TEST BENCH FOR RELUCTANCE SYNCHRONOUS MOTORS

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Abstract **– In this paper frame a test bench for reluctance synchronous motors is presented. The connection schemes corresponding to the steady state and dynamic regimes are detailed. The acquisition program, special designed and carried out, is also presented. The paper ends with a few suggestive experimental results.**

Keywords: reluctance synchronous motors, test bench, steady state regime, dynamic regime, data acquisition.

1. INTRODUCTION

The problem of the experimental determination of the electrical machines behaviour, in general, and of the reluctance synchronous motors, in particular, is obviously a present one. It has got other dimensions when the data acquisition boards have been produced.

Such a data acquisition board is the weight center of the test bench which will be presented further on. It is an analogical and digital interface which is assembled inside the computer. The sampling frequency can be modified by the program up to 100 kHz.

2. HARDWARE DETAILS

In order to obtain the characteristics of RSM, in steady state regime, the following connection scheme has been used.
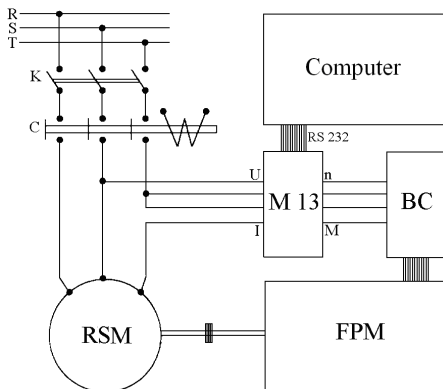

Figure 1: Experimental scheme for the operation characteristics determination.

The used notations have the following meanings:

RSM – reluctance synchronous motor;

M 13 – digital multi-meter;

FPM – magnetic powder break;
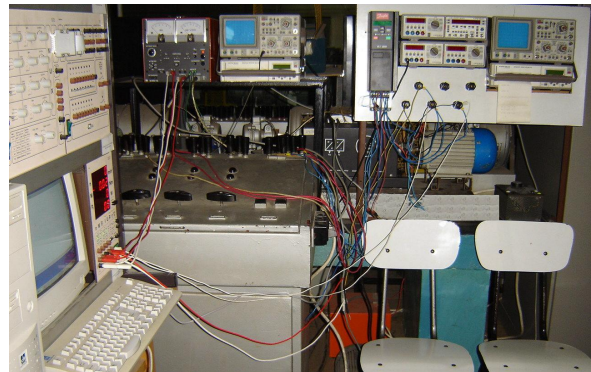
BC – break command block.
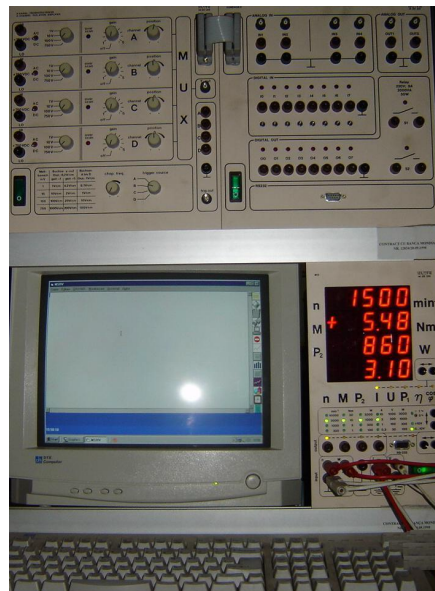

Figure 2: Photography of experimental scheme.

Figure 3: Detail of experimental scheme.

In order to obtain the determinations in dynamic regime the experimental scheme depicted in the following figure has been carried out, having an acquisition board DAS 1601 as central element.
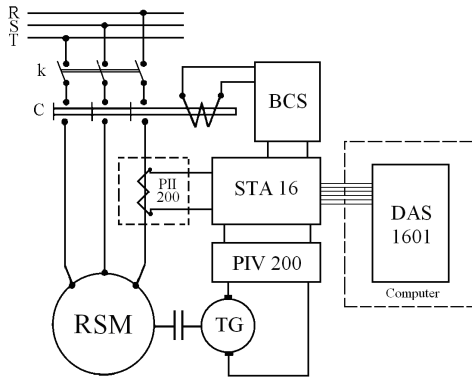
Figure 4: Experimental scheme.

The significances used in the previous figure are the following ones:
- RSM – reluctance synchronous motor;
- DAS 1601 – data acquisition board;
- STA 16 – connection block;
- PIV 200 – voltage divider;
- BCS – command and synchronizing block;
- PII 200 – current transformer with Hall sonde.

3. ACQUISITION PROGRAM

An original program has been conceived in Visual Basic for acquiring and processing the obtained data.
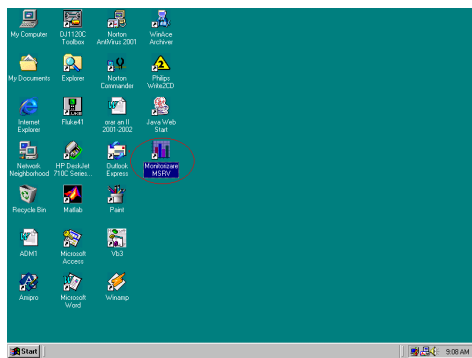This program can be run by a double click applied on the pictogram placed on the desktop (figure 5).

Figure 5: Desktop.

When running the program, the presentation cover of the program appears on the display (figure 6).

Figure 6: Window „Coperta".

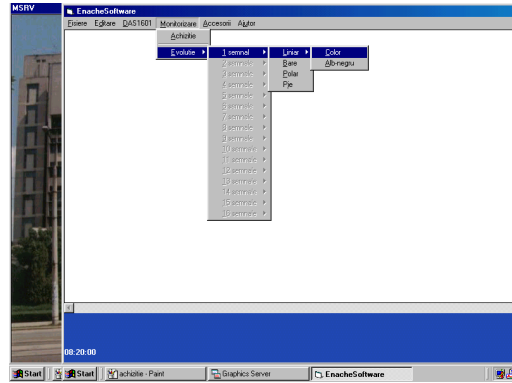The main windows of the program are detailed in the figures 7-15.

Figure 7: Window „Meniu".
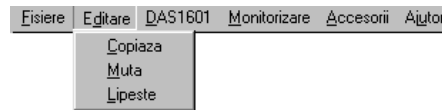

Figure 8: Detail menu „Fisiere".
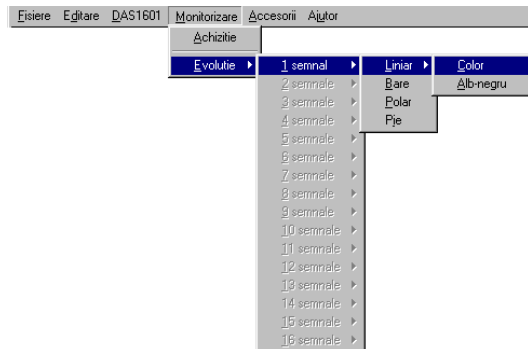

Figure 9: Detail menu „Editare".
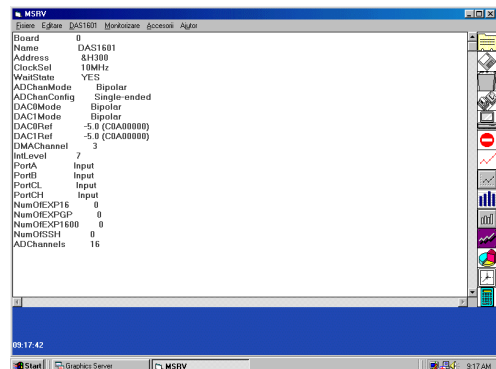

Figure 10: Detail menu „Monitorizare".

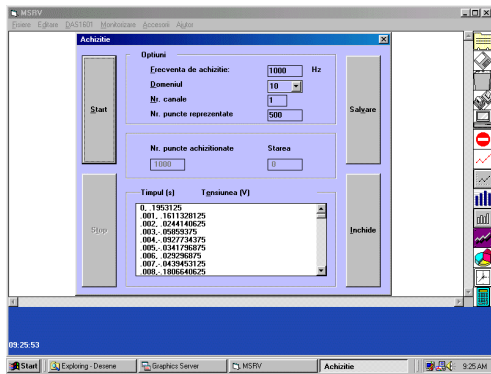Figure 11: Window „Configurare".
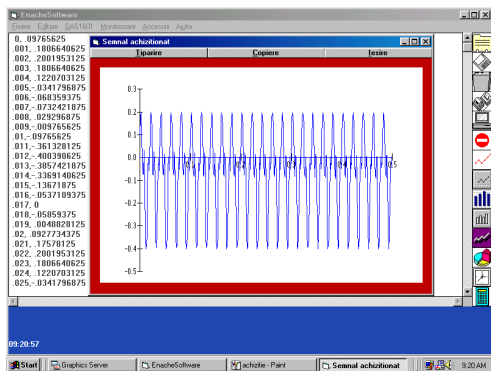
Figure 12: Window „Achizitie".
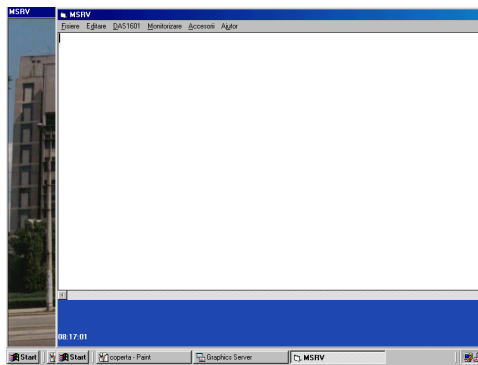

Figure 13: Window „Semnal".
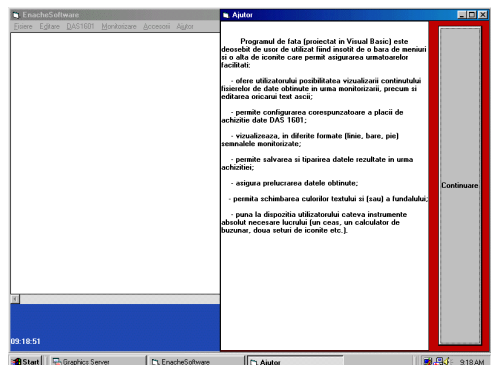

Figure 14: Window „Editare".

Figure 15: Window „Ajutor".

This program has many facilities:
- allows the configuration of the data acquisition board;
- ensures the acquisition corresponding to the dynamic signal we want;
- allows the visualization in different forms (line, bars, pie) for the acquired signal;
- allows to edit the files ASCII of the obtained data;
- allows to save and to type data;
- ensures the access to a series of accessories useful during work (pocket computer, clock);
- allows the configuration corresponding to the work interface (background and text colour, text dimensions, icons on the desktop);
- ensures the work aided by a help window.

4. EXPERIMENTAL RESULTS

The following characteristics in steady-state regime have been obtained with the help of the scheme from the figure 1.
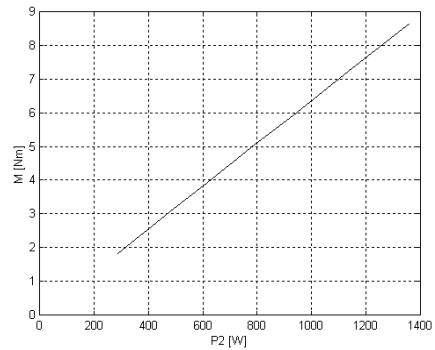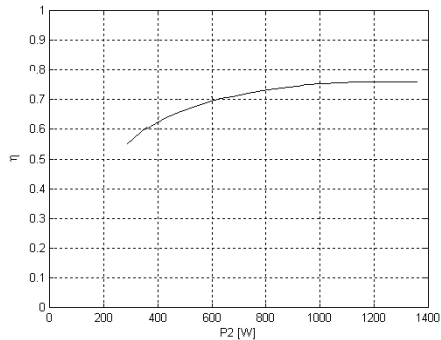

Figure 16: $M = f(P_2)$.
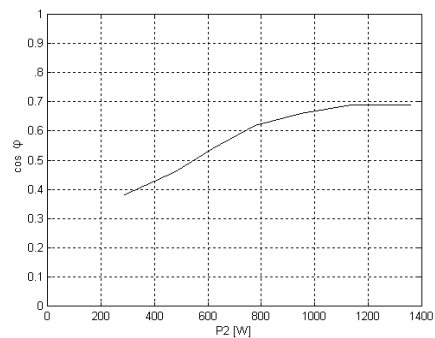

Figure 17: $\eta = f(P_2)$.
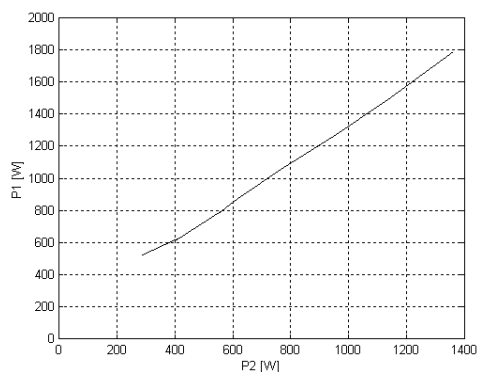

Figure 18: $\cos \varphi = f(P_2)$.

Figure 19: $P_1 = f(P_2)$.

A series of characteristic in dynamic regime have been obtained with the help of the bench depicted in the figure 4. The speed and the phase current dependence during the transient regime of asynchronous starting are depicted further on.
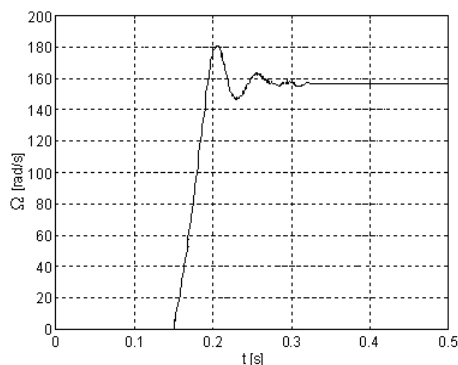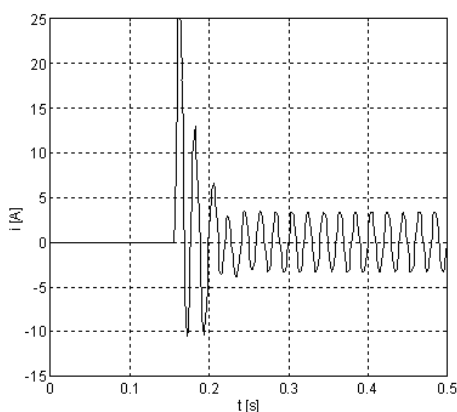

Figure 20: Speed variation.

Figure 21: Current variation.

4. CONCLUSIONS

The following conclusions results from the ones presented before:
- the bench allows the analysis of the reluctance synchronous motors behaviour both in steady-state regime and in dynamic regime;
- the bench is a fast, smart and economic variant for monitoring these motors;
- the obtaind results are confirmed by the speciality literature.

References

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