

Multipurpose mobile power means for AIP

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The purpose. Finding ways to expand the technological capabilities of the car chassis, which will increase efficiency of their application, increase annual load and reduce their idle time. **Methods.** System analysis and methods of statistical processing of the obtained results of researches of operational indicators. **Results.** Perspective directions of use of car chassis MES-330 «Autotractor» as multipurpose mobile power means are substantiated, and formation on its baseline of mobile agricultural assemblies for accomplishment of production operations in agroindustrial production are proved. Basic constructional characteristics of MES-330 «Autotractor» are brought, as well as its basic operating characteristics with tillage combines. **Conclusions.** Use of multipurpose MES-330 «Autotractor» in agroindustrial production enables to reduce net cost of production of plant growing due to application of direct-flow schemes (a warehouse — field) of entering technological material, and to reduce cost of technical park. Nomenclature of hardware components for accomplishment of transport operation will raise efficiency of its use within a year.

Key words: multipurpose, mobile power means, autotractor, car chassis.

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Problem. One of the ways to reduce the cost of crop production is the use of multifunctional mobile energy products (MEZ), which can be effectively used as a performance of technological operations in the field of traction and drive concept, and in transport operations.

Use in transport operations of tractors is limited by a relatively slow speed (30 km / h), shoulder crossings, etc. With an increase in the distance of transportation of more than 5 km, fuel consumption significantly increases compared to the car. In view of the above, there is a need to create an MEZ that will not have these deficiencies. If such a creation of the MEZ through the modernization of the tractor, it will lead to significant changes in its design, in particular: suspensions to extinguish road inequalities; control system; increase of longitudinal base; transmissions; braking system and other units. The cost of this tractor will increase several times compared with existing models. Accordingly, the unit cost of their work will also increase.

The use of a high-performance automobile chassis on the implementation of agricultural technological operations will enable to solve the above-mentioned problem at lower costs.

Analysis of recent research and publications. With the advent of technological progress, the tractor as an energy tool for agricultural operations loses its monopoly. Automobile plants Mercedes, MAN, KamAZ, Ural, MAZ, Joskin [1-6] create automobile chassis that can be used in agroindustrial production by performing technological operations involving: introduction of various technological materials, soil tillage, sowing of crops, caring for their crops, transport operations, etc.

To realize the power of the engine through the chassis, the cars are fitted with low-pressure tires with larger structural dimensions and high passage treads, which have a pronounced ground loader, a control system for tire inflating, provide for the installation of an additional ballast to increase the coupling weight of the car, etc.

Taking into account the aforementioned issue on the use of motor vehicles in agricultural operations is relevant and aimed at the creation of competitive, high-performance, multifunctional domestic production equipment.

The purpose of research. The purpose of the research is to find ways to expand the technological capabilities of the car chassis, which will enable them to increase the efficiency of their use, increase the annual load and reduce their idle time.

Methods. System analysis and methods of statistical processing of the obtained results of researches of operational indicators.

Research results. The most adapted from the domestic automobile chassis to the conditions of the field (a small bearing property of the soil, high dustiness) is the automobile chassis KrAZ-6322, which is serially manufactured in Ukraine by Private joint stock company "AvtoKrAZ".

As a result of joint work of PJSC "AvtoKrAZ" and NSC "IMEA", a mobile power sowing (MEZ-330) "Autotractor" was created (Fig. 1).



Fig. 1. Mobile power means MEZ-330 "Autotractor"

MEZ-330 has a mass of 11700 kg, engine power - 243 (330) kW (hp), a wheeled formula 6×6 , a maximum speed of 80 km / h. On the frame ME3-330 it is possible to install capacities with technological material (weight 10 tons), in the rear part is mounted coupling device type NU-3. With the help of which it is possible to carry out aggregation of hoisting and trailing agricultural machines or implements. A power take-off shaft has been installed that has a rotational speed of 1000 and 540 rpm. MEZ is equipped with a centralized control system of pressure in wheel tires, which allows to reduce pressure during agricultural operations in the field to 0,08 MPa and increase it to the recommended values at transport interchanges 0,35 MPa, and also to regulate it in the process of carrying out a technological operation at reduction in mass of the technological material. The gearbox, together with the distribution box, has 16 gears, which makes it possible to provide the required working speed of the machine assembly. Driving bridges of the car are two-stage, single-speed, inter-axle and inter-mast blocking differentials, which gives the opportunity to get the highest traction parameters when blocking the differential in traction operations, and the unlocked differential makes it impossible to generate parasitic power.

Operations on which MEZ-330 can be used (fig. 2):

- introduction of solid and liquid organic fertilizers;
- introduction of solid and liquid mineral fertilizers and chemical meliorants;
- soil cultivation: plowing, peeling of stubble; cultivation; discourse; dying harrowing; snow removal;

- pre-planting of soil;
- loading of seeders;
- sowing
- fertilization of crops;
- caring for crops;
- accumulation-overload of loose technological materials;
- transportation of loose technological materials.

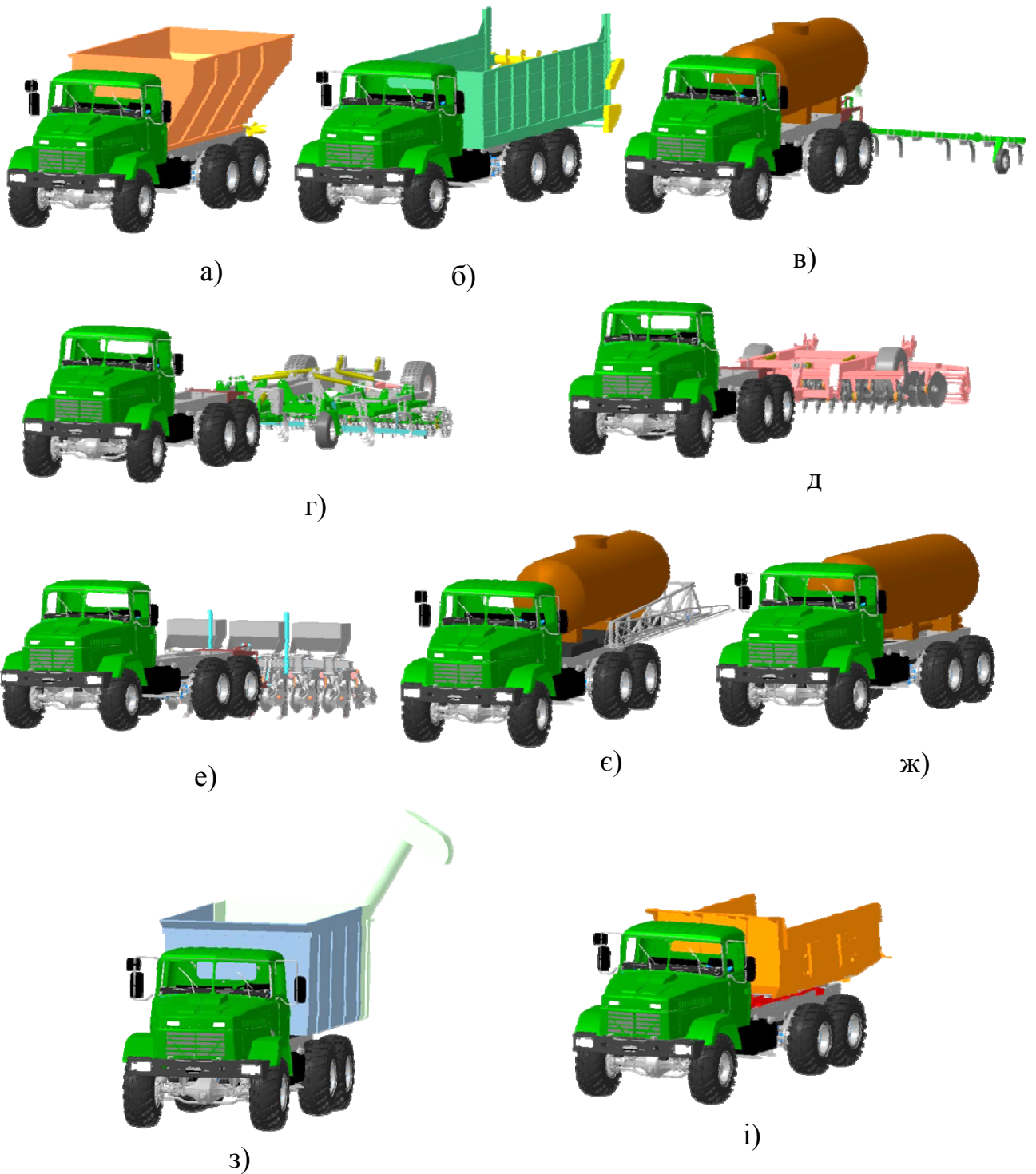
The use of the MEZ-330 "Autotractor" in transport operations is beyond doubt, since it is based on the serial chassis of KrAZ-6322, which is used for the transportation of various types of goods. To determine the efficiency of its use in traction operations in the field, a study of the work of MEZ-330 with soil-aggregates was carried out.

The mentioned researches were carried out with the following variants of assembling of aggregates based on the MEZ-330 "Autotractor" and the 7th housing reversible plow Hektor-1000 (Fig. 3), the 5-body reversible plow XMS950 (fig. 4), the disc harrow Catroc 6002 -2TS (Fig. 5) and the Solitair 9000 seeding complex (Fig. 6). The operational characteristics of the above-mentioned aggregates are given in the table.

Tabl. Performance characteristics of agricultural aggregates, formed on the basis of MEZ-330 "Autotractor" and guns and machines

Parameters	The name of the guns and the machine			
	Plow XMS 950	PlowHekt or 1000	Disc harrowCatros +6002-2TS	Sowing complex Solitair 9
1. Width of capture, m	2,0	2,8	6,0	6,0
2. Depth of cultivation, see	30 – 32	32 – 35	2 – 12	2-12
3. Workingspeed, km/h	10,1	7,5	10 – 12	to 12,0
4. Fuel consumption, l/ha	21,5	25,0	5 – 8	19,5 (on the grain of grain); 11,2 (on the prepared soil)
5. Operational productivity of the unit, ha/h	1,52	1,29	4,0 – 7,2	to 6,2

As can be seen from Table. The fuel consumption of aggregates on the basis of MEZ-330 "Autotractor" provided the depth of cultivation and speed are at the level of aggregates, complete with the mentioned implements and cars and tractors of the corresponding classes.



a) - introduction of solid mineral fertilizers; б) - introduction of solid organic fertilizers; в) - intragastric introduction of liquid fertilizers; г) - pre-planting of soil; д) - lane cultivation and sowing; е) - spraying of crops; ж) - transportation of liquid substances; з) - accumulation and overload of bulk materials; и) - transportation of bulk materials

Fig. 2 - Variants of aggregation ME3-330 for carrying out of technological operations



Fig. 3 - MEZ-330 with 7 hood plow Hektor-1000



Fig. 4 - MEZ-330 with 5 housing plow XMS950



Fig. 5 - MEZ-330 with disk harrow Catroc 6002-2TS



Fig. 6 - MEZ-330 with sowing complex Solitair 9

In addition to the advantages mentioned above, the use of multifunctional ME3-330 "Autotractor" in agroindustrial production has the following advantages:

- high technical reliability of the car chassis in comparison with tractors of domestic production;

- automobile plant PJSC "AvtoKrAZ" has a service of technical service which will reduce the simple technique due to the failure of the car;
- comfortable conditions for the driver's work (modern cab, air conditioning, heating the cabin, etc.);
- high transport speed of the car chassis for crossings and use of its main purpose;
- less cost compared to a tractor of traction class 5;
- cheaper fleet of agricultural machines and implements (body cars will be placed on the frame MEZ-330);
- reduction of pressure on the soil due to the redistribution of the weight of the machine unit on the three axles and the adjustment of the area of the track of the contact of the tire;
- trailed and hauled agricultural machines and tools that are intended for work with a tractor, are aggregated from MEZ-330 without any additional changes in their design;
- an increase in the annual load of MEZ-330 and as a consequence of a reduction in the cost of the work performed by him compared to a car or a tractor.

The high transport speed of the MEZ-330 "Autotractor" makes it possible to use a straight flow system (storage-field) on solid and liquid organic and mineral fertilizers, which will significantly reduce the cost of performing these operations. In this case, the need to use additional technical means for transportation and overload of technological material disappears.

After analyzing the cost of energy in the Ukrainian market (Fig. 7), it came to the conclusion that the MEZ-330 "Autotractor" has the same value as a tractor HTZ-17121 - 1,7 million hryvnias, while KhPZ has a less powerful engine (160 k .with.). The cost of tractors K-744R1 and Fend-936, whose engine power is almost identical to MEZ-330 (330 hp), respectively 1,78 and 3,2 times more than MEZ-330.

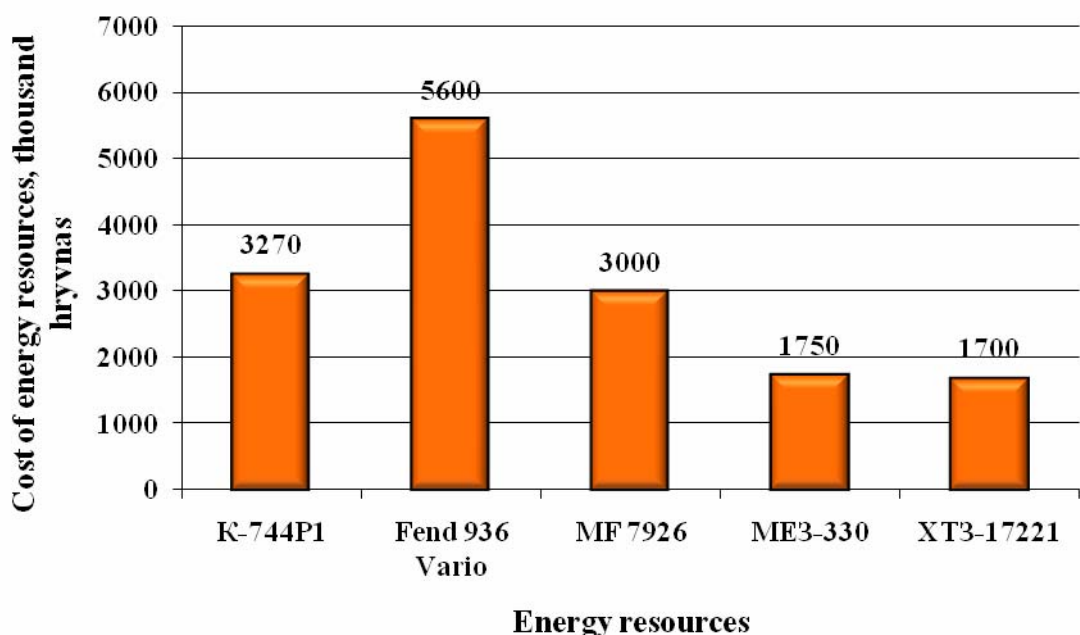


Fig. 7 - Cost of energy resources (as of 01.01.2016)

Conclusions

The use of multipurpose ME3-330 "Autotractor" in agroindustrial production will make it possible to reduce the cost of crop production through the use of direct-flow schemes for the introduction of technological materials, reduce the cost of the technical park and the range of

technical means for carrying out transport operations and increase the efficiency of its use during the year.

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