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Process Automation of PEMEX LOGISTICS in Laboratory based on ISO / IEC 17025: 2005 / NMX-EC-17025-IMNC-2006

CURIOCA-VARELA, Yedid†*, GARCÍA-PÉREZ, Eleazar, GALICIA-GARCÍA, Christian and SÁNCHEZ-DELGADO, Octavio

Universidad Tecnológica de Tehuacán. Prolongación de la 1 sur No. 1101 San Pablo Tepetzingo, 75859 Tehuacán, Pue
Terminal de Almacenamiento y Despacho Miahuatlán, Pemex Logística

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Abstract

The project its in focus at strengthening of the Standard processes of ISO / IEC 17025: 2005 (NMX-EC-17025-IMNC-2006) carried out within the activities carried out by the Laboratory of the Operation Area of the Storage and Dispatch Terminal Miahuatlán, which is in charge of the administration, control of the tests of quality verification of the petroleum products received for its respective distribution to the clients of the region. Based on Information Technologies, of software prototype was developed which serves as an administrative support that allows automation of all the Laboratory activities established by the Standard processes. Among the obtained results are the administration of the measuring equipment / instruments, the control of the sampling to the different products for the validation of the quality specifications and the monitoring of the maintenance and calibration of the measuring equipment / instruments used for the realization of tests. Likewise, queries and quality formats required by the Standard can be generated.

Automation, petroleum products processes, Quality, ISO / IEC 17025: 2005 (NMX-EC-17025-IMNC-2006)

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* Correspondence to Author (email: yedid.curioca@uttehuacan.edu.mx)
† Researcher contributing first author.

Introduction

The Miahuatlán Storage and Dispatch Terminal belonging to Pemex Logística, is a Government Institution in charge of the Storage and Distribution of hydrocarbons. Within which there are different processes of which highlight those of the Operation Area in which the laboratory in this area is responsible for quality control where their testing and calibration activities are carried out to verify compliance with the requirements of the standard ISO / IEC 17025: 2005 (NMX-EC-17025-IMNC-2006) and satisfy the customer's product quality.

In this area, a project was developed to automate the processes of Product Validation by the different equipment / measuring instruments by means of a transparent record of the different tests carried out as well as the control in the calibration of said equipment / instruments to guarantee the correct quality verification required based on the standard.

Justification

This project will support the administration and control carried out by the Quality Laboratory of the operation area to the different measuring equipment / instruments which in turn are responsible for carrying out the sampling to determine quality parameters and the registration of the results that these show all based on the requirements of ISO / IEC 17025: 2005 (NMX-EC-17025-IMNC-2006) establishes.

Problem

The Miahuatlán Storage and Dispatch Terminal (Pemex Logística). Based on its multiple activities of Administration, Operation, Maintenance and Security.

Each of its activities is based on different control and quality standards that guarantee the quality of its product (s) (Magna Gas, Premium and Diesel) and services provided to its customers.

The Laboratory belonging to the Operation area is responsible for validating that the product that will be sent to its customers for sale complies with the guidelines established by ISO / IEC 17025: 2005 (NMX-EC-17025-IMNC-2006) . For this they carry a series of processes, which are managed by various software applications; but there are other activities that are validated through different formats and logs (all in paper). It is in the latter that areas of opportunity for the development of Software Prototypes that streamline processes are opened.

Objectives

General objective

Design and Development of a Software Prototype for the Automation of the Management System in the Quality Control Laboratories in the Miahuatlán Storage and Dispatch Terminal, under the ISO / IEC 17025: 2005 / NMX-EC-17025-IMNC-2006.

Specific objectives

- Analyze the requirements and understand the needs of the Miahuatlán Storage and Dispatch Terminal client.
- Make a design that pleases the client and that has a positive impact of interest on the users.
- Design the Database Structure based on the requirements survey.
- Program and code each of the designed modules.

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- Design reports and generate quality formats required by the standard Generation of quality formats required by the standard.
- Generate performance and quality tests, guaranteeing the satisfaction of the users and the client.
- Grant training in the use and Asministrción of the Software Prototype.
- Deliver the finished project and according to the client's requirements.

Software Development Methodology

Due to the complexity of the processes, and the sudden changes in the contexts of the Standard. As well as modifications to the client's requirements, a methodology will be required where planning, development, administration and control allow to generate decisions and quick results.

Among the software development methodologies that fulfill these characteristics is Scrum, which was applied for the first time by Ken Schwaber and Jeff Sutherland, who documented it in detail in their work "Agile Software Development with Scrum" [1]. This methodology focuses its attention based mainly on an adaptive planning and the incremental development of software with functional deliveries in brief periods of time.

Schedule of activities

For the realization of the project, the main phases of the life cycle of a project were determined, disaggregating it from the following activities.

Task name / Activities
Prototype of Laboratory Automation Software to comply with the requirements of ISO / IEC 17025: 2005 / NMX-EC-17025-IMNC-2006
Phase 1 - Start
Procedures Study
Interview with the user (s)
Evaluate the vision of the project
Evaluate potential risks and benefits
Phase 2 - Planning
Define the broken work structure (WBS)
Identify the materials and supplies needed
Phase 3 - Execution
Analysis and Design (System dynamics and Information structure)
Phase 4 - Control
Prototype installation and Configuration of the Software Prototype Database
Prototype Documentation
Documentation of the Database
Phase 5- Project Release

Table 1 Work Breakdown Structure

Modeling and administration of the Software

Database

Based on the requirements of the Standard and the user, the Relational Database normalized to the Third Normal Form was designed; using the SQL Server Database Manager Microsoft 2008 Express.

Coding

The construction of the Prototype is based on Object Oriented Programming, based on the SAP PowerBuilder Technologies. Which offers a graphic programming environment that is composed of different tools that allow the rapid development of applications.

With these tools you can develop Client / Server applications through ODBC (Open DataBase Connectivity) or Native Drivers for the Database.

This application is Client / Server which puts in communication a workstation with a Central Database Server.

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This model consists in using a Database that resides in a separate machine called Server. The Database Management Software is located in the remote work stations (Clients). The applications that are executed in the client stations, access to the data that are in the server. [2]

Communication Interfaces

The protocols that should be used is TCP / IP or NetBios, in addition to this it must be indicated that the connection to the Database will be through the protocol conexión.ini.

Results

The results of the Software Prototype are presented below as a result of all the requirements made and validated by the Operation Manager and the Laboratory Manager.

- Analysis, design, coding and implementation of three main processes:
  - oEquipment Management / Measurement Instruments.
  - Quality Control of Laboratory Sampling and
  - Control of Maintenance and Calibration of Measuring Equipment / Instruments with which the processes of the standard is administered, controlled and validated in a more effective way.

Figure 1 Equipment Management Screen / Measuring Instruments

Figure 2 Screen of Control of Maintenance and / or Calibration of Equipment / Measuring Instruments

Figure 3 Generate Sampling Tests.

Figure 4 Verification of the Sampling and the detail of the Result.

- Generation of quality formats required by the standard.

Figure 5 Generation of Worksheet Formats.

Figure 6 Reports Product Quality Report.

- Security in the access to each one of the modules of the system.

Figure 7 Login

Figure 8 Main Screen

- Generation of Catalogs 100% self-managed by users.

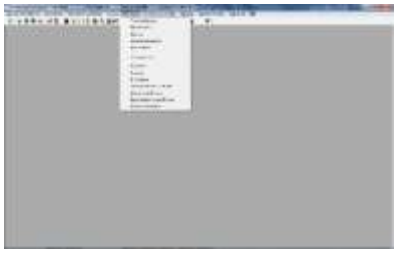

Figure 9 Available catalogs

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– Generation of different reports printed in PDF or export to Excel.

Figure 10 Filter for reporting and / or consulting Measurement Equipment / Instruments

Figure 11 Filter for reporting and / or consulting the Maintenance Calendar of the Equipment / Measuring Instruments

– Administration and maintenance of users and Generation of Backup by the user.

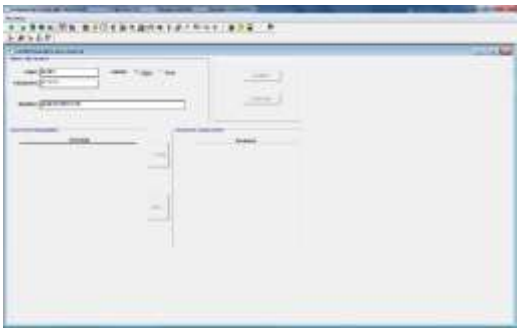

Figure 12 Manage users

Figure 13 Generate Backups

Conclusions

This project fulfilled the objective established in the implementation of a software in the Laboratory that would comply with the ISO / IEC 17025: 2005 (NMX-EC-17025-IMNC-2006) processes since the results shown were liked and satisfaction for the client. This software improved quality processes by having a tool that automates your information and having it available to take better control of the activities carried out and to be carried out. Likewise, the times for the filling of quality formats established by the standard were optimized, since they are now carried out automatically presenting real information at the moment. On the other hand, the competences in the development of Software, Management of Professional Project Management and the generation of a circle of confidence for the detection of areas of opportunity in the participation of future projects of the oil sector and with this to generate agreements were strengthened and relations with other interdisciplinary bodies and dissemination of some popular science articles.

Aknowledgement

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References

[1] Ken y Sutherland, Jeff. Schwaber, Agile Software Development with Scrum, Primera ed.:Prentice Hall, 2001.

[2]http://alfa.facyt.uc.edu.ve/computacion/pensum/cs0347/Laborat/ManualPB.pdf

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