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ELECTRICAL SHAFT SCHEME WITH STATIC FREQUENCY CONVERTERS AND ASYNCHRONOUS MACHINES WITH SHORT CIRCUIT ROTOR

[1] DEACONU Sorin Ioan, [2] GHERMAN Petre Lucian

[1,2] UNIVERSITATEA „POLITEHNICA" TIMIŞOARA,
FACULTATEA DE INGINERIE HUNEDOARA

SUMMARY:

This paper presents on original scheme for electrical shaft using asynchronous machines with the rotor winding in short circuit and static frequency converter.

The paper proposed presents a scheme with two asynchronous motors with the rotor winding in short circuit each supplied by on static frequency converter.

KEY WORDS:

electrical shaft asynchronous machine,
static frequency converter.

1. INTRODUCTION

In the present state of the electrical shaft schemes is used asynchronous machines with winded rotor. Between the connected rotors take place a circulation of current when a lack of balance appears. For on important equalization torque of the speeds it is necessary to introduce resistances in the rotor winding which increase the losses.

2. THE METHOD PRINCIPLE

The paper proposed presents a scheme with two asynchronous motors with the rotor winding in short circuit each supplied by on static frequency converter. On of the converters is the master (SFC_1) and the other is the slave (SFC_2).

The master converter receive information about the speed reference the direction and the START/STOP controls. The slave converter receives the same information from the master converter through a optic fiber with a high speed. This way the broth converters impose the same output frequency which means same speeds for the both motors (AM_1; AM_2).

The static frequency converters can achieve internal regulators. The regulator is used in the slave converter to control the difference between the motors speed (fig. 2).

The speed of the motors is compared with the reference of speed imposed by the ruling converter. The slave converter is programmed that the error in the regulator output is null.

The figure 1 presents the principle scheme:

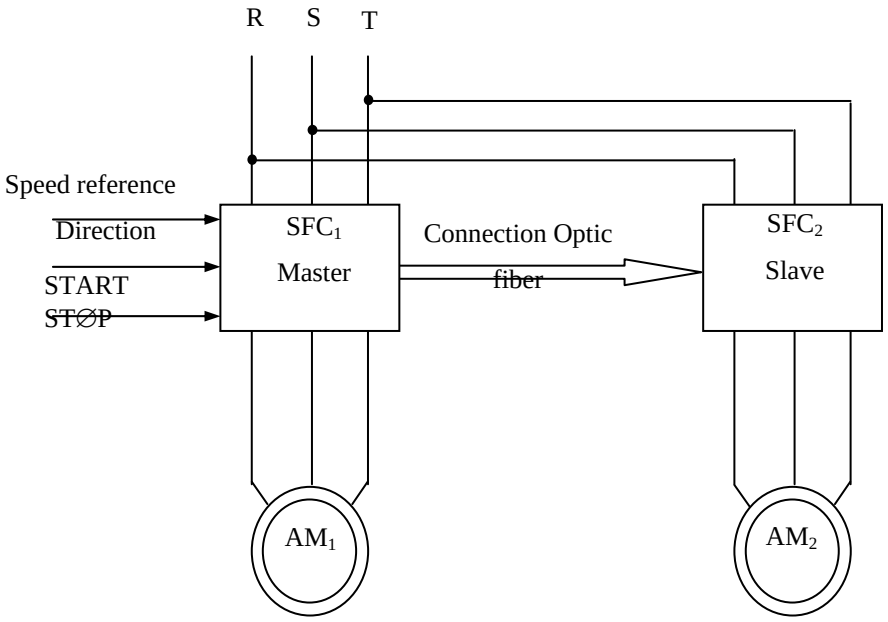

FIG. 1. The principle scheme of the electrical shaft

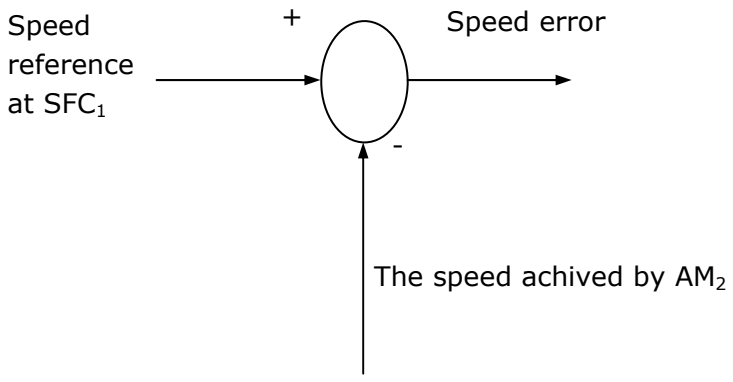

FIG. 2. The scheme of the internal regulator of SFC_2

3. EXPERIMENTAL RESULTS

This scheme is in use at a thermo power plant. The motors values are:

$$P_N = 5,5 \text{ KW}, n_N = 720 \text{ rpm}, U_N = 380 \text{ V}, I_N = 14 \text{ A}.$$

The converters used are: ACS 800-01-0011-3 with, I_N =18,5 A, U_N = 400 V, I_{MAX} = 24 A, P_N = 7,5 KW.

The table 1 presents the measurement results with out the use of the internal regulator in SFC_2 at maximum load.

Table 1

n_1	rpm	100	300	450	600	750	900	1200	1350	1500
n_2	rpm	126	357	549	708	900	1098	1428	1607	1815
M_1	[%]	32	34	36	39	43	48	54	62	67
M_2	[%]	20	18	16	13	9	4	-2	-10	-15

It was established a difference between the speed imposed by SFC_1 and the speed achieved by AM_2. The torque of AM_2 decrease until the machine regenerating and an error come out. To resolve this problem in SFC_2 was created on internal regulator.

The results obtained are presented in table 2.

Table 2

n_1	rpm	100	300	450	600	750	900	1200	1350	1500
n_2	rpm	120	360	540	720	900	1080	1440	1620	1800
M_1	[%]	31	37	40	42	45	51	56	62	66
M_2	[%]	22	16	13	11	8	2	-3	-9	-13

Using the regulator the difference between n_1 and n_2 is 20%. After the verification of the mechanical part was established some differences between the motion wheels (different diameters) and the reference of speed for the SFC_2 was decreased with 20%. The results are shown in the table 3

Table 3

n_2	rpm	100	300	450	600	750	900	1200	1350	1500
n_2	rpm	100	300	450	600	750	900	1200	1350	1500
M_1	[%]	27	26	27	28	25	27	28	26	27
M_2	[%]	27	28	27	26	29	27	26	28	27

4. CONCLUSIONS

After the experimental attempts was established that the scheme is stout and flexible. Without the replacing of the mechanical parts it was succeeded to synchronize the speeds of the both motors.

5. REFERENCES

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