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A MONITORING SYSTEM FOR PREVENTIVE DIAGNOSTICS OF MOBILE MACHINES IN OPERATING ENVIRONMENTS

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ABSTRACT:
The opportunities for preliminary estimate on the technical state of mobile machines components as well of operating work conditions are analyzed in the paper. It offers for that purpose to use the results got by the intelligent information communicational systems on the estimate on the proficiency-the economic indicators are used to the mobile machines in the course of their use.
KEYWORDS:
monitoring system, technical state, fuel consumption

1. INTRODUCTION

The technical state of mobile machines is taken to be evaluated in fact of their engines, as well their generalized diagnostic parameters. The most frequently used generalized diagnostic parameters are: the tractive power, the effective power, on assessment of the technical state. These parameters integrally reflect the state of control target without the accurate installation to be possible on the diagnosis that associated with placing the bug and establishing the cause of his appearance. In this case it is necessary to passage in element diagnosing with consecutive elementary checks at a state that there is appointment extra checks with the purpose of their localize [4].

Given the necessity of the use of differentiated approach of the option of methods and the instrumentalities for diagnostic procedure places a resource with different function and the dissimilar on elements on the always complexity of the used in our country agricultural and auto transport techniques of a proficiency and the handiness and the scheme, had connected to keeping the operating capability of the products. The group theory, that is modern, and practice about control are associated with a deciding in the technical state on the about control are associated with a deciding in the technical state on the following main tasks therefore [1, 2, 3]:

- Continual control of the critical parameters of the main units and knots that denials and securing automate the machine steer to pathological;
- Continual control to the parameters that reduce the resource of the main units and knots;
- Reading of work off from the last technical servicing TO of the permissible work off until next TO.

An entity in a research in present paper is an engine – D-240 from tractor - TK 80 and it techniques-economic indicators are subject on exploration of particularly

spending as well at different regimes. The purpose of the present work is investigating the possibilities of continuous control of fuel consumption using monitoring systems.

2. EXPOSITION

It is used a system of regime control (Fig.1) for that purpose, developed at University of Ruse in collaboration by company "NiPo-electronics" LTD – Sofia.

The system used information and communications links, that the information is carried away. The controller, mounted in the machine the operate deal with elemental and the data entering, is received from them.

The detectors for measuring the revolution of engine are used, for speed of motion for spending as well to fuel. The received information is given of emitting device in GPRS connection to server to device for taking. The information processes and archive by specialized software. The parameters that are determined are passing –fuel consumption per hour $G_ч$; The cost of 100 kilometers fuel 100; Frequency of rotation of the crankshaft of the engineω, The speed of motion of V; The past drive S ; The temperature, The press and summary – the past drive, quantity of fuel, time of work, time of stay.

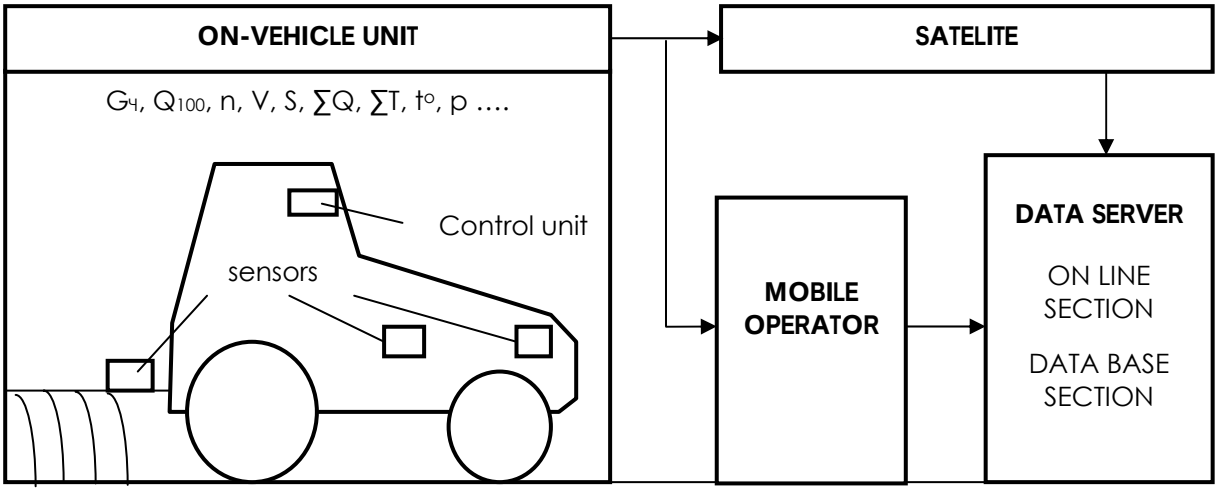

FIGURE1. PRINCIPLE SCHEME OF THE SYSTEM FOR REGIME CONTROL

Some of the above - mentioned parameters as $G_ч$, G_{100} use themselves by as generalizing diagnostic parameters for determining the fleeting technical state of the machine components and systems as well.

It is known that the curves are situated in different technical status of the engines on function in the power $G_ч$ one with respect to other of different degree but the distance between them at all loads in the borders in the regulative branch to the regulative characteristic.

Controlling spending in fuel and power indicators is coincident in special meaning to the engine. That is bound with fact that at uncorrected resource define units, like the piston – cylinder group, the gas separated mechanism, cooling system and others the power indicators are deemphasized on the engine with the comparable manners of work. That decrease of the power was made frequently really by boosting number of nosed fuel from fuel supercharge pump.

In this manner needed power indicators are achieved for charge to the worse frugality to the engines. Diagnostic can be used by as generalizing at different modes work of engine to fuel. That diagnostic parameter gave us the needed news on making decision on a coming or not to element diagnostic for deciding as well localizing the defect or refused. That follows from the fact that the spending on fuel is in function in the

state of large number of the related subsystems with different function and environments of work. That can be expressed with following

$$G_Ч = f(t^o, \omega_н, \omega_{max}, M_В, \Delta_{БЦ}, C_{ХС}, C_{ГРМ}, C_{ВИС}) \quad (1)$$

When t^o is temperature regime of work;

$\omega_н$ and ω_{max} – nominal and maximal frequency of spinning the crankshaft;

$M_В$ – spinning moment;

$\Delta_{БЦ}$ – size of closing section of piston-cylinder group;

$C_{ХС}$, $C_{ГРМ}$, $C_{ВИС}$ – fuel system technical state of gas separated mechanism and suction and discharge systems.

The fuel cost of the idle running to the different high-speed regime is on of the factors, bearing particular information on the state of the separate subsystems. On condition this indicator does not reply to the face values, fixed of maker can serve as signal for a coming to compounded diagnostics on designating the spending in fuel with different manners of work. On condition having essential discrepancies it is needed in the nominal values for us to come out for element it had made of the diagnostics and determining private diagnostically parameters – from easy for the complex, from the greater chance for the less.

For determining $G_Ч$ of engine D-240 of blank move the frequencies to spinning the crankshaft are used above system (Fig.1) as being held attempts with minimal ω_{min} and maximal ω_{max} frequency of spinning the crankshaft. The attempts for three middle points between ω_{min} and ω_{max} as well allocated to the equal intervals to the five multiple reiterate are held so. The results are exposed to Fig.2.

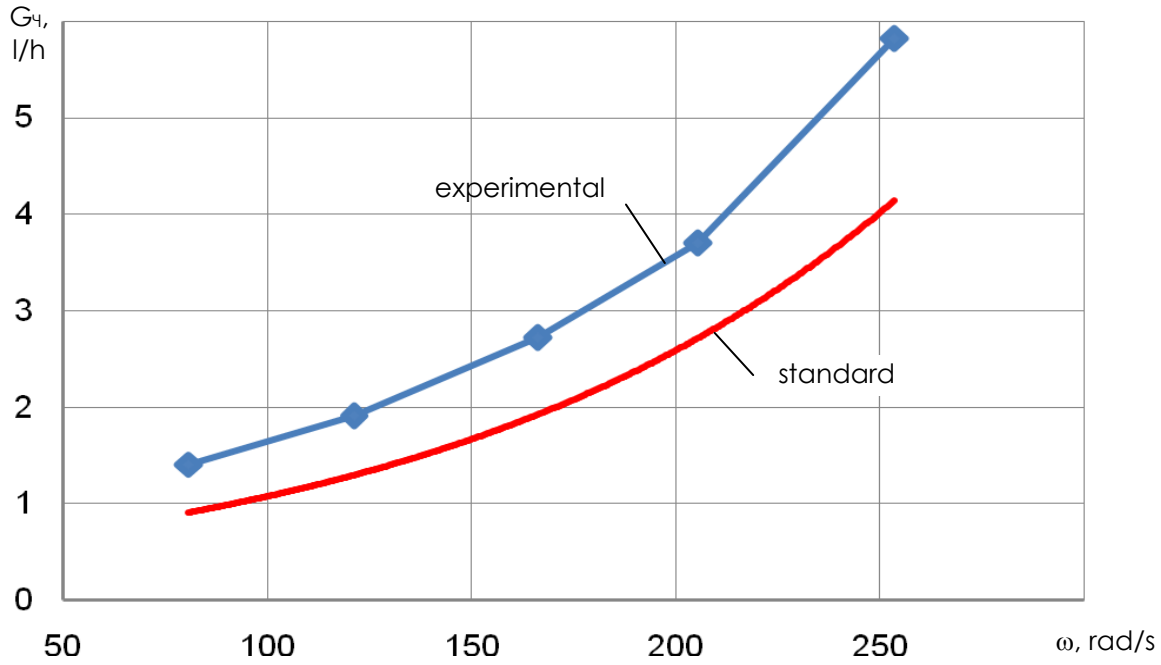

FIGURE2. CHANGE OF FUEL CONSUMPTION RATE PER HOUR FROM THE FREQUENCY OF SPINNING OF THE CRANKSHAFT

The curve of a new engine is being used for comparison, like a standard. Based on the received results it is seen that the fuel consumption respect to standard curve on fuel with nearly 30-50 percent, that is a signal for coming to ingredient diagnostics.

3. CONCLUSION

Using the offered monitoring system for control range of parameters gives opportunity for integral evaluation of the engine status for making decision as well for the ingredient diagnostics on preliminary developed algorithms.

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