The system and method of rotation speed control of wood chipper drive
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The subject of the invention is a system and method for controlling the rotational speed of an internal combustion engine of a wood chipper, performing a control process depending on the operating conditions. The system is intended for the field of technology dealing with the construction and operation of machines and devices in wood waste processing. It can be used in cylindrical shapers driven by a spark-ignition internal combustion engine designed for driving non-road mobile machines, with an electronic injection-ignition system, where the fuel-air mixture control system is equipped with an electrically controlled air damper.

The purpose of the invention is to reduce fuel consumption and quantitative emission of exhaust gases by disintegrating machines characterized by discontinuous operation. Achieving such effects is enabled by the proposed by the authors of the invention of the rotational speed adjustment system of the internal combustion engine, while maintaining full power and torque parameters during the processing. Obtaining a reduction in fuel consumption and quantitative emission of exhaust gases is caused by the introduction of two idle conditions during operation. In contrast to the available solutions, the statuses are activated without maintenance. Optical sensors placed in the feed channel, whose state changes the object to be crushed, are used to obtain the state activation. Detection of the shredding object by the sensor increases the speed of the engine when the engine is idling, enabling the maximum power or maximum torque of the engine and the operating member to be achieved. When grinding is completed, the engine lowers the speed, awaiting the next signal, while generating lower fuel consumption and quantitative exhaust gas emissions.

Operation of the device with a greater adaptation of the drive control process to the operating conditions by adaptive speed control allows to limit the amount of exhaust gas emissions and fuel consumption. The reason for the limitations of emisssivity and fuel consumption is the fact that with constant parameters of other factors regulating the dose of fuel per cycle, the rotational speed increases the number of cycles at the same time.

Another advantageous effect of the system introduction is the limitation of the operator’s function in speed control depending on the operational needs. The operator after starting the engine does not interfere in the control process, he only focuses attention on delivering the machining raw material, automatically activating the function of the control process.

By using the solution according to the invention, the following technical and utilitarian effects have been obtained:
- maintenance-free change of the rotational speed of the internal combustion engine and the operating member depending on the operating conditions (idle or grinding);
- obtaining two idle conditions, by changing the rotational speed, generating a reduction in fuel consumption and quantitative exhaust emissions;
- adaptation to the operating conditions by automatically distinguishing the idle or active state,
- automatic preparation of machine parameters for idle or active work,
- limiting the absorption of the operator’s attention,
- reducing the operator’s stress related to the operating costs of the machine.

An illustrative presentation of the maintenance-free and adaptive wood chipper drive control system includes:
- object sensor in the working space (optical sensor),
- object sensor (optical sensor),
- starter motor,
- engine speed sensor,
- starter driving drive,
- housing of the sensor working space,
- control panel,
- spark-ignition internal combustion engine,
- transmission pulley,
- transmission belt,
- drive pulley (driver),
- belt transmission,
- first starting drive,
- control panel,
- control unit,
- clutch device,
- the internal combustion engine (adiabatic)
- electronically controlled throttle valve,
- air throttle controller.

Three-dimensional nonlinear function of the volumetric efficiency of the motor depending on the rotational speed and engine load.

Fuel consumption in selected operational states, red - carbon dioxide (CO2) emissions, blue - dust emissions, gray - fuel consumption, possibility of increased wear during chipping depending on the workspace.