

The analysis of non-conformities and Customer claims in polish companies specialized in solid wood furniture.

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Abstract: *Analiza poziomu wadliwości produktów w polskich zakładach produkujących meble z drewna litego*
The aim of the study was to determine what the biggest challenges in quality assurance in polish factories specialized in solid wood furniture production are. The research was oriented on mapping non-conformities occurring on different production stages and reasons of Customer returns. The research was carried out in 10 polish companies with main production profile of solid wood furniture, designed and constructed for customer assembly ("flat-paked").

Keywords: non-conformity, detect, solid wood production process, wooden furniture, quality

INTRODUCTION

In today's world of growing Customers expectations towards product and services, quality is one of the factors which can lead the company to the success. According to ISO 9001 definition: quality is the degree to which a set of inherent characteristics meet the requirements. From the other perspective, quality can be defined as "a total loss for society from the time the product is shipped to the Customer" [Taguchi, 1989]. In this term, the cost is closely dependent on the occurrence of deviations between intended function and life cycle, but also losses through harmful side effects [Taguchi, 1986]. Following ISO 9001 "Non-conformity is a failure to meet the requirements" [ISO 9001:2005]. Depending on severity of issue: defect or small non-conformity (observation) can occur in the production process or on ready product. Defect is a variability from requirements resulting in total failure of product function (e.g. broken table top in the table) or safety (e.g. death, injure of the customer, environment pollution). It is strongly connected with product liability. Non-conformity is defined as deviation from the properties in use, which means that the product does not meet the established requirements and can result in limited usability – for instance: the colour of furniture does not meet requirement stated in the order. In accordance with the above, every defect is a non-conformity, but not every non-conformity is a defect.

In the solid wood furniture factories poor quality usually is measured in 2 ways: value of non-conformities in money (usually for Customers claims) or number of non-confirming pieces, which have to be reworked or scraped. The exact definition of key performance indicators for quality differs between the companies. Generally, the cost of poor quality increases with the production process stage on which it's found (the more advanced in the production process, the higher cost). The highest value of non-conformity is reached by the product returned by the Customer. Such cost includes not only the total production cost, transport and handling cost, advertising cost etc., but also "hidden costs" (e.g. an influence on the brand perception). To meet Customer's expectations companies performs quality inspections, which should delimit internal cost of poor quality and the impact on the Customer.

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METHODOLOGY OF RESEARCH PROCEDURE

The research was carried out in 10 polish companies with main production profile of solid wood furniture, designed and constructed for customer assembly (“flat-paked”). All companies were located in Poland. Small, medium and big (classification based on employment level and yearly turnover in EUR) companies were questioned. The level of non-conformities occurring in the production process was analysed. Main quality issues and critical production operations were defined. Quality claims level (Customer returns) were analysed and the results were presented. All analysis were based on data from calendar year 2014.

RESULTS AND DISCUSSION

First stage of research was oriented on quality data gathering scale and methods in the production process of solid wood furniture. Results are presented in the form of graph in Fig. 1.

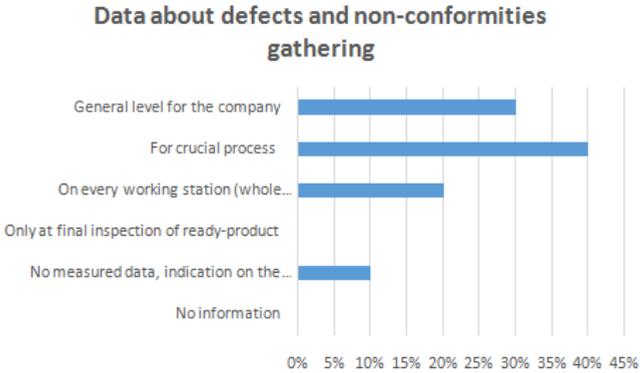


Fig.1. Data about defect and non-conformities gathering in polish solid wood furniture factories

The performed analysis shown that data about the non-conformities and defect level in the production process of furniture is gathered by almost all questioned companies. All measurement are oriented on the product and components. The working methods including the details level, number of controls and production phase differed depending on the manufacturer. Only 10 % of respondents claimed not having real data or KPIs (Key Performance Indicators) on production quality. Nevertheless, they were able to give indication about defectiveness based on experience. The defectiveness on the general level for the whole factory is used as an indicator by 30 % of furniture producers. In this case, the non-conformities and defects are calculated as a difference between production input and output (by analysing ready-product availability in accordance to production plan). More detailed data about non-conforming pieces is collected by 40 % of respondents for most critical processes. Some of those companies claimed using more than one forms of data gathering (e.g. general company level and data gathering for crucial process). Those factories are usually able to have more reliable data about cost of poor quality and main quality issues. Quality data gathering

on all working stations in the whole production process (complex approach to cost toward production) was claimed only by 10 % of solid wood furniture manufacturers in Poland.

The data obtained and analysed also allowed to conclude that the level of waste generation in the surveyed plants ranged from 2 % to 20 %, while the level of customer returns of 0.7 % to 2 %. Details are shown in the Fig.2. The below data about defects level are not comparable in value because of differences in range (furniture offer), technology, machinery set-up and material (wood species) between manufacturers.



Fig.2. The level of production waste (scrap and rework) caused by non-conforming pieces production and the Customer claims in solid wood production plants located in Poland

It was found, that a structure of problems reported by customers differs from the problems prevailing in the production process. For production process, further data analyses shown that non-conformity level is the highest in the stage of planning, drilling and lacquering. Most of the respondents claimed planning as the biggest contributor to total waste level connected to production process. Material chip outs and so-called „under-planned pieces” (some part of the element surface not planned, rough) are a common issue. High defectiveness level was claimed also for drilling process, where cracks, delamination of raw material or glueboard on the gluing line occur. For furniture with surface treatment, defects are often formed during lacquering process in a form of e.g. sanding through, partly missing surface treatment/not fully covered surface. Examples of defect are presented in Fig. 3.

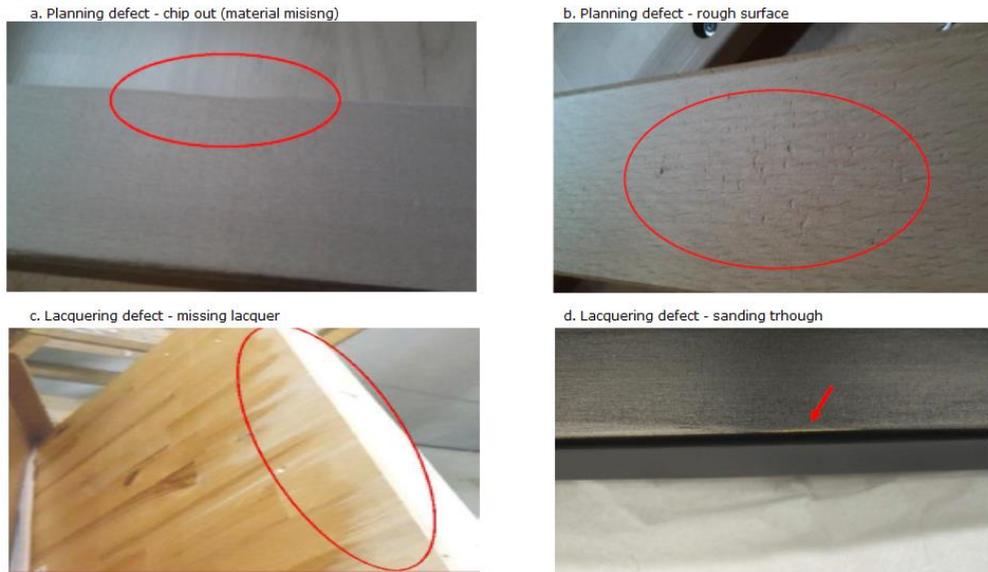


Fig. 3. Examples of defects occurring in different production stage of solid wood furniture

The structure of Customer returns reasons differs from problems occurring in the production process. 3 main issues were claimed by solid wood furniture manufacturers:

- packaging errors – wrong component (e.g. 2 identical components instead of left and right one), missing component, missing fittings;
- drilling errors – missing holes, displaced holes;
- visual defects – surface treatment quality, wood features, dents, scratches and cracks.

The data gathered and analysed further confirmed above statements. Visual imperfections (dents, scratches, and cracking of knots) together with surface treatment issues represents 34% of all customer complaints reasons. 19 % of furniture is returned due to packaging errors – missing or wrong components (including wrong size of element). Cracks are reported by 17 % of Customers as main reason of claim. The data confirmed also the scale of drilling errors claimed by manufacturers – 17% quality claims. Only this 4 issues generate 80 % of the claims cost. The detailed data are presented on Fig. 4.

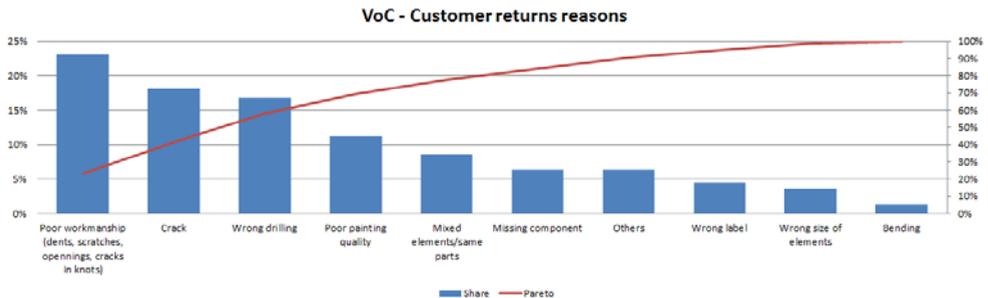


Fig.4. Pareto diagram of customer claims reasons for solid wood furniture

The differences in the structure of waste reasons in the production process and customer claims reasons may be indicated as a result of efficient quality inspection in the production on stages defined as crucial. Planning defects with waste level reaching even 20-30% are not observed in articles returned by customers. However, the scale of production non-conformities (both in ready-made article and on single processes) generate a high cost of poor quality. High cost development potential is foreseen in this field.

CONCLUSION

The data presented and analysed led to the following conclusions:

- Quality data are gathered and analysed by leaders on polish market of solid wood furniture, but the details level differs depending on the manufacturer.
- Structure of problems reported by customers differs from the problems prevailing in the production process.
- Highest waste level is observed by most of the companies after planning, lacquering and drilling operations.
- Surface imperfection, mixed or missing components and drilling errors are defined as main reasons of claims from Customers.
- High cost development potential is foreseen by production non-conformities reduction by better control of the manufacturing process.

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Streszczenie: *Analiza poziomu wadliwości produktów w polskich zakładach produkujących meble z drewna litego.* Celem przeprowadzonych badań była analiza problem jakości w wybranych zakładach produkujących meble z drewna litego. Przeanalizowano poziom niezgodności występujących na różnych etapach procesu produkcyjnego oraz wadliwość będąca przyczyną zwrotów produktów przez klientów. Dane liczbowe do przeprowadzenia analizy uzyskano z ankiet przeprowadzonych wśród 10 wiodących na rynku polskim przedsiębiorstw produkujących meble z drewna litego. Badania przeprowadzono w 10 wiodących polskich zakładach produkujących meble z drewna litego (do samodzielnego montażu).

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