in accordance with the recommendations of the GESIP Guideline N° 2008/002.

In regions where constructive provisions such as mechanical protections are implemented, it is recommended to verify afterwards the effectiveness of the cathodic protection of the pipeline and to carry out coating fault detection with the highest care.