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Applying FMEA in the knitting process

Diploma Thesis

Examicus

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APPLYING FMEA IN THE KNITTING PROCESS

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ABSTRACT

This diploma thesis "APPLYING FMEA IN THE KNITTING PROCESS" shows how to develop a FMEA in the production process of the knitting department. The quality control shows several important defects, which have to be improved and reduced.

The FMEA (Failure Mode and Effect Analysis) is an analysis to detect and prevent potential failures and defects in the quality assurance.

While getting familiar with the production procedure of knitting fabric the idea to develop a FMEA became more interesting. In the textile industry the used methods for predicting quality assurance are still not very common. The knitting department is still using a classic strategy of analysing and preventing defects.

First there was the need to define a responsible team to develop a FMEA process. The team members are selected from different areas in the production. To learn about the purposes and benefits of an FMEA the chief of the team should visit a training-program for moderators.

The process FMEA includes 13 steps to follow and conduct a FMEA. Process FMEA, because it focuses on the failure modes caused by process or assembly deficiencies.

The most important reason for conducting a FMEA is to improve its process and quality.

The first step in developing a FMEA is to define the complete production process of knitting. Therefore it is necessary to identify the detailed functions of the workstations. Further the most important and critical defects have to be defined with its causes and defects. The Cause-Effect-Diagram is a helpful method to analyse the root causes. The defects are listed by its appearance according to the functions in the process. It is important to do an analysis of the total percentages of defects before starting to apply the FMEA process in the procedure.

Risk evaluation is in charge of evaluating the defects according to severity, occurrence and detection. The ranking system is between 10

and 1, in which 10 identifies a very high risk and 1 a minor risk. Severity applies to the importance of the defect, occurrence to the frequency, and detection to the efficiency of detecting the defect.

At last the Risk Priority Number (RPN) is calculated by multiplying severity by occurrence and by detection to define the total potential failure or defect. Recommended actions are to be defined in order to give solution and reduce the problems in the procedure. There are different methods, which helps to determine actions to be taken and give solution to a problem. The mistake proofing (Poka Yoke) is a common method to eliminate defects. After taking action the RPN has to be recalculate and compared with the months before conducting FMEA.

The requirements of the FMEA are identified in an appropriate form, which every company has to reflect on its own.

Through this process some results have shown improvements in reducing defects, some others disappeared completely. The FMEA has to be followed constantly and continuously to obtain better results in the improvement.

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LIST OF ABBREVIATIONS

AIAG	Automotive Industry Action Group
ASQC	American Society for Quality Control
BOM	Bill of Materials
CP	Compare
CRIT	Critical Characteristics
DET	Detection
DFMEA	Design Failure mode and Effects Analysis (applied to Product Design)
DR	Detection Ranking
FMEA	Failure mode and Effect Analysis
FMECA	Failure mode and Effects and Critical Analysis
KGS	Kilograms
NASA	National Aeronautics and Space Administration
OCC	Occurrence
OR	Occurrence Ranking
P	Pieces
PFMEA	Process Failure Mode and Effects Analysis (applied to Process Design)
RPN	Risk Priority Number
SEV	Severity
SR	Severity Ranking

LIST OF IMPORTANT VOCABULARY [1]

Specific words used in the FMEA-process, which are not explained during this thesis.

Cause – The reason why a particular element of a design or process results in a failure mode

Critical Characteristics – Product characteristics that potentially affect customer safety and / or non-compliance with government regulations thus requiring special controls to ensure 100% compliance with the specification

Current Controls – Any organised screening mechanism (person, thing, process or design) that prevents the Failure Cause from occurring, or detects the Failure Cause or Failure Mode and precludes it from reaching the customer

Customer – Any person and / or process that utilizes the product along the chain of processing and may be adversely by a product failure

Detection Ranking – The assignment of a numerical ranking to the perceived likelihood that the current controls (design and / or process) will detect a failure's cause or its failure mode prior to the product reaching the customer

Effect – An adverse consequence that the customer might experience

Failure Mode – The way in which a product or process failure manifests itself to the customers

[1] cp. Dailey [2004], p.2-4
Textiles Panamericanos [1995]