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THE USE OF COMPUTER SUPPORT FOR REGISTRATION AND EVALUATION PROCESS OF FRICTION

The paper presents the possibility of using computer support registration and evaluation of processes of friction. It was discussed the construction and operation of the modernized machine Amsler and describes work rules and the scope of the measurements and registration for the specified parameters of friction and wear of friction pairs.
Keywords: computer support, conditions of friction, wear, Amsler's machine.

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ИСПОЛЬЗОВАНИЕ КОМПЬЮТЕРНЫХ СРЕДСТВ ДЛЯ РЕГИСТРАЦИИ И ОЦЕНКИ ПРОЦЕССА ТРЕНИЕМ

В статье представлены возможности использования регистрации и оценки процессов трения компьютерной поддержки. Об этом шла речь на строительство и эксплуатацию модернизированной машины Амслера и описывает правила работы и объем измерений и регистрации для заданных параметров трения и износа пар трения.
Ключевые слова: компьютерная поддержка, условия трения, износа, машина Амслера.

INTRODUCTION
Computer support in registration and evaluation process of friction

The evaluation of abrasive wear resistance of eutectic materials were carried out on the upgraded Amsler's machine. It is equipped with a measuring system - computer- aided recording [4] with computer support. Designed measuring stand of microprocessor recorder X-Yi Y - t was installed on the machine (Fig. 1).

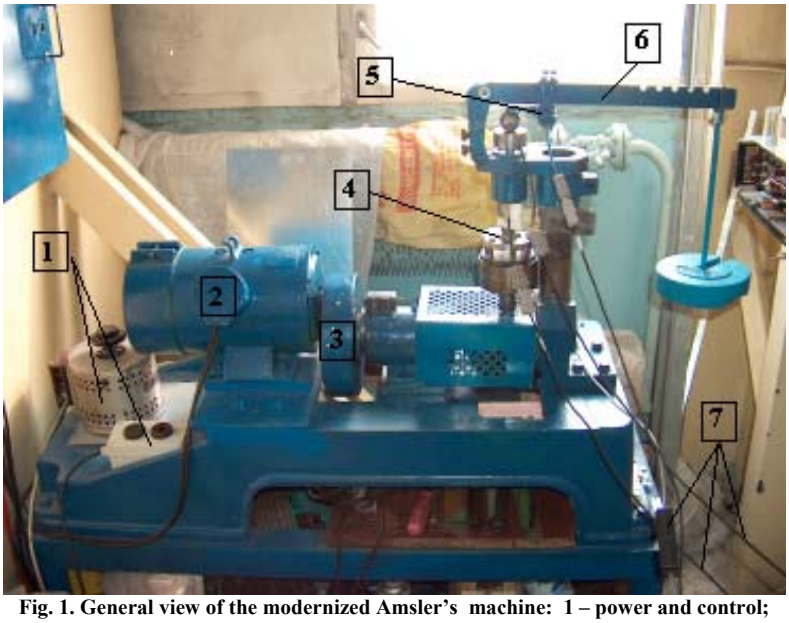

Fig. 1. General view of the modernized Amsler's machine: 1 – power and control; 2 – electric motor; 3 –planetary gear; 4 – head test of friction torque sensor; 5 – load force sensor; 6 – loading arrangement; 7 – connection to a capture measuring and recording system
Source: Authors' own elaboration

Figure 2 shows a diagram of the modernized Amsler's machine and the measurement system.

Designed and made head of research of friction torque sensor enables the study of friction process diagram pin - shield (pin of disk). There is a possibility to analyze a single, three or more samples [1].

The register measurement system (Fig. 2) admits monitoring of parameters such as:

- clamping force;
- the relative speed of the pair of friction;
- distance of friction ;
- friction torque;
- size of the linear wear.

Carrying out measurements of the parameters established in the friction is to use a strain gauge measuring and replacement of the mechanical system - the electronic circuit. The drive is realized by a DC motor with adjustable output shaft revolutions [3].

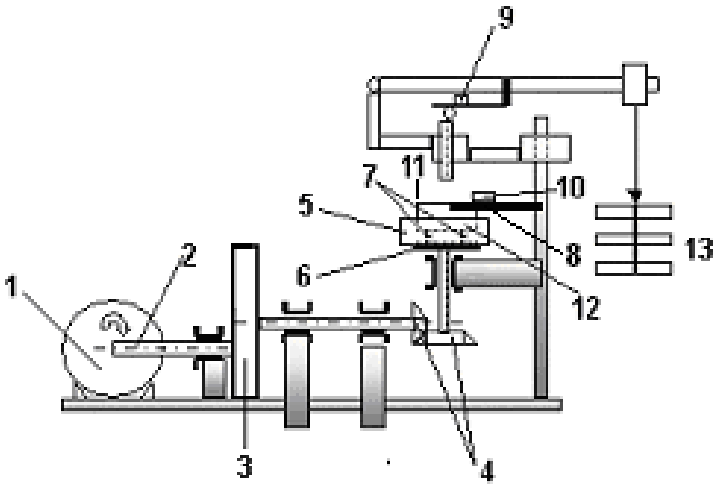

Fig. 2. Diagram of the modernized Amsler's machine and the measurement system: 1 – direct current motor; 2 – main drive wheel; 3 – planetary gear; 4 – bevel drive; 5 – head of research; 6 – counter specimen (shield); 7 – sample (the test material - pin); 8 – frictional torque sensor; 9 – sensor down force; 10 – friction force sensor; 11 – sensor linear wear; 12 – temperature sensors; 13 – load on the pin - shield

The measuring system of the register in which the machine is equipped with modernized Amsler (Figure 1, 2, 3) is equipped with a measuring system - recording with a computer program, and is called the Tribol 1.

The program Tribol 1 is used for measurement recording speed head and seven analog value and convert them into digital data using computer data recording. It has eight measurement channels [2].

Fig. 3. The register measuring system Source: Authors' own elaboration

Channel 0 cooperates with reluctance digital sensor and is used to measure rotational speed of the head in the range of 15 to 1000 rev / min. Measurement resolution is 0.25 rev / min. The speed range can be increased while increasing the resolution [6].

Channels 1–7 are used to measure and record the current analogue signals with standard values from 4 to 20 mA, may cooperate with sensors and transmitters, of which the output signal is a current of a specified range of values (eg. strain gauges, force, temperature, pressure, flow, or other size).

In the standard version to the next channel assigned to the measurement values of the following values:

- Channel 1 - measurement of the friction torque;
- Channel 2 - measurement of the force on the sample;
- Channel 3 - measurement of linear wear samples;
- Channel 4, 5 and 6 - temperature measurements;
- Channel 8 - not used.

It's possible to change the size measured in these channels after appropriate declaration in the use of measurements [5].

The measured analogue signals are converted to digital signals in 12-bit analogue-to-digital. The performance of measurement is controlled by the internal clock generator built with the measuring device. The number of measurements made in one second reference is a computer program operating measurements by forecasting the duration of the test. Adopted the maximum number of measurement equal to 100 measurements per second in eight channels, and the maximum number of measurement points equal to 2000 each channel.

Measurements, data recording and playback, as well as graphical or tabular presentation of the results of measurements is supervised by special service program "Triprog 1".

The program can perform the following procedure (Fig. 4):

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¦ MEASUREMENTS ¦
¦ READING FROM DISK ¦
¦ PARAMETERS OF DIAGRAMS¦
¦ GRADUATION ¦
¦  SIMULATION ¦
¦ END OF WORK ¦
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Each of the procedure has its own functions. The choice of procedures and functions with the arrow keys and press "Enter." Choosing or reference values the program make it easy on-screen messages.

Procedures: GRADUATION and SIMULATION are used to scale the device and testing program.

Functions of procedures MEASUREMENTS (Fig. 5):

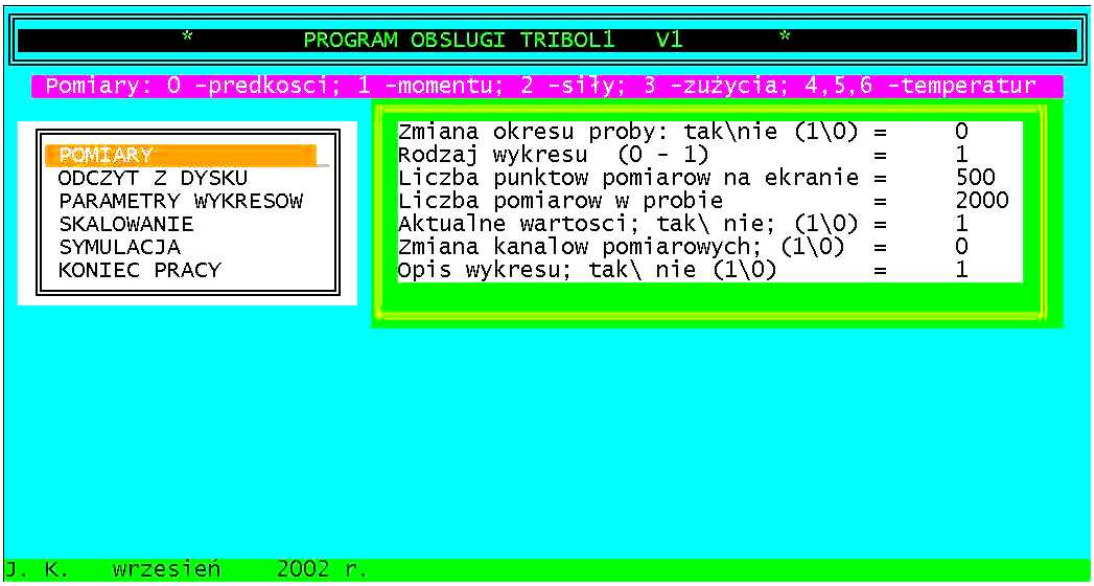

Fig. 4. The procedures carried out by the program Tribol 1
Source: Authors' own elaboration

1) function of "Changing the sample period: yes \ no (1 \ 0)"

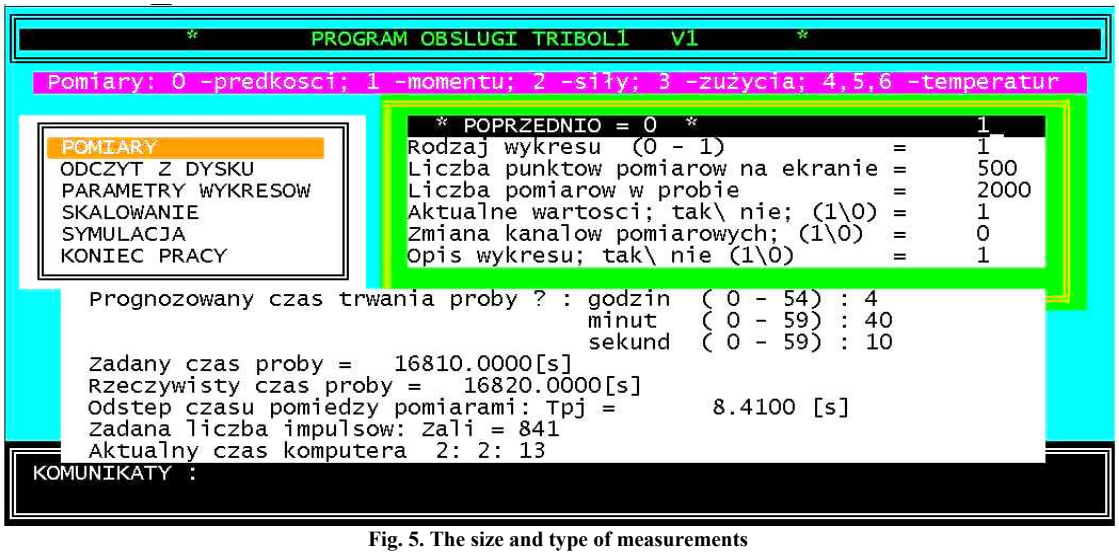

Fig. 5. The size and type of measurements
Source: Authors' own elaboration

After selecting the function of "Change of the sample period," you have to enter the number of hours, minutes and seconds of the projected duration of the test. The computer calculates the specified test time in seconds and takes real time equal to the set, or slightly larger, so as to share it with the rest of the product of the clock period timing and number of measuring points [6].

When the frequency of the clock generator fG = 100 Hz and the maximum number of measurements in a series of equal 2000 accepted the actual minimum sample time is thus 20 seconds. The screen is also visualized the time interval between consecutive measurements (TPJ) and the number of counted pulses to the initiation of measurement (Zali).

Functions of procedures PARAMETERS OF DIAGRAMS (Fig. 6):

1) The function of "Active"

Entering a value 1 in the column with the specified number means that the graph of the measured values in the channel with this number is displayed on the screen. This allows you to display waveforms values from one or more channels on a single graph.

2) The function of „Color"

Entering a number describes the colour of which will be determined chart the course of a given channel. The colour codes show the auxiliary table (Fig. 6).

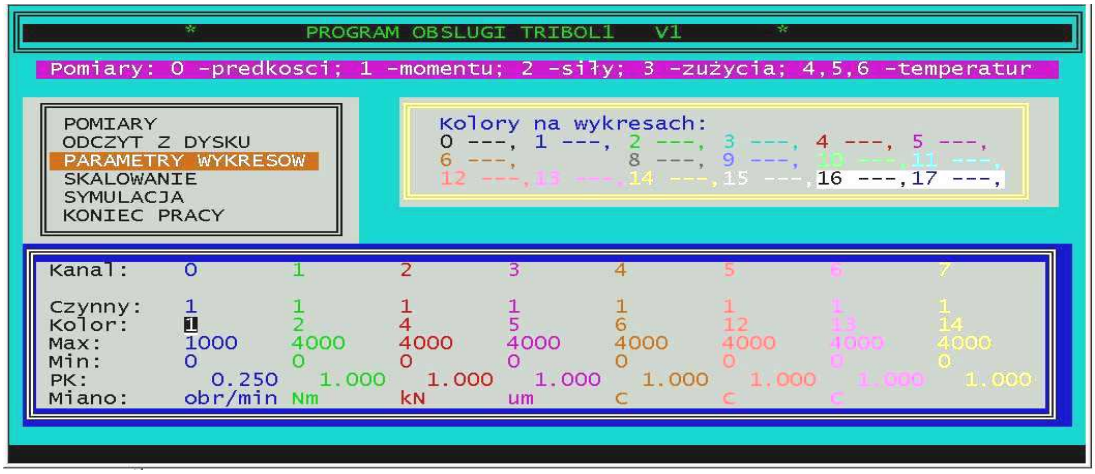

Fig. 6. The parameters of graphs
Source: Authors' own elaboration

3) The function of „Max"

The value of this function defines what the maximum measured value of the channel has to fit on the graph. This feature, together with the "Min" allows you to "stretch the graph vertically." Entered values must be integers in the range from -32768 to + 32768.

4) The function of „Min"

The value of this function defines what the minimum measured value of the channel has to fit on the graph. Entered values must be integers in the range from -32768 to +32768.

CONCLUSION

Discussed in this article and upgraded test stand friction processes on the basis of the Amsler's machine enables practical use in a wide range of loads and conditions of friction (dry, border or other) analysis of the process of sliding friction. This means the possibility of research on consumption [PN-82 / H-04332] specific materials or diffusion layers and protective coatings and technical test piece friction pairs using computer support, as monitoring the process of friction.

Manufactured and used in the research process friction measuring and control system implemented using the program Tribol 1 for obtaining data such as force parameters, the relative speed of the pairs of cutting road friction and wear size line. The resulting data through the use discussed the use computer support for their description and analysis can we get in tabular or already finished graphs variability of parameters studied.

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