Predstavlenы Studies movement dynamics beater zernouborochnoho combine. Studies were conducted for two cases Changed drive points: Constant time drive mechanism; Changing parabolic moment. Installed dependence amplytudы velocity fluctuations beater and engine from zhestkosty drive.

Molotylnыy drum drive, zhestkost, velocity, dynamics.

The research of dynamic motion in threshing drum of combine harvester is conducted. The research was conducted for two cases of change drive point: constant moment of drive mechanism; parabolic changing moment. The dependence of vibration amplitude of speed in threshing drum and engine from drive stiffness is established.

Threshing drum, drive, stiffness, speed, dynamic.

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Thermodynamic processes of friction and wear of structural materials

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In sliding form new streamlined regulatory structure-entropy. This effect can be used to adjust the properties of the tribotechnical. Using the principles of thermodynamics nezrivnovazhenyh processes in open systems proved that the friction pair corresponds to the principles of self-organization.

Energy friction theory, secondary structure, abrasive wear, entropy.

Problem. Wear parts and components business of inevitable natural process and supervising the majority of vehicles, machinery and equipment. Many researchers found that 80-90% of cases, the efficiency of machinery and equipment lost due to wear of moving joints. Fundamentals of modern concepts of friction were laid by such prominent scientists as I. KRAGELSKY, F. Bowden and D. Teybor [1-3], which greatly expanded knowledge of friction, formulated molecular and mechanical adhesion and deformation theory. According molecular-mechanical theory for external friction processes of deformation and damage of contacting surfaces may be closer to a solid surface, which it should form a thin, less sturdy than the basic material, the surface layer

(applied externally or generated by surface friction) , that must be performed normally gradient.

BI Kostetsky and LI Bershad [4-6] put forward the theory of structural adjustment and energy by friction. The theory is that the system adapts itself to the friction conditions by forming secondary structures with properties that ensure minimum energy costs in given conditions.

Analysis of recent research. The need for structural and energetic approach to friction and wear was observed in the works PA Rebinder NN Davidenkov [7,8]. But the real development of structural and energetic approach is in the works BI Kostetskii and Y. Linnik in the energy balance of friction precision kalorymetruvannya [9], and in the writings of AD Dubinin. LI Bershad [6] triathl system is viewed as an open thermodynamic system that exchanges matter and energy with the environment. When driving in triathl system for certain critical value, entropy flow of external influence (load and environment) - formed stable dissipative structures. In triathl technical systems formed various thermodynamic processes, the nature and intensity of which are defined by functional characteristics of TC. Each movable coupling parts and components farm machinery may present as a set of separate elements which are technical staff triathl system with certain relations between them, which form the structure (Fig. 1).

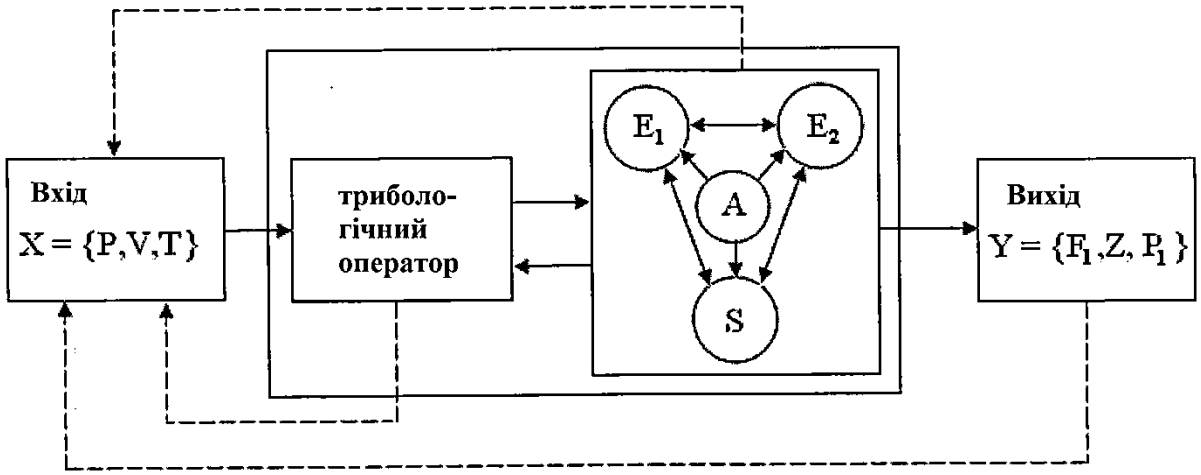

Fig. 1. Structure of the functional action TC: E1, E2 - solids, S - lubricant A - the environment.

External influences (kinetic, dynamic, thermal) play a major role in triathl logical processes are energy and character. Login triathl system is the impact of the environment on the system, including a set of actions mechanical and electrical forces, chemical reactions. Output in TS may be regarded as system response to external stimuli, and as a result triathl logical processes: resistance (strength) friction F1, wear Z, related

processes P1, such as fever friction surface, aging structural materials thermomechanical processes. Tribe technical system can change its functional characteristics in the process, thus changing its state.

Indeed, in terms of thermodynamics friction units generally are not balanced systems, and these systems peculiar phenomenon of self-regulation and self-organization. Units friction under certain conditions can in a state of metastable equilibrium.

The purpose of research is the study of friction and wear of construction materials on the basis of structural and thermodynamic approach and modern ideas about triathl system and processes described by thermodynamics not balanced systems.

Results. The essence of the use of the laws of classical thermodynamics is an idea of the local balance of elements within small areas triathl system. In thermodynamic approach surface layer is seen as an open thermodynamic system which is capable of exchanging energy and matter with the environment. The presence of adsorption processes on the surface of materials makes them similar to the membranes, but unlike conventional membrane systems, the surface layer has also bulky characteristics and thus their own set of characteristics. The use of concepts of thermodynamics parameters of possible use to describe any macroscopic systems change through thermodynamic potentials, adsorption and consider other effects.

In the description wear attempts were made to get the equation of state of the surface layer in the form of general equations of energy balance or balance of entropy. This led to the creation of power models, representing the functional dependence of the wear rate:

$$J = f (U, S, t, ...), (1)$$

where U - internal energy; S - entropy; t - time.

The basis of the thermodynamic approach proposed the following hypothesis:

- In the surface layer of friction material may separate volume in a state of local equilibrium;
- Friction and wear of structural materials can be described by equations of energy balance;
- The rate of wear is controlled by the rate of entropy.

Research and development of power models devoted BV Protasova, B. Kostetskii, AD Dubinin, Y. Linnik, L. Bershad, VV Fedorov, AA Polyakov, SV Panin, G. Poltsera, Porsche AG, H. Fleischer and others. Processes wear at thermodynamic approach is also referred to as mass transfer phenomena. The immediate cause of mass transfer is the chemical potential of local agents and the environment, and the development of mass transport based on the general laws of

thermodynamics, particularly the principle of Le - Chatelier, under which, various external influences that give triathl system out of balance, she initiated processes returning the system to its original state. A common symptom changes in triathl systems is their irreversible, which is reflected in the production of entropy. Entropy is a function of state of matter because its value does not depend on the path of integration, but only on the initial and final state parameters. She, along with temperature and internal energy is an important thermodynamic quantities that uniquely characterizes the system.

Entropy can be defined as. Choose a random equilibrium state of 0 and call it standard. Let some other A-equilibrium state of the system. Consider the integral is taken along a reversible process.

$$S(A) = \int_{\theta}^{A} \frac{\delta Q}{T}. \quad (2)$$

The value of this integral depends only on the states of the system A and does not depend on θ A. As to the provisions recorded, it can be argued that equation (2) depends only on the state of the system A. This function is called entropy state A.

Yes, Gibbs, which shows the dependence of the internal energy U of entropy S, volume V and chemical potentials of the components of a system consisting of various components, we can write for a small area in the form of:μ_K

$$dU = TdS - pdV + \sum \mu_K dC_K \quad (3)$$

where U, S, V-belong to a small area (local importance); Concentrations of CK.

However, there are difficulties in the calculation of local values of internal energy, entropy, and so on. N., As well as values vary depending on the area and time coordinates. This difficulty was possible to overcome by applying the principle of calculation using entropy balance equation for the local areas [10]:

$$\rho\frac{dS}{dt} + Div\, S = \sigma\,[S]. \quad (4)$$

Here the right side of equation σ [S] represents the rate of (production) entropy inside the area. The first term of the left side of the equation $\rho\frac{dS}{dt}$ is the rate of increase of entropy in this area, and the second term of the left part of $div S$ rate of outflow of entropy from the site. With consideration of the entropy balance equation follows fundamentally important conclusion that entropy, as opposed to the total mass and energy can be formed in this area. The reason for its formation can be physical (friction, relaxation) and chemical processes. By definition Hlensdorfa and Prigogine, classical thermodynamics is essentially the theory of fracture structures formation entropy should be considered as a measure of the rate of destruction.

By analyzing the self triathl systems, LI Bershad [5, 6] states that when the system is formed in triathl dissipation heterogeneity of certain parameters, such as temperature gradients, dislocation density, electrochemical potential, concentration of product deterioration. During prypratsyuvannya at a certain critical value of the flow of energy-entropy external influence (load and environment) created new dissipative structures, which are not equilibrium, and sustainable. For open systems, which is a friction pair, the second law of thermodynamics can be written, respectively Prigogine as:

$$dS = S + S, \quad (5) d_i d_e$$

where S ≥ 0 - entropy change within the system, S ≥ 0 - entropy change due to exchange with the environment.$d_i d_e$

Friction pairs must be viewed as passive dissipative structure-system interconnected with the environment, and working under conditions of increasing entropy. Therefore, the destruction triathl system may determine how dissipative phase transition at which the reverse transition from dissipative structures to equilibrium, and accompanied by the growth of their accumulated growth of entropy. Accordingly, in terms of thermodynamics does not return fracture processes in structural material wear is not determined by reverse power dissipation, and combined with the accumulation of entropy in microvolumes. BV Protasova [11] concluded that with a constant flow of energy J = const in the system and constant temperature T0 = const «the rate of entropy» dS / dτ determined only by the properties of the system, describing its thermal resistance:

$$\frac{dS}{d\tau} = (6) \frac{1}{r_{\tau c} + T_0/J}$$

where $r_{\tau c}$ - thermal resistance system.

Development of thermodynamic concepts of friction and wear were asked to AA Ryzhkinym [12], where the scheme based on the energy balance of the separate heat flow friction energy dissipation as essential to wear warm-loaded friction pairs. It is shown that friction should be considered as a set of microscopic (fluctuation) and macroscopic (bulk) energy dissipation processes that are connected to each other. To assess the wear rate used concept entropy criterion destruction derived from the theory of strength following expression:

$$Jh = \frac{(\int_0^{\delta} P[S] - \Phi[S]) dx^2}{P[\delta S] \cdot (S_* - S_0)\, \nu} \quad (7)$$

where P [S] - formation entropy microvolumes contact; P [δS] - the formation of excess entropy; S0 - initial entropy density; S *- critical density of entropy; ν - speed friction; *F*[S] - flow entropy dissipation environment.

The above expression indicates ways to reduce the wear rate,

reducing density material accumulated entropy localization of energy processes in thin surface layer wears my material, the use of materials with a maximum value of S0 or increase this value by different methods (surface hardening, alloying elements with high activation energies). According to thermodynamics, equilibrium processes is not new streamlined structure can occur naturally in the performance of the four necessary conditions, first formulated by IR Prigogine [13]

1) system is thermodynamically open, that can communicate with the environment of matter and energy;
2) dynamic equations of nonlinear;
3) deviation from equilibrium exceeds the critical value;
4) microscopic processes are cooperative (agreed).

Units friction in many cases also meet the requirements of self-organization, and are open thermodynamic system. Units friction and working bodies of machines substance exchange with the environment (active components of the environment and the lubricant, the formation of wear products). This creates conditions for self-equilibrium processes with no mass transfer with the environment.

Conclusions

1. Reliability and durability triathl systems in a large degree depend on the properties of structural materials and their proper choice for given conditions of friction knot.
2. The above analysis work leads to the conclusion that the most promising is the study and description of friction and wear using the methods and laws of equilibrium thermodynamics is not. Friction is always accompanied by dissipation of energy with a set of physical and chemical processes, entropy can triathl system described by thermodynamic criteria destruction of structures.

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When trenyy obrazuyutsya New uporyadochennыe structure with rehulyruemым urovnem entropy. This effect can u bыt yspolzovan for regulation friction characteristics of the contact. Yspolzuya Principles termodynamyky neravnovesnыh processes in systems otkrытыh proven something couple trenyya udovletvoryaet principles of self-organization.

Эnerhetycheskaya Theory trenyya, vtorychnыe structure, abrazyvnoe yznashyvanye, entropy.

At friction new ordered structures with adjustable level of entropy are formed. This effect can be used for regulation of frictional characteristics of contact. Using principles of thermodynamics of noneguilibrium processes in open systems it is proved, that friction pair satisfies to self-organising principies.

Energetics theory friction, secondary structure, abrasive wear, entropy.

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Mathematical model HIDROREAKTYVNOYI blade mixers biodiesel production

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Improved mathematical model to determine the parameters hidroreaktyvnoyi blade mixers in the production of biodiesel.

Biodiesel, hidroreaktyvna blade mixer, viscous environment,