IMPROVEMENT OF THE BILLING PROCESS OF A COMPANY DEDICATED TO THE SUPPLY OF ELECTRICITY

Ernesto Ramírez Cárdenas[1], Gabriela Espinoza Erunes[2], Arnulfo A. Naranjo Flores[3], Mauricio López Acosta[4] and Raúl Figueroa Valverde[5]
Industrial Department, Institute Technological of Sonora, Mexico

Summary: *Currently, companies are in a constant search for continuous improvement both in their processes and in the safety of their workers. The study consisted of generating actions to improve the billing quality indicator of a company in the energy sector. To achieve this, the methodology of the Deming Plan-Do-Check-Act cycle known as PHVA was applied. As a result, after statistical and causal analysis, visual controls were implemented for the delivery of notifications to users related to the anomaly, instructions for the verification process were developed and staff were trained in order to prevent errors. With this, it was possible to eradicate approximately 70% of the anomalies, in addition to the identification of missing services to be invoiced, yielding in the quality of the process. In conclusion, it is important to monitor the activities carried out by the operator, as well as assign personnel to the statistical control of the process, which will allow timely monitoring of the services* **.**

Keywords: *Actions, improvement, anomaly and quality.*

INTRODUCTION

Electric power generation began in Mexico at the end of the 19th century. The first generating plant that was installed in the country (1879) was in León, Guanajuato, and was used by the "La Americana" textile factory. Almost immediately this way of generating electricity was extended within mining production and scarcely for residential and public lighting. This project was carried out in a company in the energy sector whose clients are grouped by the industrial, commercial, agricultural, services and domestic sectors, the latter being the one with the highest percentage of participation. Among the main activities lie in the taking of meter readings, the distribution of receipts, power outages, reconnections and billing.

The billing area of the company is one of the most important since it is through the issuance of invoices that materialize and document the income of the company and its work of receiving, examining and accepting or rejecting the invoices received depending on what these meet or not the requirements demanded by the regulations which is subject to the availability and access of the meter in the limit of property of the user.

Sometimes this availability and access becomes null with the modification of the facade of the homes, installation of bars or gates, establishment of fences or perimeter fences, among other causes that prevent entry to the facility where the meter is located, generating among others consequences, the estimation of the consumption corresponding to the billing period, possible accumulation of real consumption, nonconformity due to consumption, real sales deficit due to real unpaid consumption, impossibility of attending to failures or emergencies based on the measurement. (Federal Electricity Commission, 2019).

It is in the reading taking process where the presence of anomaly in the closed house predominates, which in turn encourages the indicator called billing quality, an indicator that, although it is true, has been fulfilled, does not reflect the work in the regularization of users in certain cycles, replacement and installation of meters and the implementation of new contracting processes for new service, readings and billing.

An average of 260 services labeled with a closed house anomaly is estimated per month. Given this, the following question was raised: What will be the way to reduce the number of anomalies per closed house and improve the quality of billing in a management company? electrical supply?

To answer the question, the objective is to: Generate actions that allow the reduction of anomalies due to closed houses and the improvement of the billing quality indicator of a company dedicated to the management of electricity supply.

MATERIALS AND METHODS

A. Subject of Study: To carry out this project, the billing process of the energy company, specifically the reading record, was addressed as an object under study.

B. Materials : Specialized software, was used in the tracking of essential information of the service conditions (house closed or not), the consumption history and the description of the monitoring; Microsoft excel, used for data processing and generating reports in a structured manner.

C. Procedure: The steps of the methodological route used for the development of this project obey the steps suggested by Deming through the PHVA methodology (ISOTools, 2015) and which are described below:

- Collect information on the problem under study: The information obtained from all services was collected by closed house, followed by stratification of the information for a better appreciation of the percentages of presentation and thus prioritizing the services of interest.

- Analyze the causes of the problem: Supported by the brainstorming technique, an Ishikawa diagram was drawn up to list the possible causes and their effect on the described problem. After that, the main causes were categorized according to their priority level.
- Develop solutions: Once the causes of the problems were identified, improvement actions were generated that lead to the solution referenced in the applicable kaizen tools according to the previous analysis (ISOTools , 2013).
- Validate results: Here we proceeded to verify the closed house anomaly indicator, this in order to have information that allows a timely comparison of the impact on said indicator before and after the implementation of actions.

RESULTS AND THEIR DISCUSSION

Of the routes analyzed during the two months that the study lasted, around 77% presented an anomaly due to a closed house, the main causes being those described in the following figure.

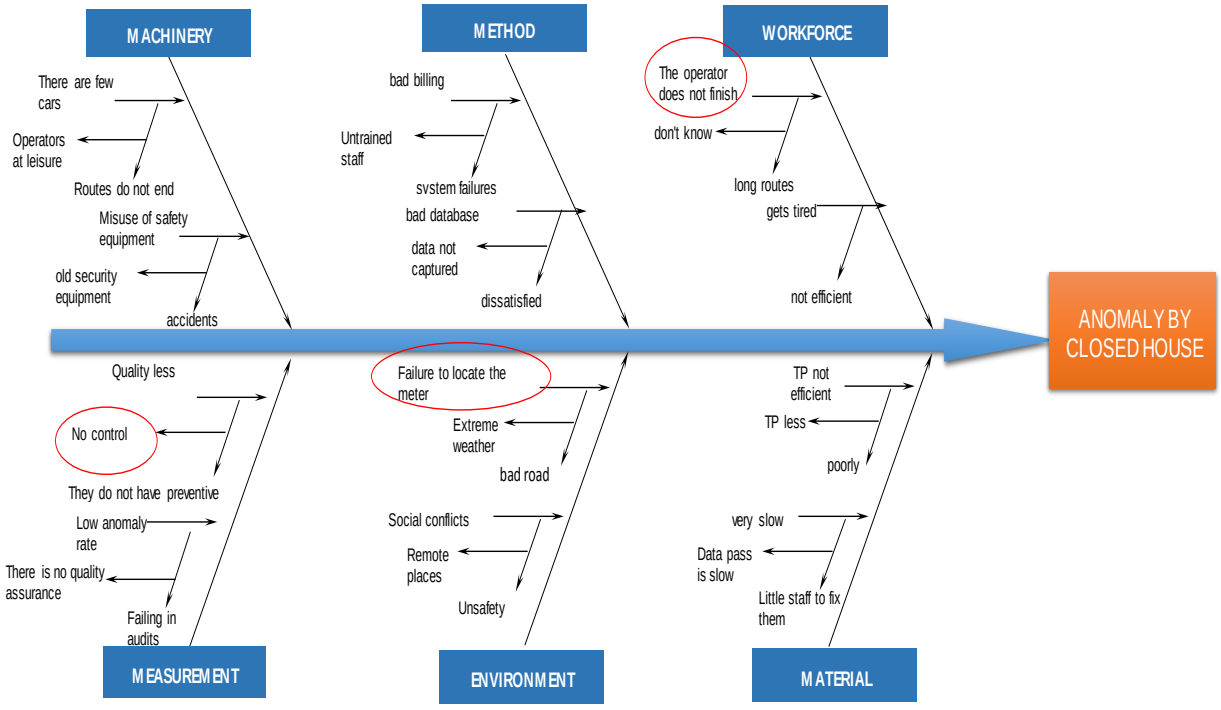

Figure 1. Cause-effect diagram for the closed House anomaly problem.

The figure above shows the main causes of anomalies for a closed house, which was based on the 6M of quality (material, environment, measurement, labor, method and machinery). It can be seen enclosed in red the causes considered as root and for which actions should be focused, not without first analyzing each detected cause using the same technique.

Once the information described above was obtained, priorities were established, the result being described in the table below:

Table 1. Categorization of causes by priority level.

main causes	Secondary causes	Description	Priority level
They don't have control	- Unbilled data - bad billing - No quality assurance - Data pass is slow	The assistants do not carry out a follow-up control where it is observed that the services must be attended to in the event of an anomaly due to a closed house.	high
The operator does not finish his route	- You skipped services you needed to check - Lack of training - The route is assigned late - new formats	The auxiliary does not finish his route for reasons other than those of the closed house, which increases the anomaly indicator.	high
Failure to locate the meter	- Lack of notifications - Do not know how subpoenas work	The client does not have the property limit of his meter, thereby failing to comply with the requirements for an accurate taking of the reading.	high

As part of the improvement actions, an instruction card was made for the operator, with which he could carry out his work in an orderly manner during the visit to the client (see figure 2).

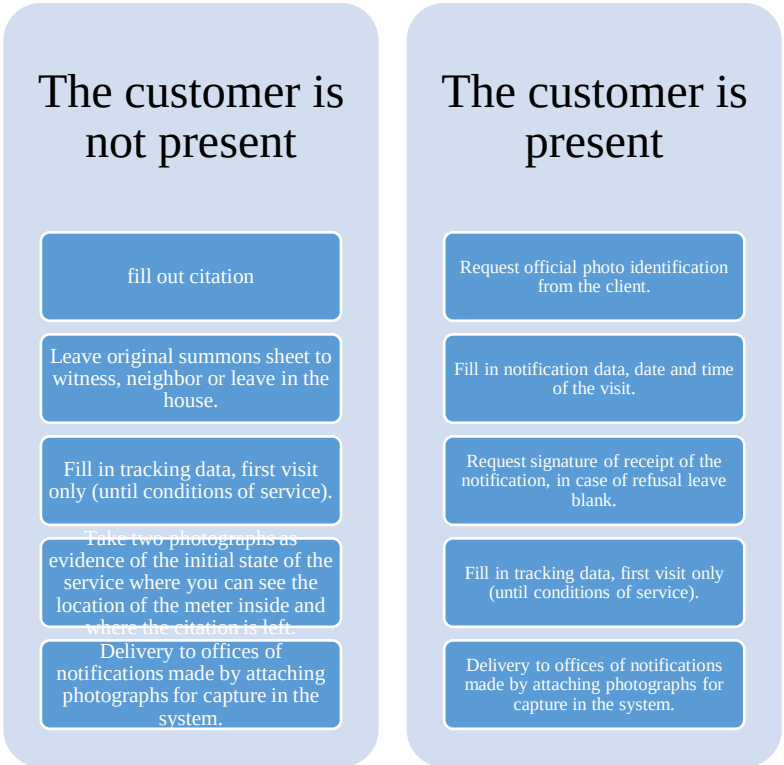

Figure 2. Instruction card.

Figure 3 shows what actions should be taken in the event that the client is at home or not, since in one case a notice summons is left that will be returned in a few days and in the event that the data of the notification for the regularization of the service. Said instructions were accompanied by a training course for operators by the area supervisor. To complement the follow-up to the instructions, formats were prepared accompanied by visual aids which facilitate the identification of the condition in which the service is found in such a way that: blue when the service is normalized, red to visit the service again customer or visit for the first time, yellow to check if the service is really closed house and gray to give the customer time to normalize his meter in the indicated period.

As a final step, validation was carried out for this, a comparison of data was made based on the previous year, since they were the last records that were had on the billing quality index and were related to the records of the last months before to start working with the project, that is, after having applied the PHVA methodology to those months (see table 2).

Table 2. Billing quality indicator

Billing quality (Before)	Billing quality (After)
81%	88%

As can be seen in the figure above, the percentage of billing quality with respect to the previous year increased by approximately 7%, which is undoubtedly a favorable result given that the objective of improving billing quality was achieved.

CONCLUSIONS AND RECOMMENDATIONS

The project fulfilled the objective of generating actions that allowed the reduction of the indicator of anomalies due to closed houses, contributing to the billing quality of a company dedicated to the management of electricity supply. As part of the actions, the implementation of visual controls for the delivery of notifications to users related to the anomaly and in the monitoring of the degree of compliance of the operators stand out. Instructions were developed with the new verification process and regular training whose content is characterized by the most relevant aspects of the aforementioned in order to prevent errors. At the end of the present perceives an assertiveness of the actions undertaken.

REFERENCES

- *Federal electricity commission. (2019). Who we are About CFE. 2019, from the Federal Electricity Commission Website: https://www.cfe.mx/acercacfe/Quienes%20somos/Pages/historia.aspx*
- *ISOTools . (OCTOBER 7, 2013). Lean Methodology XI. Lean tools: Kaizen . 2019, from ISOTools Website: https://www.isotools.org/2013/10/07/metodologia-lean-kaizen/*
- *ISOTools . (FEBRUARY 20, 2015). What does the PDCA cycle of continuous improvement consist of? 2019, by ISOTools Website: https://www.isotools.org/2015/02/20/en-que-consiste-el-ciclo-phva-de-improvement-continua/*