УДК 621.314 + 517.9

A WAY OF THE AC MACHINE STATOR CURRENT DECREASING

V.S. Goon, A.A. Bakin, E.V. Litvinova

The AC machines have become most popular with their relative simple design and high reliability in work. It is known that in AC machine with torques less nominal position there is a possibility to decrease the stator current for varying the voltage [1]. For varying voltage magnitude with constant frequency it is possible to decrease the stator current when the AC machine is idling or loaded tow-three times less nominal.

Key words: the AC machine stator current decreasing, the voltage magnitude with constant frequency, the thyristor convertor of alternating voltage.

When the work conditions demand for the AC machine to act with the load less nominal or has the work regime S6 [2] it is worth to use the AC machine controlled by the voltage magnitude with constant frequency.

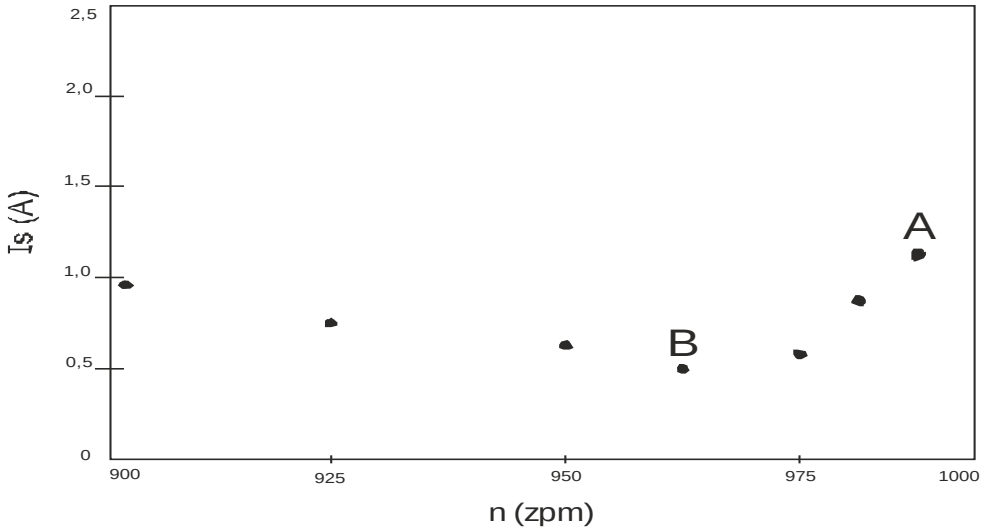
The simple example of such a system can be the AC machine controlled by the thyristor convertor of alternating voltage (TCAV). It is known [3] that the ask of AC machine optimization work with the stator current minimum is the task of the extremal controlling and such systems by the way of approaching the minimum divides into two types:

1) the system with the set up controlling characteristic;

2) the system with the automatic minimum searching.

For the practical realization the systems of the second type it is necessary to create such a system that can automatically find the current minimum for the every loading. It is expensive and the more accuracy must be the more expensive system is. Therefore for practice it is worth to use the first type system. Such systems have the controlling characteristic close to optimal and are the suboptimal system. The conclusion is any way of the energetic optimization of the AC machine use (with the minimum loss, the station current minimum, the power input minimum) can be realized with the constant slip (rotation).

As an example of realization the above mentioned system is the system with the slip (rotation) and stator current feedbacks, at department of electrical engineering the South Ural State Univ. Russia coordination with the US university of Detroit (prof. Gladyshev S.P.) the researching have been fulfilled and it has been found out that the optimal way of the AC machine controlling (with the stator current minimum) occurs when the AC machine works with slip less nominal (rotation more nominal). A practical specimen of the suboptimal AC machine controlling system with the rotation feedback that works with the constant set up signal has been designed. As a voltage convertor the thyristor voltage converter has been used. The set up signal is chosen up to the condition of the stator current (or the closest to it) minimum ensuring when the AC machine is idling. En use was the AC machine: Pnom = 1.1 kWt; Nnom = 920 rpm, the results of experiment are shown on fig.



Stator current versus speed characteristic

The AC machine is idling at point A with the nominal voltage. Consequently the voltage magnitude is fallen down. The control points are shown on fig. The stator current is started to decrease approaching to the minimum at the point B. The further decreasing of the voltage magnitude leads to a small increasing the stator current. The experiments allows to release the fallowing: at the point A – Is = 1.25 A, at the point B – Is = 0.6 A.

For the AC machine that often acts idling there is a possibility to ensure the energy economy by creating the closed system “voltage converter – AC machine” with the rotation feedback. The magnitude of the energy economy depends on the AC machine power. The more power the more energy can be saved by the system.

References

1. Gladyshev S.P. , Gladyshev P.S. , Bakin A.A. The dynamic of the control loops of the alternating voltage thyristor converter. Int. Conf. – The aynamic of the non – lenear system. The trinity college, Dublin, Ireland, 1995.

2. Rotating electrical machines : nominal data and working characteristics. GOST 281173-83 E. M.: 1989, p. 2–51.

3. Petrov L.P. thyristor voltage converters for the AC machines. – M.: energyatompull, 1986. – 199 p.

К содержанию