ASSOCIAZIONE PER LA PROTEZIONE
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Ceocor Conference Florence 2013

Application of European CP standards in Italy

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Introduction

APCE is a non-profit cultural-scientific association to ensure that the various managers or owners of buried or immersed structures are better able to interface with each other to ensure the safety and quality of services to its customers.
APCE aims at:

- Promoting and coordinating initiatives addressed to cooperation between its members, to study and solve the problems involved with protecting metal structures against electrolytic corrosion.
- Focusing the awareness of the technicians on the problems involved with protecting buried metal structures from corrosion.
- Studying the various phenomena that interact with buried metal structure corrosion phenomena, by promoting study and research.
- Promoting meetings and events to spread information about corrosion phenomena.
- Organizing courses for the certification of the know-how

APCE was founded in 1981 and has also been backed up since 1982 by an Electrolytic Corrosion Office in Milan.
Milan represents the site where the electric interference between metallic structures and electrified railways gave the first problems of corrosion. It was due to the development of the infrastructures in the city.
It was a complex situation because railways were powered by D.C. currents and the Operative Units of Railway companies were not strictly coordinates, with the result of sometimes applying different technical and economic solutions to their networks. So metallic buried structures were affected by an increase of electrical interference, and especially in Milan the electric field of the interference became more complex when the first underground plant switched on.
The cathodic protection knowledge of transport and distribution companies was poor in this period, while in Europe and in the USA they started installing the first automatic CP stations.
In Italy the application of cathodic protection organized in terms of research and collaboration between owners of metallic buried structures, started in 1952 after a terrible explosion in Milan due to corrosion in a gas pipeline which was affected by electric interference from the city railway/underground.

Nowadays, cathodic protection is usually carried out according to European standards, but in Italy, its application is also mandatory for gas transport, distribution and storage companies, based on Ministerial laws and regulations issued by AEEG "Electric and Gas Authority".
Actually, the Authorities decided to consider cathodic protection as part of the elements used to verify the quality of the service and the safety of the natural gas network in Italy.

APCE has been recognized by the "Electric and Gas Authority" as the competent technical organization for defining the guidelines for cathodic protection of metal pipelines, used for natural gas distribution (ARG/gas Resolution n. 120/08 art. 28-2), transport (ARG/gas Resolution n. 141/09, art. 9.2) and for the connection flow-lines of natural gas storage plants (ARG/gas Resolution n. 204/10).
APCE Guide lines are based on the main criteria of European and national standards for cathodic protection, and they drive transport and distribution companies in using common maintenance criteria, and a common issue of technical documents to evaluate the general assessment of the network.
The Electric and Gas Authority is going to define new rules for water pipes, because water now is considered as a primary source.
In Italy cathodic protection for water pipes is not universally applied, so APCE in going to meet the main National owners of buried or immersed water pipes in order to define the right point to start implementing the integrity of those structures.

APCE and Certification of CP personnel

Personnel certification is an extremely important factor, and is at the base of quality construction and assurance processes. Personnel certification is generally additional to systems and product certification, and is fundamental for those processes where the human factor plays a very delicate role towards quality process results.
Certain operations cannot be controlled while they are being carried out, and therefore being able to trust in the ability of the personnel to do their work properly is of fundamental importance.
Certification is the guarantee that the personnel work with recognized and certified technical ability, and their certification is a true added value both when it is requested by the customer, and when the company freely presents it to guarantee the ability of its personnel.
To guarantee certification for professional personnel who intend working with acknowledged and certified skills in the cathodic protection field, APCE has established the APCE Training Centre (CFA), and has stipulated a cooperation agreement with CICPND, which is the ACCREDIA accredited Certification Body for cathodic protection of metal structures (ACCREDIA Accreditation Certificate n. 012C dated 23.03.2001) according to EN 15257.

Transport gas - Feedback of the first year under ARG/gas Resolution n. 141/09, art. 9.2

Introduction

Snam Rete Gas is the company leader in the transportation of gas and the major player in the natural gas infrastructure in Italy.
Network integrity is carried out by using an operating mode of procedures, instructions and maintenance programs.
Operative procedures, joint laws, standard criteria and more than half a century of experience.
The organization of Snam Rete Gas in Italy became a reference for some other National companies working in the same field.
Procedures, instructions and maintenance programs are used to control a new pipeline or a new network for all the operative life of the structure: design, construction, commissioning and maintenance.

Design

Design is the first phase, recognized by the Authority and APCE Guideline too, in this phase the knowledge in cathodic protection is used to define the single components and devices of the CP system, looking to avoid electrical interferences that could happen on the new pipeline, e.g. presence of high power lines, foreign structures, railways, cross rivers and so on.
In this step, the following main devices and material are chosen:

- Coating
- Number and position of the insulating joints
- Typology of test posts including CP rectifier
- Type of CP rectifier
- Position and typology of groundbed installations of Remote Monitoring devices on CP rectifiers

Usually new structures are included in an existing complex reality, so the main goal of the designer is to adopt technical solutions which minimize the maintenance in the future for the owner.
Nowadays third parties carry out the design for new structures or implementation of the existing network, so, in order to avoid mistakes which could have a detrimental effect on the periodical maintenance, the design is verified by the owner of the structure, who could modify or implement the final issue.
The design phase is supported by software which allows sharing the project between the designer, owner, and implementers.

Building

During the building phase, cathodic protection is applied by portable temporary impressed current stations.

During building, the coating application and electrical plant installations are controlled by certified EN15257 supervisors; sometimes yard works are controlled by the owner with certified corporate personnel, who verify if corporate operative procedures are strictly respected by implementers and supervisors as well.
The implementers' responsibility stops at the end of the electrical commissioning of the new structure, when it is accepted by the owner.
Info exchange for this phase is by software which shares all the information and technical documents.
The electrical parameters defined during commissioning are also verified over time through the ordinary maintenance, in order to assure the effectiveness of CP according to European and National standards, and corporate procedures.

Snam Rete Gas in line with Authority and APCE

After commissioning approval by the owner, the new structure is included in the existing network, so all the maintenance activities, including remote monitoring systems, are implemented.
Nowadays this phase has to respect the Resolution ARG/gas 141/09: 2009.
For Snam Rete Gas this didn't mean a change of direction or change of the technical approaches, but of course, during 2008-2009, Snam Rete Gas carried out extensive implementation and development of corporate software in order to respect the prerequisites of Resolution ARG/gas 141/09: 2009.
In 2008 Snam Rete Gas joined a WG with APCE and other National natural gas transport companies, in order to define the Guideline for the cathodic protection of gas transport pipelines.
The aim of the WG was the issue of common rules to clarify the criteria for the design, commissioning, maintenance of the cathodic protection systems, taking into account the difference between gas transport networks with respect to distribution networks, as reported in the following:

- ✓ development of long linear pipelines
- ✓ from 1980 systematic use of the insulating joint to imitate stray current
- ✓ two cp automatic rectifiers are usually installed on all cathodic protection systems
- ✓ low CP output current from CP rectifiers, due a good coating quality

One of the data required by the Authority was a method to verify the general cathodic protection assessment of each cathodic protection system, both for natural gas distribution and transport companies.
APCE with their Guideline implemented a calculation named "coefficient KT" applicable to a cathodic protection system with impressed current stations.
This coefficient is based on a "cathodic protection system model" which was defined for both natural gas distributor and transport networks.

In Italy it was quite easy to define a model, because networks are usually electrically subdivided in CP systems with an average length of 20 km.
The "coefficient KT is composed of three parameters:

- ✓ Design: how many test posts are installed; for this parameter one test post was fixed every 1.5 km
- ✓ Maintenance: according to standard prerequisites, how many measurements are carried out in a year, according to the number of CP rectifiers, drainages, railway crossings, connections with foreign structures. A minimum number of characteristic test posts were defined according to the variability of the electric field.
- ✓ Quality of measurements: how many measurements indicate the general assessment of the CP system. Data collected by remote monitoring or measurements carried out by operators are taken into account

The Coefficient KT gives a final number in the range of 30 ÷ 70 with the following information:

- ✓ KT > 60 sufficient general assessment of the cathodic protection system
- ✓ KT < 60 the general assessment of the cathodic protection system is not verified enough

In this calculation, design has a maximum weight of 30% while maintenance and quality of measurements have a maximum weight of 70%.
Natural gas transport and distribution companies, according to ARG/gas Resolution n. 120/08 and ARG/gas Resolution n. 141/09, have to issue and store the coefficient KT annually, and annually report the CP system for each cathodic protection system.
At the same time, annually, natural gas companies have to send the Authority some more general data for all the plants / networks, including information about the number of CP systems with and without cathodic protection.
According to the ARG Resolution and APCE Guideline, a CP system is defined "not cathodically protected" when, for three years consecutively, its KT is < 60.

Snam Rete Gas – first year under Authority Resolution

Just to understand what it means to respect the Authority resolution in terms of corporate software organization, the following reports the data requested referring to 2010 only for cathodic protection:

- ✓ network length……. 31.364 km
- ✓ networks controlled by remote monitoring…….. 98%
- ✓ cathodic protection systems…… 3.166
- ✓ cathodic protection systems fully controlled by remote monitoring…… 95%
- ✓ number of test posts installed on the network…… 102.631
- ✓ number of test posts used to verify the general CP assessment ……. 33.069

- number of test posts controlled by remote monitoring …….. 11.914
- number of test posts controlled by operators …….. 21.155
- number of measurements carried out by operators …… 55.514

On analyzing those data, 470 km of network have KT < 60.
Usually this portion of network is dynamic and changes year by year, this is due to external factors such as lightning, damage to rectifiers, which don't allow reaching the minimum of measurements to demonstrate the general assessment.
Sometimes remote monitoring presents problems on data transmission, then loss of data has to be recovered by operators and this has a negative influence on the final KT.
Of course this condition doesn't mean that cathodic protection effectiveness of the network is not reached and, basically, this is one of the reasons why the Authority and APCE guideline consider a CP system not cathodically protected only after three consecutive times with KT<60.
All the CP systems are remotely monitored, but a lot of measurements by operators are carried out usually in distant test posts with respect to where the remote monitoring devices are installed.
It is fundamentally important in order to obtain information about possible electrical interference which couldn't be detected by remote monitoring devices.

Conclusions

Snam Rete Gas corporate policy is looking to assure high quality for the integrity of its own network, respecting laws, standards and using its own experience in this sector.
Snam Rete Gas thinks that the approach imposed by the Authority allows reaching constant information about the maintenance on the network and it is the right level to implement the following:

- ✓ Increasing the quality of the corporate personnel by training and certification according to EN 15257
- ✓ Research on devices used in cathodic protection in order to decrease the percentage of damage or out of service
- ✓ Constant development of corporate software in order to reach information more quickly or flexibly for the quality control of networks and to answer the Authority inquiries.

On the other hand:

- ✓ Coefficient KT only gives the information regarding the general assessment of a CP system.
- ✓ A general assessment can't be carried out correctly without a detailed and comprehensive assessment of the cathodic protection, for this reason Snam Rete Gas is going to invest a lot of energy to carry out the electrical commissioning of the new structures and to review systematically what was carried out for the existing CP systems.
- ✓ Commissioning gives the right technical information to select the minimum number of characteristic test posts prescribed by standards, and which are necessary to correctly apply the coefficient KT
- ✓ Quality of CP corporate personnel is the base to assure the management of the network integrity, to analyze measurements and feedback information.

The Authority is going to learn those points of view, in fact they are going to introduce the "CP in field control" in order to verify if an owner bases the general assessment on a solid or a poor technical approach.