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## CONTROL PLAN AND RESEARCH SUPPLY AS A TOOL IN THE PROCESS OF DECISION-MAKING

**Abstract.** The article presents a plan for the control of prefabricated products one of the companies as an effective tool for identifying non-compliance of supplied materials to the manufacturing process. It has been shown that the results of research carried out on the basis of the presented plan are the basis for negotiations with contractors and affect change in board decisions in terms of contracts with suppliers, and also indirectly affect the cost reduction of complaints and downtime. They provide the basis for faster decisions on corrective actions and complaints.

**Keywords:** quality of supply, the control and research plan, quality management methods, production process, supply management

## PLAN KONTROLI I BADAŃ DOSTAW JAKO NARZĘDZIE W PROCESIE DECYZYJNYM FIRMY

**Streszczenie.** W artykule przedstawiono opracowany plan kontroli półproduktów dla jednej z firm jako skuteczne narzędzie do identyfikacji niezgodności dostarczanych materiałów do procesu produkcji. Wykazano, że wyniki badań przeprowadzonych przy wykorzystaniu zaprezentowanego planu stanowią podstawę do negocjacji z kontrahentami i wpływają na zmiany decyzji zarządu w kwestii umów z dostawcami, a także pośrednio wpływają na obniżenie kosztów reklamacji i przestojów. Są też podstawą do szybszego podejmowania decyzji w sprawie działań naprawczych i reklamacyjnych.

**Słowa kluczowe:** jakość dostaw, plan kontroli i badań, metody zarządzania jakością, proces produkcji, zarządzanie dostawami

## 1. Introduction

Modern management concepts such as Total Quality Management and Lean Manufacturing are based on continuous improvement done according to the Deming quality wheel<sup>1</sup> Methods and techniques are designed to not only improve the quality of services or products but should also bring other measurable benefits for the company. These advantages may include speeding up decision-making processes and improving the quality of auxiliary processes, eg. By order those processes to other firms. Nowadays most well-known and widespread methods of management that affect the acceleration are benchmarking and outsourcing<sup>2</sup>.

Separation of the company's organizational structure some function carried independently and transfer them to perform other entities, carries the risk of failure by these entities tighter requirements that so far the company placed in the given process. In the case of delivery non-compliant prefabricated products from external companies for the manufacture of components made from these materials they do not meet established specifications couldn't pass validation or will be subject to a complaint. These factors generate significant losses in the company. These losses, it's not just the cost of a single complaint, but often stopping of the production process, the withdrawal of already manufactured goods and also scrapping and deterioration of the image of the company. In this case, firms seeking to meet the demands of a changing market and competition must take quick and effective decisions on corrective and preventive actions<sup>3</sup>.

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<sup>1</sup> Kulkarni V.G.: Modeling and analysis of stochastic systems. CRC Press, 2016 p. 6-23; Miller J., Wroblewski M., Villafuerte J.: Kaizen. Budowanie i utrzymanie kultury ciągłego doskonalenia. MT Biznes, Warszawa 2014; Marchwiński C., Shook J., Schroeder A.: Leksykon Lean. Ilustrowany słownik pojęć z zakresu Lean Management. Wydawnictwo Lean Enterprise Institute Polska, Wrocław 2010, s. 10; Wolniak R.: Relationship between selected lean management tools and innovations. Zeszyty Naukowe Politechniki Śląskiej, s. Organizacja i Zarządzanie, z. 75. Gliwice 2014, s. 157-266.

<sup>2</sup> Mazur A., Gołaś H.: Zasady, metody i techniki wykorzystywane w zarządzaniu jakością. Wydawnictwo Politechniki Poznańskiej, Poznań 2010; Kavčič K., Tavčar M.I.: Planning successful partnership in the process of outsourcing. "Kybernetes", Vol. 37 Iss. 2, 2008, p. 241-249; Greaver M.F.: Strategic outsourcing: a structured approach to outsourcing decisions and initiatives. AMACOM Div American Mgmt Assn, 1999, p. 73; Talluri S.: A benchmarking method for business-process reengineering and improvement. "International Journal of Flexible Manufacturing Systems", Vol. 12(4), 2000, p. 291-304; Wolniak R.: Kryterium wzajemnie korzystnych powiązań z dostawcami w samoocenie systemów zarządzania jakością. „Logistyka”, nr 5, 2012, s. 229-233.

<sup>3</sup> Skotnicka-Zasadzień B.: Doskonalenie procesu produkcyjnego w przedsiębiorstwie przemysłowym z zastosowaniem metod projektowania jakości, [w:] Knosala R. (red.): Innowacje w zarządzaniu i inżynierii produkcji. Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, Opole 2013; Wolniak R., Skotnicka-Zasadzień B.: Wybrane metody badania satysfakcji klienta i oceny dostawców w organizacjach. Wydawnictwo Politechniki Śląskiej, Gliwice 2008; Wolniak R., Skotnicka-Zasadzień B.: Zarządzanie jakością dla inżynierów. Wydawnictwo Politechniki Śląskiej, Gliwice 2010.

Before such a problem faced one of the companies in Poland, where the assembly there were problems associated with the improper execution of details by subcontractors. The time to repair and detailing the complaint adversely affect deadlines of contract, which resulted in relatively high financial losses. The article outlines the measures that the company has taken to more quickly identify non-compliance and the effective retirement components that do not meet the requirements of the production process.

## 2. Develop a plan of control and testing

Details, manufactured by external companies, on the basis of documents received in the form of technical drawings were not always compatible with all specifications. Installation of defective components affect, among others, on: lengthening delivery times, increase in the number of customer complaints, production downtime, returning the entire supply to customers. This influenced the increase in costs in the company and its overall image<sup>4</sup>.

In order to improve the situation it was decided to develop and implement a quality control plan of derived prefabricated products. In addition, they developed a spreadsheet forms to record inspection.

To develop a plan, it is assumed that prior to installation, each component will pass internal quality control. First out of 100 components were selected 20 most commonly used in the production, for which plans have been developed inspection and testing.

It was assumed that the control should be performed on the basis of technical drawing. In that form, the full figure number and the name of prefabricated product should be given. The name of controlled product is given in bold letters. Each form has its own identification number consisting of a sequence of characters, in line with procedure "Control of documents and records" which is implemented in this company. The last part of the number is a ordinal number corresponding to the next document.

In the column "Name/description of activities" was defined the method of control, in the "specification" is part of the document or the criteria by which the detail is controlled. In the column "method/tool" enter the tool, device test, which is used to carry out the investigation. The column "action" is a place to enter any corrective actions to be taken when there is a mismatch.

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<sup>4</sup> Zbylut Ł: Opracowanie planu kontroli jakości elementów maszyn linii produkcyjnej na przykładzie firmy Zigler Polska Sp. z o.o. WSZOP, Katowice 2017 (promotor B. Szczucka-Lasota).

Table 1

The form developed quality control plan of the prefabricated product

<b>Name/company logo</b>	<b>RESPONSIBLE PERSON: QUALITY CONTROLLER</b>	No of production batch:
<b>Document:</b> .....	Name of controlled prefabricated product .....	.....

**CONTROL PLAN ACCORDING TO TECHNICAL DRAWING**

No.....

*Give the full figure number*

No.	Name/ description of activities	Specification:	Method/Tool or referenceto standards:	Corrective actions* * <i>Mark where</i>	Date of execution
1					
2					
3					
4					

<b>Checked and approved:</b> ..... <b>Date.....</b> <i>year/month/day</i>	Signature of the employee performing quality control: .....
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Source: own work.

Developed unfilled form (Table 1) is universal for all tested and controlled details. In the first 20 forms are prepared containing a description of test methods, tools and specifications according to which should be examined typed intermediates. Example of the form given in Table 2.

Table 2

The form of developed a quality control plan for element: Hub turntables

<b>Document :</b> <b>Q/08/01/05</b>	<b>RESPONSIBLE PERSON: QUALITY CONTROLLER</b> Nazwa kontrolowanego półwyrobu PIASTA OBROTNIC	No of production batch: .....
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**CONTROL PLAN ACCORDING TO TECHNICAL DRAWING**

Nr 2001.01.102.01

*Give the full figure number*

No.	Name/ description of activities	Specification:	Method / Tool or referenceto standards:	Corrective actions* * <i>Mark where</i>	Date of execution
1	Visual inspection of the surface of the workpiece	According to a draw	Template surface	- customer complaint - internal correction	
2	Testing of the product (steel/ stainless steel)	According to a draw	Magnet	- customer complaint	
3	Measuring the dimensions of the external block	According to a draw	Caliper	- customer complaint	

				cont. table 2
<b>4</b>	<b>The dimensions of the holes and grooves</b>	<b>According to a draw</b>	<b>The gauge micrometer</b>	<b>- customer complaint</b>
	Hole spacing	According to a draw	Caliper	- customer complaint
	The size and pitch of the threads	According to a draw	Test to threads	- customer complaint
<b>Checked and approved:</b> .....			Signature of the employee performing quality control: .....	
<b>Date</b> ..... <i>year/month/day</i>				

Source: own work.

### 3. Preparing the location for examinations

For the purposes of the control the location was selected and prepared in accordance with the 5s inspection and testing method (Figure 1). The location was supplied with all the necessary tools needed to control (for example: calipers with different measuring range, micrometers, templates area, checking to thread bore hole gauge clock) and provided ergonomic working conditions.

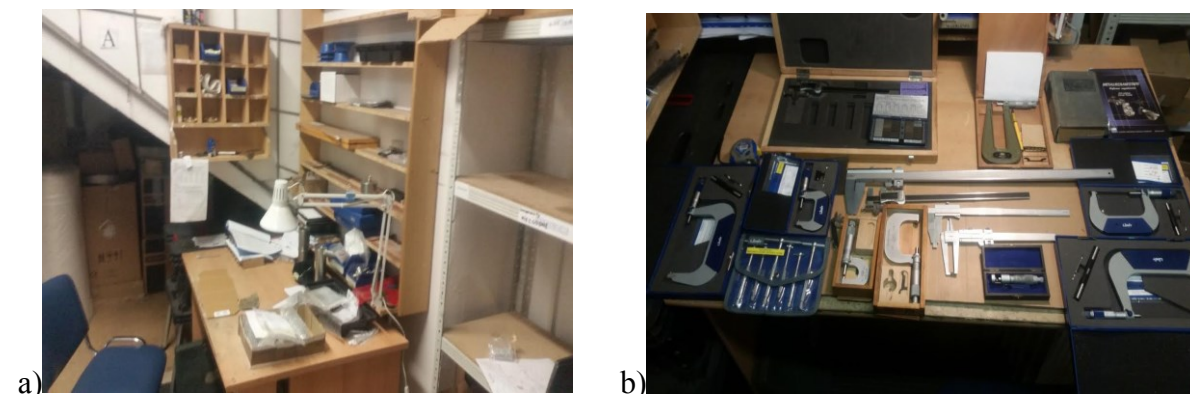


Fig. 1. Place of work before and after the introduction of the principle 5s

Source: Zbylut Ł.: Opracowanie planu kontroli jakości elementów maszyn linii produkcyjnej na przykładzie firmy Zigler Polska Sp. z o.o. WSZOP, Katowice 2017, s. 47 (promotor B. Szczucka-Lasota).

On the basis of a control plan and testing the location (Figure 1) 100% quality were conducted in the case of control element: "HUB MOTOR". The study included:

1. Visual inspection of the surface of the part referring to the template surface.
2. Testing of the device by means of a magnet.
3. Measurement of external dimensions solids using electronic calipers.
4. Measurements of holes and grooves with micrometers.
5. Measurement of hole spacing using electronic calipers.
6. Specify the size and pitch of the threads test thread.

The inspection and testing aimed at checking whether the plan is suitable for use in the company and whether the use of checks in accordance with the adopted plan will raise the detection of defective parts provided by external companies. Example of controlled the detail is given in Figure 2.



Fig. 2. The selected controlled component

Source: Zbylut Ł.: Opracowanie planu kontroli jakości elementów maszyn linii produkcyjnej na przykładzie firmy Zigler Polska Sp. z o.o. WSZOP, Katowice 2017, s. 52 (promotor B. Szczucka-Lasota).

#### 4. Results and analysis

The results are stored and summarized in prepared sheet records of quality control. The spreadsheet created in Microsoft Excel, enabled an easy way to analyze the data components from various companies in terms of their compliance with the documentation.

The worksheet contains data such as the number of pieces which individual companies supply, the amount of conforming and non-conforming parts supplied by individual companies. Total number 809 parts from the companies were inspected, of which 673 were details in accordance with technical drawing, and 136 have been separated from production.

Based on the obtained results a decision was taken on the complaint (at the supplier), or repair of a component in the company, if the repair does not require excessive expenditure of money and time.

The data are analyzed in the company, for example: in terms of the share of the amount of compatible parts from the company, the amount of complaints from individual contractors etc. A sample sheet covering one month of control is given in Table 3.

At the bottom of the sheet has been assigned the name of the company. Due to data protection the names of companies were changed to numbers, where each number

corresponds to another company. Each sheet is divided into 10 columns, which in turn is given the date of receipt detail, document number WZ (Edition External) or invoice number, the number of technical drawing, quantity, number of consistent documentation of details, the amount of detail inconsistent with the documentation (row 1, column AF in Table 3).

Table 3

## The results of a monthly inspection of the contractor on the example of Firm 1

A	B	C	D	E	F	G	H	I	J
DATE of receipt:	WZ number:	FIG. Number:	the number of checked:	the number of compatible:	the number of non-compliant:	number of corrective actions:	Reclamation:	Comments:	Quality controller:
1	02.11.2016	WZ218/2016	2001.01.102.00	6	6	0	0	0	-
2	03.11.2016	WZ219/2016	2002.00.100.00	10	5	5	5	0	-
3	04.11.2016	WZ220/2016	2003.01.100.01	2	1	1	0	1	-
4	15.11.2016	WZ230/2016	1200.00.100.01	4	4	0	0	0	-
5	16.11.2016	WZ231/2016	2001.01.102.01	10	7	3	2	1	-
6	17.11.2016	WZ232/2016	2002.00.100.01	2	2	0	0	0	-
7	22.11.2016	WZ233/2016	2003.01.100.02	4	2	2	1	1	-
8	23.11.2016	WZ234/2016	1200.00.100.03	5	5	0	0	0	-
9	24.11.2016	WZ225/2016	2003.02.100.00	6	6	0	0	0	-
10	25.11.2016	WZ236/2016	2003.03.100.01	1	1	0	0	0	-
11	28.11.2016	WZ238/2016	2003.03.100.02	2	1	1	1	0	-
12	29.11.2016	WZ239/2016	1200.01.100.01	1	0	1	1	0	-
13	30.11.2016	WZ240/2016	2001.02.102.00	4	4	0	0	0	-
14	02.12.2016	WZ278/2016	2002.03.100.00	5	5	0	0	0	-
15	03.12.2016	WZ279/2016	2001.02.102.01	1	1	0	0	0	-
16	04.12.2016	WZ278/2016	2002.03.100.01	1	1	0	0	0	-
17	07.12.2016	WZ288/2016	2001.02.102.01	2	1	1	1	0	-
Firm:	1	2	3	4	5	6	7	8	9

Source: Autors own work.

The next column (marked F) is "internal improvement retail" – these are the details that can be repaired in the company – in this case, the individual details are sent to the production department and the time spent on the repair of the part, and its defects are entered in column "comments". On the other hand, if the detail has to go the complaint process, also forms part of the indication in the "comments" and the component is transmitted to the logistics department, along with technical drawing, on which are marked errors. The last column is the signature of the controller.

The introduction of controls on the designed position enabled the separation of incompatible components and to decide on complaints or internal repair detail (column F-G Table 3).

The sheet has enabled the analysis of such information as the number of compliant and non-compliant elements derived from the contractor, and also gave practical possibility to compare contractors at an angle of delivery of the quantities of products compatible.

## 5. Conclusion

The presented results indicate that the implementation of quality control in accordance with a plan made it possible to detect inconsistencies of components. All components have been recognized to be incompatible with the separation of the production process. It can be concluded that as a result of actions taken, timely delivery to customers has decreased, because eliminating delays and downtime associated with installing non-compliant components in the machines.

The results of research were a basis to negotiate with contractors and alter the agreements. Sheets were used to easier obtain information on the number of compatible parts from the company and contractors to compare with each other.

The part of the orders was redirect to other companies that provide a higher percentage of the compatible elements.

A tangible result of the actions taken is also successful negotiations process with individual companies, based on the obtained results of the inspection, lowering the cost of purchased components.

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