ABOUT THE MAGNETICAL CHARACTERISTICS OF THE SYNCHRONOUS MOTOR, PROPOSED IN ACTIVATING THE CONVEYORS FROM THE LIGNITE MINE SHAFTS

Cozma Vasile
"Constantin Brancusi" University Tg-Jiu
Tg-Jiu 1400
Romania

Orban Maria Daniela
University of Petrosani
Petrosani 2675
Romani

ABSTRACT
In this paperwork, the authors present the results obtained by making a program in the Borland Pascal language, to obtain the partial magnetical characteristics, used to determine the excitation solenation at nominal duty of the synchronous motor with appearing polls and in the combined variant, proposed in activating the transport tools from the lignite mine-shafts. This is done in the purpose of implementing some new types of controllable activations mend to contribute at reducing the electrical power consumption of the tools mentioned above, according with the realizations obtained in this way by the countries with tradition and experience in the domain of the extraction, transporting and depositing the useful and sterile.

1. INTRODUCTION

For activating the large capacity belt conveyors from the mine shafts is proposed the synchronous motor with the rotor in the constructive combined variant, with longitudinal-transversal silencer completely made from Cu-Cu, with the following nominal data's: 777,4 kVA/630 kW, 6kV, 1000 rot/min. (fig. 1)

In the purpose of quick determining the magnetical characteristics, the program determines the main dimensions of the motor, the electrical and magnetical solicitations of the motor, the parameters of the notches and the windings, establishes the values of the magnetical tensions in different portions of the magnetical circuit (in the main inter-iron, in the teeth and in the ladle shank of the stator, in the big tooth of the rotor, in the area of the rotorical notches and in the inductor's ladle shank)

A

A

Section A-A

Fig. 1 Synchronous motor with rotor in combined constructive variant

2. THE CONSTRUCTION OF THE MAGNETICAL CHARACTERISTICS AND DETERMINING THE SOLENATION EXCITATION AT NOMINAL DUTY

Based on the data's obtained in table 1 by the conceived program, for different values of the electro-motor tension (0,55 ; 0,70 ; 0,80 ; 1 ; 1,05 ; 1,15 ; 1,26 ; 1,28 ; 1,3) U_{1nm} , is determined the values of the flux (Φ) and also the magnetical tensions and is built:

– the magnetization characteristic at running on empty = f ($\sum U_{mi}$) or E = f (§);

– partial magnetical characteristics;

– = f (µ §) – of the stator;

– = f (µ §) – of the rotor;

– µ § = f (µ §) – of the magnetical flux of slipping between polls.

All these magnetical characteristics (functioning unloaded and partial for motor, in u.r.) are traced by a special program in figure 2, and serve at determining the excitation solenation at nominal duty thru the method of the partial magnetical characteristics, which remembers the demagnetized effect of the inducted reaction, using the following operations:

– construction of fazorial diagrams for resulting t.e.m. E1, in u.r. for motor regimes (and if r1<<x1, this value is neglecting);

– determining of saturation rapport corresponding of following relations: µ § (1)

– determining of coefficients ksd, ksq, k1 like mathematical functions of saturation, resulted before, from variation of inter-iron, for M/=1,5..2,5;

– establishing transversal solenation with magnetical saturation influence, according to following relations:

µ § [u.r.] (2)

where:

µ §[A] (3)

µ §for U1NM

(4)

– establishing fictive t.e.m. Eq0=µ § corresponding of solenation ksqkaqFa from partial magnetical characteristic of stator, µ §;

– determining of transversal direction (q), the line µ §, which guiding t.e.m. E1d=µ §;

– determining rotor magnetical tension (t.m.) corresponding of resulting t.e.m., Umdj1=µ § [u.r.]

– establishing angle from fazorial diagram and "effective" rotor reaction solenation, µ § for M/=1,5..2,5;

– determining of dispersion flux µ §[u.r.] and rotor magnetical tension µ §[u.r.], resulting rotor solenation for nominal duty µ § [u.r.];

For looseness work, due to digressions from magnetization curves or little modify at constructive dimensions, sue to increasing obtained value with approx.4-6%, resulting:

µ § [u.r.] (5)

respectivelly:

µ § [A] (6)

Conclusions

The presented method have the great advantage because allow to use modern technique of calculation and, in this way, could be known permanently the variation of excitation solenation, respectively the excitation circuit could be dimensioned optimally.

Bibliography:

1. I.Cioc, C. Nica Proiectarea masinilor electrice, Editura Didactica si Pedagogica Bucuresti 1994

2. V. Cozma Contributii privind reducerea cosumului de energie electrica la actionarea transportoarelor cu banda cu

motoare de curent alternativ Teza de doctorat, 2000 Universitatea din Petrosani

Construction of magnetical characteristics and determination of solenation for nominal excitation of syncronous motor with rotor in combined constructive variant with nominal parameters: 777.4 kVA/630 kW; 6kV; 1000 rot/min and longitudinal-transversal complete dumping from Cu-Cu and Am-Cu

Table Nr:

µ §

ur0.550.700.851(U1NM)Ke(ENM)1.151.261.281.30RelationV1905.22424.82944.4346436543983.64360.724433.924503.2123456789 1011µ §Wb0.0420.0530.0650.0760.0800.0870.0960.0970.099µ §T0.4200.5340.6480.7630.8050.8770.9600.9760.992µ §A4028.9505127.7556226.5597325.3647727.1598424.1689221.6699376.4669522.973µ
§T9.52112.11814.71417.31118.26019.90721.79222.15822.504µ §T0.8321.0591.2861.5131.5961.7401.9051.9371.967µ §T0.6810.8671.0521.2381.3061.4241.5591.5851.610
µ §= 0.791 µ §= 0.893 µ §=10.214

HdmaxA/cm2.250 5.025 15.500 90.000 140.000 170.000 760.000 880.000 1000.000 HdmedA/cm2.000 3.400 6.000 20.000 35.000 95.000 150.000 200.000 250.000 HdminA/cm1.500 2.250 2.750 5.250 6.500 9.500 17.500 25.000 34.000 µ §
A/cm1.958 3.479 7.042 29.208 47.750 93.250 229.583 284.167 339.000 Umd1=2hc1 Hd1A18.408 32.704 66.192 274.558 448.850 876.550 2158.083 2671.167 3186.600 µ §T0.703 0.895 1.086 1.278 1.348 1.470 1.609 1.636 1.662 µ §A/cm1.500 2.250 3.250 6.000 7.500 12.500 25.000 37.500 49.000 µ §A38.745
0.630 56.272
0.610 77.285
0.580 118.080
0.480 138.375
0.450 194.750
0.380 328.000
0.320 476.625
0.310 602.700
0.300 µ §A4086.103 5216.731 6370.036 7718.002 8314.384 9495.468 11707.75212524.25713312.273µ §Wb0.001 0.002 0.002 0.003 0.003 0.003 0.004 0.004 0.004 µ §T0.642 0.817 0.993 1.169 1.234 1.347 1.481 1.509 1.536 µ

§A153.317 195.149 237.008 279.093 294.602 321.676 353.653 360.309 366.626 µ §A4239.420 5411.881 6607.044 7997.095 8608.986 9817.145 12061.40512884.56713678.899µ §Wb0.003 0.004 0.004 0.005 0.006 0.006 0.008 0.008 0.009 µ §
Wb0.046
1.098 0.058
1.098 0.071
1.098 0.084
1.101 0.088
1.103 0.097
1.108 0.107
1.122 0.110
1.128 0.112
1.134 µ §Wb0.004 0.005 0.006 0.008 0.008

	0.009	0.012	0.012	0.013						
µ §	T	0.763	0.971	1.180	1.390	1.468	1.606	1.772	1.809	1.844
µ §	T	0.927	1.180	1.433	1.690	1.786	1.956	2.167	2.216	2.262

µ §0.346 µ §0.287

µ §0.245

1	2	3	4	5	6	7	8	9	10	11
HdRmin	A/cm	1.500	2.000	2.400	4.500	6.500	8.600	19.000	25.000	27.500
HdRmed	A/cm	1.750	2.500	4.500	10.500	19.500	50.000	100.000	140.000	190.000
HdRmax	A/cm	2.250	4.750	9.750	86.000	125.000	280.000	950.000	1000.000	1600.000
µ §	A/cm	1.792	2.792	5.025	22.083	34.917	81.433	228.167	264.167	397.917

UmdR=2hc2 HdR	A	23.292	36.292	65.325	287.083	453.917	1058.633	2966.167	3434.167	5172.917
µ §	T	0.743	0.945	1.149	1.355	1.432	1.568	1.737	1.776	1.813
µ §	A/cm	1.850	2.500	4.750	9.500	18.500	40.000	100.000	130.000	190.000
µ §	A	33.419	45.160	85.805	171.609	334.187	722.566	1806.416	2348.341	3432.190
µ §	A	210.027	276.601	388.138	737.786	1082.706	2102.876	5126.235	6142.816	8971.733
µ §	A	4296.131	5493.333	6758.174	8455.788	9397.090	11598.344	16833.988	18667.074	22284.006
µ §	ur	0.550	0.700	0.850	1.000	1.055	1.150	1.259	1.280	1.300
µ §	ur	0.604	0.769	0.934	1.101	1.164	1.275	1.412	1.444	1.474
µ §	ur	0.054	0.069	0.084	0.101	0.109	0.125	0.153	0.164	0.174
µ §	ur	0.508	0.650	0.799	1.000	1.111	1.372	1.991	2.208	2.635
µ §	ur	0.483	0.617	0.753	0.913	0.983	1.123	1.385	1.481	1.574
µ §	ur	0.025	0.033	0.046	0.087	0.128	0.249	0.606	0.726	1.061

Fig. 2