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ANALYSIS OF SEASONALITY OF DEMAND FOR MAINTENANCE SERVICES OF AGRICULTURAL TRACTORS

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ABSTRACT

Agricultural tractors produced in the twenty-first century will require high-quality services related to their servicing. The aim of the work is to obtain information on the distribution of demand in each month for maintenance services of agricultural machinery based on the service facility located in Wielkopolska Region. The paper presents the analysis of the demand for warranty and post-warranty services for farm tractors over the year. The results have been developed statistically in order to determine the period of greatest demand for service. In the form of histograms quarterly distributions of values of the demand for warranty services, guarantee services and the total number of service were presented. The results have been analysed in terms of time limits for performance of agrotechnical treatments recommended for vegetable crops in Poland.

Introduction

Modern farm tractors have a great number of complex technical systems, which face high requirements related to their reliability, strength and efficiency. Such criteria follow from specificity of agricultural production, where the date of performing works is dictated by atmospheric and climatic factors (Juściński and Piekarski, 2009a). The basic condition of good exploitation of farm machines is technical maintenance (periodical diagnostics, technical service) which consists, inter alia, in replacing exploitation material, proper protection of protective layers against harmful atmospheric, soil and chemical factors, regulation of units etc. (Niziński and Michalski, 2007; Rybacki and Durczak, 2011; Rzeźnik, 2008; Legutko, 2004; Tomczyk, 2009; Wiśniewski, 2012). Giving up a periodical technical service leads to wear and tear and faster ageing of a machine, which affects the change of their operation parameters through achieving or exceeding border values for a given working unit reducing at the same time their reliability (Rzeźnik, 2008; Rybacki, 2011; Juściński and Piekarski, 2008).

Periodical technical maintenance should be carried out within a time limit specified by a manufacturer to prevent a situation, when an exploited tractor is unfit for use during intense field works. A period of exploitative fitness is expressed with a number of moto hours of a particular tractor. The use of farm tractors in farms depends highly on agrotechnical

periods. Such distribution of machines use is an important obstacle in careful planning of services demand by the service department (Juściński and Piekarski, 2009b).

Aiming at achieving high reliability, quality and effective operation of farm tractors, it is important to carry out high quality technical service. Services of farm tractors should render services for their clients in adequately equipped and organized repair facilities (Durczak and Rybacki, 2011; Skudlarski, 2006; Juściński and Szczepaniak, 2008). A good quality of technical services brings overtime financial advantages to producers of farm machines as well as users, shaping a seller-client bond, which displays loyalty towards a company in case of the first purchase (Juściński and Piekarski, 2010; Durczak and Rybacki, 2011).

Variable demand for service during a year is a great impediment in functioning of the service facility. Service facilities, who want to reduce uneven demand for the offered services use various solutions, such as: service offers, price discounts, client's card, etc.

Monitoring the maintenance service demand in a narrow scope influences accumulation of orders for such services, because damages to machines are random in nature and the time limits of planned inspections (e.g. warranty) are determined with the amount of performed work (in moto hours, working hours, kilometres). The issue undertaken in this paper is crucial for organization of work in repair-maintenance facilities. Unfortunately, service facilities have no greater impact on accumulation of notifications in particular periods, thus in order to keep clients they introduce internal changes of work organization and they employ additional mechanics or they extend work time from 8 hours to 10 or 12 hours for those employed based on the employment contract. In some situations they introduce a two-shift work system.

Objective of the paper

The objective of research is to identify present distribution of seasonality of demand for warranty and post-warranty maintenance services and suggesting a possibility of decreasing the demand changes for services in the selected service facility located in Wielkopolskie Voivodeship.

Methodology

Presently a services market is very competitive which influences constant raise and improvement of the services quality by service facilities. It consists in constant control of production process, enhancing actions related to the improvement of quality, implementation of new technologies for companies and such organization and management, which takes into account client's satisfaction.

For realization of the objective of the paper, data from orders of the authorized service facility which renders technical services of farm tractors in Wielkopolskie Voivodeship were analysed. The investigated company employs seven workers of the service department for the fixed period of employment and has two cars with service equipment which is used for diagnostic purposes of tractors, in which failure occurred during field works. Investigations were carried out from 1st October 2012 to 30th September 2013. In order to reflect the actual state of the company functioning, orders concerning tractors were not selected. All

maintenance services, both warranty and post-warranty, carried out in those establishments, were analysed. The scope of power of tractors was neither selected.

The collected data were developed in the form of histograms which present distribution of the annual demand for warranty and post-warranty services of farm tractors of the investigated company. Demand for maintenance services was measured with the number of orders in the investigated time intervals, which is some kind of a simplification.

Research results and their analysis

The research which was carried out shows that the company since 1st October 2012 to 30th September 2013 had executed 359 orders of all maintenance repairs of tractors including 154 repairs of machines covered with the manufacturer's warranty and the rest are machines which were not covered by warranty. The time limit of performing maintenance service was previously provided in 121 orders concerning tractors covered by warranty and 139 in case of tractors which were in the post-warranty period. The remaining orders were opened in the moment of notifying a failure and rendering a disposition by the service representative to the tractor operator or after providing a machine to the repair facility. During a year, the most because as much as 58% of orders, was related to tractors with power from 100 to 199 KM, another groups consisted of machines with power below 100 KM (37%). Tractors with power exceeding 200 KM constituted 5% of all the investigated orders. Such distribution of power results from the fact that farms in Wielkopolska region are average farms acc. to the Agency for Restructuring and Modernization of Agriculture (as of 3rd January 2014). Average area of agricultural farms in 2013 was 13.46 ha (for the country it was 10.42 ha).

Demand for warranty services in the analysed period is presented in figure 1. Distribution of demand for maintenance services of new tractors considerably depends on the date of their purchase and intensity of exploitation during field, transportation and other works carried out in a farm.

Owners of new machines after determined service life in moto hours notify the need of warranty service (also called inspection).

In the last quarter of 2012 demand for warranty services in comparison to all warranty inspections in the investigated period were 10%. In the monthly distribution the lowest number of operations related to warranty service of tractors was carried out in October and November. The end of the third decade of November and the beginning of December had the increase of the number of notifications concerning the need for maintenance services, whereas the end of the year reduced the number of notifications to zero. The reason for such distribution of orders is reduction of intensity of use of farm tractors related to the winter season and the end of field works. Sowing winter cereals at the end of September and beginning of October results in formation of a reserve related to unused possibilities of repairs and warranty inspections.

The first quarter of 2013 is an increase in the number of service orders concerning warranty inspections. At the end of January and the beginning of February higher demand for warranty service was reported – in comparison to the previous month; in the second decade of February decrease was reported. On the other hand, at the end of the first and in the beginning of the second quarter demand for warranty orders increased considerably. It was

related to the increase of intensity of exploitation of farm tractors. The end of March and beginning of April is a period, when field works related to cultivation, fertilization and sowing of spring plants are initiated. In the second quarter, 34% of all notifications related to warranty service of machines were reported. A systematic decrease of orders and another increase in June had been reported since April. In the beginning of the third quarter the number of inspections and warranty inspections and repairs of farm tractors was dropping systematically and achieved stabilization in August. In the first decade of September, a sudden increase of orders took place, which resulted from the greater exploitation of tractors during harvest in July and August and the required moto hours, which qualified a tractor for warranty inspection and service.

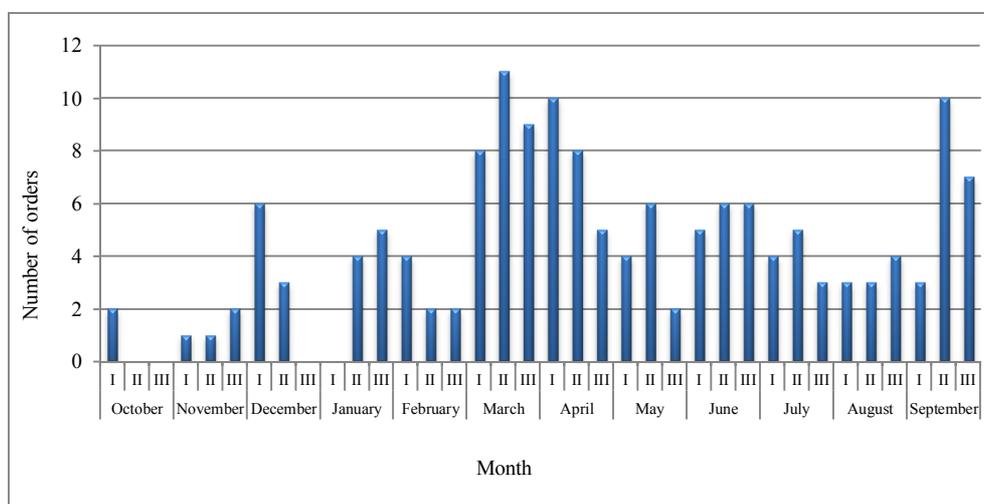


Figure 1. Distribution of demand for warranty service of farm tractors

Seasonality of works performed with the use of farm tractors influenced accumulation of warranty services demand in the investigated period. In winter months, intensity of tractors exploitation is reduced which is related to abandoning plant production, which causes decrease in the number of warranty orders. Users of farm tractors usually perform warranty inspections shortly before field works begin – the period for such works is uniform for a given region - thus the maintenance service carries out orders in March and April, which could have been carried out earlier.

Figure 2 presents a histogram of distribution of post-warranty services demands of the company from the beginning of October 2012 to the end of September 2013.

The objective of the post-warranty service is maintaining a machine in the fit condition. It mainly consists in inspection and post-warranty repair which eliminates failures of a farm tractor, which are mainly random.

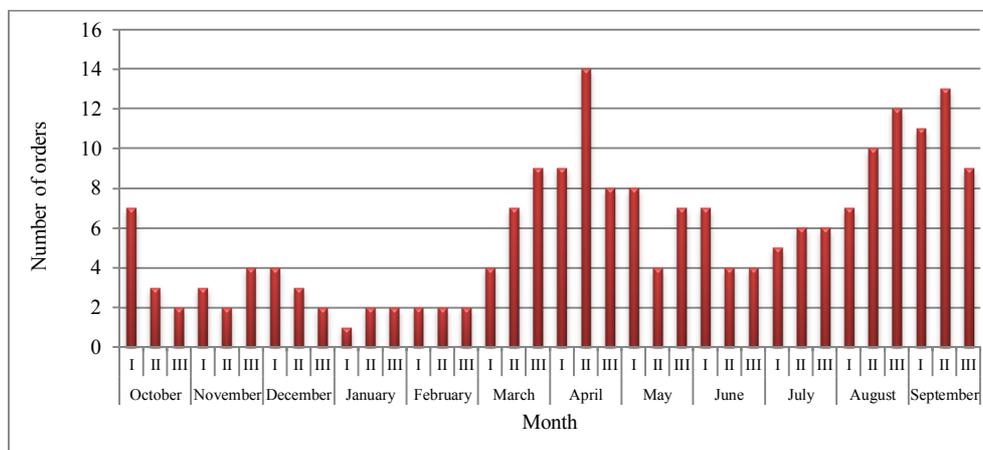


Figure 2. Distribution of demand for post-warranty service of farm tractors

Post-warranty orders in the last quarter of 2012 and the first quarter of 2013 constituted the same number of orders and were in total 30% of the total annual number of all repairs covered by warranty. In these months, post-warranty repairs concerned mainly machines working for animal farms, because such farms exploit tractors more regularly during the entire year. In the first decade of January demand for this type of repair was minimal. Increase was visible in the second decade of March as late as to the last decade of April. It is related to the beginning of field works and thus with the increase of intensity of exploitation of farm tractors. Post-warranty repairs of farm tractors in the second quarter were 31% of all orders analysed for the given period. The highest number of orders related to repair of tractors which did not have warranty was reported in the second quarter of 2013. It is a period of intense exploitation of farm tractors during harvest of grains and post-harvest works. These works are carried out in summer months, when draughts occur and thus machines are more threatened to failures due to dusting their units and possibility of overheating working units.

In case of tractors, when the producer's warranty expires, the increase of failure takes place from March to October, which results from the higher number of field works. Along with the age of a machine its unreliability increases. Often it is random and therefore it is more difficult in this case- in comparison to the warranty service – to suggest reduction of accumulation.

A histogram (fig. 3) presents total demand for maintenance services (warranty and post-warranty) in the investigated period of time. Distribution of maintenance orders since October 2012 to the end of February 2013 does not exceed 10 orders in total. The increase of the total number of orders takes place in March when the field works begin during which farm tractors are exploited more intensively. Post-warranty orders mainly affected the increase of the number of orders from June to August. But accumulations in April, May and September were equally affected by warranty and post-warranty orders.

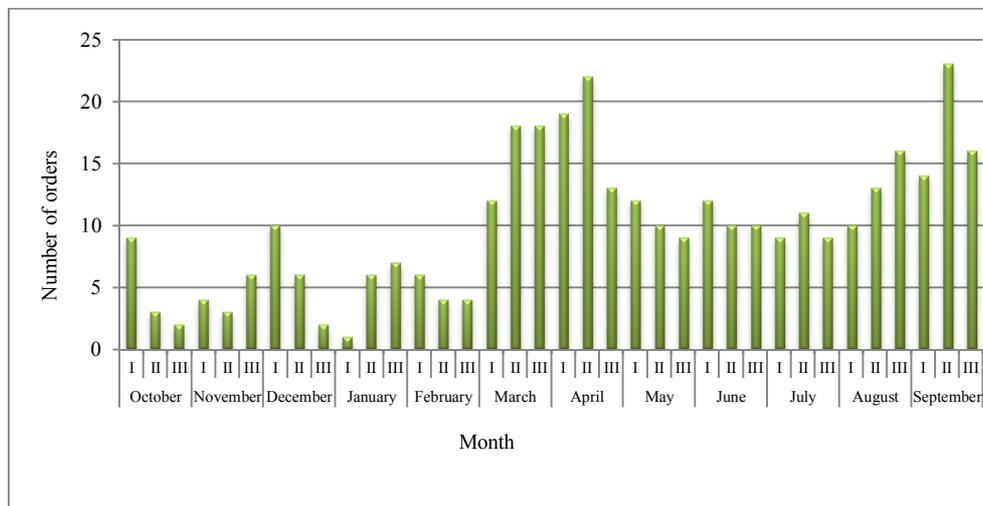


Figure 3. Total demand for warranty and post-warranty service of farm tractors

Conclusions

The research, which was carried out, development of results and their analysis allow formulation of the following conclusions:

1. In the investigated facility, great seasonality of demand for maintenance services took place, which impeded its functioning.
2. Observations made during investigations enable to produce a statement that particular orders are repeatable to some extent and time of their realization is similar.
3. In the investigated company, 10 orders at the average are for a decade; this number increases from March to May and in August and September. Thus, in this period, the following issues should be taken into consideration: employing additional specialists, extension of work time of employees, who are employed based on the contract for employment or implementation of the shift system in a facility. Such solution would provide a possibility of performing repair in a shorter time and thus it would reduce the time of stoppage resulting from a machine fault.

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ANALIZA ZAPOTRZEBOWANIA MOCY PRZEROBOWEJ WARSZTATÓW NAPRAWCZYCH CIĄGNIKÓW ROLNICZYCH NA PRZYKŁADZIE WOJEWÓDZTWA WIELKOPOLSKIEGO

Streszczenie. Ciągniki rolnicze wyprodukowane w XXI wieku wymagają wysokiej jakości usług związanych z ich serwisowaniem. Celem pracy jest uzyskanie informacji dotyczącej rozkładu zapotrzebowania w poszczególnych miesiącach roku na usługi serwisowe maszyn rolniczych na podstawie danych z zakładu serwisowego zlokalizowanego w województwie wielkopolskim. Przedstawiono analizę zapotrzebowania na usługi serwisowe gwarancyjne i pogwarancyjne ciągników rolniczych na przestrzeni roku. Wyniki opracowano statystycznie w celu wyznaczenia okresu największego zapotrzebowania na usługi serwisowe. W postaci histogramów przedstawiono kwartalne rozkłady wartości zapotrzebowania na usługi gwarancyjne, pogwarancyjne oraz łączną liczbę usług serwisowych. Wyniki przeanalizowano w aspekcie terminów realizacji zabiegów agrotechnicznych zalecanych dla upraw roślinnych na terenie Polski.

Słowa kluczowe: naprawa ciągników rolniczych, obsługa serwisowa ciągnika, serwis gwarancyjny i pogwarancyjny

