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ELIMINATION OF INCORRECT LEVEL (GAP) BETWEEN RR GATE AND RR BODY, BASED ON DEMING CYCLE AND STATISTICS TOOLS – CASE STUDY

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ABSTRACT: The current investigation has an objective to present a methodology solution to eliminate the incorrect level (gap) of clearances and gates from the Rear Gate and Rear Body Side made during the auto motor vehicle manufacture. Based on the PDCA Control Cycle (Deming Cycle) and supported on the application of the process statistics tools, the activities were scheduled in order to systematically resolve the issue in the product's box. Applying the methodology, the planned activities were implemented to eliminate the problem and the impact of the incident was 100% effective, the main obstacle was the low model production volume, but eliminated the problem. The established work methodology to non-conforming elimination is a solution proposal that it has been documented in books, however currently, is a better option to implement FTA (Factor Tree Analysis) instead of the Ishikawa diagram in order to achieve a methodology of solution more efficient, achieving a work proposal that allowed the total elimination of the issue presented.
KEYWORDS: Deming Cycle, FTA (Factor Tree Analysis), Pay of matrix, selection matrix, 4M's

INTRODUCTION

The Total Quality Management indicates that the continuous improvement of processes is a vital aspect and for many years has showed that the perfection of these is a very important factor to achieving the business excellence.

Fernandez and Ortega (2008) [1] write that Deming considered that is important that the organization has defined a strategic plan on its direction and how to achieve this; it must adopt a philosophy where the errors, defects and substandard materials are not acceptable and should be removed. In addition management should create an environment where employees are not afraid to report about the problems they encounter and have to recommend innovations to improve the production process.

The point of these processes is that each person working with them should be very familiar with the work that they do, who will be the customers and the quality requirements that they have to satisfy, therefore it is necessary to have a well-defined working method and standards according to there sources with which to work.

Deming writes a very important phrase that should always be considered: "What cannot be measured cannot be improved", so it is essential to implement methods of monitoring the process to get a measurement indicator for comparing what is made against what the customer wants.

There are several tools used in different manufacturing processes in order to have control on these variables presented, all with an application and proven effective over the years, including some that have been combined and their effect in solving problems has been outstanding.

While doing a revision in the literature, it was found that Wanderson (2003) did a research applying a methodology in order to identify the root cause of case study, which support his work using the methodology 8D (8 Disciplines) from Ford, Analysis Methodology and problem solution, Kepner e Tregoe Problem Solution Methodology and QC Story, in addition using an others Quality Tools.

The aim of the research was to find a methodology to remove a root problem caused by the special factors to appear sporadically and are not inherent to the process, its result was to obtain an *effective model that eliminated the problems found, noting that although apparently a simple way to work, behind it is an exhaustive work that eliminated the problems found [3].*

Using these tools and methodologies has been widely extended among goods-producing industries, especially among car makers industries and their suppliers in which the most used are Kaizen, Six Sigma, Lean Manufacturing and others, for example Garcia Garnica describes the case of the company CAMSA [2].

Doing a review of the use of this art of the tools, it was found that there are few reports of methodologies, probably due to the apparent simplicity that is showing but in reality the potential in the problem solution is not used to its fullest.

In this document the research report has been structured as follows: in the second item it is showed the work area and the research of the methodology, in the third part explains the way in which was applied the methodology, for paragraph fourth shows the findings and finally in the section five presents the conclusions that were reached.

WORK AREA

This problem occurs in body main, box process; in this process is performed the assembly of the gates (RR Gate) to the sides (RR Body Side), fastener devices are placed before to passing through the paint process, during "mechanical groups" process is incorporated the box on the chassis and installs the clamping mechanism and closing the gate (striker).

In the final line process detects, reports and records the quality results of operations such as appearance or functionality and is at this point where the incident reports "Incorrect Level RR Gate vs RR Body Side model.

Here are started investigations of the main root causes through the methodology of QC Story which is based on PDCA control cycle (Edward Deming Cycle) and in others tools statistical quality control such as Pareto, stratification, pay off matrix, selection matrix, box plot, 5W2H, FTA (Factor Tree Analysis), Process map, brainstorm, all applied in relation to the 4 M's of the process (Manual Labor, Method, Material and Equipment).

RESEARCH METHODOLOGY & PROGRAMMING OF THE METHODOLOGY

The methodology used was QC Story, which is a systematic approach to problem solving, one of the important parts is the section of the current knowledge and analysis of causes, as it is in both which appear most difficulties in applying the method. This technique is supported by the Deming Cycle (PDCA).

Also through the application of analysis tools are made search of the problem that affecting the quality of the final product. It was based on eleven tools for the analysis of the problem presented: Histogram, Box plot, FTA, Selection Matrix, Pareto Chart, Payoff Matrix, Correlation Matrix, Process Map, Brainstorm, 5W2H and the Cp and Cpk analysis.

Based on control cycle PDCA (Deming Cycle) and according to the 5W1H, activities were planned to systematically resolve the incident. As shown in the following table.

Table 1. Programming Methodology Solution. Source Manufacturing Management, 2010

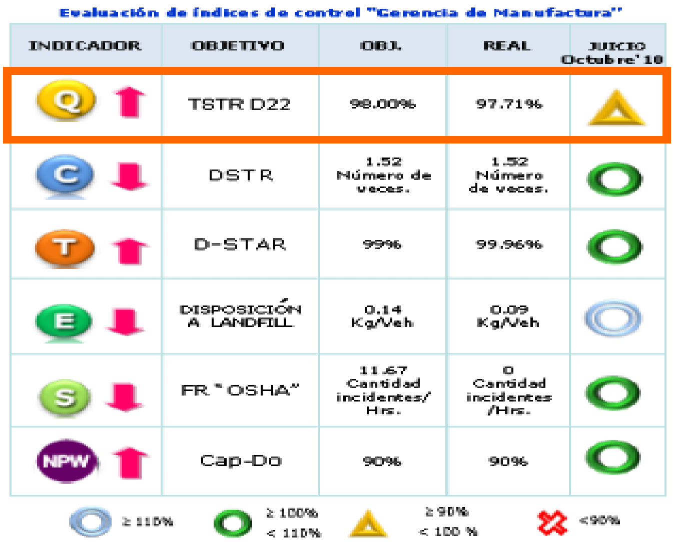
	¿Qué? (What)	¿Por que? (Why)	¿Cómo? (How)	¿Dónde? (Where)	¿Quien? (Who)	Semana
PLAN	1.- Selección del tema.	Clasificar el incidente a investigar	Identificando los principales incidentes que permitan el flujo de proceso.	Sala QRQC C2.	S. Alonso	Objetivo / Real
	2.- Razon de la selección del tema.	Justificar la importancia de la selección del tema, con respecto a los indicadores de planta.	Usando las herramientas estadistícas para verificar tendencias de los resultados SQCT.	Sala QRQC C2.	S. Alonso/QA Vehículos	Objetivo / Real
	3.- Establecimiento del Objetivo.	Fijar la cifra del tema y que represente un reto.	Que exista tendencia con el objetivo general del proceso para pronosticar su impacto.	Sala QRQC C2.	S. Alonso	Objetivo / Real
	4.- Programa de actividades.	Establecer un cronograma tentativo para cada una de la etapas, definiendo su alcance y responsablidad.	Estimando tiempos por etapas de acuerdo al Know How de experiencias anteriores.	Sala QRQC C2.	S. Alonso	Objetivo / Real
DO	5.- Conocimiento de la situación actual.	Clarificar las caracteristicas descriptivas más significativas que alteran la normalidad.	Clarificar los factores de las 4 M's que intervien definiendo las causas potenciales.	Carrocerias (Cajas) C2. Pintura C2. Grupos mecánicos C2. Linea Final C2.	S. Alonso/Manufactura/QA Vehículos	Objetivo / Real
	6.- Analísis.	Definir la causa que origine el problema.	Verificando fisicamente, haciendo la recreación de los factores para encontrar las causas verdaderas.		S. Alonso/Manufactura/QA Vehículos	Objetivo / Real
	7.- Programa de acciones correctivas.	Describir en forma clara cada una de las acciones a realizar para cada una de las causas raices, identificada en la etapa de analísis.	Evaluando las diferentes soluciones, tomando en cuenta el costo.		S. Alonso	Objetivo / Real
	8.- Ejecución de acciones correctivas.	Garantizar la ejecución de cada una de las actividades propuestas para la solución del incidente.	Informando a todo el personal involucrado sobre las contramedidas implementadas.	Carrocerias (Cajas) C2.	S. Alonso/Manufactura/QA Vehículos	Objetivo / Real
CHECK	9.- Verificacion de resultados.	Conocer claramente el impacto de cada una de las contramedidas establecidas.	Midiendo el impacto de cada una de las soluciones planteadas.	Línea final C2.	S. Alonso/QA Vehículos	Objetivo / Real
ACTION	10.- Acción para evitar la reincidencia.	Establecer las acciones a seguir para minimizar o impedir desviaciones futuras.	Estableciendo y verificando su cumplimiento.	Carrocerias (Cajas) C2.	S. Alonso/Manufactura/QA Vehículos	Objetivo / Real
	11.- Conclusión y Reflexión.	Identificar claramente las debilidades y fortalezas aprovechándolas en el futuro para una mayor efectividad.	Evaluando cada una de las etapas, su impacto en la mejora del proceso.	Sala QRQC C2.	S. Alonso/Manufactura/QA Vehículos	Objetivo / Real
	12.- Tema a futuro.	Definir las necesidades de analísis para la solución sistemática de otros incidentes y mejoramiento de los procesos.	Definiendo en equipo cada una de las tareas futuras con base al SQCT			Objetivo / Real

¿Cuando? (When) — Mes: Noviembre-10 (Semana 1, 2, 3, 4), Diciembre-10 (Semana 1, 2, 3), Enero-11 (Semana 1, 2, 3, 4)

3-Noviembre-2010

31-Enero-2011

Among the activities of the first phase, it reviewed the evolution rates of control and during reviewing of the indicators was found, that the quality point (percentage of direct units) was outside of the established (the Total Straight through Ratio (TSTR)).



Evaluación de índices de control "Gerencia de Manufactura"

INDICADOR	OBJETIVO	OBJ.	REAL	JUICIO Octubre' 10
Q	TSTR D22	98.00%	97.71%	
C	DSTR	1.52 Número de veces.	1.52 Número de veces.	
T	D-STAR	99%	99.96%	
E	DISPOSICIÓN A LANDFILL	0.14 Kg/Veh	0.09 Kg/Veh	
S	FR "OSHA"	11.67 Cantidad incidentes/ Hrs.	0 Cantidad incidentes /Hrs.	
NPW	Cap-Do	90%	90%	

Figure 1. Control Index,
source Manufacturing Management

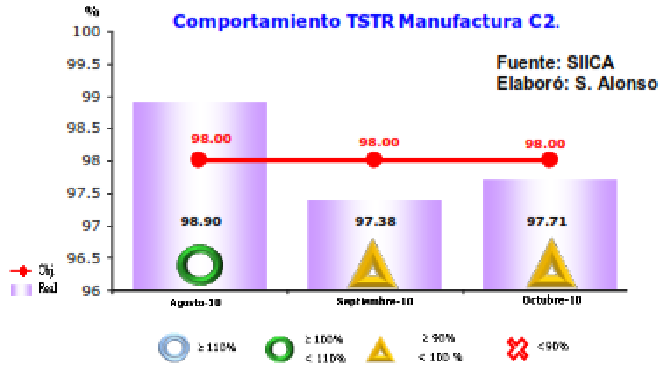


Figure 2. TSTR manufacturing behavior,
source SIICA

APPLICATION OF THE TOOLS

The cause of the problem it was defined through of Pareto chart using the possible variables that should have been the cause of the non-conformity, the analysis is shown in the following figure (Figure 4).

According to the previous graph, the item "clearances and levels", is the largest contribution with 53.27% in the body area.

Again, It was performed a second Pareto, to define between the "clearances and levels", what was the cause of the problem and was found that the main problem is the incorrect level of the sides and gate with a 73.68% of the contribution. Figure 5 shows the results obtained

Complemented of the activities, in evaluating individually the TSTR manufacturing, we can see that in the months of September and October, it was out of order (Figure 2).

In the area of box bodies, is performed gate assembly (RR Gate) to sides (RR Body Side) and placed the fastening for the passage through the painting process.

Subsequently passed to the next process "mechanical groups", in which is incorporated the box assemble on the chassis and installs the retention mechanism and closure (striker). When the product is evaluated, quality results reported in the final line indicate the difference of the heights that are out of the specification among the parts mentioned in the gate. The incorrect level is present of in a indistinct way in the superior part of the box (left, right) and in the bottom (left, right). See figure 3.

This incident appeared irregularly between August and October.

Figure 3. Location of the incident,
source SIICA

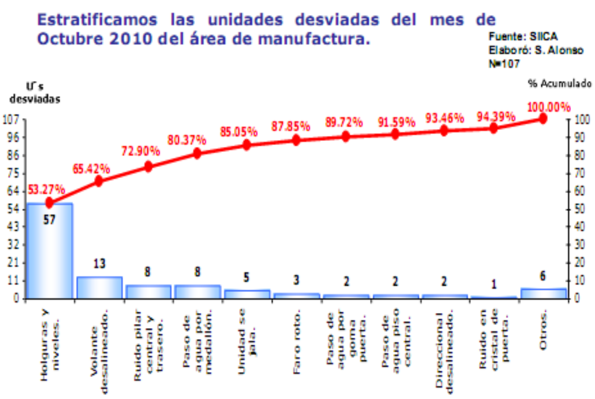


Figure 4. Pareto analysis, source SIICA

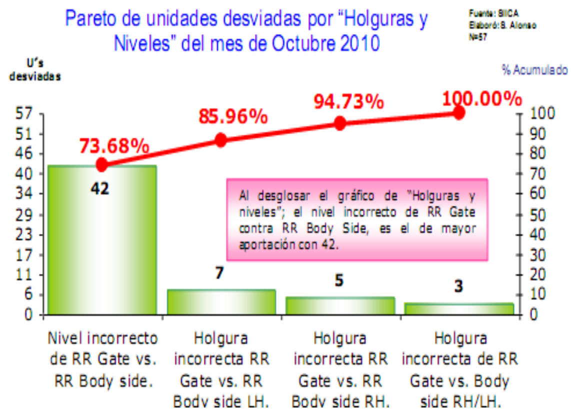


Figure 5. Pareto analysis for the characteristic of clearances and levels, source SIICA

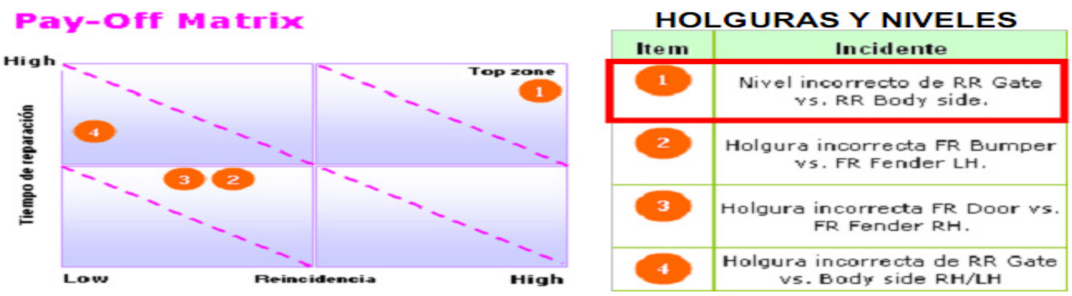


Figure 6. Pay off Matrix, source SIICA

In order to confirm this issue, it was applied the Pay Off Matrix (see figure 6), considering the recurrence in the repair time, thus confirming that the wrong level of RR Gate vs RR Side is an area of opportunity.

Additionally, there was a correlation matrix (see figure 7), to verify a possible relationship with other resolved cases and was not found relationship, therefore begins the analysis of the problem in depth.

Item / Problema	Existe pieza relacionada con el incidente	Existe modificación de norma relacionada con el incidente	4 M's relacionadas con el incidente	Se involucró algún ítem con el tema a futuro
Eliminar el Headlining visible por el front glass window D22 LCV	0	0	0	0
Eliminar el Paso de Agua por Sash Rear Door LH Vs. Ctr Pillar Modelo D22 LCV	0	0	0	0
Eliminar interferencia de Headlamp vs FR Fender LH D22 LCV	0	0	0	0

1= Tiene Relación 0= No tiene relación

Figure 7. Correlation Matrix, source SIICA

To identify potential factors that are causing the incident and have a clearer picture of the origin, the detection and measurement, first identified the parties involved in the incident (Figure 8).

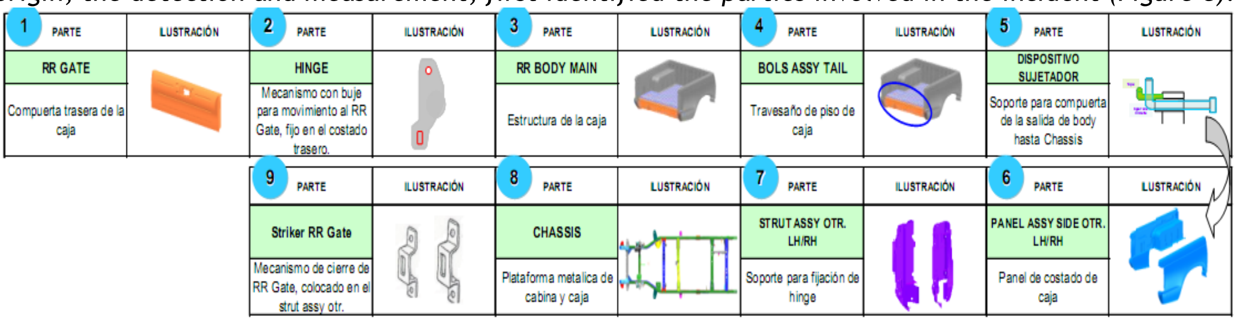


Figure 8. Parties involved, source SIICA

Then we conducted a process mapping (Figure 9) to identify the transactions related to the incident, in which not only checked four processes (bodywork, paint, mechanical and finish line groups) also included the supplier and the material handling department.

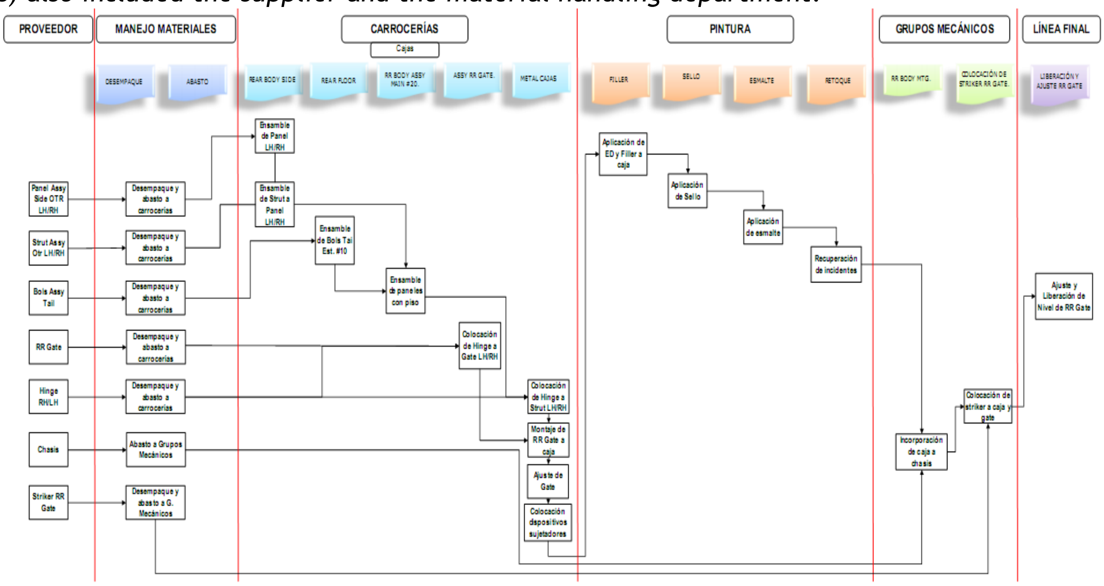


Figure 9. Process mapping, source SIICA

In relation of the 4M's, were classified the factors by process and operation, begins this analysis for each M and was obtained as follows:

1. *Method, it was evaluated in a matrix per each process involved: the existence, maintenance and consistency of all working documents (Standard Operation Sheet, Synoptic Table Operation Requirements, Operation Sheet, Letter Process Control and Individual Control Sheet) and besides ease of operation (Especially tools, special techniques, ergonomics, effort and accuracy). There was a discrepancy between the Operation Sheet (HO) and Standard Operation (HOE) Sheet, in the operation of mounting the RR Gate.*
2. *Labor force, it was evaluated all shifts and operators, in the following concepts: average of the cycle time, operator sequence vs Standard Operation Sheet, skill level, basic technique and the quality that deliver after the operation. There is not anomaly that affects or influence in the incident of the generation.*
3. *Machinery, there was a tree of factors, pressure settings, thicknesses and general attributes in all gauges, clamps, bolts, devices and templates. Finding non-standard conditions only in the fasteners, which had excess paint accumulated, layers for their use in the process.*
4. *Material, was evaluated the accuracy of the parts in the plant and suppliers dimensional reports, in addition to verify packaging and supplies. The data are within the safe zone and the process is controlled. The Cp and Cpk analysis indicate that the process is potentially capable and skilled. We did not find any point outside the norm, so the material is not a potential factor.*

FINDINGS

The conclusion of 4M's analysis in which was found 2 non-standard conditions:

1. *A Method discrepancy between standard operation sheet HOE (hinge placement) and operation sheet HO (by placing the hinge forward and up to stop)*
2. *Machinery (excess paint fastener devices)*

In the assembly operation of RR Gate placement is made hinge LH / RH to Strut Assy Otr. The Hinge is the mechanism that allows movement to RR Gate once fixed on the side and the Strut Assy tr., is support for fixing the Hinge. To fix it matches the nut of the hinge (1) through hole of the strut assy otr. (2) and to guide the bolt rope 3 minimum and vice versa. See Figure 10 to understand what is written.

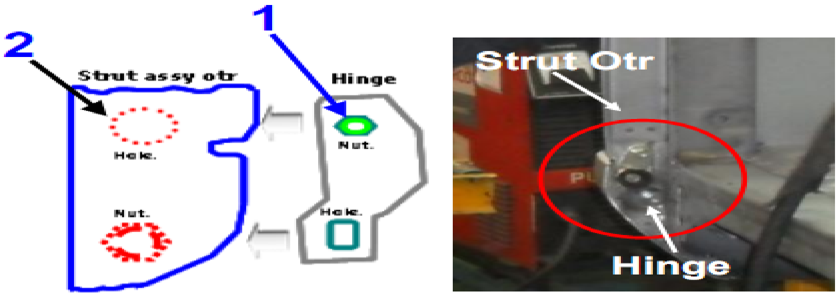


Figure 10. Mounting operation (Source SIICA)

Once determined the assembly, it was observed that the hinge presents displacement (set) in the strut assy otr., On the axes "Y" and "Z", generating possible shifts observed in Figure 11.

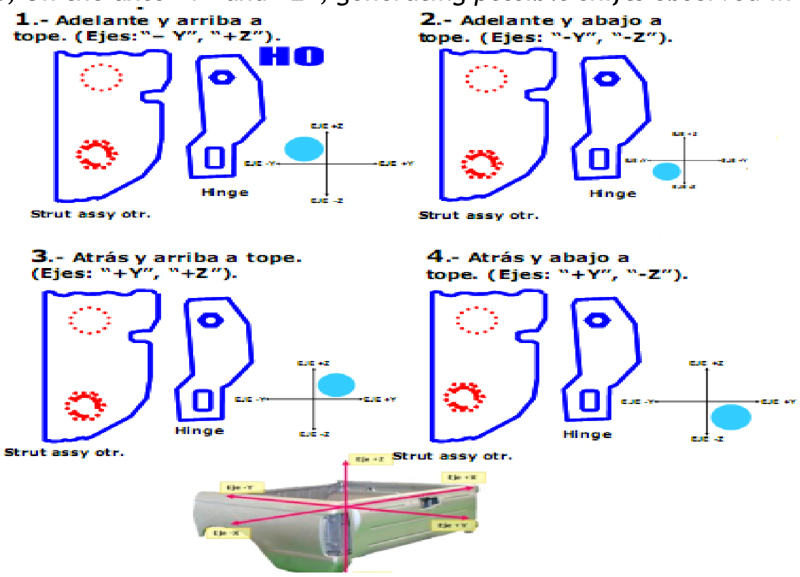
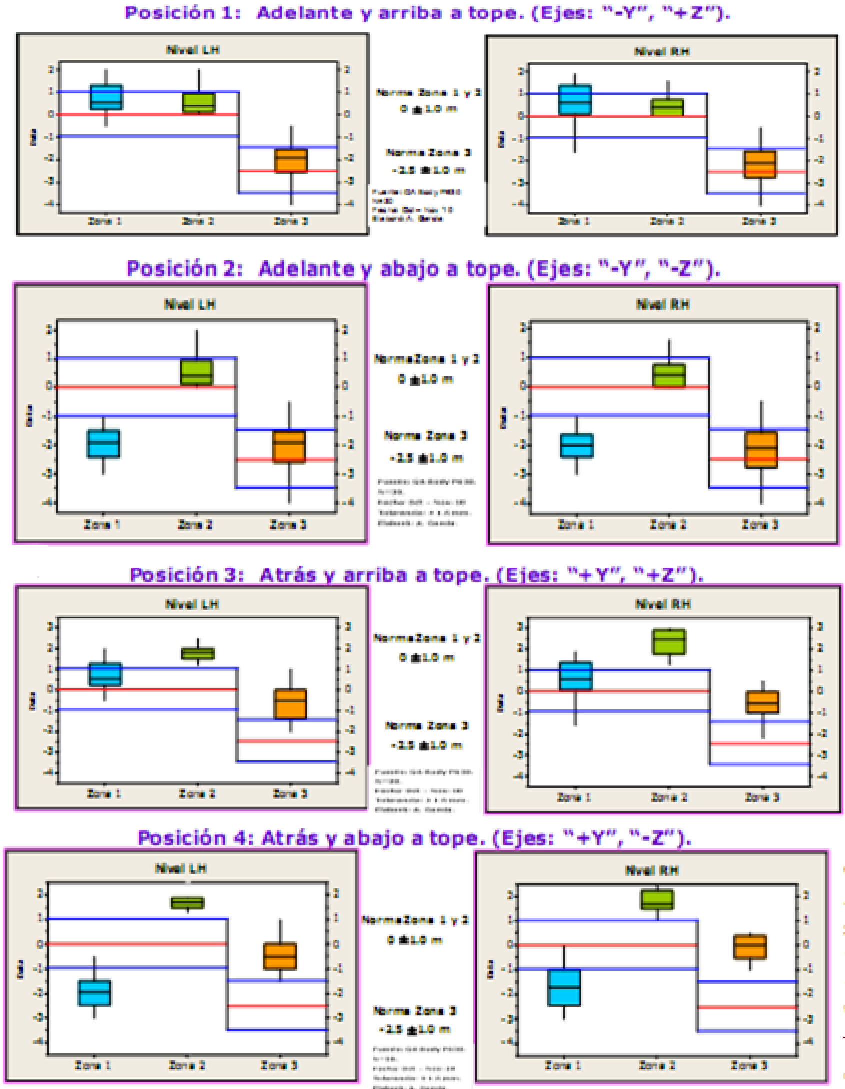


Figure 11. Possible displacements, Source SIICA

For the first discovery, we used the tool box plots to evaluate the performance level versus RR RR Gate bodyside and the results obtained were as follows:



Conclusion: the level of RR Gate vs RR Body Side, in the 3 measurements zones, remain wiithin the control limits by 70%, thereby reducing the incident.

Conclusion: Zone 1 is below the lower limit, that is RR Gate is to "-Z". Will be penalized 100% by QA.

Conclusion: Zone 2 and 3 are above the upper limit that is, RR Gate is towards "+ Y". Will be penalized 100% by Q.A.

Conclusion: Zones 1, 2 and 3 are outside the specification limits, that is, RR Gate is towards "+ Y" and to "- Z". This is the worst condition

Figure 12. Box Plot Nivel RR Gate vs RR Body Side (Source SIICA)

It was found that the 1 (OH) does not guarantee 100% assembly and the remaining 3 positions definitely generate the incident, with these results it was concluded that the fixing position of the hinge to the Strut assy otr., is the potential factor of the problem (lack of concentricity between the Nut of Hinge and Strut Hole of Otr. (Figure 13)

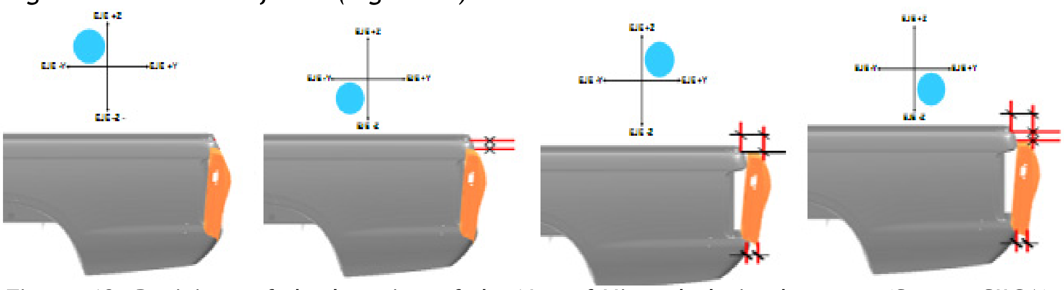
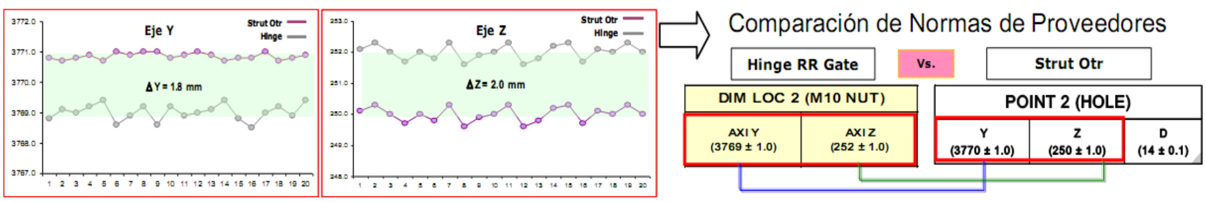


Figure 13. Positions of the location of the Nut of Hinge hole in the strut (Source SIICA)



Comparativo de datos de reportes Proveedor (Diferencias):
Eje Y (Promedio)= 1.8 mm; Eje Z (Promedio)= 2mm

Existe diferencia entre normas en eje "Y" de 1 mm. y en "Z" de 2 mm.

Figure 14. Comparative Data

Reports comparing dimensional parts suppliers involved, there was a difference between standards with which they had in the company.

When doing a review to make a judgment about which of the suppliers have the right standards, reviewed the design drawings and found that:

Table 2. Design drawings

Nut Hinge		Hole Strut Otr.	
Design Drawing	Supplier	Design Drawing	Supplier
Y = 3769 ± 1 mm	Y = 3769 ± 1mm	Y = 3769 ± 1 mm	Y = 3770 ± 1mm
Z =252 ± 1 mm	Z = 252 ± 1mm	Z =252 ± 1 mm	Z = 250 ± 1mm

There is a difference vs. the design view in the standard of the center of the Strut Hole Otr. There is a marked shift in the norm of the center of the Strut Hole Otr., In the Y and Z, which causes the loss of concentricity between the parties. In making the motion simulation indicating HO following was observed (Figure 15).

By respecting the method, on the Y axis (forward), the position of the hinge nut is outside the center of the standard, however, to move in Z axis (upper limit), at some point this position is very close the center of the standard (due to displacement of the nut bolt for fixing the hinge on the strut hole circle Otr.)

The location of the hinge nut non-standard (sending) in the hole of the strut otr., Is the root cause of the problem.

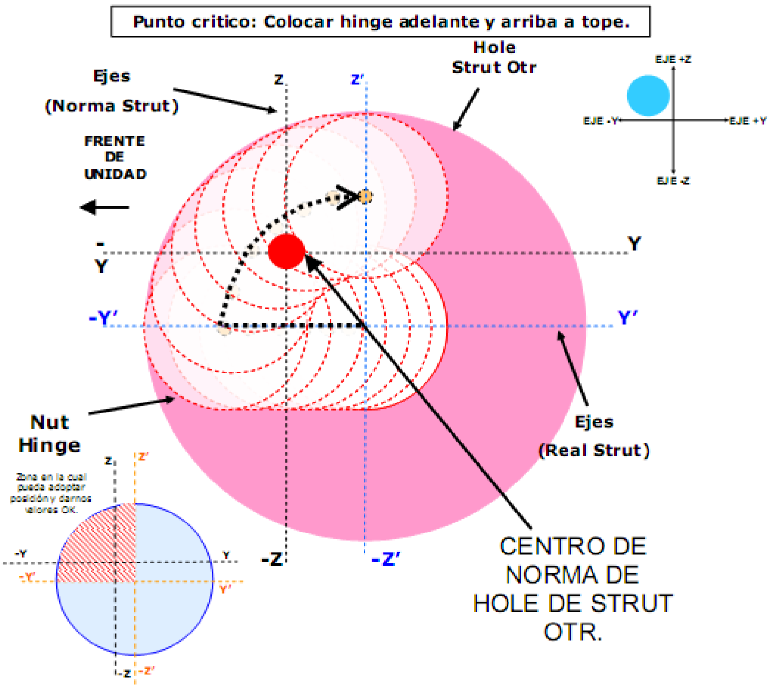


Figure 15. Location of the hinge nut, source SIICA

Regarding to the Paint excess in the fastener devices, this device is placed in boxes area, used to hold the side with the gate in the absence of the locking mechanism, the purpose is to facilitate handling and prevent damage to the gate. We assessed whether the physical device and the design drawing was a discrepancy in their size, but everything was within the norm. This Item was eliminated as a risk factor.

So we proceeded to verify whether the excess paint was the cause of the problem. Were conducted test with cleaned devices and with excess paint respecting the operation sheet and analysis was made with measurements obtained by box plots and it was detected that painting in the device was above the allowed limit and the gate undergoes a slight deformation failure due to lack of device's functionality (Figure 16).

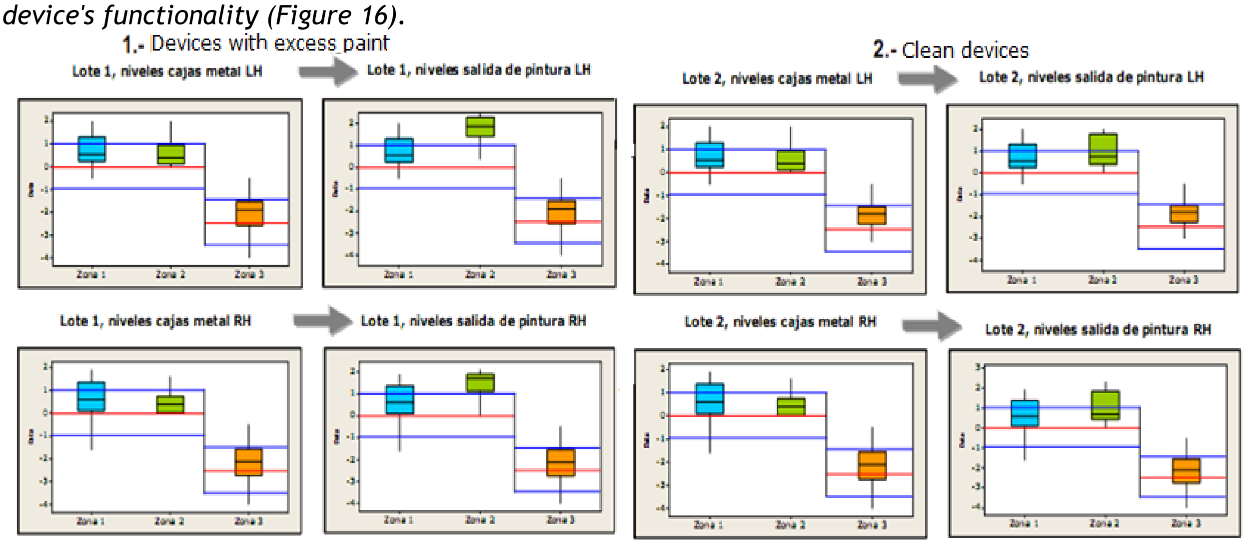


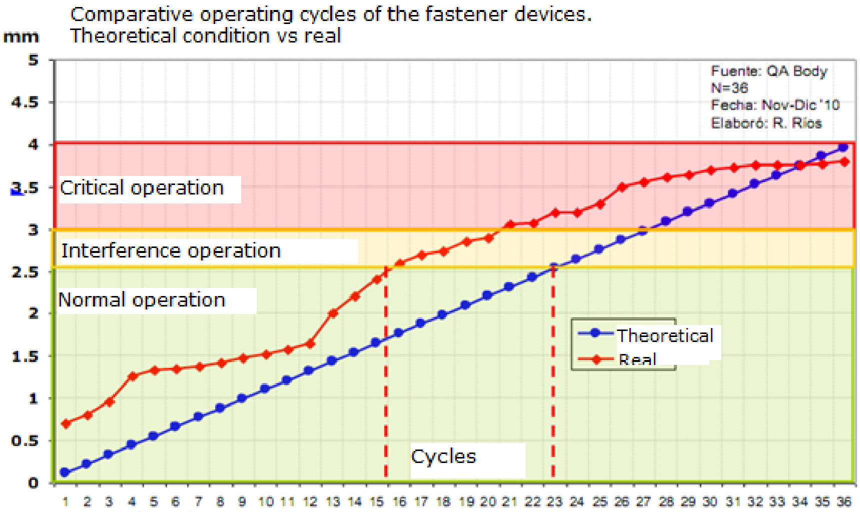
Figure 16. Box-plot of devices, source SIICA.
Standard zone 1 and 2: 0 ± 1.0 m; Standard zone 3: -2.5 ± 1.0 m

In both lots in Zones 1 and 3 do not vary, but in zone 2 is above the upper limit of what causes the RR Gate suffers a deformation in the painting process, we conclude that the excess paint in the means for fastening is a potential factor.

Again we worked with the factor tree to confirm compliance with the standards according to the 4 M's and were found two points out of specification to referred to the cleaning frequency, reinforcing with the test carried out since the devices lose functionality before the expected time due to the established methods of work.

To corroborate this, we proceeded to perform tests to determine the number of cycles in which the device loses functionality, theoretically obtained a value of 36 cycles, this value was determined from the thicknesses generated through the painting process This marks a total thickness of 110 microns (0.11mm) and the maximum amount of paint in the Gap to reach 4mm painting and does not allow the correct restraint RR Gate causing deformation. It proceeded with circulating clean a set of devices 36 cycles obtaining the results shown in the following table (Table 3).

Table 3. Comparative cleaning cycles, source QA Body



In real conditions the devices begin to lose functionality between cycles 15 and 23, was theoretically between 23 and 27 cycles. Looking at the painting process devices, circulating on average 12 cycles per month. The supplier makes move 24 cycles (critical condition) that was defined for them while cleaning, which is set in the method but not defined the period for doing so.

There are the rules but do not set the cleaning period and the lack of establishment of the specific frequency of cleaning means for fastening was the root cause of the problem.

Analysis of the solution

In order to set a final solution to the findings, was developed a selection matrix with different kind of solution proposals to get each one of the root cause found, considering ease, cost and applying time. The results obtained were as shown below:

1. *Regarding to the hinge nut out of specification, two possible solutions were evaluated with the above criteria.*
2. *It has found three possible solutions for the excess of paint fastening devices due to lack cleaning frequency.*

The shape and the evaluation criteria are summarized in the following table (Table 4).

Table 4. Matrix analysis of proposed solutions

Causa raíz.	Posible solución.	Facilidad.		Costo.		Tiempo de aplicación.		Total
5W y 1H La localización del Nut del Hinge fuera de norma (centro de origen) en el Strut Otr.	Fabricación de Plantilla para garantía de localización de Hinge en Strut Otr., a norma.	Se requiere diseño y pruebas.	▲	Se realiza con material y personal herramental de planta.	●	1 semana	●	5
	Modificación por proveedor Yamakawa de la posición a norma y reducción de diámetro de Hole del Strut Otr.	Se requiere solicitud de modificación de troquel.	✖	Se requiere inversión y adelanto de producción.	✖	3 meses aproximadamente	✖	0
La falta de establecimiento de la frecuencia específica de limpieza de los dispositivos sujetadores.	Establecer la frecuencia de limpieza a 20 días.	Inmediato.	●	Se incrementa equipo y material de limpieza.	▲	2 días	●	5
	Diseño y fabricación de nuevo dispositivo sujetador.	Se requiere diseño y pruebas.	▲	Se requiere inversión.	✖	30 días	✖	1
	Establecimiento de GO NO GO para garantía de funcionalidad de dispositivos sujetadores.	Se requiere diseño.	●	Se realiza con material y personal herramental de planta.	●	1 día	●	6

Criterio: ✖ 0 puntos. ▲ 1 puntos. ● 2 puntos.

Three options for the solution were obtained, through of the corrective actions matrix were defined the actions that are going to do; based on 5W and 2H were programmed the actions to do. These are shown in Table 5.

Table 5. Corrective Action Matrix

CAUSA RAIZ	¿Qué? (What)	¿Por qué? (Why)	¿Cómo? (How)	¿Dónde? (Where)	¿Quién? (Who)	¿Cuándo? (When)	¿Cuánto? (How much?)
La localización del Nut del Hinge fuera de norma (centro de origen) en el Strut Otr	Fabricación de Plantilla	Para garantía de localización de Hinge en Strut Otr a norma	De acuerdo a dibujo NM-PC-016-D22 emitido por Procesos Carrocerías	Taller de herramental (Mantenimiento pl-2)	Pedro Pedroza Personal Herramental Pl-2	7 al 11 Diciembre 2010	Eliminar al 100 % incidente de nivel incorrecto (en las 3 zonas del RR Gate vs. RR Body Side) desde origen
La falta de establecimiento de la frecuencia de limpieza fuera de norma de los dispositivos sujetadores	Realizar limpieza al 100 % de los dispositivos sujetadores	Para garantizar la funcionalidad del dispositivo sujetador	De acuerdo a H.O. Limpieza de soportería "CM-D22-02"	Taller de proveedor	Sergio García Ing. Procesos Pintura	11 y 12 Diciembre 2010	Eliminar la posibilidad de que la zona 2 del incidente, presente nivel incorrecto, esto por deformación del RR Gate en el proceso de pintura
	Modificar la frecuencia de limpieza a 20 días	Para garantizar la funcionalidad del dispositivo sujetador	De acuerdo a H.O. Limpieza de soportería "CM-D22-02"	Oficina de Manufactura	Sergio García Ing. Procesos Pintura	15-Dic-10	
	Elaboración y establecimiento de "GO NO GO"	Para garantía de funcionalidad de dispositivos sujetadores	De acuerdo a dibujo NM-PC-017-D22 y H.O. FIX RR GATE emitido por Procesos Carrocerías	Oficina de Manufactura Taller Central	Antonio García Ing. Procesos Carrocerías Antonio Sanchez Ing. Taller Central	15 y 16 Diciembre 2010	

Planned activities were implemented making an impact of 100% effective for root causes 1 and 2, in the beginning had a slight drop in production that was corrected himself to dominate the changes in working methods.

We checked the results of corrective actions by observing a forcefulness on the results obtained free of crime and enforcement of the planned production volume.

The fulfillment of the objectives shown in the following figures (Figure 17).

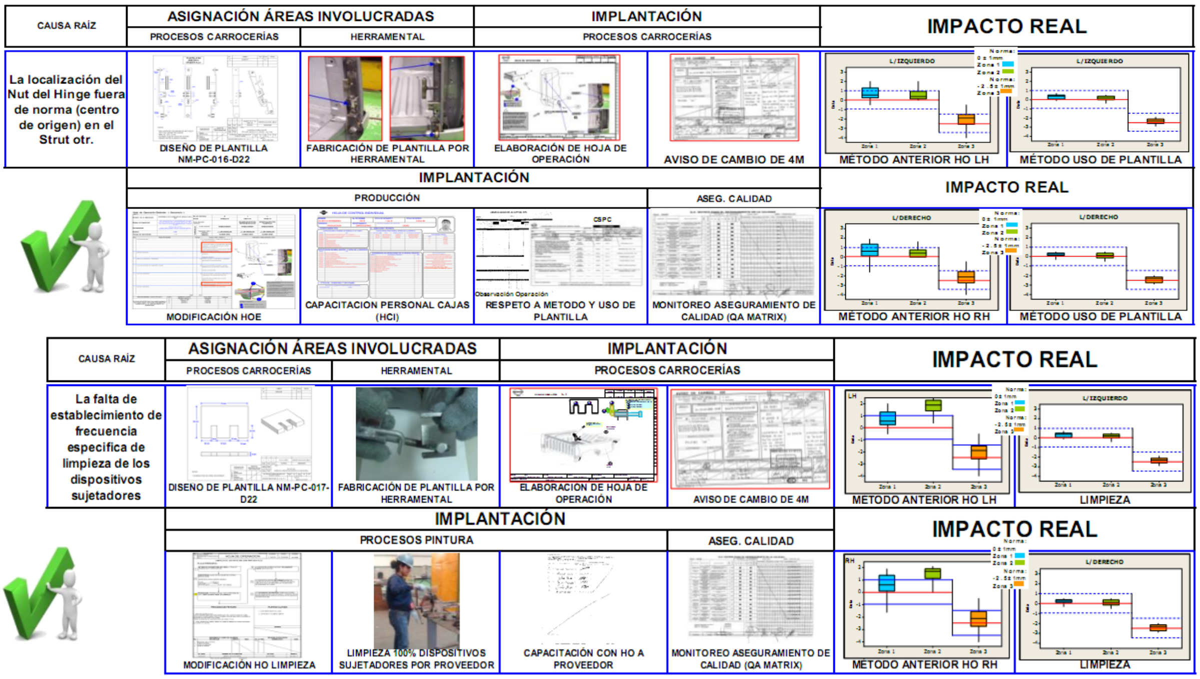


Figure 17. Fulfillment of the objectives

It was the design of the new standard to ensure non-recurrence of problems. This is shown in the following table.

Table 6. Design of the new standard

Contramedida	It	What?	Why?	How?	Where?	When?	Who?
Plantilla	1	Emisión de H.O.	Por diseño de nueva plantilla	Describiendo el método de uso	En la H.O. de Fix RR Gate	14-Dic-10	Ingeniero Procesos Body Antonio García
	2	Establecimiento de frecuencia de verificación de plantilla	Para garantía de norma de fijación del Hinge en Strut Otr	Realizando medición de acuerdo a norma cada mes	En lay out machine C2	Ene-11	Ingeniero Procesos Body Antonio García Supervisor QA Body Roberto Rivera
	3	Modificación de H.O.E.	Por cambio en el proceso y congruencia vs. H.O.	Asentando puntos críticos de H.O.	En la H.O.E. de Montaje de compuerta	14-Dic-10	Supervisor Cajas Ulises Cruz
	4	Elaboración de Atención Básica	Para garantizar funcionalidad de plantilla	Revisión por atributos de plantillas diariamente x turno	En la estación de Montajde de compuerta	15-Dic-10	Supervisor Cajas Ulises Cruz
	5	Capacitación a operadores (titulares, jefes de gurpo, cubreausentismo)	Para garantizar la posición del Hinge en el Strut Otr	Con el método de las 3 etapas de la enseñanza	En la estación de Montajde de compuerta	14-Dic-10	Supervisor Cajas Ulises Cruz
	6	Observación de operación	Respeto a H.O.E.	De acuerdo a programa	En la estación de Montajde de compuerta	14-Dic-10	Supervisor Cajas Ulises Cruz
	7	Establecimiento de punto de control C.S.P.C.	Para confirmar se respete puntos críticos de H.O.E. de uso de plantilla	Através de H.V.P.C.	En la estación de Montajde de compuerta	14-Dic-10	Supervisor Cajas Ulises Cruz
	8	Punto de control en QA Matrix	Para vigilar el uso de plantilla y respeto de puntos critcos	1 vez x turno	En QA Matrix del área de Cajas	16-Dic-10	Supervisor QA Body Roberto Rivera

CONCLUSIONS

Program was completed in a timely manner, key to the success of this project, assessed the situation opposite what has been done before, the results were excellent, with one area of opportunity: to improve the technical analysis of incidents.

Also thought evaluation of the individual skill level, measured the increase in skills related to solving methodology by comparing incidents before and after. Applying the QC Story and supported of PDCA cycle as well as statistical tools was achieved to find an orderly and methodical solutions to the problems encountered. May be considered a successful case study has served as a benchmark among other plants in the corporate enterprise.

As future work has considered improving this methodology combining it with some lean manufacturing tools to potentiate their results.

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