

## Support in the Control of the Maintenance Record of the Installations of the System for the Prevention of Corrosion

### Apoyo en el Control de Registro de Mantenimiento de las Instalaciones del Sistema para la Prevención de la Corrosión

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DOI: 10.35429/JIO.2021.9.5.24.30

Received July 28, 2021; Accepted December 30, 2021

#### Abstract

The project is to perform support work in monitoring the implementation of the operational reliability model of the facilities. Currently has a maintenance manual, which attached to the established guidelines, determines what activities, describes the area where we must work, that schedule time in which to perform and preset length of each. All this must be followed for proper operation. Moreover, having tracked to maintain a Quality Management System helps to increase the competitiveness of any organization whether public or private at the international level through continuous improvement of productivity. System requirements for quality management have been developed specifically to be applicable to any type of generic product.

**Quality, Corrosion, Methodology**

#### Resumen

El proyecto consiste en realizar un trabajo de apoyo en el seguimiento de la aplicación del modelo de fiabilidad operativa de las instalaciones. Actualmente se cuenta con un manual de mantenimiento, el cual apegado a los lineamientos establecidos, determina cuáles son las actividades, describe el área en la que se debe trabajar, el horario en el que se debe realizar y la duración preestablecida de cada una. Todo esto debe seguirse para un correcto funcionamiento. Por otra parte, el tener seguimiento para mantener un Sistema de Gestión de Calidad ayuda a aumentar la competitividad de cualquier organización ya sea pública o privada a nivel internacional a través de la mejora continua de la productividad. Los requisitos del sistema de gestión de la calidad se han desarrollado específicamente para que sean aplicables a cualquier tipo de producto genérico.

**Calidad, Corrosión, Metodología**

**Citation:** CRUZ, Vianey, WONG, Juan, RUIZ, Cinthia and LEMA, David. Support in the Control of the Maintenance Record of the Installations of the System for the Prevention of Corrosion. *Journal-Industrial Organization*. 2021. 5-9: 24-30

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**Introduction**

Referring to the current situation there is the ISO 9001:2000 Quality Management Manual, which establishes and describes the guidelines of the Quality Management System (QMS) based on the International Standard ISO 9001:2000 Quality Management System – Requirements, and its National equivalent NMX-CC-9001-IMNC-2000. The current certification (QS O57/06 MX), which is the result of the formal and public recognition of the reliability and technical competence of the company, obtained through Conformity assessment specifies the requirements for a quality management system that a company needs to demonstrate for customer satisfaction.

**Justification**

The interest in carrying out this project is due to the need to create an annual maintenance plan for the Maintenance area that allows controlling and guaranteeing the useful life of the pipelines and thus being able to provide reliability in the process. Therefore, the preparation and scheduling of the maintenance program is essential, since it will provide security to the personnel regarding the work team as well as the work area in which they are going to work.

Yes is going to monitor the Quality Management System, because according to its standards and always adhered to, the company must continue with the guidelines established by the current standard.

Therefore, with the implementation of the maintenance program and with the follow-up of the QMS, costs are minimized, the reliability of the operations is sought, the useful life of the pipelines is intended to be prolonged, and thus to be able to comply with the established process and maintain essential services for the continuity of operations.

**Targets General and Specific Objective**

Elaborate a maintenance program for corrosion control facilities to prolong the useful life of pipelines through cathodic protection; as well as continue with the Quality Management System.

**Objective specific**

- Make a field investigation on cathodic protection methods to maintain pipelines.
- Analyze pipeline maintenance information.
- Control and update the documentation of the Quality Management System.
- Elaborate weekly work orders in the SAP system (Management of productive systems) for the manual personnel in charge of the operation and maintenance of the Rectifiers of the cathodic protection system.
- Report of fuel consumption of the vehicles assigned to the Corrosion area and that are owned by the company, as well as keeping a statistical control of the performance of each one.
- Elaborate Monthly reports of charges for maintenance on the rights of way shared with other subsidiaries.
- Elaborate monthly reports of electrical energy consumption of each of the rectifiers of the cathodic protection system installed and keep a statistical control of both the Kw. /h as \$.
- Elaborate AST's (Job Safety Analysis).
- Elaborate closure of AST's (Analysis of Safety at Work)
- Elaborate ACR's (Root Cause Analysis).
- I have a register of the certificates of the measuring instruments calibrated in the year 2010
- Elaborate a request for decals for the control of the Rectifiers of the Madero Pipeline Sector for access doors of each rectifier.
- Give a follow-up to the RELIABILITY practice.

- Makes Pipeline risk assessments by the sector by applying the IAP (Risk Management Index) software and updating the information at least every 4 months.
  - Structures a maintenance program for PGPB facilities to prolong the useful life of the pipelines and prevent them from corroding
  - Delimits the maintenance borders between Operational Managements as well as the frequencies of each activity.
  - Inform CFE the exact location of the pipelines by means of plans.
  - Evaluate the maintenance program.
- Troubleknow how to solve**
- Parto follow up on the Quality Management System and develop the Maintenance Plan for corrosion control facilities to extend their useful life. It is important to have reliable records on maintenance management, which allows knowing the efficiency of the activities and evaluating the performance in the maintenance management and execution process.
- To be able to carry out field research on cathodic protection methods, it is necessary to review the files related to this topic.
  - It's about having the documents, analyzing why the pipelines are maintained, what it is for, what is cathodic protection, so that the Quality Management System is followed up, etc.
  - Yes must keep track of all the records, ensure that it is maintained with the reference standard, report the operation of the system to the superintendent, support the execution of internal quality audits and verify the implementation of corrective and preventive actions.
- To be able to prepare work orders and later pass them to the SAP system, it is necessary to know what is the situation that requires maintenance; since with this the crew is informed what they should do. It must be uploaded to SAP to have control of everything that is done.
  - Pairfuel reports follow a pre-established format. These are done at the end of each month. A record of each previous month must be kept and formulas that are already established are used to obtain results on the performance, mileage traveled in the month and total fuel cost of each vehicle.
  - Elaborate reports in relation to shared rights of way. These must be done monthly.
  - I have a control of the monthly charges of each rectifier. Each station has its own control. You must have information on the 41 facilities managed by the Pipeline Sector of Ciudad Madero. You must take into account the location, the meter number, the KWH and the total cost involved.
  - To follow up on the RELIABILITY practice, it is necessary to keep track of the different areas it covers, such as maintainability, management of releases and major repairs, reliability-focused maintenance, risk-based inspection and work management, planning and programming. "ATPP".
  - To be able to carry out Risk Assessments at the time of executing work orders, you must first answer a questionnaire related to working conditions to find out if they are safe, if they have the correct work team; This is divided into 2 areas: prior to leaving the workplace and verification at the workplace.
  - To be able to structure the maintenance plan, the pre-established guidelines must be followed and according to the needs that the Pipeline Sector requires.

- To a correct maintenance planning, the activities that are responsibilities of each management must be delimited. A series of activities must be carried out for each type of management, specify the maintenance orders that must be carried out in each management, the operations, as well as specify how many times a year these operations will be carried out.
- At the time of making the plans to inform CFE of the exact location of the pipelines, you must go to the place where it is located, with the GPS take the exact location and later capture on the plan where you can go to get to said rectifier, define the access paths, as well as name the valve located at the specified point.
- The evaluation of the maintenance program must be carried out monthly, within the first 15 calendar days of the following month. There will be a period of 3 business days for the closing of orders in order not to be considered as breaches.

### Scopes

When preparing the different reports, they will be delivered to me classified in order to issue the one corresponding to each case, for example, the one on the operation of the cathodic protection system of the different gas pipelines, which includes operating parameters of the automatic rectifiers. remote controlled. From these, the consumption of electrical energy is derived, for which a record of Kw/Hr and Cost is issued, which is supported by the billing that the Federal Electricity Commission delivers to PGPB.

De the foregoing consolidates the information for the preparation of the monthly reports of the charges for the maintenance of shared road rights. For the maintenance of the cathodic protection system, it is necessary that the manual personnel in charge of such objective move to each of the facilities where the different Rectifiers that comply with this connection are located, leaving evidence in the work orders that are elaborated in the SAP system.

### Limitationss

The information provided by the company will not be updated for reasons of company policies. The work will be carried out from the Madero Pipeline Sector where all the information collected from each of the work areas will be controlled throughout the residency period.

The development of procedures and manuals are determined at the national level, which indicates that they must be followed to the letter. La lack of time to carry out the project limits all activities to be carried out in the duration of the residency. The distances at which each of the Rectifiers that provide cathodic protection are located are far from the facilities of the Madero Pipeline Sector.

### Foundator theoretical

#### Finisheds relating to quality Quality

Grador in which a set of inherent characteristics meets the requirements.

#### Satisfactioncustomer no.

Perceivedn of the client on the degree to which their requirements have been fulfilled. Customer satisfaction.

#### Capacityd

Aptituded of an organization, system, or process to perform a service that meets the requirements for that product.

#### Finisheds related to System management

Setor of mutually related or interacting elements.

#### Systemto Quality Management

Systemmanagement skills to direct and control an organization with respect to quality.

#### Politicsto the quality

Intentionoverall s and orientation of an organization related to quality as formally expressed by top management.

#### Objectiveor the quality

Somethingor ambitious, or intended, related to quality.

**Assurance of the quality**

Part of quality management aimed at providing confidence that quality requirements will be met.

**Better to the quality**

Part of quality management aimed at increasing the ability to meet quality requirements.

**Finisheds related to the organization Work Environment**

Set of conditions under which the work is performed.

**I provider**

Organization not a person who provides a product.

**Finisheds related to the process and the product Product**

Yes it is defined as "result of a process".

**Processes or**

Yes it is defined as "a set of mutually related or interacting activities, which transform inputs into outputs".

**Design development**

Set of process that transforms the requirements into specific characteristics or the specification of a product, process or system.

**Procedure or**

Form specific to carry out an activity or a process.

**Finisheds related to conformity Non-conformity**

Break or a requirement.

**Action Preventive**

Action taken to eliminate the cause of a potential nonconformity or other potentially undesirable situation.

**Action Corrective**

Action taken to eliminate the cause of a detected nonconformity or other undesirable situation.

**Action Predictive**

Action taken to eliminate the cause of a non-conformity or other undesirable situation that could arise according to the useful life cycle of the machinery or tool related to the natural gas transportation process.

**Ducts**

Space or hole with a rectangular or circular section, generally limited by walls and used to house pipes or to channel air in ventilation systems, allowing inspection, repair and/or maintenance.

**Program to maintenance**

The most important goal of any maintenance program is the elimination of any malfunction of the machinery. Many times a major breakdown will cause serious peripheral damage to the machine, increasing repair costs. A complete elimination is not possible in practice at this time, but can be approached with systematic attention to maintenance. The second purpose of maintenance is to be able to accurately anticipate and plan your requirements. That means spare parts inventories can be reduced and major overtime work can be eliminated. These repairs to mechanical systems can ideally be planned during scheduled plant shutdowns.

The third purpose is to increase the availability for production of the plant, through the significant reduction of the possibility of some stoppage during the operation of the plant, and to maintain the operational capacity of the system through the reduction of the time of downtime of critical machines. Ideally, the operating conditions of all machines should be known and documented. The ultimate purpose of maintenance is to allow maintenance personnel to work during predictable and reasonable work hours.

**ISO 9001:2000**

It is a set of standards on quality and management. ISO 9001:2000 has been prepared by the Technical Committee ISO/TC176 of the ISO International Organization for Standardization and specifies the requirements for a good quality management system that can be used for internal application by organizations, for certification or for contractual purposes.

**RuleMexicans**

These Official Mexican Standards contain the information, requirements, specifications and methodology, which for their commercialization in the country, must comply with the products or services to whose fields of action they refer. They are, therefore, of national and mandatory application.

**Layouyou**

The process of locating the right place to install an industrial plant requires the analysis of various factors, and from the economic, social, technological and market points of view, among others.

**Systemto**

Chartto some production process.

**Chartto process flow**

It is a graphic representation of the steps that are followed in a whole sequence of activities, within a process or procedure, identifying them through symbols according to their nature; It also includes all the information considered necessary for the analysis, such as distances traveled, quantity considered and time required.

**Corrodedn**

Corrosion is understood as the interaction of a metal with the environment that surrounds it, producing the consequent deterioration in its physical and chemical properties. The fundamental characteristics of this phenomenon is that it only occurs in the presence of an electrolyte, causing fully identified regions, called anodic and cathodic: an oxidation reaction is an anodic reaction, in which electrons are released going to other cathodic regions. In the anodic region the dissolution of the metal (corrosion) will take place and, consequently, in the cathodic region the immunity of the metal. Corrosion can manifest itself in different ways; either by uniform attack, pitting attack, intragranular attack, galvanic attack, crack attack, selective alloying and/or medium-related fractures.

Cathodic protection implies the reduction of the potential difference between the anodic and cathodic sites to zero, in order to reduce the corrosion current to zero.

To achieve this goal, current is impressed at one end of the electrode towards the structure, polarizing the cathodic sites in the electronegative direction. As the potentials of the cathodic sites are biased towards the potentials of the anodic sites, the corrosion current is reduced. When the potentials of all the cathodic sites reach the potential of the most active anodic sites, corrosion in the structure is eliminated.

**Methodologyto Root Cause Analysis.**

Andhe Root Cause Analysis (RCA) is a reliability methodology that uses a set of techniques or processes to identify casual failure factors. And that is, the origin of a defined problem, related to personnel, processes, technologies, and the organization, with the aim of identifying profitable activities or actions that eliminate them.

**Layouts specific to the Cause Analysis Methodology****Raiz (RCA)**

Below are the stages that will be developed during the execution of a Root Cause Analysis Methodology in PEP to identify the actions and/or recommendations that eliminate the causes of the failures and that offer profitability. Below is an example of how to approach a problem with the Root Cause Analysis Methodology.

**Compilationny Data Processing.**

ANDhe analysis of a problem begins with the collection of data on equipment failures and their respective associated impacts (in safety, environment, production and maintenance costs); in order to prioritize the failures through the use of histograms that allow a treatment of the data. The data to be collected must be captured in the computer tool available at the facility. The minimum data required are:

- Names of the installation and equipment(s) associated with the failure.
- DescriptionNo of failure (Failure mode).
- Dateoh time the error occurred.
- Causes of the fault.

- Powers executed corrective actions.
  - Cost of the repair made.
  - Time out of service.
  - Production deferred.
  - Impacts in safety and in the environment.
- Its information will be obtained from the review of:
- Manuals of equipment.
  - Manuals of operation.
  - Conditions operational / trends.
  - Plans of maintenance.
  - Information specific on failures: immediate causes, previous studies, photos, failure analysis, laboratory analysis, among others.

All the above can be consulted in the operational context document of the facility.

### **Analysis Cause-Effect**

The Root Cause Analysis in PEP must be carried out using the Cause-Effect method. This method is based on the fact that a failure event always has a cause, and that this in turn has another cause, the first becoming the effect of the second. In other words, a cause always becomes the effect of another cause, thus forming a chain of causes and effects, which can continue until reaching the root cause of the problem.

### **Conclusions**

As a conclusion to the monitoring and analysis of each of the parameters reported by the operators and registered in the SAP system during the year 2012, a Maintenance Program was carried out for the gas pipeline in charge of the Ductos Madero Sector for the year 2013. Leaving said open program to changes in the period of work for possible preventive, corrective or predictive actions throughout the year, however, said program must be complied with in order not to put the transportation of Natural Gas at risk.

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