VERIFICATION OF CHANGING INTO STATE OF ASYNCHRONOUS INDUCTION GENERATOR OF INDUCTION MOTORS

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ABSTRACT

The photovoltaic generation system must have protection device and islanding detection devices to connect with utility line of the electric power company.

It is regulated in the technological requirement guideline and the electric equipment technology standard that the country provides.

The islanding detection device detected purpose install for blackout due to the accident occurrence of the earth fault and the electrical short circuit in the utility line. We had already known that the islanding detection device can't detect the islanding phenomenon, if is there the induction machine load in the loads. Authors decided to investigate the influence that the inducement machine load gave to the islanding detection device.

The result was confirmed the induction machine load had changed from the state of the electric motor into the state of the generator.

1. CONFIRMATION OF CHANGING INDUCTION MOTORS INTO ELECTRICAL GENERATOR

1.1 IMPORTANT INDUCTION MOTORS FOR CERTIFICATION TEST

The induction motors used for the certification test of the grid connected power conditioner for the photovoltaic generation system in Japanese case.

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But, it has not been clarified that the islanding detection device cannot detect the islanding phenomenon when the induction motors is used.

The following items are thought as the reason.

1. The induction motors state changes into the dynamo. And, it is thought that electric energy into which electricity is generated influences the islanding detection device.

2. It is thought that the induction motors separated from the distribution line plays the role of the pilot of the frequency and the voltage.

This time, authors assumed that they confirmed driving as the dynamo when the induction motors was separated from the distribution line by the experiment.

1.2 OUTLINE OF INDUCTION MOTROS

The induction motors can easily buy everyone that uses it by the certification test. Because it is important that it is not induction motors only for the certification test but equipment used in general widely.

Table 1 shows the spec of the induction motors that uses it by the certification test.

Table 1. Spec of the induction motors.

Electric ratings	Size of motor W[m]×H[m]	The size of the Flywheel D[m] W[kg]	Moment of inertia [kg・m2]
1Φ100V , 6.5A , 50/60Hz , 2960/3560rpm Output power 645W	W:0.452 H:0.267	D:0.205×2 W:1.300×2	0.015

1.3ELECTRICAL GENERATION PHENOMENON MEASUREMENT OF INDUCTION MOTORS

The induction motors is composed of a main winding and the sub-winding. The capacitor is connected with the series in the sub-winding. These are well-known capacitor generally induction motors.

In the circuit chart shown in Figure 1, the confirmation to which electricity was generated measured. Current [Am] of a main winding of the induction machine load, current [As] of the sub-winding , and common current [Ac] voltages [V1] and

rotational speeds[rpm] according to the following procedures.

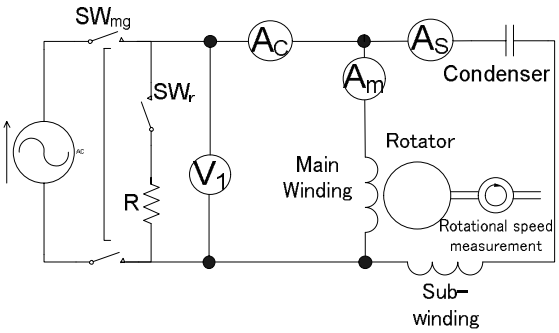

Fig. 1 Circuit chart of inducement machine load.

1.4 MEASUREMENT RESULT OF POWER GENERATION

The measurement result became a result as shown in Figure 2

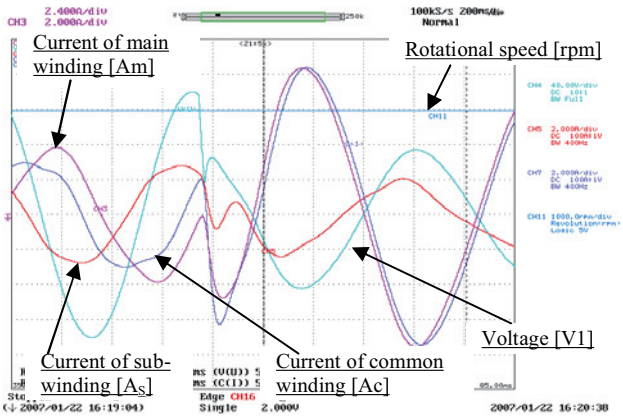

Fig. 2 Power generation state measurement result of inducement machine load.

The direction where common current [Ac] and current [Am] of a main winding flowed after having liberated switch SWmg reversed.

That is, this current state is a result of showing that the current discharges from the induction machine load.

However, it actually changed from the state of the induction motor into the state of the electrical generator in the shape of waves of the measurement result or is indefinite.

2. FIXATION OF ELECTRICAL GENERATOR PHENOMENON

2.1 CALCULATED SLIPPING

We calculated slipping that did the characteristic of the induction motors to fix the power generation phenomenon and summoned it and assumed the clarifying female.

Slipping can be calculated by expression 1.

$$S = \frac{(Ns - N)}{Ns} \quad (1)$$

$$Ns = \frac{120 \quad f}{p} \quad (2)$$

However, synchronous speed Ns always changes because it is separated from the power supply. Therefore, the frequency was calculated from the voltage wave form that remained after it had been separated. The calculated frequency was substituted for expression 2 and a synchronous speed was requested. Figure 2 shows the calculated synchronous speed and the measured rotational speed.

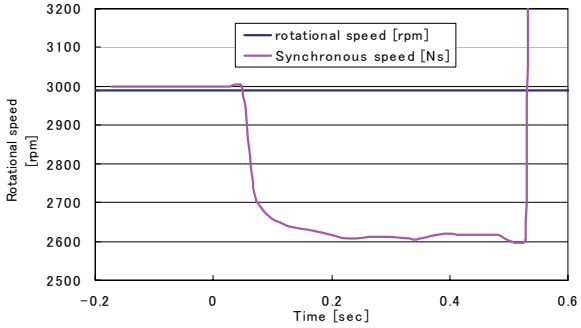

Fig. 3 Calculation result of synchronous speed and rotational speed.

Slipping after the synchronous speed separated from the power supply and the measured rotational speed was substituted for expression 1 and it was separated from the power supply was calculated. The calculated slipping is occupied to Figure 4.

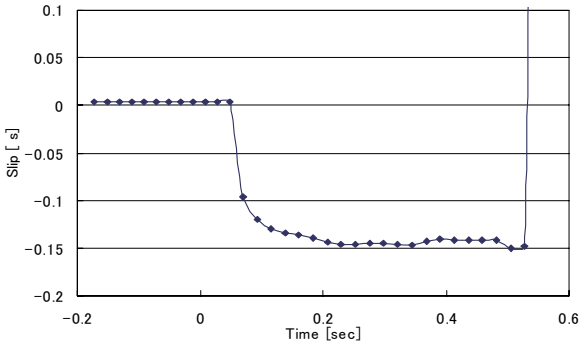

Fig. 4 Calculation result of Slip.

3. SUMMARY

We showed that the induction motors separated from the distribution line was changed into the state of the dynamo. That is, the induction motors that became a dynamo was able to show possible that influenced the islanding detection device.

REFERENCES

[1] Hironobu Igarashi: “About the influence on the difference and the Islanding test of the resonance load and the motor load”, IEEJ Trans.PE, Vol.127 No1 2007 p.192~199)