DETERMINATION OF ASYNCHRONOUS MODE AND METHOD TO CONTROL THE EXCITATION OF A SYNCHRONOUS ELECTRIC MOTOR

N.N. Narkhojaeva, N.K. Kamalov
Fergana polytechnic institute

ABSTRACT

The paper presents the results of research aimed at identifying the asynchronous mode of excited syn- chronous electric motors and their safety and stability. It is proposed to identify the asynchronous mode using a power polynomial from the ratio of the degrees of active and reactive power, determined from measured instantaneous values of currents and stator voltages of a synchronous electric motor. It is proposed to control the excitation system of a syn- chronous motor by cyclically switching the excitation winding to an additional resistance or an exciter based on a crite- rion representing the derivative of the power polynomial from the ratio of the active and reactive powers of the syn- chronous motor.

Keywords: synchronous motor, asynchronous mode, excitation feed, resynchronization.

Having a number of advantages over other electric motors, synchronous motors have become quite widespread in power supply systems of large industrial enterprises. Short-term disturbances in the external power supply system of industrial enterprises, caused by short circuits and the action of emergency automatics, can lead to the occurrence of an asynchronous mode of an excited synchronous electric motor. The appearance of an asynchronous mode poses a danger to the electric motor, since in this mode pulsations of torque and currents occur in the motor, the values of which can significantly exceed the nominal values, which is a common cause of failure of salient-pole synchronous electric motors, used as a drive for ball mills [1]. When an asynchronous mode occurs on synchronous electric motors, protection must be provided that detects its occurrence and acts on damping the rotor field with subsequent resynchronization [2, 3]. In known protections against the occurrence of asynchronous mode, the currents of the rotor and stator windings, the angle between the current and the stator voltage, direction of reactive power, as well as resistance at the stator terminals [2, 4].

However, these starting elements are capable of detecting only the loss of excitation of a synchronous electric m otor and are not able to provide protection in the event of instability. To carry out successful resynchronization in self-starting modes, it is necessary to unload the driven unit [5, 6], which is impossible under continuous production conditions. One of the ways to ensure successful self-starting is cyclic control of the excitation system of a synchronous electric motor [7–9]. However, the above methods either require the installation of additional sensors on electric motors [7, 8] or are not effective in the area of small slips [9].

Using a mathematical model of a network section, which is a two-transformer substation feeding the motor load in the form of synchronous and asynchronous electric motors, we will perform modeling of the asynchronous mode of a synchronous motor. that an excited synchronous electric motor at rated load can switch to an asynchronous mode with small slip values and a long duration of rotor rotation, equal to several seconds, and significant current surges with each rotation of the rotor,

In connection with the above, the block diagram of protection against the appearance of an asynchronous mode of an excited synchronous electric motor has the form shown in Fig.1

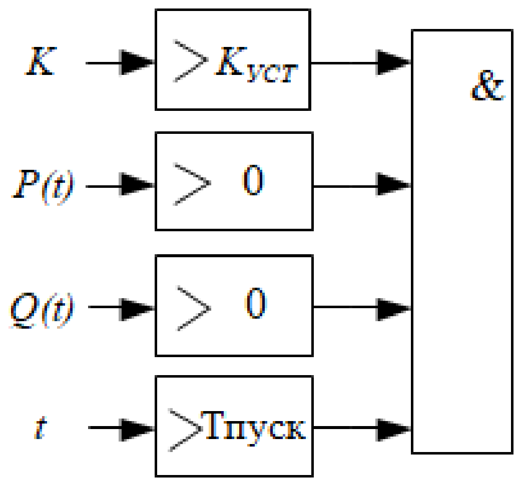

Fig. 3. Structural diagram of protection against the asynchronous mode of an excited synchronous motor

The proposed criterion for identifying the asynchronous mode of an excited synchronous electric motor most accurately describes the nature of the change in the rotor angle, which makes it possible to use it for cyclic excitation control of a synchronous electric motor in resynchronization modes.

REFERENCES:

1. Jaloliddinova Nozima Doniyorjon Qizi, Sultonov Ro‘Zmatjon Anvarjon O‘G‘Li Renewable sources of energy: advantages and disadvantages // Достижения науки и образования. 2019. №8-3 (49). URL: https://cyberleninka.ru/article/n/renewable-sources-of-energy-advantages-and-disadvantages (дата обращения: 01.12.2023).

2. Султонов Рузиматжон Анваржон Угли, Кодиров Хусанхон Мунавварxон Угли, Мирзалиев Бобурбек Бахтиёрович Выбор механических двигателей электрического тока, используемых в системе электропривода // Проблемы Науки. 2019. №11-2 (144). URL: https://cyberleninka.ru/article/n/vybor-mehanicheskih-dvigateley-elektricheskogo-toka-ispolzuemyh-v-sisteme-elektroprivoda (дата обращения: 01.12.2023).

3. Султанов Рузимаджон Анваржон Угли Рекомендации по выработке электроэнергии и компенсации потерянной энергии с помощью системы охлаждения электродвигателей // Вестник науки и образования. 2019. №19-3 (73). URL: https://cyberleninka.ru/article/n/rekomendatsii-po-vyrabotke-elektroenergii-i-kompensatsii-poteryannoy-energii-s-pomoschyu-sistemy-ohlazhdeniya-elektrodvigateley (дата обращения: 01.12.2023).

4. Usmonov Shukurillo Yulbarsovich, Sultunov Ruzimatjohn Anvarjohn O‘G‘Li, Kuchkarova Dilnoza Toptievna Research potential of energy saving pump unit and hydraulic network // Проблемы Науки. 2019. №12-1 (145). URL: https://cyberleninka.ru/article/n/research-potential-of-energy-saving-pump-unit-and-hydraulic-network (дата обращения: 01.12.2023).

5. Usmonov S. Y. Analysis of Working Modes of Well Pumping Equipment Eectr //Central Asian Journal of Theoretical and Applied Science. – 2022. – Т. 3. – №. 11. – С. 119-125.

6. Yulbarsovich U. S., Nurillaevich M. N. FREQUENCY CONTROL OF POWER EQUIPMENT DURING SECONDARY STEAM GENERATION IN THE PRODUCTION UNIT //PRINCIPAL ISSUES OF SCIENTIFIC RESEARCH AND MODERN EDUCATION. – 2022. – Т. 1. – №. 6.

7. Yulbarsovich U. S. et al. MEASUREMENT AND CONTROL OF THE LOAD OF ENERGY DEVICES //Galaxy International Interdisciplinary Research Journal. – 2023. – Т. 11. – №. 4. – С. 663-666.

8. Yu U. S., Sultonov R. A. NONLINEAR FEEDBACK CONTROL IN INTELLIGENT AC MOTOR CONTROL //Advancing in research, practice and education. – 2022. – Т. 9. – С. 188.