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# THE VARIATION OF THE ROTORICAL PARAMETERS IN COMPARISON WITH THE FREQUENCY AT THE INDUCTIVE (ELECTRIC) MOTOR

**Abstract:**

*In this paper it is shown the variation of the rotor resistance $R_2'$ and the dispersion reactance $X_2'$, magnitudes reduced at the stator in coparison with the charge.*

## 1. INTRODUCTION

The determination of the charging work characteristics is done, if we know all the parameters from the equivalent scheme in „T", for the inductive (electric) motor, shown in figure 1.
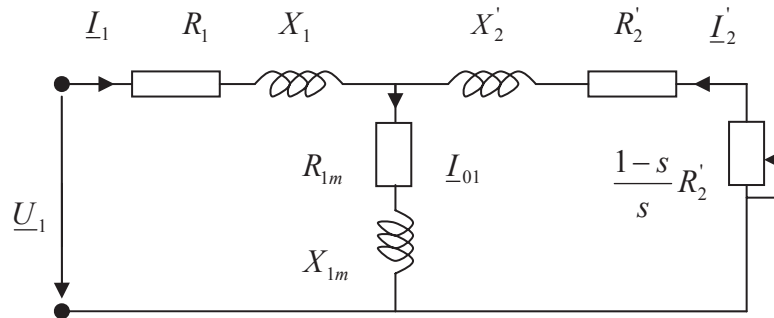


**Fig. 1** Equivalent scheme in „T" for the inductive electric motor

The parameters for the sketch below are:

$R_1$ – the resistance of the statorical phase winding;

$X_1$ – dispersion reactance of the statorical phase;

$R_{1m}$ – magnetizing rezistance;

$X_{1m}$ – magnetizing reactance;

$R_2'$ – the resistance of the rotor winding, reduced at the stator;

$X_2'$ – the dispersion reactance of the rotor winding, reduced at the stator.

In many simulations, the parameters are treated like to be steady at a frequency of $f_1$=50 Hz.

These suppositions make that the final results given by the machine model, in a certain regime, clear-away from reality.

To take into account the influence of the rotorical frequency $f_2$, on the rotorical parameters, improve the machine model, based on the equivalent scheme in „T". We try to improve a new modality to find out which of the rotorical

parameters are implicit functions to the rotorical frequevency. These determinations are made on the short-circuit evidence at a variable frequency [1], [2].

In the mathematical relations of the resistance and reactance we introduce the corrective coefficients:

$$R_2'(f) = C_R R_2' \tag{1}$$

$$X_2'(f) = C_X X_2' \tag{2}$$

where:

$$C_R = \frac{A_1 S_r + B S_x}{R_2' \left( S_r^2 + S_x^2 \right)} \tag{3}$$

$$C_X = \frac{B S_r - A_2 S_x}{X_2' \left( \dfrac{f}{50} \right) \left( S_r^2 + S_x^2 \right)} \tag{4}$$

$$A_1 = R_2' R_{1m} \left( \frac{f}{50} \right) + X_2' X_{1m} \left( \frac{f}{50} \right)^2 \tag{5}$$

$$A_2 = R_2' R_{1m} \left( \frac{f}{50} \right) - X_2' X_{1m} \left( \frac{f}{50} \right)^2 \tag{6}$$

$$B = R_2' X_{1m} \left( \frac{f}{50} \right) + X_2' R_{1m} \left( \frac{f}{50} \right)^2 \tag{7}$$

$$S_r = R_2' + R_{1m} \left( \frac{f}{50} \right) \tag{8}$$

$$S_x = X_2' \left( \frac{f}{50} \right) + X_{1m} \left( \frac{f}{50} \right) \tag{9}$$

In this relations $R_2'$, $R_{1m}$, $X_{1m}$, $X_2'$ are coresponding to a nominal frequency ($f_1$=50 Hz).

## 2. EXPERIMENTAL PARAGRAPH

We consider a triphases asynchronous motor, with a nominal power $P_N$=4 KW at 1500 rot/min, supplies by a nominal voltage $U_1$=220 V.

The electrical parameters found-out on the schort-circuit evidence and discharge working regime at a frequency of 50 Hz are next:

$$R_1 = 1,694\Omega; \quad R_2^{'} = 1,124\Omega; \quad R_{1m} = 3,690\Omega;$$

$$X_1 = 2,323\Omega; \quad X_2^{'} = 2,529\Omega; \quad X_{1m} = 59,410\Omega.$$

In figure 2 it is shown the variation of $C_R$ and $C_X$ coefficients in comparison with the rotorical frequency.

In figure 3 it is shown the rotorical impedance deviation, to rotorical impedance at a frequency of 50 Hz.
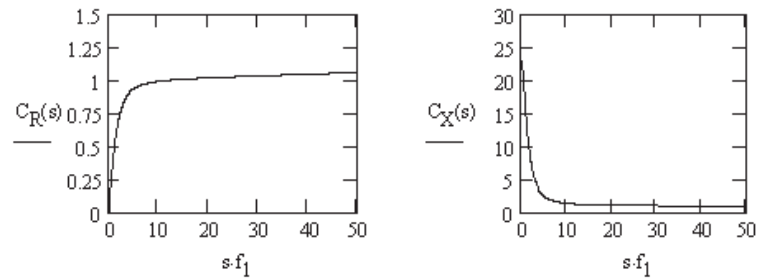


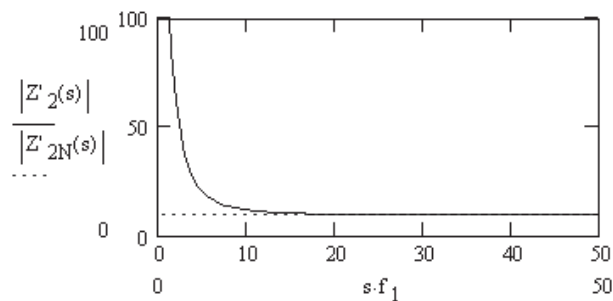**Fig.2.** The variation of $C_R$ and $C_X$ coefficients.



**Fig.3.** The rotorical impedance, to frequency.

## 3. CONCLUSIONS

The corrective coefficients $C_R$ and $C_X$ that we introduce in the relations (1) and (2) have major variations, from 0÷10 Hz.

In figure 3 $Z'_{2N}$ is the value of the rotorical impedance is calculated at the nominal frequency.

As we have already expected important variations of the rotative impedance are at low frequency from 0÷10 Hz.

## REFERENCES

[1]. Dordea, T.  *Maşini electrice.* Editura ASAB, 2002.
[2]. Biriescu, M. *Maşini electrice rotative.* Editura de Vest, 1997.