



INDICATORS OF DETERMINING THE PRODUCTIVITY OF MOTOR GRADERS IN THE NATURAL ENVIRONMENT.

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Annotation: *Motor graders on a pendulum are machines designed for pumping soil and cooling it. Their operation consists of a pneumohydraulic drive located between a pneumohydraulic drive and a pneumohydraulic drive rotating around an axis.*

Key words: *Motor grader, cutting, processing, working equipment, management, technology, work productivity, excavator.*

In the national economy of our republic, road construction machines are of great importance. In the course of construction, new production and industrial enterprises, energy facilities and transport, highways and airfields will be built, and the existing ones will be reconstructed. Excavation works in any field of construction are considered to be performed in the first place. Excavation work is considered labor-intensive, therefore, great importance will be given to the mechanization of excavation work.

Motor graders are divided into light (up to 9 t), medium (up to 13 t) and heavy (up to 19 t) motor graders based on their structural weight, and based on the wheel formula $A \times B \times C$ (where A is the number of driven or idler wheel axles, B is the number of driven wheel axles and C is the total number of axles).

All assembly units and units of modern motor graders (Fig. 1), including the engine 8, the driver's cabin 7 with hydraulic transmission, and the main and exchangeable working equipment of the motor grader are attached to the main frame 4, and the frame is connected to the front axle 18 with steering wheels on one side, and a pair of wheels on the other side. The four-wheeled bridge on the back with a flexible-balanced osmosis is moved to 10.

In order to increase the priority of movement and reduce the turning radius when the motor graders work on different roads, the front wheels can be set to be tilted to both sides.

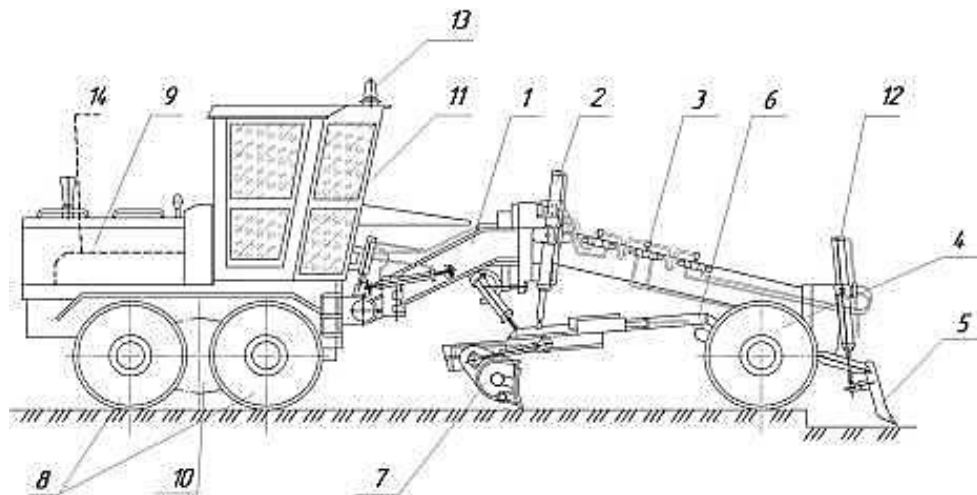


Figure 1. General appearance of the motor grader.

1 - additional equipment the ripper; 2,5 – hydraulic cylinder; 3 – pipeline; 4 – frame; 6 – cabin; 7 – door; 8 – engine; 9 – platform; 10 – cylinder; 11 – balancer; 12 - snow; 13 – transmission box; 14 – transfer; 15 – turning circle; 16 - snow; 17 - send off; 18 - the old cylinder.

The main working equipment of motor graders consists of a traction frame 16, a turning circle 15 and a dozer 14 with interchangeable two-tooth blades. The front part of the traction frame is hingedly connected to the machine frame, and the rear part is suspended on hydraulic cylinders 5, with the help of which the dozer is brought into transport (raised) and working (lowered) position.

In addition to the main working equipment, they are also equipped with additional interchangeable equipment, such as excavator extensions and expanders for pushing and leveling the soil, slats (mounted on the excavator) for leveling the slopes of mounds or pits and cleaning out ditches, and rakes with a width of 930 ... 1400 mm for breaking up road blocks and softening hard soils to a depth of 250 mm.

They are also equipped with a bulldozer and a snowplow with two excavators, which are mounted on the front of the machine and controlled by a hydraulic cylinder 2.

The hydraulic control system of the machine allows you to turn the excavator in the plan along the turning circle by 360°, move the excavator to both sides relative to the longitudinal axis of the machine (up to 300 ... 800 mm), move the excavator to the side when leveling slopes, and also adjust the excavator to various working positions in one go.

The suspension of the motor grader's walking rollers must be large enough for the working body to level the ground in working modes. The suspension of the rollers on the trailing axles is on longitudinal balancers, which is necessary to eliminate the dynamic loads on the frame of the machine when moving on uneven roads and to improve the grip of the rollers on the ground.

Motor graders are manufactured with trailing rollers or all rollers leading. Motor graders with only rear rollers leading are simple in design, easy to manufacture and convenient to operate. In terms of performance, they are no less efficient than motor graders with all rollers leading. The main advantage of motor graders with all rollers leading is that they can move on difficult road sections. Their undercarriage consists of front and rear axles with six rollers that transfer the mass of the machine to the ground through them. The leading rollers create traction when performing earthworks, as well as when moving the motor grader with a load. The last four rollers are not driven, the front two rollers are driven. The semi-axles that transmit the rotational motion and turning torque from the main gear reducers to the leading gear of the balancer are designed to be semi-free or completely free from the bending moment. Mobile carts differ only in the preparation of some elements of the rotation and torque transmission scheme to the wheels.

The mechanism for raising, lowering and extending the roller serves to set the roller in the working or transport position, as well as to change the depth of penetration. It consists of two hydraulic cylinders for setting the roller in the required vertical position and one for extending the roller. The hydraulic cylinder housing is

attached to the lever and the main frame bracket. The cylinder rods are connected to the traction frame by means of ball joints. The traction frame is attached to the main frame by a large ball joint.

Working bodies In light and medium motor graders with hydraulic control, the roller is set in the required position by hydraulics and partially manually.

Additional working bodies of the motor grader are: a rake (smoothing machine) and a bulldozer.

The dozer is used to loosen compacted soil and repair and loosen gravel and stone aggregates.

On medium and heavy motor graders, a bulldozer can be installed instead of a dozer. The bulldozer is controlled by a mechanism for raising and lowering the dozer. On light motor graders, the dozer's dozer suspension is made of pendulum or parallelogram-shaped structures hinged to the front of the main frame together with the dozer's dozer.

To change the angle of penetration, the following operations must be performed:

the dozer must be lowered to the ground so that it rests on the blade;

it is necessary to loosen the nut on the splined coupling, where the output teeth are separated from the teeth of the sectors;

the dozer must be raised above the ground to a height corresponding to the angle of penetration.

Setting the dozer to work on the skids.

The positions of the hydraulic cylinders of the dozer lifting and the hydraulic cylinders of the towing frame when entering from the right side along the course of the grader:

When the angle of inclination is 90° ;

- the right lever is set at an angle of 35° relative to the vertical (clockwise);
- the left lever is set at an angle of 180° ;

- the hydraulic cylinder for extending the towing frame is set to the initial position.

When the angles of inclination are between 40° and 90°:

- the right lever is set at an angle of approximately 65°;
- the hydraulic cylinder for extending the towing frame is hung on the outermost finger of the bracket.

When the inclination angle is from 0 to 40°, the entire working length of the roller cannot be used.

To put the roller in the transport position, the following steps must be performed:

- return the suspension system to its original position;
- raise the towing frame until it touches the main frame;
- turn the roller so that its tip is located directly in front of the front roller;
- adjust the towing frame so that the blade's cutting edge is parallel to the horizontal plane.

In heavy hydraulically controlled DZ-98 motor graders, all operations, except for changing the cutting angle, are performed without leaving the cab.

Calculation of the working capacity of the DZ-98 motor grader in natural conditions



Figure 2. Motor grader DZ-98V9.

The efficiency of the technique is determined by the following formula

$$P_{a/g} = \frac{q}{t_s \cdot K_{PB}} \cdot K_{gr} \cdot K_v \cdot K_T \text{ m}^3/\text{hours}$$

here, q – volume of moving material in front of the roller, m^3/hours ;

t_s – cycle time, sec;

K_{rv} – coefficient that takes into account the fragmentation of the soil during displacement, $K_{rv} = 0,60$;

K_{gr} – the coefficient that takes into account the difficulty of its operation when spreading the soil, $K_{gr} = 1,0$;

K_T – coefficient of transition from technical efficiency to operational efficiency, $K_T = 0,60$;

K_v – worker shift coefficient, $K_v = 0,75$.

$$q = 0,75 \cdot h^2 \cdot b \cdot K_n = 0,75 \cdot 0,71^2 \cdot 4,12 \cdot 0,85 = 1,32 \text{ m}^3$$

here, h – the height of the horse, $h = 0,71 \text{ m}$;

b – width of the dump, $b = 4,12 \text{ m}$;

K_n – loss coefficient in soil propagation, $K_n = 0,85$.

$$t_s = t_n + t_{g.b.} + t_{per}$$

here, t_n – the time it took to push the grunt, hours;

$t_{g.b.}$ – return time, hours;

t_{per} – time taken to lift and lower the gearbox or axle $t_{per} = 0,005 \text{ hours}$.

$$t_n = \frac{l_n}{1000 \cdot V_n} = \frac{8}{1000 \cdot 5} = 0,0016 \text{ hours}$$

here, l_n – push distance when spreading material, $l_n = 8 \text{ m}$;

V_n – the speed of movement in spreading the grunt, $V_n = 5 \text{ km/hours}$.

$$t_{g.b.} = \frac{l_n}{1000 \cdot V_{r.s.}} = \frac{8}{1000 \cdot 10} = 0,0008 \text{ hours}$$

here, $V_{r.s.}$ – reverse speed – 10 km/hours.

$$t_s = t_n + t_{g.b.} + t_{per} = 0,0016 + 0,0008 + 0,005 = 0,0074 \text{ hours}$$

We determine the productivity of the autogreider.

$$P_{a/g} = \frac{q}{t_s \cdot K_{pB}} \cdot K_{gr} \cdot K_v \cdot K_T = \frac{1,32}{0,0074 \cdot 0,60} \cdot 1 \cdot 0,75 \cdot 0,60 = 135 \text{ m}^3/\text{hours}$$

We determine the productivity of the autogreider in one shift.

$$P_{a/g}^S = 8 \cdot P_{a/g} = 8 \cdot 135 = 1080 \text{ m}^3/\text{shift}$$

We determine the number of shifts

$$N = \frac{V_{um}}{P_{a/g}^S} = \frac{19500}{1080} = 18,02 \approx 18 \text{ shift}$$

We define the length scale

$$l = \frac{L}{N} = \frac{10000}{18} = 560 \text{ m}$$

We determine the coefficient of useful work.

$$K_f = \frac{18,02}{18} = 1,0$$

We determine the Working Time

$$T_{w.t.} = 8 \cdot K_f = 8 \cdot 1,0 = 8 \text{ hours}$$

Conclusion: In Uzbekistan, motor graders are one of the main machines in the field of road construction. Motor graders are used to level the ground, level the edges

of the ground, mix the soil, and clear the roads of snow. Motor graders are also used to level the slopes and mounds.

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