



## AN ANALYSIS OF FACTORS INFLUENCING THE INNOVATION OF PRODUCTS MANUFACTURED AT PONAR WADOWICE S.A.

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### Abstract:

Product innovation is one of the major elements considerably influencing the competitiveness of an enterprise on the market. The article presents an analysis of factors which have an impact on the innovation of the elements of machines and devices produced by Ponar Wadowice S.A. Ponar S.A. is a manufacturer of machine and equipment elements used in oil systems, hydraulic control and transmission systems as well as filter systems. Data from the years 2010-2014 has been analysed, taking into account selected production, organisational and human factors influencing the occurrence of rejects, which in turn generate financial losses for the enterprise.

**Key words:** *product, reject, quality, cost*

### INTRODUCTION

Ponar Wadowice S.A., specializing in the production of power hydraulics elements, came into existence in 1965.

A period characterized by its greatest development were the years 1976-1987. At that time an increased demand for modern power hydraulics for the sector of producers manufacturing machines used in plastics processing was observed. The technology was modernized and investments were made into a new fleet of machines.

In the year 2011 the company successfully completed an auditing process and received a Certificate of Environmental Management System according to 14001 standard. Currently the firm is engaged in activities related to implementation of ISO 18001 Occupational Safety and Health. An audit is projected at the end of 2015.

Ponar Wadowice S.A. is a domestic leader in the area of power hydraulics. The major tasks of the enterprise in relation to its customers include:

- designing,
- production,
- servicing of oil systems, including systems of hydraulic transmission and control as well as filtration systems.

Basic areas of the company's activity are production and distribution of power hydraulics elements (Fig. 1), composed of:

- all kinds of pumps and hydraulic motors,
- slide valves,
- non-return valves,
- pressure control valves,
- flow regulating valves,
- pressure relays,
- cartridge hydraulics,
- mobile hydraulics,
- hydraulic cylinders,
- hydraulic batteries,

- proportionally controlled elements,
- filters.

Additionally, the company is engaged in the production of auxiliary equipment elements and services such as:

- assembling and delivery of hydraulic elements,
- renovation and modernization of hydraulic systems,
- renovation and regeneration of hydraulic elements and systems,
- technical consultancy,
- servicing,
- trainings in the operation and servicing of the delivered appliances and devices [7].



**Fig. 1** Examples of products manufactured by Ponar Wadowice S.A.

Source: [7]

### APPLICATION OF PRODUCTS MANUFACTURED BY PONAR WADOWICE S.A.

Appliances, devices and systems of hydraulic transmission and control manufactured by Ponar Wadowice S.A. are used in:

- machinery and equipment applied in the machine-building industry and plastics industry,
- agricultural, road, building and transportation machinery,
- lifts and mobile platforms,
- heavy industry: mining, metallurgy and processing of metals,
- ship-building industry,
- power engineering [5].

### SELECTION OF RESEARCH PROBLEM

An important element is analysis of the occurrence of rejects in the production process. An important issue for each enterprise is striving to have 0 rejects. Unfortunately, it is not possible for companies to achieve. There are many factors influencing this state of affairs. Additionally, the differentiated assortment of Ponar Wadowice S.A. and very frequent retooling of machines cause that by the natural course of things such defective products occur in the process of their manufacturing or assembling. However, we have to answer the question: „What factors and to what extent influence the quality of production”.

### PRODUCT QUALITY CONTROL

Owing to introducing ISO 9001 standard, the quality of manufactured products has considerably improved. Procedures applied in product quality control during treatment have increased the percentage quantity of nonconformities found. Moreover, employees started to pay greater attention and pull their weight. The question is: what activities enabled that? Every day each employee settles his/her work on the basis of:

- a worksheet and the number of good and defective pieces he/she made during their shift,
- affixing the stamp on the first good piece in a batch on the product data sheet,
- accepting the pieces and confirming the manufacture of good ones by entering the quantity in an appropriate column for a particular operation and affixing the stamp.

Application of such „tools” increases the awareness of employees, which translates into greater precision of their work. Their work is monitored on a daily basis, which makes it visible to everyone and prevents a possibility of hiding one’s mistakes. Another tool for monitoring production in terms of quality is the use of a time sheet of measurements, dimensions and parameters. Such sheets are applied for products with critical dimensions, i.e. workmanship tolerance is forced and placed in the technical drawing of a given product [1]. Such sheets are also used when this is demanded by a customer, i.e. a dimension is important for the functioning of a particular product and the real dimension exceeds the tolerance range; then such a product is not able to ensure efficient functioning. Control samples are randomly selected. They are chosen by the system when the sheet is being created. Spreadsheets with data are stored and available to internal as well as external auditors (usually companies that require such data to be collected and stored).

### THE PROBLEM OF PRODUCTION PROCESS QUALITY

It is worth focusing on an analysis of causes and costs related to rejects. For each entrepreneur the costs incurred due to production of defective elements generate losses, which are an inherent element of each production. Owing

to ERP system, which is used in the organisation, data concerning the costs of faulty products can be easily derived [8]. The graph below (Fig. 2) shows data for the period from 2010 until September of 2014:

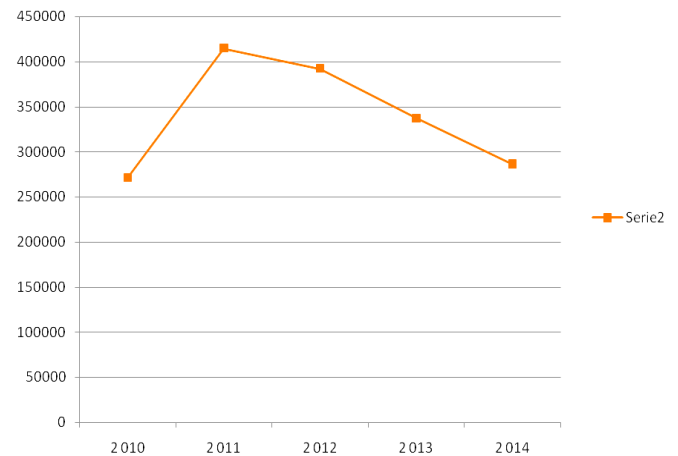


Fig. 2 Graph of costs related to rejects

This graph shows that a considerable increase was noted in the year 2011, due to increased orders and increased production. The increased production generates a larger number of rejects. However, the resulting annual losses, reaching more than PLN 400 000, compared to the annual sale, which oscillates around PLN 50 000 000, gives us 0.8% of defective production. From the entrepreneur’s point of view it is a big loss. For this reason, records of the causes of nonconforming products are kept. This enables taking corrective measures, which allow rejects to be eliminated [3].

The conducted Pareto analysis has revealed the most frequently committed mistakes which lead to defective production [4].

The analysis allowed focusing in the first place on 20% of causes which generate 80% of all faulty products. The main reasons are:

- hidden defects of material, workpiece,
- setting a machine tool in the automatic mode,
- employee’s mistake.

To limit the first cause of generating rejects, due to hidden defects of material and workpiece, the procedure of non-destructive tests has been applied for the production process. This will allow spotting a defect in the material and discovering it at the very beginning of the production process [2], which will reduce the costs of rejects. This procedure is also required from material suppliers.

To eliminate the second reason, i.e. rejects caused by setting a machine tool in the automatic mode, efforts have been made to obtain more precise and longer forecasts concerning orders for products from customers. This will allow increasing the number of elements in one batch and limiting the number of settings of a particular machine.

The last reason for the occurrence of rejects were employees’ mistakes. The most frequent error involved improper mounting of a workpiece on the machine tool. The largest group of people who committed such a mistake were the newly employed workers. Additional trainings were organised for them and production technology visualisation, describing the manner of mounting a given workpiece on the machine tool, was introduced.

Technical awareness of employees is a priority here [6].

To increase workers' awareness of the production, each seat has been equipped with a table of indicators, which are completed on a daily basis and show the work of the whole unit, providing information whether the goal set has been achieved. An example of such a table has been presented in Fig. 3.

Lp.	Wskaźnik	Skala	Ur.	Dzień	Tydzień	Miesiąc	Problem w osiągnięciu celu
1	Wykonanie planu	%	90				
2	Skuteczność pracy	%	90				
3	Braki	%	08				
4	Przebieżność	%	100				
5	Awarie	ilość	0				
6	Skuteczność obsługi	%	85				
7	Nadgodziny	%	10				
8	Prace awaryjne	ilość	0				
9	Ujemny koszt	ilość	0				
10	Wydajność	%					

Fig. 3 Table of seat indicators

Significant limiting of the first three major factors responsible for the occurrence of rejects will enable a considerable reduction of costs incurred due to defective production.

#### SUMMARY

To maintain its position on the market, an enterprise caring about the innovation of its products has to invest in advanced technologies, materials as well as a systematic development of the managerial staff and regular employees.

In the article selected factors have been analysed, among others the ones related to technological processes, planning and organisation.

The conducted research among others indicates that the main causes of rejects are:

- hidden defects of material,
- hidden defects of a workpiece,
- setting machine tools in the automatic mode,
- worker's mistake.

Taking corrective measures allows improving the quality and innovation of the products, which is a key to the company's success. Thanks to it, the enterprise has regular and trusted customers and continues to acquire new ones. Furthermore, its reputation is also growing, which will allow the company to become a potentate on its branch market.

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