

# Tasks, ways and approaches to improve service maintenance of machinery (on the example of Rostselmash)

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**Abstract.** The article is devoted to the issues of improving the system of service maintenance of machinery manufactured by Rostselmash Combine Plant LLC. The strategic objective is to develop the corporate service network in terms of its quantitative expansion and qualitative growth. The introduction lists the main points of the company's service network strategy. The main body of the publication contains the main advantages of transitioning to a new system of guarantee fulfillment, as well as approaches to achieve such a transition. Potential difficulties and unresolved problems hindering the improvement of the service delivery system are outlined. Also, in the 'Materials and Methods' section of the publication, approaches to the improvement of machinery service are formulated, touching upon such areas of this work as: payment for warranty services, termination of warranty obligations, training of mechanics and specialists of service centers, etc. The main business objectives covering the following aspects of service improvement work are presented as the results of the research study: franchise development, increasing customer satisfaction, information gathering, and cost reduction. Each of the outlined aspects is given its extended description in the third section of the article.

## 1 Introduction

Rostselmash Combine Plant LLC has positioned itself as a leader among agricultural machinery suppliers in terms of the quality of its service network in terms of warranty service for its products.

Today more than 100 enterprises have contracts for warranty service of combines. And the existing procedure since 2003 allows to conclude such contracts only on condition of compliance with the requirements of the service standard, which provides for the availability of a certain set of spare parts, qualified personnel, equipment, buildings and facilities, elements of corporate style, as well as compliance with a number of principles of work organization.

The enterprises representing the plant in the sales regions, as a rule, have sufficient stocks of spare parts to eliminate failures of equipment in accordance with the nomenclature of

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warranty kits and service vehicles, specialists trained and certified at the plant based on recommendations. Every purchaser of a harvester is entitled to free pre-sale preparation.

Rostselmash has traditionally offered a high level of service in the North Caucasus, Central Black Earth Region and Central Region. The plant is well represented in the Volga region and the Western Urals. The Company managed to seriously improve the situation in some Siberian regions (Novosibirsk, Omsk, Altai Krai, Irkutsk) and significantly strengthen its position in Kazakhstan. In the future, efforts should be made to turn the situation around in the Eastern Urals, in the North-Western region and throughout Siberia (Tyumen, Kemerovo, Tomsk, Krasnoyarsk Krai, etc.).

Thus, the strategic task of developing the corporate service network with a gradual transition to cooperation with warranty providers on the principles of franchising was realized.

A well-developed service network is not only the most effective means of ensuring warranty obligations - it is the most important tool for product promotion.

The plan is to continue to improve the service network in the 2024-25 crop year. Due to the stabilization of sales, it is not so much a question of its quantitative expansion as of its qualitative growth.

The main challenges faced by the company in the field of service network development are summarized in the following points:

- introduction of unified technology for additional assembly, repair and maintenance of combines;
- carrying out preparatory measures for the transition from settlements for the warranty harvester to settlements for the warranty event;
- organization of work to ensure mass training of mechanics;
- increasing the volume and reliability of information on the operation of warranty agricultural machinery.

## **2 Materials and Methods**

An important distinction of the service program in 2025 should be the preparation for the transition to the transition to settlements for the performance of warranty obligations by compensating the costs for the actual work performed. [1-4] The company needs to pay for a warranty claim, not every combine that comes off the assembly line. This will put it in perspective:

1. Optimize warranty costs, as only actual breakdowns will be paid for, not every harvester registered under warranty.
2. Achieve transparency in sales policy, as now “service” money in many cases is nothing more than a discount on products, and the company cannot assess what exactly the funds are used for.
3. Exclude unscrupulous partners from the list of the plant's service network who, having received the resources intended for the organization of the service, do not provide services to the consumer.
4. To receive complete and reliable information on the operation of the warranty agricultural machinery, as the condition of payment for the eliminated failure will be the documented presentation of each warranty case to the factory.
5. Introduce “proprietary” repair technology and improve the technical culture of the plant and its partners.
6. Increase the responsibility of the consumer for improving the qualification of mechanizers and compliance with the rules of combine harvester operation.

Despite the fact that in 2023 the regulatory framework for the transition to payment for warranty services on a pay-as-you-go basis was prepared (technological maps and

compilations of time standards), there are still unsolved problems that do not allow to change the form of payment already in 2024. Such difficulties must first of all include:

1. Trade discounts on finished products alone do not provide sufficient motivation for dealers to engage with the factory. Rostselmash partners consider “service money” as an important preference and do not hide the fact that its purpose is far from only financing the warranty service.

2. Competitors keep paying for every combine produced. Thus, changing the form of payment may lead to a situation where their offers look preferable.

3. The factory services (quality, accounting, supply, spare parts sales) have no experience in handling thousands of warranty cases per season. Therefore, we cannot be sure that today Rostselmash will be able to ensure rhythmic repayment of its partners' expenses. This, in turn, may result in dealers losing interest in warranty service and Rostselmash losing an important competitive advantage - an efficient service network. [5,6]

Taking all of this into account, a transitional payment option for warranty service is proposed, assuming:

- payment of a fixed amount (less than in 2023) for each combine taken under warranty (as payment for work performed to eliminate failures and control maintenance, as well as transportation costs and costs to maintain the service standard);

- current accounting of expenses for the organization of warranty service, in order to compensate the expenses of the service center in the event that the costs exceeded the payments received for the work performed.

With this approach, the Rostselmash company:

1. Motivates dealers to review each warranty case and maintains continuity of the Appliance Service Program.

2. Facilitates “soft” implementation of warranty failure review procedures at the factory, since the availability of resources for warranty service at dealers somewhat reduces the requirements for prompt decision-making.

3. Obtains reliable statistical material to estimate the cost of switching to pay-as-you-go.

4. Gives dealers a chance to get used to bringing every warranty claim to the factory.

This transitional option will allow, while preserving attractive commercial terms of fulfillment of warranty obligations, to tighten the requirements for compliance with maintenance and operation regulations. Warranty obligations will be unconditionally terminated in case of detection of cases of violation of maintenance and operation instructions.

Approaches to improving service maintenance of machinery should also address the procedure of termination of warranty obligations in cases of violation of the rules of combine harvester operation. [7-9]

In order to control the consumer's compliance with the operating and storage conditions of combines, authorized representatives of Rostselmash conduct control inspections of the combines' operating condition, with involvement of representatives of local agricultural authorities (including Gostekhnadzor). The results of the inspection of the machines in the farms are formalized by a tripartite act. The act shall be signed by the manufacturer's representative, Gostekhnadzor representative and farm representative.

If the operating organization refuses to sign the inspection report, the latter shall be signed by a representative of the manufacturer and a representative of Gostekhnadzor.

The inspection report is sent for approval to the Director of the Spare Parts Sales and Service Department (SPSSD) of Rostselmash Combine Plant LLC, who makes the final decision to terminate the warranty service of the combine harvester.

Copies of each survey report shall be sent to the Gostekhnadzor inspection, district agriculture department.

After the decision is made to terminate the warranty service for the harvesters, the Director of SPSSD sends the servicing organization an executed notice of removal of the product from the warranty.

The warranty service of combines may be terminated in the following cases [10-12]:

1. Failure by the owner to comply with the requirements of the operating instructions and service book, including the use of the specified operating materials.
2. Violation of periodicity and scope of maintenance (maintenance after running-in, first maintenance, second maintenance).
3. Use of the combine harvester for purposes other than those for which it is intended (including practical driving training).
4. Making changes to the design of agricultural machinery.
5. Damage to a combine harvester as a result of an accident.
6. Unauthorized disassembly or repair of assemblies and units without factory approval.
7. Repair of the combine harvester using assemblies that have not passed the manufacturer's inspection.
8. The combine harvester was allowed to be operated by a mechanic who had not studied the device and rules of operation of the combine harvester, had not undergone practical training and did not have a harvester operator's license.

Commercial terms and conditions on service maintenance presuppose for dealers (service centers) the payment for the performed work, carried out in cash in stages:

- 50% of the total amount of payments after the agricultural machinery is placed on the warranty register;
- 25% of the total amount of payments after removal of agricultural machinery from winter storage;
- 25% of the total amount of payments after the end of the warranty period.

Also, in case of expiration of the warranty period of the combine harvester operation in the first year of operation due to operating time, payment shall be made in the following proportion:

- 50% of the total amount of payments after the agricultural machinery is placed on the warranty register;
- 50% of the total amount of payments after the end of the warranty period.

If the dealers (service centers) costs for warranty service of combines registered under warranty in 2024, at the end of the warranty period, exceed the total amount of payments for two years of service for all combines in the sum, then the costs in excess of the paid sums shall be compensated.

Table 1 presents the scheme of accounting of current expenses of the service center for warranty service.

**Table 1.** Scheme of accounting of current costs of the service center for warranty service

	<b>Accounting for the cost of replacing a defective part</b>	<b>Accounting for transportation costs for delivery of repair personnel and spare parts to the warranty harvester</b>	<b>Recognition of repair costs based on approved repair time standards</b>
<b>Calculation procedure</b>	Costs of the service center for replacement of the part will be taken into account based on the price of the part in the manufacturer's price list at the time of submission of all necessary documents.	Calculations of transportation costs for elimination of the warranty failure are made on the basis of the conclusion on acknowledgement of the manufacturer's fault. <ul style="list-style-type: none"> <li>- fuel and lubricants costs for one round trip for each warranty case.</li> <li>- fuel consumption rate is set at 12 liters per 100 km of travel.</li> </ul>	The calculations are made on the basis of the conclusion of the commission on the acknowledgement of the manufacturer's fault. <p>The labor intensity of works is determined by the collection of time standards or by</p>

	The costs are taken into account if the commission of Rostselmash Combine Plant LLC recognizes the manufacturer's fault.	- kilometrage within 400 km round trip. - price of gasoline per liter according to Rostov petroleum storage depot at the time of submission of documents.	the commission of the warranty service of the manufacturer. In exceptional cases the executor may be authorized for direct timekeeping. The cost of a standard hour is determined by the contract for warranty and pre-sale service.
<b>Documents to be submitted and information about the warranty case</b>	Denial information posted in the remote access program. The act of claiming. Defective spare part with a marking containing information about the warranty case. Warranty card of the service book.	Failure information posted in the remote access program. The act of claiming. The original of the trip sheet with the indication of destinations and calculated kilometers certified by the stamp of the service center. Warranty card of the service book.	Failure information posted in the remote access program. The act of claiming. Warranty card of the service book. Direct timekeeping report, if applicable.

Training of mechanics and service center specialists is an important part of the machinery service system. Service center specialists, regardless of their experience with Rostselmash machines, are required to undergo training and certification at the factory.

Training of specialists of service centers should be conducted on the basis of training classes of the plant. Training for specialists of service centers is free of charge, according to preliminary submitted applications. It is also necessary to include in the training and recertification plan the plant representatives, who are supposed to be placed at the bases of the plant's partners for their technical support during the harvesting season. [13-15]

The machinery service program for the current year included external training activities and, in particular, training and professional development of mechanics. This was due to the following considerations:

- observations over the operation of machinery produced by Rostselmash Combine Plant allowed us to conclude that up to 30% of machinery failures are related to the low level of training of mechanizers.;

- training programs implemented in the regions are an important component of the program to promote Rostselmash products;

- the plant's product line includes models with the peculiarities of design and operation of which mechanizers are not familiar to the majority of them;

- in the absolute majority of cases, Rostselmash does not "see" the operator of its machinery and does not receive important information about the advantages and disadvantages of its products.

It is advisable to organize field courses, as well as to organize training of farm representatives directly on the field. Service centers can organize training classes and conduct training for mechanics, chief engineers and mechanics of farms. To conduct such training it is possible to attract specialists of service centers, teachers of local technical schools, colleges, higher educational institutions, who will undergo mandatory training and certification at the plant.

Briefing upon receipt of the combine harvester is an integral part of pre-sale service. The basic rules of using the machinery produced by Rostselmash Combine Harvester Plant LLC

are explained to the mechanizers against signature. Briefing of the mechanizer upon receipt of the combine harvester is obligatory and is included in the dealer's standard.

Regional projects can also have a significant impact on the efficiency of the machinery service system. Due to the peculiarities of Rostselmash machinery promotion in some regions and the need to ensure prompt development of the company's service partners to meet the standard, it is proposed to implement special projects in a number of regions.

As an example, the following projects may be suggested:

- delivery of a service package to open a service center in case of purchasing a batch of at least 20 harvesters;
- storage space for spare parts on consignment;
- bringing the base into corporate compliance at the expense of Rostselmash Combine Plant LLC;
- on-site training of service center specialists by the teaching staff of Rostselmash Combine Plant LLC at Rostselmash's expense;
- leasing a service car.

Due to the unpreparedness of some partners for effective warranty support of Rostselmash machinery, SPSSD recommends the presence of its representatives in some regions during the season.

Specifically:

- 1) Saratov and Penza region is served by a team of 2 Rostselmash specialists from the base of Penzaagrotechnika JSC.
- 2) The Leningrad, Kaliningrad and Tula regions will be served by one specialist from the base of JSC Tulaselkhoztekhnika.
- 3) Kurgan, Sverdlovsk and Tyumen regions will be served by one Rostselmash specialist from the base of Tyumenagromash JSC.
- 4) The Republics of Mari El, Chuvashia and Tatarstan will be served by a 2-person team from the Tatagropromkomprom base in Vysokaya Gora village.
- 5) Irkutsk region will be served by one specialist from the base of Irkutsk Food Corporation JSC.
- 6) Kemerovo region will be served by a team of one specialist and a driver equipped with an energy-rich service car.

For their part, the technical centers in these regions should provide the plant representatives with their transport, tools, communication and office equipment (if necessary), stationary equipment and base areas to ensure the possibility of warranty service work in season. The costs for this can be compensated on a contractual basis.

To ensure that Rostselmash partners fulfill their contractual obligations on warranty service during the harvesting season, as well as to assist newly established service centers, it is necessary to place an order for 3 fully autonomous, fully equipped with a full set of necessary diagnostic and repair equipment and special tools service cars on the basis of a cargo-passenger car "Gazelle". The cars should also contain a minimum set of spare parts and consumables.

During the season one such car with a team of driver and Rostselmash specialist will operate from the base of LLC "Agro" in the Kemerovo region. One car will be delivered as a service package to the service center of LLC Loskutovskoye in Tomsk region. One more car will be leased to the newly established service center of Achinskselkhoztekhnika JSC in Krasnoyarsk region. At the end of the season, it will be possible to transfer these cars to the above-mentioned service partners to settle accounts payable, which will be an additional PR-factor.

Prior to the start of the campaign it will be necessary to inform all Rostselmash technical centers and local farms about it through the press, indicating the cell phone numbers of the teams.

The organizational management structure of the company is important for the formation of an effective system of machinery service. The spare parts sales and service department is a structural subdivision of Rostselmash Combine Plant LLC and has the following tasks:

1. Formation and development of the service network.
2. Collection and transfer to the quality service of statistical information on failures of warranty agricultural machinery.
3. Reviewing and resolving claims of a technical nature.
4. Fulfillment of warranty obligations in cases of direct application to the factory.

In the perspective period it is proposed to deploy an external training department in the Department of spare parts sales and service to ensure systematic work on implementation of training programs for mechanics and specialists of service centers.

Among administrative methods of management there are methods of organizational impact, which are often expressed through the standards operating at the enterprise. One of such standards in Rostselmash Combine Plant LLC is called Service Standard. The Service Standard is mandatory requirements developed by the SPSSD of Rostselmash Combine Plant LLC, aimed at improving the organization of warranty service and contributing to the growth of the service department. They are determined on the basis of the optimal ratio of funds invested in bringing the technical center into compliance with the service standard and the possibility of ensuring a qualitatively high level of pre-assembly work and warranty support of machinery during the season and off-season.

The following organizational operating principles are suggested:

1. Re-assembly of new agricultural machinery in strict accordance with the approved technology, free of charge for the customer (turnkey reassembly on the basis of the dealer (technical center)).

2. Obligatory briefing of machine operators against signature upon receipt of the combine harvester. In order to ensure the possibility of conducting the briefing and its quality level, as well as for the possibility of conducting additional training and seminars, a training room with training materials should be organized on the territory of the service center.

3. Delivery by the partner of a spare part for a failed combine harvester during the harvesting period, within 24 hours at the latest.

4. Adherence to deadlines for correcting failures:

During the harvesting period:

- within twenty-four hours, if it is not necessary to disassemble the main components of the machine;

- within three days, if disassembly of major components is required;

- within five days, if disassembly with replacement of basic parts (frames, engine blocks, rear axle housings, gearbox housings and other basic parts) is required.

Offseason:

- within a period not exceeding ten days.

5. Availability of dispatcher's telephone (round-the-clock work during harvesting period).

6. Provision of electronic, real-time information with the history of the combine harvester operation (Remote Access Program). Warranty cases will be considered at the factory only if the information about them was received by the factory in time electronically via the "Remote Access Program", otherwise, the case will not be considered as a warranty case at all.

7. Conclusion of contracts with the main related plants (JSC "Gidrosila", JSC "Avtodizel", JSC "Altaydizel").

In terms of equipment, the following recommendations can be made:

1. Availability of universal and control and measuring equipment in accordance with the requirements of technological charts for pre-sale, maintenance and repair of combines.

2. Availability of a diagnostic car. Each car working on consumer requests must be

equipped with special equipment and comply with the corporate style.

Personnel management decisions should contain the following points:

1. Having a service manager responsible for warranty service.

2. Availability of service desk staffing.

3. Availability of service personnel certified in accordance with the requirements of Rostselmash Combine Plant LLC (two specialists for adjustment of mechanical part, one specialist for adjustment of hydraulic part and filling of conditioners, one specialist for adjustment of combine electronics, per 50 combines).

### 3 Results of scientific research

In view of the above, the business objectives of the service program can be formulated for a prospective period covering 2025-2030. As main business objectives, we will highlight: 1) development of the service network on the basis of franchising; 2) increasing customer satisfaction; 3) collecting information about the operation of agricultural machinery; 4) reducing warranty costs.

Development of the service network on the basis of franchising will require:

- preparation and implementation of technological charts and collections of time standards for repair and maintenance of machinery;

- offering commercial terms of service that ensure fulfillment of the requirements to the:

- equipment;
- personnel qualification;
- used spare parts and consumables;
- buildings, facilities and organization of workplaces;
- corporate compliance;
- unified organizational principles of work.

Improving customer satisfaction will require:

- availability of training and professional development opportunities for mechanizers;

- free pre-sale preparation;

- availability of scheduled maintenance and defect inspection services;

- compensation of expenses on repair of the warranty machine in cases when the service cannot be provided by the official representative of the plant;

- motivation of dealers and service centers for unconditional implementation of the "Spare part in the field in 24 hours" program in the season.

Collecting information on the performance of agricultural machinery involves:

- introduction of remote access program as a mandatory requirement for dealers and service centers;

- compensation of additional expenses of service centers for warranty service in case of acknowledgement of the manufacturer's fault.

Reduction of warranty service costs can be achieved by:

- reducing the amount of payments for warranty maintenance of combines;

- development of measures to prepare for transition to settlements by compensating actual costs of failure elimination:

- replacement of a part, unit or assembly of an agricultural machine;
- compensation of transportation costs;
- compensation for the cost of work according to time standards.

## 4 Conclusion

The Russian agricultural machine building industry is going through a serious transformation stage, which is reflected, among other things, in the service system of Rostselmash production facilities. In these conditions, the machinery manufacturer has a special responsibility to improve business processes in the field of its service system, which in turn contributes to increasing the efficiency of Rostselmash's operating activities.

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