Method for Determination of Mechanical Life of Electric Machines

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Abstract: **This paper presents a method for determination of residual life of electric machines. The method is based on the cumulation of data base by means of microprocessor system and its consequent processing through relevant mathematical facility.It also allows to be hooked up to computer networks.**

I. INTRODUCTION

With the higher specification requirements in terms of machine structure and performance , the methods for control and diagnostics which employ both nondestructive and operation-without –interference techniques, are gaining greater importance. Trouble free operation of the machine under investigation is indicative of the capacity of the electric machine to sustain its serviceability during its operating time which is measured in work hours. Diagnostics in this case aims at foreseeing possible breakages which will help eliminate consequent breakdowns and ensuing cost of repair. Electric machines diagnostics is automatically carried out over various time intervals which depend on the individual machine features and relevant estimation of results. The aim here is to obtain information about the physical condition of the machine by using its electrotecnical parameters.

Control over bearings would be of no use if the machine failed. Accordingly, disturbances are not to be merely accepted, but the underlying reason should be eliminated.

II. EXPLANATION

Fig. 1 shows the suggested device by means of which information is obtained concerning electric current fluctuations during machine operation as well as its harmonious content (see Fig.2)

This information is obtained by means of electric current pliers with standart interface coupled with a microcomputer. Database is extended by including information about the change in rotation frequency and temperature (see Fig. 3) during operation. This is achieved by employing a special device built with a single chip microprocessor which is connected to the microcomputer through interface RS 232.

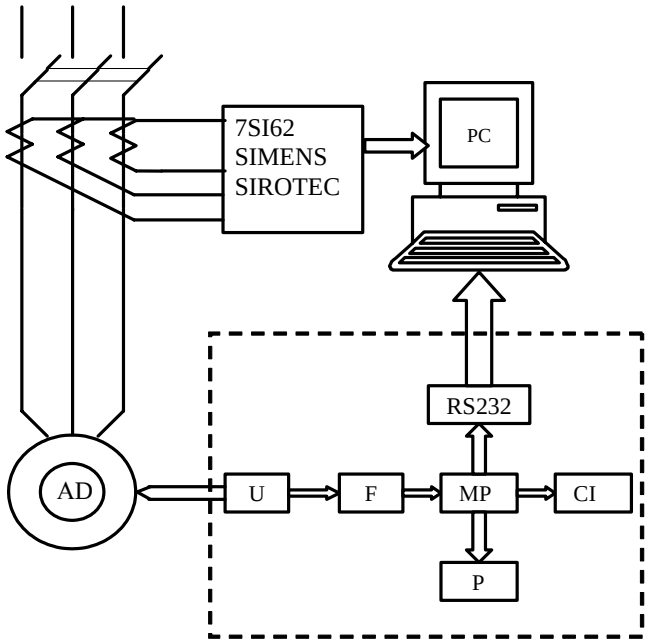

Fig. 1

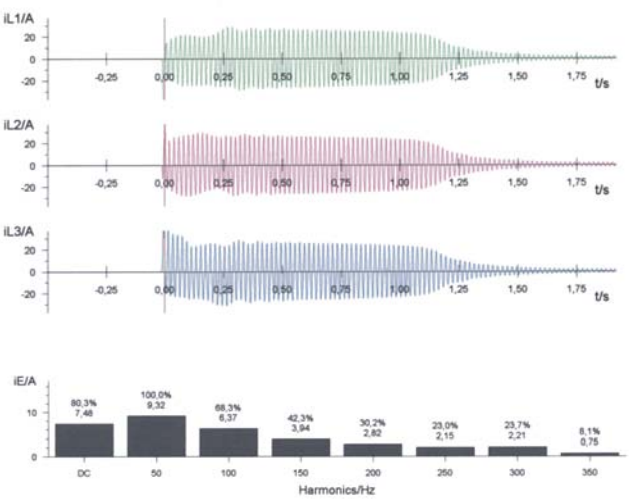

Fig.2

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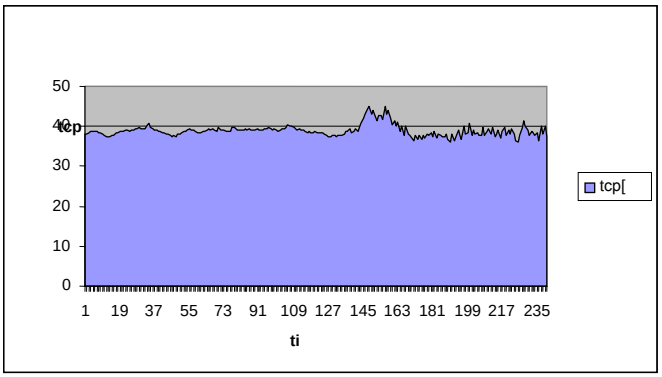

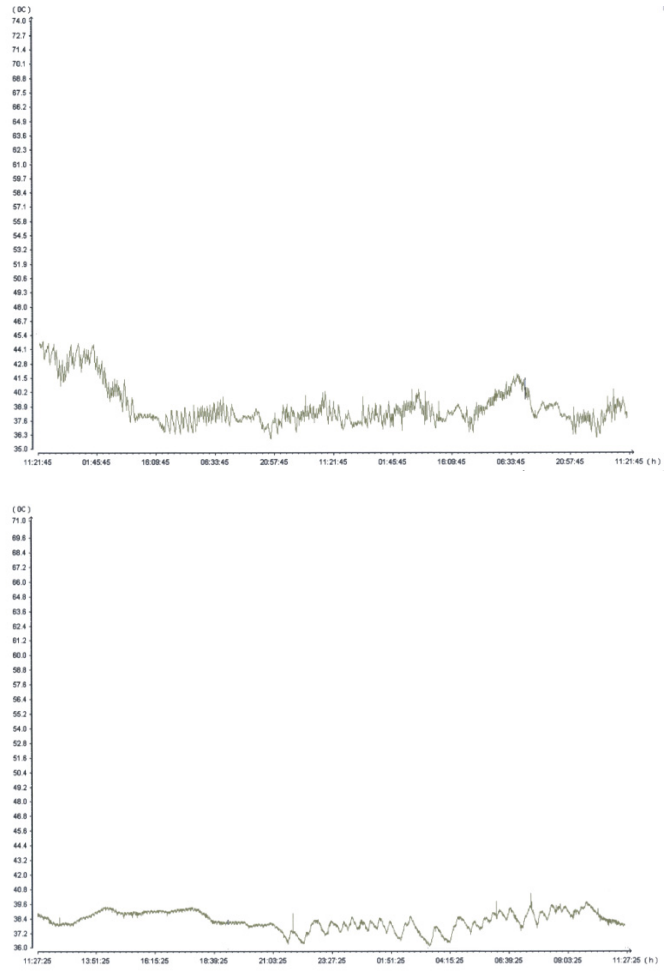

Fig. 3

Input entries of values include technical parameters quoted in the machine catalogue such as diameter and length of shaft, air gap, height etc and, also, rated power, rated frequency of rotation, rated current and rated moment. Fig.4 shows the variation in the effective value of current recorded over a definite period of time. All investigations were carried out on electric motor featuring the following parameters:

P_H = 7,5 kW;
n = 2880 min^{-1};
U_H = 380/660 V;
f = 50 Hz;

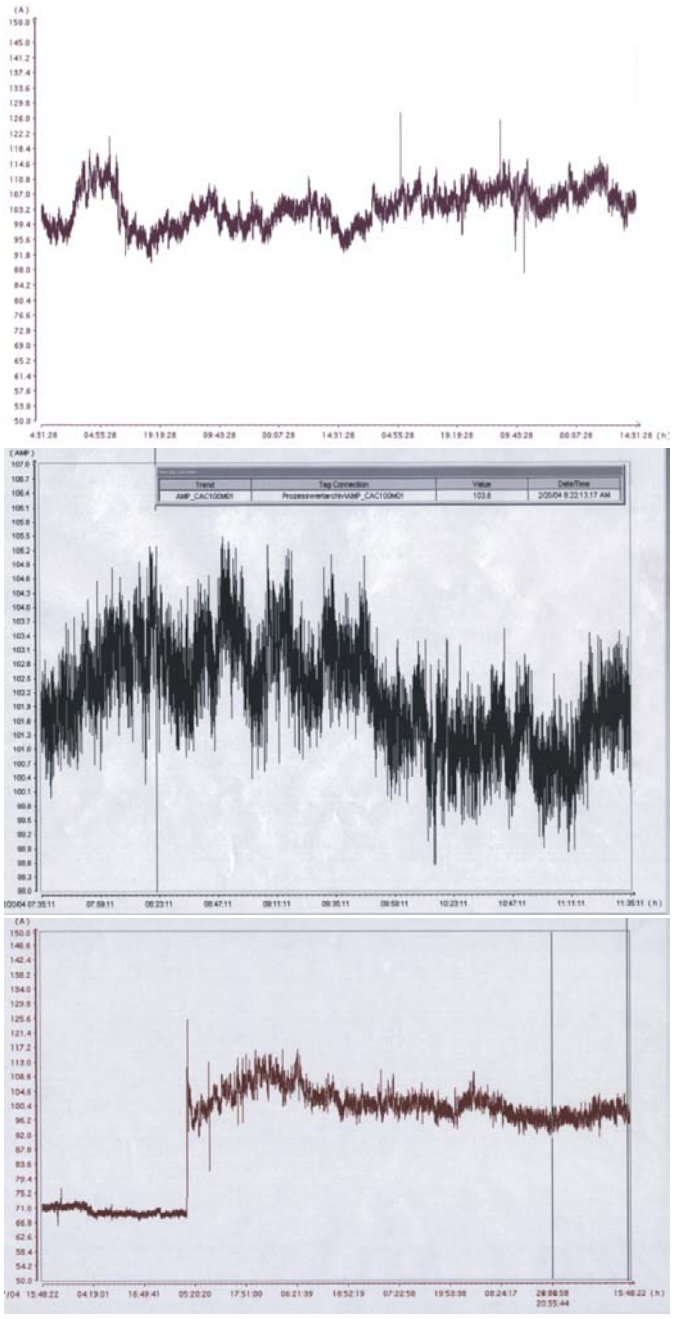

Fig.4

I_H = 14,7 A;
cosφ = 0,89.

The electric motor is supplied through a frequency converter to ensure smooth switch -on and off, however, the nonsinusoidal character of the current causes overheating of insulation. Fig. 2b presents the harmonic analysis of the current whereas Fig.5 shows the readings related to to the residual service life of the electric motor.

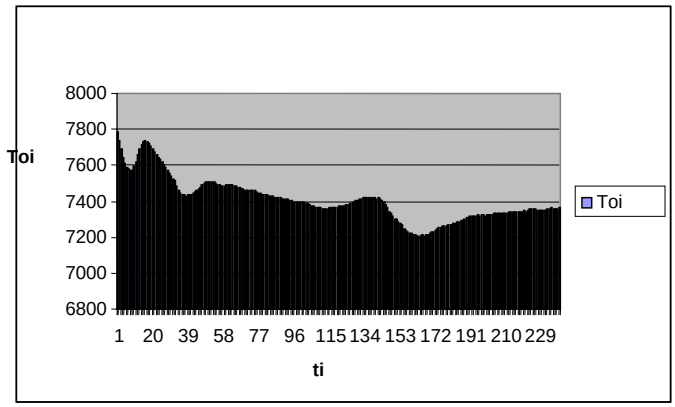

Fig.5

III. CONCLUSION

Proper determination of service life of any electro-technical unit appears to be a very important feature of its existing rate of operation.All technical procedures conducted in connection with machine maintenance would ensure longer operation time and fewer overhauls. This method of control of bearings does not affect machine operation , allows to build up data arrays without interrupting its work and requires no special attending.Feasible inclusion in a network of a number of investigated units enables minimal attending staff to carry out unbiased and precise predictions of possible failures in them. A USB cable could be used to transfer the information to a central computer which controls a certain type of manufacture thus considerably reducing maintenance and wear and tear cost.

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