Заключение

Передовые технологии в области электроники, сенсорной техники и программного обеспечения определяют характер агротехнических инноваций и ведут к увеличению автоматизации рабочих процессов в растениеводстве с целью организовать работу более эффективно, качественно, точно, экологично и экономически целесообразно.

Приоритетное развитие должна получить разработка инновационных технологий, обеспечивающих значительное увеличение урожайности, продуктивности и ресурсосбережения в сельском хозяйстве. Повышению надежности сельскохозяйственной техники должно способствовать применение новых технологий при техническом обслуживании и ремонте техники и оборудования, износостойких и высококачественных материалов и покрытий. Это позволит достигнуть моторесурс двигателя 16-20 тыс. мото-ч за срок службы.

Работа на интеллектуальной технике, освоение наукоемких, точных технологий потребуют пересмотра кадровой политики и образования в АПК, которая должна базироваться на организации хозяйств и их инженерном обеспечении нового типа.

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QUALITY IN THE PROCESS OF MACHINERY AND AGRICULTURAL TRACTORS OPERATION (КАЧЕСТВО В ПРОЦЕССЕ УПРАВЛЕНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫМИ МАШИНАМИ И АВТОМАТИЗАЦИЕЙ ОПЕРАЦИЙ)

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Развитие сельскохозяйственного машиностроения связано с рассмотрением проблемы качества. Несмотря на различия в определениях качества, в результате чего от доминирования различных аспектов и потребностей, для которых эти определения были созданы, они имеют тесную связь между термином «качество» и конкретным продуктом. Многие исследования в области сельскохозяйственного машиностроения дифференцируют особенности техники, пытаясь измерить или оценить их. Научные исследования, проведенные независимыми институтами и центрами имеют дело с механизацией сельского хозяйства и являются необходимыми в этом процессе. С точки зрения качества машин польские стандарты и системы сельскохозяйственной техники могут быть важны, так как в них содержатся списки эксплуатационных требований к качеству различных групп сельскохозяйственных машин и оборудования. В зависимости от предполагаемого использования машины, число параметров эксплуатационных и технических характеристик, описывающих его качества на комплексной основе, в пределах от нескольких до нескольких десятков. Только некоторые из этих параметров оказывают непосредственное влияние на качество собранных изделий, т.к. есть необходимость в проведении исследований и анализа, чтобы определить, какие из них важны, а какие нет.

Introduction

Agricultural machinery are characterized by a great diversity in comparison with other machines. They have to fulfill a number of requirements for reliability, durability, performance, resulting from the specificity of the agricultural production, whose rhythm is dictated by climatic and weather factors. According to the assessment of many researchers, operation of farm machinery is a sequence of activities, processes and phenomena associated with their use [Rzeznik 2008; Tomczyk 2009a]. In the operation of machines and tractors the quality of both the operation, maintenance and servicing is an important issue.

There are several definitions of quality that for different users have different meanings. It is believed that the first time the concept of quality (gr. poiotes) was defined by Plato as "a degree of excellence." Today, quality is "the degree of product's conformity with the requirements of the customer", "meeting the requirements relevant to a particular phase in the life cycle of the product", "the ability of the product to meet human needs." The concept of quality can also be considered institutionally in standards and legislation. According to PN-EN 9000:2001, quality is the degree to which a set of inherent characteristics fulfills requirements. Operational quality, otherwise known as product quality is a measure of utility satisfaction, experienced by a user in connection with the ownership and use. Product quality is characterized by such features as: functionality, practicality, reliability, durability, safety.

From the above definition one can conclude that the manufacturer himself is not able to assess the quality of the product, for a full evaluation it is needed to confirm the degree of satisfaction of user needs. Currently, we have developed a number of tools and methods for quality assurance. Quality management should be understood as coordinated action for directing the organization and its supervision in relation to quality. The most well-known concepts of quality management are: TQM, Kaizen, 5 × S, Six Sigma, FMEA, QFD, JIT, Kanban and Poka-Yoke

[Wawak 2002].

Quality of agricultural machinery

Agricultural machinery, like all products, may be subject to overall evaluation of quality, which first of all should take into account indicators of operational quality - often exhibited by manufacturers, but also economic criteria, ergonomic and safety of operation [Durczak 2008b].The evolution of approaches to the problems of quality of agricultural machinery is closely linked with the development of technology, industry and production methods.The perception of the quality of the product depends on the form, which may be material subject, service, an intellectual product or processed material [Hamrol 2005]. Many products can be divided into parts belonging to different categories. For example, a modern self-propelled combine harvester includes all forms of the product. What you see, what you can touch and it is fixed (e.g., engine, cab, grain tank, wheels), these are material objects - in accordance with the common name also called products. Maintenance of the machine performed periodically is usually done in the form of services. Software of on-board computers controlling and supervising the work of the combine is the product of man's intellectual ability and the fuel to the engine can be the processed material. In practice, whether the product is called a service, a product, a product of intellectual ability or processed material depends on the dominant element in it [Durczak 2008a].

Quality is perceived multi-dimensionally: through properties and characteristics (thematic groups), belonging to the product, based on which criteria for evaluating the quality are built [Bulinski et al 2007, Durczak 2008a, 2008b Durczak]. According to ISO 9000:2001 one should take into account only the inherent qualities for quality evaluation of products. In the case of agricultural machinery, particular attention is paid to features that affect the quality of the work, i.e. indicators of the quality of work.

These indices for different groups of farm machinery are included in the Polish Standards "General requirements and tests". For example for harvesters they are included in the PN-89/R-36585 standard. These indicators were the subject of many scientific studies. The work of Durczak and Butcher [2005] attempted to systematize the selected indicators of operational quality of drills and combine harvesters, potato planters and potato harvesters using Pareto-Lorenz `s method. The same authors have developed a method for assessing a set of quality criteria of machine processes in terms of quality systems implementation [Butcher and Durczak 2007].

Evaluation of the quality of the product should always be preceded by the definition of methods of attributes and characteristics valuation and the measurement scales used.

Valuation is supposed to determine the quantitative standing of product quality. The problem of evaluating the characteristics occurs when it is necessary to quantify the quality of the product with both measurable and immeasurable characteristics of as well as their varying importance. In order to deal with this problem several methods have been developed. The need for evaluating the quality of quality was recognized by users, for which the publisher of popular science magazines will summarize the results of testing of agricultural machines and make their statements and comparisons. Durczak [2008b] sees no overall rating of quality of agricultural machinery. Individual features grouped into characteristics are evaluated on a scale of usually five grades, by giving the pros and cons. Two pluses (+ +) are given when the assessment of the features is very good, one plus (+) = good, zero (0) = average, one minus (-) when there is a fault, below average, two minuses (-) = mean significant defects, inadequate, defective [Durczak 2008b].

The individual field works, carried out periodically, should be very carefully planned and executed so that the end result of crop production, in the form of high-yield, would be satisfactory for the farmer. Thus, machinery and tools implementing these works should be subject to constant or periodic inspection according to specific criteria.

According to Kraszewski et al. [1982] criteria of quality, are magnitudes or phrases adopted as a measure of results obtained using a specific controlled process. For agricultural machinery and tools, the most important criterion is the quality of the work done, which can be described by means of appropriate indicators (parameters). Each group of agricultural machines is required to comply with a few or more of the quality of work. These indicators are defined in the Polish Standards (PN) - General requirements and tests, and the requirements contained in the cards in the System of Agricultural Machinery (SMR). Indicators of the quality of machines are related to the so-called "Normal operating conditions", which are described in detail each standard. In addition to the numbered indicators of quality of machines, these legal regulations also contain technical, operational and economical, ergonomic indicators, safety regulations and environmental protection. In order to determine the value of various indicators of work quality of agricultural machinery and tools one should use the detailed procedures contained in the test methods (PN) and strictly adhere to the conditions under which these tests are to be carried out.

The quality of agricultural products, including plant products, is derived from a number of factors that are mutually interpenetrating and complementary. The quality of harvested crops depends on the type of soil, climate, human factors, applied production technology, the number of doses of fertilizers and plant protection products, as well as used machines, namely some of their parameters.Analysis of the state of knowledge on technical and ergonomic operating parameters of agricultural machinery, directly and indirectly affecting the quality of the collected plants is extensive, and the results of comparative tests, assessments and reports on this topic are mainly published in popular science literature [Olszewski 2010; Wilmer 2010].

The quality of the technical service of agricultural machinery

In operating practice, technical servicing of agricultural machinery is defined as technical service whose aim is to be able to maintain their fitness for use for a period that is economically justified or because of user’s needs [Rzeznik 2008, Tomczyk 2009a]. Due to its intangible nature, technical service is a service, which can be divided into multi-

operational service (complex), including complex operating processes (engine overhaul), and Single-operation (simple) containing a single service operation (periodic refilling of fluids in agricultural vehicles) [Bennington et al. 1998].

Processes of maintenance of agricultural machinery have to be improved in terms of quality. Hence, there is a need for continuous development and modernization of the scope of the servicing, and adapting it to the needs of the operating system. This need is also apparent from the fact that, according to Tomczyk [2009b] , the characteristic of any system of agricultural machinery operation is a constant tendency to expand the scope of the service, which is caused by the appearance of faults, which were not foreseen at the design stage of the servicing system.One of the basic characteristics of the process is its quality of service, which Hamrol [2005] defined as the degree of compliance with the requirements, which are determinants of service and should be treated as a tool to improve all areas of human activity. Quality of service is the ability to maintain all features of the machine in a certain condition for its full usefulness in the long term. Evaluation of quality of service of agricultural machinery is extremely difficult, due to the complexity of the system in which it is implemented. In the available literature, this problem has been increasingly addressed [Bulinski et al. 2007, Durczak 2008a, 2008b, Durczak et al. 2005, 2010]. But there is no objective and multi-criteria method of quantifying the quality of machines service. Well-made processes of maintenance of agricultural machinery, provide opportunities to use them efficiently, which directly affects the economic performance of the farm [Rybacki, Durczak 2011].

Summary

The development of agricultural engineering is associated with the quality problems. Despite the differences in definitions of quality, resulting from the dominance of the different aspects and needs for which these definitions have been created, they share a close relationship between the term "quality", and a particular product. Many studies in the field of agricultural engineering distinguish machinery features, trying to measure or estimate them. Scientific studies carried out by independent institutes and state centers dealing with the mechanization of agriculture are helpful in this regard. From the point of view of the quality of machines Polish Standards and System of Agricultural Machinery can be important, which contain lists of operational quality requirements of different groups of agricultural machinery and equipment. Depending on the intended use of the machine, the number of parameters of operational and technical characteristics describing its quality in a comprehensive manner, ranges from a few to several dozen. Only some of these parameters have a direct impact on the quality of the collected plants because there is a need for research and analysis in order to determine which ones are important and which are not.

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