Article **Journal-Public Economy**
June, 2021 Vol.5 No.8 7-14

Diagnosis of quality in the production process of industrial warehouses in the GRECON company

Diagnóstico de la calidad en el proceso productivo de naves industriales en la empresa GRECON

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DOI: 10.35429/JPE.2021.8.5.7.14 Received July 15, 2021; Accepted June 30, 2021

Abstract

Within GRECON Company the rework of some metal structures was held due to not keeping assembly specifications. To solve this problem a diagnosis of the quality in the production process was performed, so checklists and staff interviews were selected and designed to identify quality and process conditions, and the company visiting procedure was mapped as well. Following the information analysis with SWOT supporting, these were identified as improvement proposals 8D, FMEA and operation register. The systematization of these tools will allow continuous improvement on the processes.

Diagnostic, Quality, Process, Improvement

Resumen

En la empresa GRECON se llevó a cabo el retrabajo de algunas estructuras metálicas debido a que no se cumplieron las especificaciones de ensamble. Para solucionar este problema se realizó un diagnóstico de la calidad en el proceso productivo, por lo que se seleccionaron y diseñaron listas de verificación y entrevistas al personal para identificar las condiciones de calidad y proceso, además se mapeó el procedimiento de visitas a la empresa. Después del análisis de la información con apoyo del FODA, se identificaron como propuestas de mejora 8D, AMFE y registro de operaciones. La sistematización de estas herramientas permitirá la mejora continua de los procesos.

Diagnóstico, Calidad, Proceso, Mejora

Citation: ORTIZ-SANTAMARÍA, Alberto, GÓMEZ-GONZÁLEZ, María Concepción, CÉSAR-MAULEÓN, María Guadalupe and MORALES-TORIBIO, Leticia. Diagnosis of quality in the production process of industrial warehouses in the GRECON company. Journal-Public Economy. 2021. 5-8:7-14.

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Introduction

Currently, quality in production processes is essential to compete with other companies and continuously improve by increasing customer satisfaction. That is why organizations seek to improve based on the diagnosis of their processes, as GRECON did, a micro company that is dedicated to the development of metal structures to produce industrial buildings.

GRECON's mission is to fulfil the customer's total satisfaction by offering them services of: structural calculation, roofing and manufacturing of supports for industrial buildings. These have a double water slope, this means that when it rains it causes the rain to go to the sides and not remain stagnant in the upper part of the industrial building.

Among its objectives is to manufacture a quality product with customer requirements and improve production tools. Likewise, for the provision of its services, it has the following production processes:

- Cut. In this process, the drawing, measurement and cutting with oxyacetylene of the different pieces that make up the metal structures are carried out.
- Welding. In this stage, the pieces that make up the metallic structures are joined, and 7018 electrodes are used.
- Clean. In this process, the parts are cleaned with a polishing machine and a metal grinding disc.
- embossed. It consists of applying a layer of Gray primer to all parts to prevent corrosion.
- Placement of pieces. In this stage, the assembly of the structure is carried out with the pieces previously made.

The quality of the metal structures used in the installation of industrial buildings is the responsibility of the operators and the production manager. However, in the last half of 2014, there were some complaints from customers, attributable to errors in the joints of the structures.

Likewise, the GRECON production manager identified through his records that the reprocessing of some parts that did not meet the assembly specifications was increasing.

To solve this problem, it was decided to carry out a diagnosis on the quality in the production process of the GRECON company in order to identify improvements that allow reducing rework and improving customer satisfaction.

Literature review

The diagnosis is a methodological practice that must be applied in a certain time and in defined periods, to know the behaviour of the systems within a company or in any of its parts, to plan and guide actions at any time.

The results of a diagnosis tend to sustain, improve, or overcome the current situation of the process and/or system. Likewise, through its practice, trends and situations are evaluated, facts, strengths and weaknesses (SWOT) are explained; or problems, causes and effects. Its objective is to conclude about the causes that prevent each of the company's systems and the organization, from operating efficiently and effectively (Rebollo Lozano, 2005).

According to Rebollo Lozano (2005), we can divide the organizational diagnosis into three main stages:

Generation of information, which in turn encompasses three aspects

- The way in which information is collected, the tools and processes used.
- The methodology used to collect information, which follows two streams, the methods used to obtain information from the client (interviews, questionnaires) and those used to obtain it from the consultant (observation).
- The frequency with which the information is collected, which depends on the stability of the system.

Organization of information, where it is necessary to consider three key aspects:

- The design of procedures for the information process.

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- The proper storage of data.

- The ordering of the information, so that it is easy to consult.

Analysis and interpretation of the information, which consists of separating the basic elements of the information and examining them to answer the questions raised at the beginning of the investigation.

Within the company, when the diagnosis is made, it is possible to see the quality in the company and/or in the process, to evaluate and be able to improve, for the benefit of GRECON's clients.

Total quality involves and commits each person in the organization and focuses on getting things done right the first time. Quality allows to offer the client what has been promised, it also helps to identify, accept, satisfy and continuously exceed the expectations and needs of the clients.

Total quality, according to Ferrando Sánchez & Granero Castro (2006), requires a constant process, called continuous improvement, this is a process that very well describes the essence of quality and reflects what companies need to do if they want to be competitive over time.

To carry out a diagnosis, various tools are used that are selected according to the type of company and the objective pursued. According to Ishikawa (1986), among the tools that can be used are:

- Ishikawa's diagram. It allows identifying the real causes and facilitates the analysis of problems and their solutions in areas such as: quality of processes, products and services.

- Verification Sheet. It is a table or diagram format, intended to record and compile data through a simple and systematic method, such as the annotation of marks associated with the occurrence of certain events. This data collection technique is prepared in such a way that its use is easy and interferes as little as possible with the activity of the person who performs the registration.

- Pareto chart. It is a graph to organize data so that they are in descending order, from left to right and separated by bars. The diagram allows to graphically show the Pareto principle: few vital, many trivial.

- Process map: Helps to identify and select the processes, it is useful to make a graphic representation that defines and reflects the structure, relationship and the different processes of the organization's management system, while allowing them to be grouped. The purpose, according to Alcalde San Miguel (2010), is to simplify and obtain a joint vision.

- The level of detail of the process map will depend on the size of the organization and the complexity of its activities. It also allows you to know what they are like inside and thus observe how the transformation of inputs into outputs is carried out.

- The SWOT allows to identify the strengths (F), opportunities (O), weaknesses (D) and threats (A) present in a process, system, or company. It allows to determine the true possibilities that the company must reach the objectives that are the initially established. Likewise, it makes the owner of the company aware of the size of the obstacles that he will have to face. It also makes it possible to explore positive factors and neutralize or eliminate the effect of negative factors more effectively. (Jones & George, 2006)

On the other hand, from the SWOT, improvements must be identified as part of the diagnosis methodology. Said improvements, in the field of quality, can contemplate, as Alcalde San Miguel (2010) refers, the application of planning tools and quality improvement, such as the 8 disciplines (8) and the potential failure mode and effect analysis (FMEA), whose characteristics are indicated below:

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8 Disciplines. It is a systematic methodology to identify, correct and eliminate problems. According to Gutiérrez Pulido (2005), the 8D allow the development of competitive advantages by quickly and effectively solving problems, maintaining customers through good service and quality in the products provided, reducing the number of problems within the organization. The stages that make up the 8D are:

1. 1-D Establish a work team. Here the team that will develop the diagnosis will be chosen.

2. 2-D Identify and state the problem. The problem that arises in the company will be sought and it will be presented to the team looking for practical solutions.

3. 3-D. Implement containment actions. Actions will be implemented to detect potential failures.

4. 4-D. Identify the root cause. Here we will try to identify the main cause for which the problem exists.

5. 5-D. Implement corrective actions. Actions will be implemented which will correct the problem at its root.

6. 6-D. Select corrective actions. Will be the action what EU correct and the problem.

7. D-7 Prevent recurrences. It will try to prevent with quality tools, so that the problem does not happen again.

8. D-8. Recognize team effort. The team will be congratulated for their achievement.

FMEA. This tool helps find all the potential flaws in a design, product or process, before they occur. It allows analyzing the possible ways in which it can fail as well as the effects that these failures could cause. It helps to reduce the smallest error that may arise.

Methodology

To carry out the diagnosis in the GRECON company, the activities indicated in Figure 1 were applied, which are described.

Figure 1 Flowchart of the methodology

1. Define purpose of diagnosis. The purpose was to identify the activities that generated re-processes in the production of metal structures.

2. Selection of instruments and information gathering techniques. Instruments such as: semi-structured questionnaire, checklist and process map were chosen to collect the information. It was also decided to apply field and documentary research with the techniques of observation, interview and documentary review.

3. Design of instruments for collecting information. Two checklists were designed, the first based on Ishikawa (1986), to identify the characteristics of quality in the processes (see Figure 2a.); while the second was designed based on OIT (1999) to identify quality conditions in the production process of metal structures (see Figure 2b).

	Criterios	si	no	Comentarios
1	¿El personal responde rápido ante una situación con la maquinaria?			
2	¿La maquinaria tiene buen estado?			
3	¿En ocasiones el proceso de los productos tiene errores?			
4	¿El personal pone su mejor esfuerzo en los procesos?			
5	¿Los productos se entregan a los clientes a tiempo?			
6	¿El entorno de trabajo esta acomodado?			
7	¿Las herramientas de trabajo están a la mano?			
8	¿Se almacenan por días los productos?			
9	¿El proceso se detiene cuando se detecta falla?			
10	¿Se revisan las unidades producidas antes de la entrega?			
11	¿Se soluciona el problema inmediatamente cuando se detecta?			
12	¿Se inspecciona cotidianamente el proceso y maquinaria?			

Figure 2 Quality checklist

	Criterios	Respuestas
1	¿Qué se hace en realidad?	
2	¿Por qué hay que hacerlo?	
3	¿Cuándo lo hacen? ¿Por qué lo hacen en ese momento?	
4	¿Quién lo hace? ¿Por que lo hace esa persona?	
5	¿Cómo se hace? ¿Por que se hace de ese modo?	

Figure 3 Table and quality conditions

On the other hand, the following guiding questions were established to conduct the interview:

- What measures or tools are applied for quality?
- How do you know that the process has control?
- Is a tool applied in all processes?
- In which process do you have more quality problems?
- Finally, to identify the processes of the company, the process map was made, under a process approach as shown in Figure 4.

Figure 4 Process map

1. Application of the instruments. 12 interviews were conducted with 12 people from GRECON, who were General Manager, production manager, 5 workers and 5 clients. 4 visits to the company were made to characterize the process and identify improvements, plans and process diagrams were reviewed to understand the sequence of production processes.

2. Analysis of the results. The analysis was carried out based on the information that was collected from the visits and interviews, this allowed identifying the problems that were found in the GRECON production process.

3. Identification of improvements. From the results, a SWOT was elaborated, which allowed to identify the improvements.

4. Improvement proposal. Based on the results of the SWOT and considering the weaknesses and strengths, the application of the following tools was proposed: AMEF, 8D'S and Annual Operating Certificate.

Results

Once the checklist (see Figure 4) on quality was applied, it was found that one of the weaknesses that the Grecon company has is that in the cutting process, it continually has defects and this directly affects the production process of the blades. metallic structures. There is also another weakness, which is delays, since you have to wait for night to transport the metal parts.

	Criterios	si	no	Comentarios
1	¿El personal responde rápido ante una situación con la maquinaria?	*		Se le comunica a la persona en cargada de la producción.
2	¿La maquinaria tiene buen estado?		*	La maquinaria ya está un poco deteriorada por el uso de ella en el exterior (en obra).
3	¿En ocasiones el proceso de los productos tiene errores?	*		El proceso tiene errores en las medidas para el proceso de corte.
4	¿El personal pone su mejor esfuerzo en los procesos?	*		El personal está comprometido con la empresa para entregar productos de buena calidad.
5	¿Los productos se entregan a los clientes a tiempo?	*		Se acuerda una fecha de entrega entre el ingeniero y le cliente.
6	¿El entorno de trabajo esta acomodado?	*		El entorno se encuentra acomodado por el tipo de maquinaria que se ocupa, tiene designado su lugar.
7	¿Las herramientas de trabajo están a la mano?	*		Las herramientas tiene su lugar de colocación para su rápido uso
8	¿Se almacenan por días los productos?	*		Hasta que se tiene al menos el 50% del producto se empieza a mandar a obra.
9	¿El proceso se detiene cuando se detecta fallas?		*	Se continua con el proceso y se atiende aparte el error
10	¿Se revisan las unidades producidas antes de la entrega?	*		Se le da una pequeña inspección que cumpla con todos los requisitos
11	¿Se soluciona el problema inmediatamente cuando se detecta?	*		Se hace una pequeña reunión entre el encargado de producción y el encargado de los empleados para darle solución.
12	¿Se inspecciona cotidianamente el proceso y maquinaria?	*		Se le da una compostura a las maquinas después de cada terminación de obra.

Figure 5 Verification list

Likewise, an interview was conducted with company personnel (general manager, production manager and workers) and the following responses were obtained (see Figure 5).

	Criterios	Respuestas
1	¿Qué se hace en realidad?	Se fabrican piezas para las extructuras
2	¿Por qué hay que hacerlo?	por que en obra civil no se puden solventar los gartos de produccion
3	¿Cuándo lo hacen? ¿Por qué lo hacen en ese momento?	Lo hacen 2 mese antes de la colocasion. Lo hacen en ese tiempo por que es el tiempo estimadode fabricasion
4	¿Quién lo hace? ¿Por que lo hace esa persona?	el encargado de produccion, lo hace por que es la persona con los conocimientos y experiencia necesaria parallarla a cavo
5	¿Cómo se hace? ¿Por que se hace de ese modo?	Se realizan las piezas en el taller y despues se mandan al lugar acordado con el cliente, y se realiza de este modo por que es el unico modo para las nave industriales

Figure 6 Table and quality conditions

The results that the interview gave us is that the cutting process has more quality problems, since sometimes the pieces are cut in the wrong way.

On the other hand, from the visits to the company and the review of its production documents, the process map and the production diagram were made, which are shown in Figure 6.

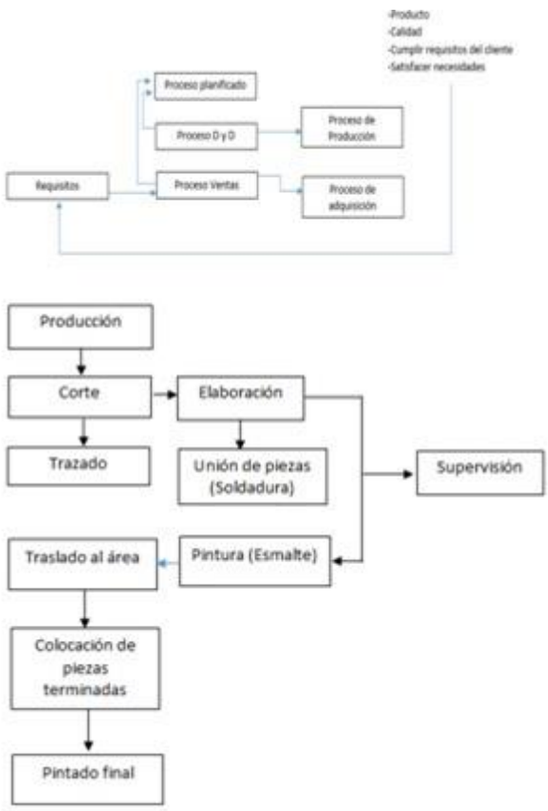

Figure 7 Diagram and process map

To classify the information obtained from the interviews and the observation, the SWOT was carried out, which shows the strengths, weaknesses, opportunities and threats of the company (see Figure 7)

Fortalezas	Oportunidades
-La empresa tiene un trabajo en conjunto muy eficiente. -La empresa tiene altos de experiencia creando naves industriales. -Toda persona que labora en la empresa tiene experiencia.	-La empresa puede hacer cualquier nave industrial en el lugar donde se le solicite. -Las herramientas que tienen dentro de la empresa para crear las naves industriales son de las mejores para así no tener ningún fallo al crearlo.
Debilidades	**Amenazas**
Falta de documentacion del proceso de produccion. Falta de una metodologia de análisis que permita prevenir y/o elimina problemas. Limitación en el cumplimiento de la normatividad legal para el cuidado del medio ambiente Falta de estandarización en el proceso de corte	-Al tener esa dificultad de transportar puede que algunos clientes lo quieran de día, y no soliciten su pedido. -Esto puede afectar tanto al proceso (en el tardado de la misma) como en el personal, el cual le afecta para poder realizar cada actividad.

Figure 8 Table the SWOT

The results that we were able to observe is that the company is good, but the faults it has make it take it as a company not dedicated to total quality, since it allows problems in the processes to continue to occur.

So, based on the results of the diagnosis, it is proposed to use the following tools:

- Identification card.
- Process FMEA
- 8-D

The weakness that will be reduced with these tools will be the cutting process, since it is the most notable weakness that the GRECON company has. Since they will help us prevent and correct errors that may occur in court.

Thes improvements that were proposed, are indicated below.

Annual Operating

To meet one of the legal requirements regarding the environment, the proposal for the annual operation certificate was made (see Figure 8), which allows identifying the pollutants generated by the company.

		GENERACION EMICION DE RESIDUOS							
		ENTRADAS							
Numero de punto	Nombre de maquinaria o actividad	Insumo directo	Insumo indirecto	agua	Combustibles	aire	Aguas residuales	Residuos peligrosos	Residuos solidos
1	cortado	x		x	x			x	x
2	soldadura				x	x		x	x
3	limpiado	x			x	x		x	x
4	pintado		x		x	x			

Figure 9 Table de annual operation of the process

FMEA

Figure 9 shows the process FMEA for GRECON, which allows documenting the production process and reducing the possibility of problems not only in the cutting process, but in all processes.

proceso	propósito	Modo potencial de fallo	efecto	Severidad	actuales control
Trazado	*marcar las dimensiones especificadas	*dimensiones mal especificadas	*piezas mal trazadas y?o fuera de especificación	4	*inspecciones de dimensiones
Corte	*hacer los cortes para la fabricación de las piezas	*dimensiones mal especificadas	*Piezas fuera de especificación en la medidas	7	*chequeo de dimensiones
Armado	*armar las piezas para formar la pieza	*piezas mal colocadas o mal posicionadas	*Piezas torcidas o piezas que no coincidan	8	*chequeo de posturas y colocación de piezas

Figure 10 Process FEM

ocurrencia	detención	causa	índice prioritario de riesgo	acciones	responsable y fecha
1	7	*no hay chequeo en el diseño *falta de comunicación	28	*hacer chequeos a los diseños *tener pláticas para checar errores	En cargado de producción 22/05/2015
2	8	* no hay chequeo de dimensiones	112	*Hacer chequeos de dimensiones	En cargado de producción 22/05/2015
4	7	*no hay chequeos de procedimiento	224	*hacer chequeo de procedimiento y capacitar al	En cargado de producción 22/05/2015

Figure 11 Process FEM (continued)

8 Disciplines

The proposal for the application of the 8D in GRECON, was carried out with the problems that were caused in the installation process of the metallic structures, since it did not have a problem analysis method as indicated in the SWOT (see Figure 7), particularly in the cutting process, where the structures had incorrect measurements. The application is shown below.

- 1-D Establish a work team. The team was integrated with the civil works engineer and the metal structures engineer.

- 2-D Identify and plan the problem. In this case, the Pareto diagram was used to identify the faults that exist in the 4 axes of the anchor structures (Figure 10).

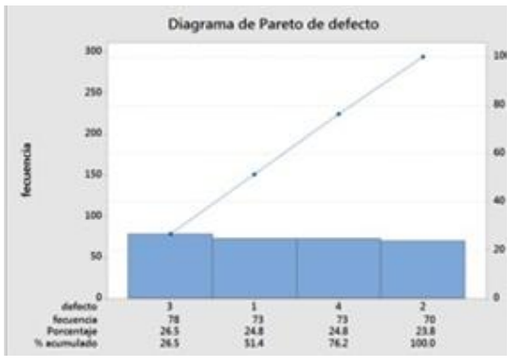

Figure 12 Pareto chart

Based on Figure 10, it was identified that one of the causes is damaged ropes with a 26.5% incidence.

- 3-D Implement containment actions. It was established to check the anchors when they are delivered by the supplier and place them in a place where they will not be mistreated.

- 4-D notify the Accuses rotis

Using the Ishikawa diagram, the causes were identified with their respective effects, the main one being the wrong installation (see Figure 11).

ISSN 2524-2016

Figure 13 Cause effect diagram

- 5-D. Implement corrective actions.

The actions that were implemented based on the causes were:

a. Inspect the raw material upon arrival at the site.

b. Supervise personnel when placing and handling anchors.

- 6-D. Select corrective actions. Based on the corrective actions, the following plan was established:

Project title: Quality control in the reception and installation of the anchors.

Objective: Establish the activities to verify the material as well as to verify the installation of the anchors.

Workplan. It included activities such as:

a. Check the anchors upon arrival at the work.

b. Review and update the installation procedure.

c. Training for installation personnel

– 7-D. Prevent recurrences. It was proposed to verify the material every 2 days and continuous training.

– 8-D. Recognize the effort of the team- In this regard, in addition to congratulations, it was proposed that based on GRECON policies they be invited to dinner.

Conclusion

In the quality diagnosis, it was observed that the GRECON company has several problems regarding the quality of the metallic structures and they were thoroughly analyzed, in order to be able to give improvement proposals for its production process, which will benefit the company. making it more competitive with other leading companies in the market.

Different information on the process was collected, which allowed us to analyze the problem that exists and as a consequence some solutions that can be implemented, in order to have a quality product and also that errors do not occur again in the process.

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ISSN 2524-2016