Improving the parts delivery system in S.C. Contitech Timișoara S.R.L.

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Summary

In the scientific work it will be presented the project „Mixed delivery”, which represent a complaint at the factory where Renault belts were delivered to Volvo instead, because they have same belt length but different part numbers. The potential causes that led to this cause will be studied in terms of Six Sigma and with the help of problem solving methods. After the actions were taken in the case of Mixed delivery, it was found that in the following months there were no more complaints from customers regarding the part numbers delivered incorrectly.
Keywords: ContiTech; Mixed delivery; complaint; Six Sigma; problem solving.

Introduction

The chosen company is ContiTech PTG, located in Timisoara, which is a researcher, manufacturer and distributor of transmission belts, components and complete belt drive systems for cars, trucks and equipments. The company orients its activity in order to satisfy the customer, being certified ISO 9001, ISO TS 16949 and ISO 14001. The company's rule is: "zero mistakes", because the constant concern for accuracy is more effective than correcting mistakes and the company seeks continuous improvement.

Methodology/Approach

The stientific work „ Improving the parts delivery system in S.C. Contitech Timișoara S.R.L.” approches the SIX SIGMA METHODOLOGY. Six Sigma is a rigorous, focused, and highly effective implementation of proven quality principles and techniques. The Contitech Timisoara performance is measured by the sigma level of their business processes. Six Sigma's goal is to improve the quality of our products and processes through continuous improvement. But the tools are applied within a simple performance improvement model known as Define-Measure-Analyze-Improve-Control, or DMAIC. DMAIC is described briefly as follows [2]

D **-** Define the goals of the improvement activity.

M **-** Measure the existing system.

A **-** Analyze the system to identify ways to achive the desired goal.

I **-** Improve the system.

C **-** Control the new system.

Research (description)

At first, to see if the "Mixed delivery" is a viable DMAIC project has been applied Viability Matrix, where it qualified as a project with a score of 4.08.

Next, the project presents all the DMAIC phases.

A. Describe Problem / Issue

1. Description & Background : In Contitech Timisoara there was reported a complaint at the factory. 24 belts – PN 7422100459 – 10 PK 1342 Renault were delivered to Volvo instead of PN 21955032 - 10 PK 1342 Volvo. Failure was found in Volvo plant Curitiba Brasil-warehouse, by the quality department, on 20.02.2021.

2. Current Condition: 5 complaint in 2021 because wrong part number delivered to the customer -> 3 complaints from Volvo Group (Volvo Truck, Renault Truck): same belt length have different part numbers for Volvo and Renault

Figure 1 – Volvo belt

Figure 2 – Renaul belt

3. Goal Statement / Objectives / Target Conditions

0 complaints from customer regarding mixed deliveries, or wrong PN delivered.

IS/IS NOT

We use next the tool „IS/IS NOT" to provide a detailed description of the facts associated with the problem. The tool it is an important part of the general problem-solving process for defining the landscape and boundaries of an unknown problem.

Key Questions	**Is**	**Is Not**	**Difference / Changes**
What?	The same dimension	Not the same PN	

Is the specific problem/defect? WHAT specific part has the problem?			Different PN& branding
Where? Is the problem on the object? WHERE has the problem occurred?	L1- cutting L2 – Rest area	L3, L6	
When? Was the problem observed	Problem was observed on the assembly line at the customer	Before delivery during control or overinspection	
How Big? HOW MANY objects have the problem HOW MANY deviations are on each object?	Belts have identical length/ height but different branding: PK/PKF. 24 wrong belts delivered	Dimensions with just one branding.	different Part no.
Who? WHO is involved?	Control operator, QP	Other operators	

Tabel 1 – Is/Is Not

B. Find Root Cause of Problem / Issue

1. *Fishbone Diagram*

Ishikawa diagrams (also called fishbone diagrams or cause-and-effect diagrams) is a visualization tool for categorizing the potential causes of a problem. This tool is used in order to identify a problem's root causes. Causes are usually grouped into major categories to identify and classify these sources of variation: Man / mind power (physical or knowledge work); Machine (equipment, technology); Material (includes raw material, consumables, and information); Method (process) and Measurement / medium (inspection, environment) [7]

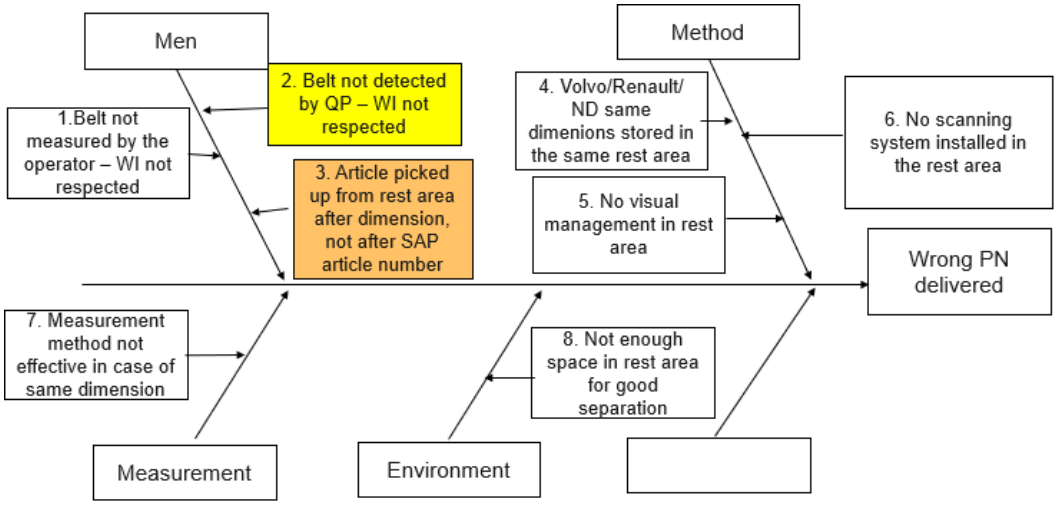

Figure 3 – Fishbone Diagram

It was concluded that the final causes that led to the incorrect delivery of 10 PK 1342 Renault parts, instead of 10 PK 1342 Volvo were:

1. Article picked up from rest area after dimension, not after SAP article number
2. Belt not detected by QP – Work Instruction not respected.

2. WHY-WHY analysis

After the team verified the major hypothesis. Only after the verified cause we can continue with your why-why analysis. Why-Why analysis is an analytical method that is designed to help us to identify all factors contributing to a problem. A why-why is conducted to identify solutions to a problem that address it's root cause(s). [8]

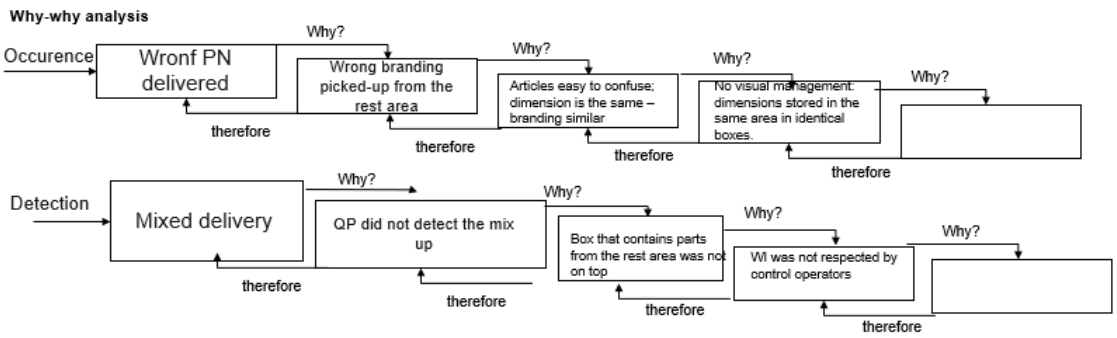

Figure 4 – Why- why analysis

C. Solve Problem / Issue

1.Brainstorming

Brainstorming is a method design teams use to generate many ideas to solve clearly defined design problems. In controlled conditions and a free-thinking environment, teams

approach a problem by such means as “How Might We” questions. They produce a vast array of ideas and draw links between them to find potential solutions. [9] For mixed delivery the next solution was taken:

	Brainstorming for Solutions (Countermeasures)
1, 3	Training for cutting / control operators for picking up the belts from rest area after SAP article number not after length and measuring of 1 belt from the rest.
2	Training for cutting / control operators for placing the box with parts from rest on the top
4	Similar dimensions will be stored in different rest locations
5	Rest boxes of different color for similar / close length
6, 7 8	Introduction of scanning system for rest area

Tabel 2 – Brainstorming countermeasures

2.Cost-Benefit Analysis

After Brainstorming, a **Cost-Benefit Analysis** was performed for all causes from Fishbone. A cost-benefit analysis (CBA) is the process used to measure the benefits of a decision or taking action minus the costs associated with taking that action. A CBA involves measurable financial metrics such as revenue earned or costs saved as a result of the decision to pursue a project.

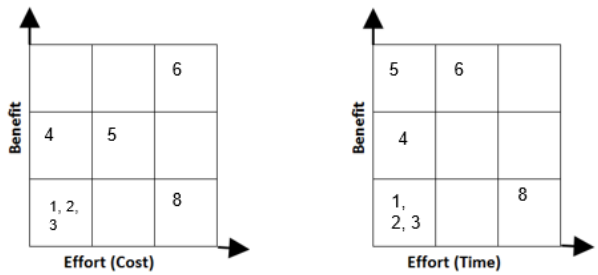

Figure 5 - Cost-Benefit Analysis

3.ACTION PLAN

An action plan for mixed delivery was created with action that must be taken, with responsible persons, due dates, with status and results**.**

Action Plan					
#	Issue / Action	Responsible	Due Date	Status	Result effective?
1, 3	Training for cutting operators for measuring of 1 belt if the delivery does contain belts from the rest area	lokai	15.12.2017		In case that the mixed dimensions are different operator notices if he picked accidentally another PN – yes
2	Training for cutting / control operators for placing the box with parts from rest on the top	lokai	15.12.2017		Operators respects the WI - yes
4	Similar dimensions will be stored in different rest locations	lokai	24.11.2017		Operator is obliged to go to the customer designated rest area to get the desired belts - yes
5	Rest boxes of different color for similar / close length	Tudosie	08.11.2017		Visual management - yes
5	Introduction of scanning system in rest area	Neagu	01.08.2018		SAP program implemented, scanner and printer must be purchased

Tabel 3 – Action Plan

D. Improvement

The introduction of the scanning system for the rest area is a major improvement for the entire production process, as the system does not allow mixing of parts numbers at the time of delivery. In the overinspection phase, a belt from KLT will be scanned, after the control sheet (ABS) that is found on KLT will be scanned. If the two match, then the system allows KLT to be sent to the warehouse area to be shipped to customers at the end. For each belt size there would be a scan code that would make it impossible to confuse customers, even if they are the same dimension. The code would appear on ABS from the first phase of production till the end. Operators will know by scanning the code exactly what are the size and customer and where it needs to be stored. In the last process (the cutting process), the operator will be guided by the scanned code to know in which box to put the belts. The operator will check by scanning if he puts the belts in the required box. In this way there will be no more confusion between customers, and operators will know exactly where to put the remaining belts. The color of the box in which it must be the belts stored will also appear in the scanner.

Figure 6 – Scanner

Figure 7 - Belt barcode

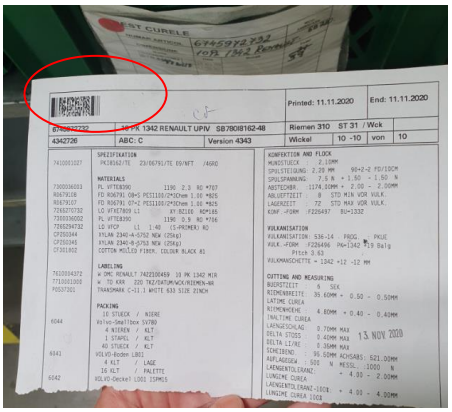

Figure 8 – ABS from box with the barcode

Research results and limitations.

There is a regular evaluation of the quality team, carried out by the Quality Manager through which the solutions are validated and standardized. After the actions were taken in the case of mixed delivery (training for the operators, boxes stored in different location and introduction of scanning system), it was found that in the following months there were no more complaints from customers regarding the part numbers delivered incorrectly.

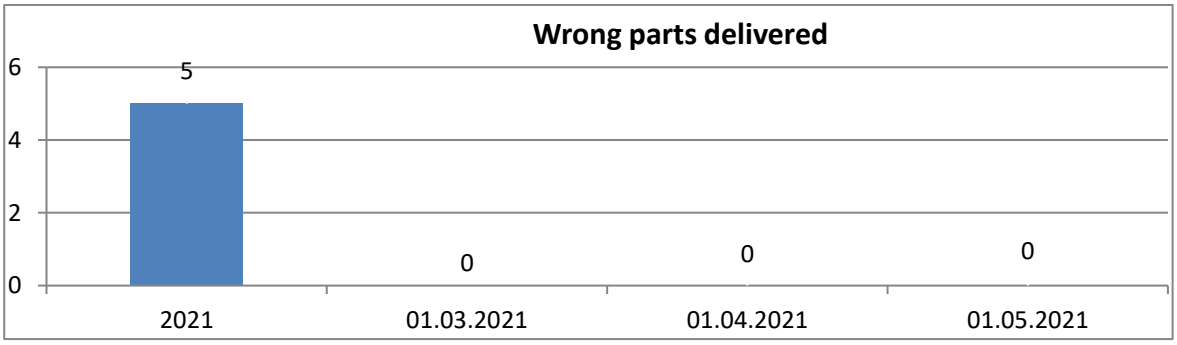

Figure 9 – Wrong parts delivery in the next months

The originality of the work

The personal contributions made in this master's thesis are:

- participation and contribution to meetings related to the complaint.
- analysis of problem solving steps for Mixed Delivery: describe the problem; find root cause of problem; solving problem; validate solutioan and standardize.
- teamwork for six sigma tools: fishbone; why-why analysis; brainstorming; cost-benefit analysis; is/is not.
- personal contribution at Viability Matrix
- transforming the documentation within the company into a scientific work

Conclusions

The scientific work shows implementation of the Six Sigma on the project „Mixed delivery" within Contitech Timisoara factory, which went through the Viability Matrix with the score of 4.08 which means that is endeed a good DMAIC project that must be solved. The project also use the problem solving – A3 which is the act of defining a problem; determining the cause of the problem; identifying, prioritizing, and selecting alternatives for a solution and implementing a solution.

The problem “Mixed delivery” represent a complaint at the factory where Renault belts were delivered to Volvo instead, because they have same belt length but different part numbers. The final causes shows that the belts were picked up from rest area after dimension, not after SAP article number – Work Instruction not respected. An action plan was carried out through which measures were taken: training for operators, similar dimensions will be stored in different places and introduction of scanning system.

We can observe the purchase of a high-performance scanner would make the confusion impossible related to identical dimension but different customer. The introduction of the scanning system for the rest area is a major improvement for the entire production process, as the system does not allow mixing of parts numbers at the time of delivery. In the overinspection phase, a belt from KLT will be scanned, after the control sheet (ABS) that is found on KLT will be scanned. If the two match, then the system allows KLT to be sent to the warehouse area to be shipped to customers at the end. For each belt size there would be a scan code that would make it impossible to confuse customers, even if they are the same dimension. The code would appear on ABS from the first phase of production till the end. Operators will know by scanning the code exactly what are the size and customer and where it needs to be stored. The color of the box in which it must be the belts stored will also appear in the scanner. After the actions were taken in the case of Mixed delivery, it was found that in the following months there were no more complaints from customers regarding the part numbers delivered incorrectly.

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