ORGANIZING A REPAIR SERVICE BASE FOR RICE CLUSTERS

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Abstract. In this article, a recommendation is given for the selection of the design of the service center and the composition of technological devices for the establishment of a repair service base in rice farming clusters. Also, in the article, a general algorithm for repairing defective combine harvesters and technological maps for repair were developed, and the procedures for technical maintenance of rice combine harvesters based on accumulated experiences were fully mentioned.

Key words: cluster, maintenance, service center, technological devices, repair shop, rice harvesters, algorithm.

Introduction

The repair and service base (RSB) has a great role in keeping tractors and agricultural machines, including rice harvesters, in technical condition during the harvest season and restoring their working capacity [1, P.99-108]. According to GOSNITI, when maintenance work on tractors is performed in good quality, their annual development increases by 20-28%, and productivity increases by 34-46%.

The effectiveness of RSB (Repair Service Base) is evaluated using indicators such as the volume, quality and speed of services provided to consumers' cars, labor productivity, return on capital, and enterprise profitability.

[2, P.227-230]. The correct and effective use of RSB (Repair Service Base) reduces the need for spare parts and repair materials, increases the technical readiness and service life of the machine-tractor fleet. As a result, due to the strengthening of the material and technical base of farms and agroclusters, technological operations in growing crops are performed in optimal terms and their productivity is increased [3, P. 5-15].

Research methods.

We have studied the “TCTRICE” LLC(Limited Liability Company) rice farming cluster in Tashkent region [4, P. 7] we propose to organize it in the form of a service center on the basis of an exemplary project presented in the literature (the first figure).

The service center consists of a repair shop for rice harvesters and a technical service point for them. In the service center, repair of defective combines, maintenance of the combine harvesters in the field itself during harvesting, after certain engine hours and at the end of the season are carried out.

The following sections are organized in this service center, where five rice harvesters are repaired at once (see the first figure):

I - outdoor car wash area;
II - disassembling, washing, defecting and equipping the defective machine;
III – repair of beaters, fans, crushing devices;
IV – repair of the jatka;
V – repair of threshers and sieves;
VI – repair of conveyors and elevators;
VII – repair of the hay harvester, assembly and adjustment of the harvester;
VIII – blacksmithing;
IX - warehouse;
X – household rooms;
XI – welding;
XII – technical service point;
XIII–painting of repaired combines;
A - 10-ton crane.

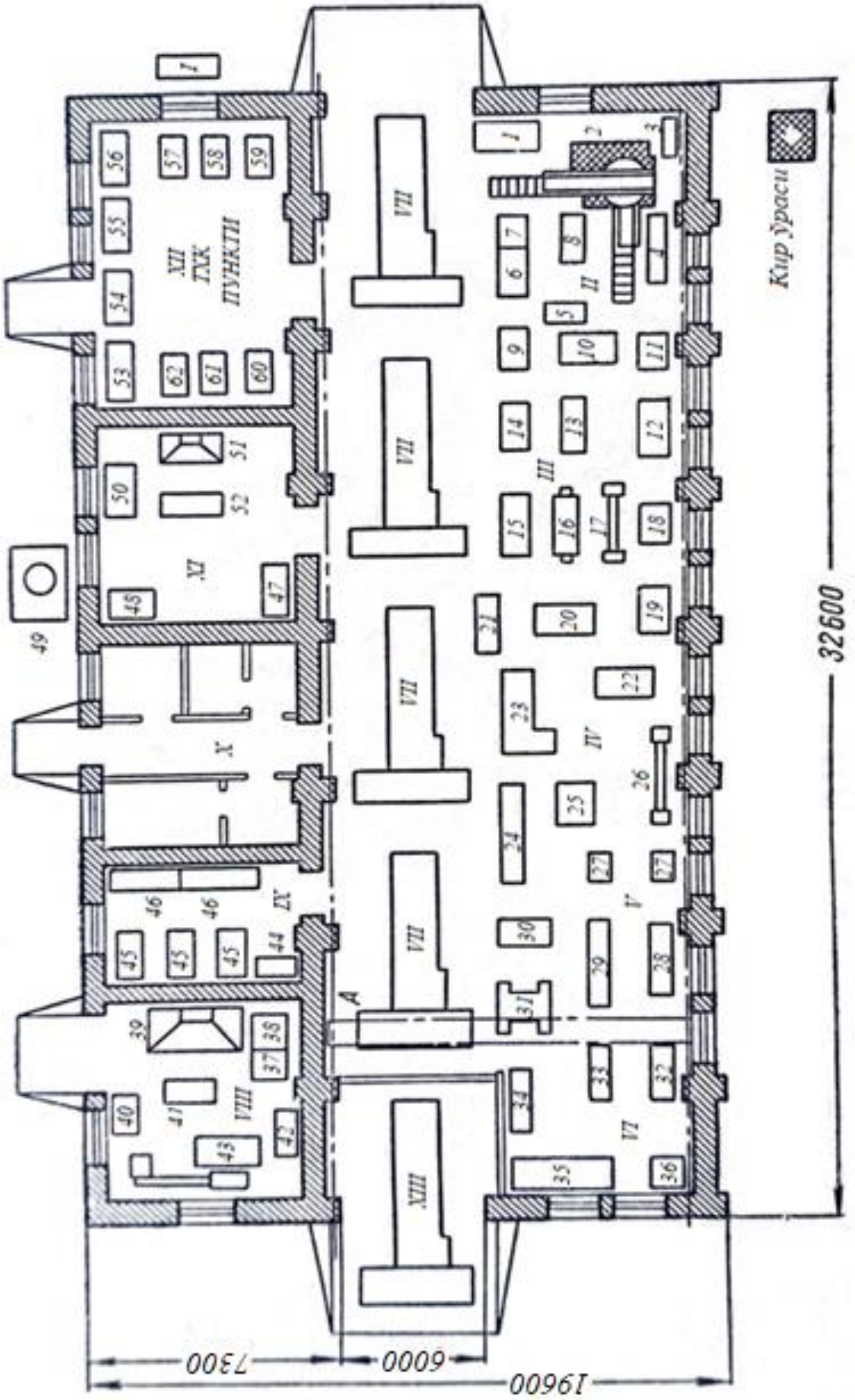


Fig. 1. Technological project of a service center consisting of a RSB (Repair Service Base) and a technical service station

Based on the composition of these plots, the service center

It is proposed to be equipped with technological devices, tools and equipment listed in Table 1.

Table 1. List of technological devices, tools and equipment to be installed in the service center

S/n	Names of devices, tools and devices	Models
1	**2**	**3**
I. Outdoor car wash area *II. Disassembly, washing, repair and equipment section of the defective machine*		
1.	Table fitter	ОРГ-1468-01-070А
2.	Washing machine for details and parts	ОМ-4610
3.	Air compressor	ГП-0,15/10
4.	Shelves for details	ОРГ-1468-05-230А
5.	Parts Trolley	1019-653-00
6.	Iron Table	ОРГ-1468-01-090А
7.	Prismlai Inspection Plate	ОСТ-20-149-39
8.	Desktop/Work tables	
III. Biters, Fans, Shredders Administration Section		
9.	Connection transformer	ТА-500
10.	Iron table	ОРГ-1468-01-090А
11.	Cabinet of measuring instruments	ОРГ-1468-07-010
12.	Surface coating device	ОРГ-1468-01-130
13.	A device for leveling the bodies of augers and elevators	ОР-6733
14.	Remove the ventilators and assemble the stands	ОР-6778
15.	Frame Alignment Device	ОПР-278А
16.	Disassembly, assembly and adjustment of the roller mechanism	ОПР-1373
17.	A rack for a roller mechanism	
18.	Stand for separation and collection of beaters and crushing drums	ОР-6709
19.	Under part of drum grille repair kit	ОПР-1301
20.	Biter repair device	
21.	A portable stand for training combines and parts	ОПР-4523
22.	Drum Repair and Balancing Stand	ОПР-278А, КИ-4274
IV. Machine Repair Section		
23.	Machine repair and training stand	ОР-13220
1	**2**	**3**
24.	Stand for repairing augers and knives	ОР-6701М
25.	Tilt camera repair and inspection stand	ОПР-1376
26.	Racks for shafts, pipes, bars	

27.	Motorcycle Mounting Device	
V. Chaff and sifter repair section		
28.	Straw rake assembly and conditioning stand	ОПР-1287
29.	Shafts for thresher fingers	
30.	Stand for adjustment and control of thresher crankshafts	
31.	Sieve repair stand	
VI. Repair station for conveyors and elevators		
32.	Device for repairing chains	
33.	Stand for repairing augers and elevator casings	ОР-6733
34.	Click for details	ОРГ-1468-05-230А
35.	Transporter Repair Stand	ОР-6689
36.	Tilt camera body repair stand	ОР-6723
VIII. Blacksmith's Precinct		
37.	Water bath for gathering	2238
38.	Oil bath for gathering	2237
39.	Iron forge	5903-06
40.	Locksmith's scaffolding	ГОСТ-7225-54
41.	Two shock absorbers	ГОСТ 11398-75
42.	Ironing device	ОРГ-1468-01-060А
43.	Crank press	К 2324
IX. Warehouse		
44.	Work tables / Desktop	
45.	Check for details	ОРГ-1468-05-230А
46.	Shelves for tools	ОРГ-1468-05-280А
XI. Welding section		
47.	Check for details	ОРГ-1468-05-230А
48.	Connection transformer	ТА-500
49.	Acetylene generators	ГВР-3,0
50.	Table fitter	ОРГ-1468-01-060А
1	**2**	**3**
51.	Electric welding table	ОКС-7523
52.	Gas welding table	ОРГ-1468-03-010А
XII. Technical Service Point		
53.	Lathe screw cutting device	1К62
54.	Vertical drilling device	2А-554
55.	Light drilling device	2М-112
56.	Universal turning device	3К12М
57.	A master-adjuster's toolkit	ОРГ-4999А-ГОСНИТИ
58.	Engine oil system washer	ГСВ-06/12
59.	The device for washing the filters of the air cleaning system	ОР-9971А-ГОСНИТИ
60.	Machine lubrication and fueling device	О3-4967М-ГОСНИТИ

61.	A set of hydraulic and transmission oil cleaning devices	ОМ-16394-ГОСНИТИ
62.	Table fitter	ОРГ-1468-01-060А

It can be seen from the table that in the service center, repair of malfunctioning combines and technical service operations are carried out in 13 sections with the help of 62 technological devices.

In addition to grain harvesters, other types of agricultural machines can be repaired in the service center, as well as maintenance work on them. In this case, the composition of technological devices, tools and devices listed in Table 1 is expanded as necessary [5, P. 151-189].

The center includes one or more mobile workshops, depending on the number of grain harvesters, technical condition and frequency of breakdowns.

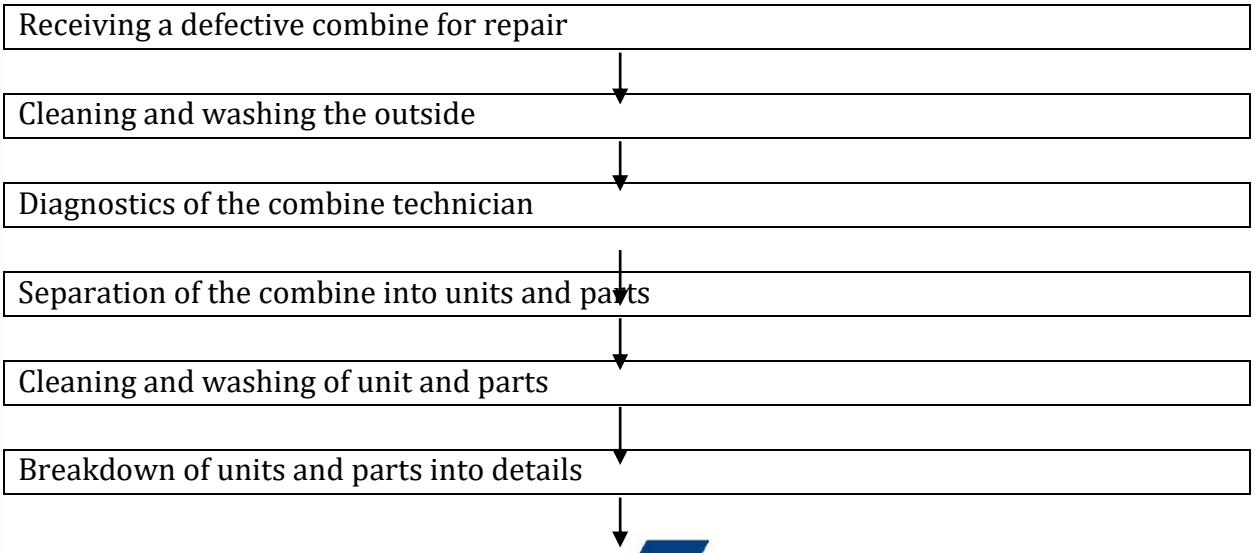
Results and discussion.

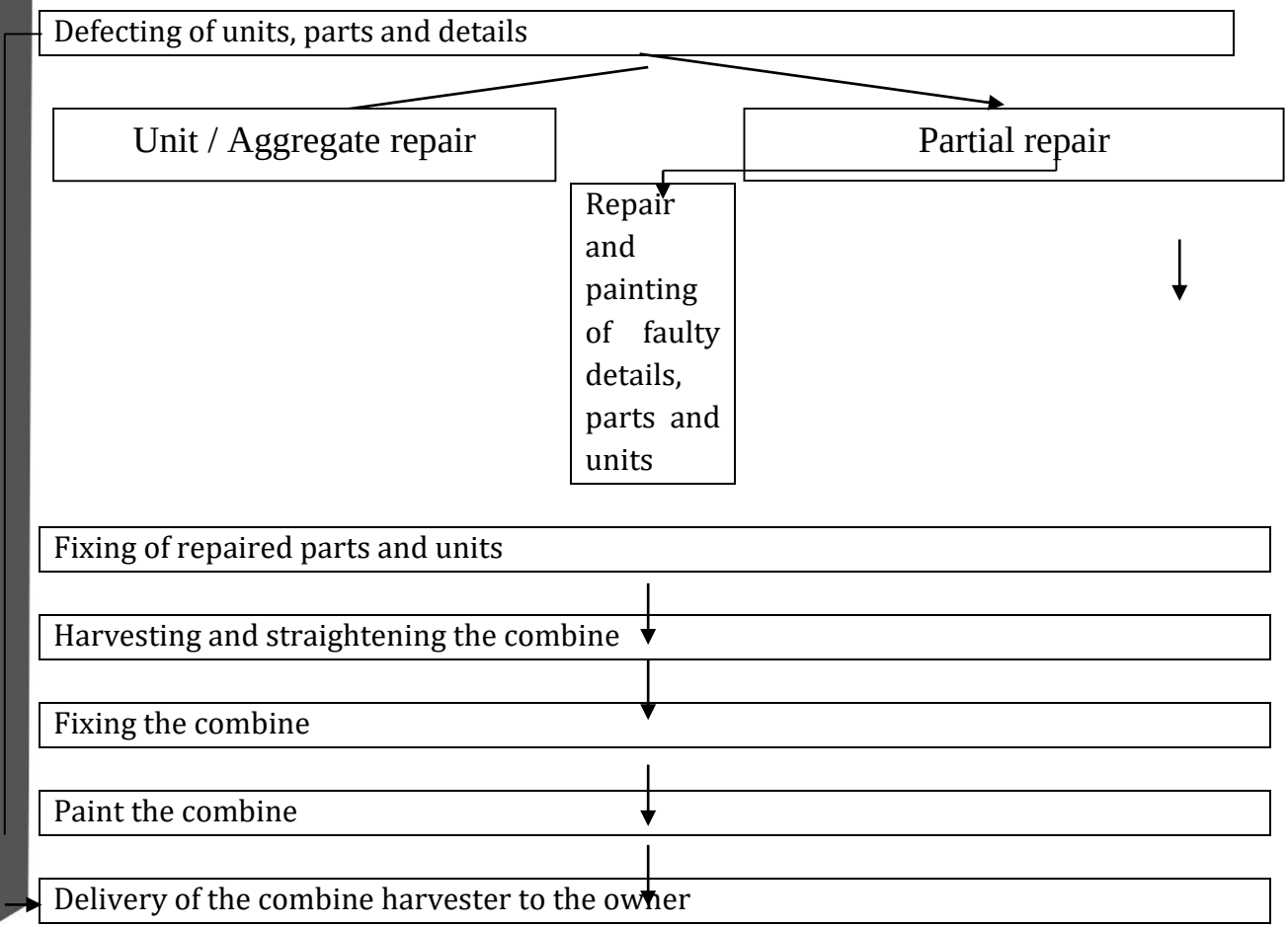
We offer to repair defective combines in the workshop of the service center by the method of partial repair according to the algorithm presented in Figure 2 [6, P. 339-347].

The defective combine brought to the workshop is inspected by the supervising mechanic. The combine operator and the mechanic draw up a handover-acceptance certificate.

The combine is cleaned of soil, straw, grass and oil residues, its exterior is washed with the help of a portable pump device OM-22612.

Fig. 2. Algorithm of the technological process of repair of rice harvesters in the workshop





The washed combine is diagnosed using the KI-3967M GOSNITI unit.
It includes KI-1871-01 (screw fingers),KI-3971 (coupling), KI-1854 (chains), KI-8839 (belts),

Includes devices that check and evaluate the technical condition of details and parts, such as KI-8853 (steering mechanism). With the result of diagnostics, the type of repair is selected: capital or current [7, P. 40-42;8, P. 10-11; 9, P. 8-9; 10, P. 16-17].

The combine is divided into units and parts. The inside and outside of the unit and parts are cleaned and machine washed OM-4610.

Clean aggregates and parts are divided into details and sent to the defect inspection station. According to the results of the defect inspection, details are divided into three groups: fine details, details requiring restoration, and generally defective details [11, P. 13-14].

During the rice harvesting season, we recommend removing all defective parts and replacing them with new ones or replacing them, i.e.(that is) repairing defective combine harvesters by aggregate method. Because in this method, defective parts or details are replaced by the words of the rice harvester himself, the harvesters are quickly repaired and returned to the owner, they start working again [12, P. 7-8; 13, P. 342-343].

Partial repair of harvesters that have finished the harvest season gives good results: all defective parts and details are repaired, and new ones are installed instead of those that have failed [13, P. 342-343].

Defective details, parts and aggregates to be repaired by the disassembly method are distributed to the appropriate sections of the workshop and removed from repair.

Repaired parts and units are painted and dried and mounted on appropriate stands.

In the next section, the combine is assembled and adjusted, fuel, coolant, hydraulic, motor and brake oils are supplied.
In the next section, the combine is only used and trained.
In the last process, the exterior of the combine is painted and dried.
A combine that fully meets the requirements is handed over to the owner by a deed [14, P. 9-10; 15, P. 2-18].

Technological maps for repairing rice harvesters

Workshop engineers, technicians and locksmiths should follow the technological maps given in Table 2 when repairing rice harvesters.

Table 2. Collection of technological maps for repairing rice harvesters

Map №1 Repair of basic parts such as frame, shaft, chain, bearing, sprocket, gear
Map №2 Repair of machine parts: body, grinding device, auger, motor, variator, tilting cam, tilting conveyor
Map №3 Repair of parts of threshing and sieving of rice husks: threshing body, beaters, threshing drum, drum head, threshing fingers, sieves, elevators, augers, fan
Map №4 Repair of hopper and unloading equipment: rice elevator, hopper housing, unloading auger, auger casing, hopper auger
Map №5 Repair of the automatic machine: splines, crankshaft, clutch, casing, automatic, clutch clutch
Map №6 Repair of storage devices: gears, friction seals, bearing parts, holes for alignment bolts
Map №7 Repair of axles of driving wheels: casings, coupling, wheels, on-board gearboxes, differential, brake pulley, transmission box, repair of repaired axle
Map №8 Steering axle repair: bushing, bracket, steering knuckles, steering knuckles, steering knuckles
Map №9 Repair of the speed variator: assembly and adjustment of the variator ball, middle disc, puller, puller axle, loading plug, variator block
Map №10 Repair of the cabin, steering gear and the combine platform: cab cabins and doors, details of the steering gear, the base of the platform
Map №11 Hydraulic system repair: pumps, separators, pipes and hoses

Map №12 Repair of electrical equipment: generators, starters, relay-regulators, wiring, horn, magneto, headlights
Map №13 Aggregates training: crushing drum (for 5-10 minutes); straw shaker (15 minutes); sieves (15 minutes); straw man (15 minutes); jatka (crankshaft mechanism, auger - 15 minutes).
Map №14 Harvesting, refining and painting of the harvester: installation (assembly) of repaired and refined aggregates in the harvester; engine warm-up (modes: 3 min - 600 rpm, 6 min - 900 rpm, 3 min - 1700 rpm); Harvesting of the combine: rotation speed of the engine shaft is 900-1000 rev/min; 10 minutes in the 1st gear, 10 minutes in the 2nd gear, 5 minutes in the 3rd gear, 5 minutes back; the combine is painted on the outside.

In case of purchase of new rice harvesters equipped with improved, new parts and aggregates of "TCT RICE" cluster and other consumer structures, appropriate additions and changes will be made to the technological maps.

Procedures for technical service of rice harvesters

List of types, periodicity and performed operations of THC for combine harvesters [1, P. 89; 16, P. 14-43; 17, P. 10-100; 18, P. 10-47] specified in the normative documents cited in the literature**.**

According to them, rice harvesters are required to carry out the following types of RSB:

shift RSB (SRSB) - before the beginning of each shift;

first RSB (1-RSB) - when the development of the combine reaches 60 motor hours or 160 physical hectares;

the second RSB (2-RSB) - when the development of the combine reaches 240 motor hours or 640 physical hectares;

post-season RSB – at the end of the harvesting season.

RSB measures are carried out by the combine harvester and mobile workshop mechanic in the rice fields themselves.

Based on our many years of experience in using grain harvesters in field conditions [19, P. 4-5; 20, P. 9-11; 21, P. 7-8; 22, P. 5-6; 23, P. 5-6], we accept the composition of the operations performed in the process of RSB in the form presented in Table 3.

3-Table. The composition of operations performed in the prcess of RSB

The composition of operations performed during shift and periodical RSB for rice harvesters
Shift technician service (SRSB):
• all parts and units are cleaned of dust and straw residues; • checking the integrity of containers and the dripping of fuel, oil, cooling and brake fluids; • the oil levels in the diesel crankcase, hydraulic system and hydraulic transmission, liquid levels in the radiator are checked, and if they are low, they are brought up to

standard; • chain and strap transmissions are inspected; • the connecting link of the grinding device is lubricated; • the condition of diesel, steering, brakes, lighting and alarm systems is checked by sight and sound, identified defects are eliminated.
In the first technical service (1-RSB):
• Operations carried out in SRSB are repeated; • chain and belt conveyors are cleaned of impurities; • the brake fluid levels in the shafts of the hopper's tilting auger reducer, brake and clutch hydraulics are checked and adjusted; • the reliability of battery terminals and electrical wiring connections is checked; • the ventilation holes in the battery and fuel tank cap are cleaned; • the tightness of the leading and driven wheels to the balls, the decks of the drum and the cutting blades is checked; • the soaps of hydraulic and hydrosystem tanks are cleaned and washed; • the debris in the fuel tank and fuel filter is thrown away; • the tension of all belts and chains and the air pressure in the tires are checked and adjusted; • the components of the combine are installed according to the scheme; • the brakes are checked at the place of operation and when the combine is moving on a flat road, defects are corrected.
In the second technical service (2-RSB):
• The operations performed in the 1st RSB are repeated; • the thoroughness of external assembly connections and diesel unit connections is checked; • diesel air cleaner and its mesh, filter parts are cleaned of dirt; • the deposits in the fuel tank, coarse and fine filters are drained; • the oil centrifuge rotor is cleaned and washed; • the old oil in the diesel crankcase, fuel pump housing, on-board reducers and gearboxes is replaced with new oil; • the chain balancing mechanism of the chain, the tension of the inclined cam conveyor chain is checked and adjusted.
Post-season technical service:
• the combine is brought to the service center; • washed and cleaned; • the condition of components in the working combine is checked; • adjust and repair parts are identified; • the combine is prepared and put into storage.

As can be seen from the above, RSB is the most important type of service for agricultural machinery, including rice harvesters.

When RSB operations are carried out on time and with high quality, breakdowns of machines are reduced by 2-3 times, fuel and lubricants are saved by 3-5% and repair costs by 20-30% [24, P. 3].

In clusters and farms where rice harvesters, vehicles and other technical equipment are in good condition, rice harvesting is carried out in optimal terms, crop failure is prevented.

Conclusions

1. We recommend the establishment of a repair shop for rice harvesters and a service center for them as part of the "TCT RICE" cluster.

2. The repair shop has the capacity to accommodate and repair five faulty harvesters at once. If it takes 10 working days to repair 1 harvester, 30 harvesters on balance will be repaired and put into storage in 300 working days.

3. It is advisable to organize it on the base of the XII - section of the repair workshop, without building a separate building for the RSB point for combine harvesters. In this case, material and technical costs will be reduced, point engineers and workers will be able to use technological devices in the workshop if necessary.

References:

1. Toshboltaev M., Dzhiyanov M. Establishing the composition of machines and technical service points for cotton-textile clusters. Monograph. - T.: "Navro'z", 2021. - 190 pages.
2. Varnakov V.V., Streltsov V.V., Popov V.N., Karpenko V.F. Technical service of agricultural machines. - M.: Kolos, 2003. - 253 p.
3. Economy of technical service of enterprises / Yu.A.Konkin, K.Z.Bisultanov, M.Yu.Konkin and others; under ed. Yu.A. Konkina. - M.: Kolos, 2005. - 368 p.
4. Semenyuk I.M., Gonchar I.S., Basargin V.A. Repair of grain harvesters. - M.: Kolos, 1968. - 303 p.
5. Projecting of technical service enterprises: textbook / A.I. Zavraznov, S.M. Vedishchev, Y.E. Glazkov, A.V. Milovanov, A.V. Prokhorov, N.V. Kholyshev. - Tambov: Izd-vo FGBOU VO "TGTU", 2018. - 192 p.
6. Kazakov V.K., Kostenko S.I., Chernoivanov V.I. Repair zernouborochnykh kombaynov. - M.: Kolos, 1978. - 400 p.
7. Technology diagnostics of tractors. - M.: GOSNITI, 1980. - 82 p.
8. Toshboltaev M. The essence and advantages of machine diagnostics// Agriculture of Uzbekistan. - Tashkent, 2015. - №1. - P. 10-11.
9. Toshboltaev M. Procedures for diagnosing and storing equipment and aggregates // Agriculture of Uzbekistan. - Tashkent, 2015. - №12. - P. 8-9.
10. Toshboltaev M. Diagnostics of grain harvesters// Agriculture of Uzbekistan. - Tashkent, 2013. - №4.
- P. 16-17.
11. Toshboltaev M. Evaluation of the technical condition of grain harvesters// Agriculture of Uzbekistan. - Tashkent, 2018. - №5. - P. 13-14.
12. Toshboltaev M. High-quality repair of grain combines - a factor of short-term harvesting // Agriculture of Uzbekistan. - Tashkent, 2010. - №3. - P. 7-8.
13. Maintenance and repair of machines / I.E. Ulman, G.S. Ignatev, V.A. Borisenko and others; pod obshch. ed. I.E. Ulmana. - M.: Agropromizdat, 1990. - 399 p

14. Toshboltaev M. Procedures for acceptance of repaired grain harvesters// Agriculture and water management of Uzbekistan. - Tashkent, 2020. - №5.- P. 9-10.
15. Toshboltaev M., Nurmatov Sh., Tokhtakoziev A. Technical requirements for abandoned agricultural machinery.- T.: UzMEI, 2011. - 19 p.
16. Lensky A.V. Specialized maintenance of MTP. - M.: Rosagropromizdat, 1989. - 236 p.
17. Combine harvesters. Service manual. - M.: GOSNITI, 1986. - 103 p.
18. "Don-1200"and "Don-1500" combines. Service manual. - M.: GOSNITI, 1985. - 52 p.
19. Toshboltaev M. Harvesting grain and ploughing. - Tashkent, 2016. - No. 6. - P. 4-5.
20. Toshboltaev M. Harvesting grain without destroying the nest // Rural and water resources of Uzbekistan. - Tashkent, 2019. - No. 5. - P. 9-11.21. Tashboltaev M. Organization of detachment of grain harvest // Agricultural and water industry of Uzbekistan. - Tashkent, 2020. - No. 6. - P. 7-8.
22. Toshboltaev M. Harvesting grain and plowing // Agriculture and water resources of Uzbekistan. - Tashkent, 2021. - №. 6. - P. 5-6.
23. Toshboltaev M. Grain harvesting: quality and responsibility // Agricultural and water resources of Uzbekistan. - Tashkent, 2022. - № 5. - P. 5-6.
24. Gushchin V.A., Kalashnikov N.M., Lensky A.V. Recommendations to the foreman on maintenance of the machine-tractor fleet of collective farms, state farms and other agricultural organizations. – M.: Rosagropromizdat, 1989. – 80 p.