Igor Yermak
V.S. Khilov, research supervisor
M.L. Isakova, language adviser
SHEI “National Mining University”, Dnipropetrovsk

Power Transfer from Generator to DC Motor

In non-energy-consuming electrical devices there appears the problem of transmitting maximum electrical power possibly in given condition, and performance index is of secondary priority.

In such cases, the agreement of characteristics of source and receiver is used.

For investigating this problem, the method of equivalent generator is used. For this, source of energy is presented as electromotive force (EMF) source with series of internal resistance, the load – as the equivalent resistance.

Thus, the power generated by the source of energy will be released on internal resistance of its source and on the load.

The power released on load will be equal to zero in two cases:

1. Resistance of load is equal to infinite, $R_{load} = \infty$ (open-circuit mode, OC).
2. Resistance of load is equal to zero, $R_{load} = 0$ (short-circuit mode, SC).

If in this cases power is equal to zero and isn’t equal to zero in other cases, the graph of the dependence of power on load-resistance has the point of bend, where power has the maximum value.

$$P = R_{load}\frac{E_{oc}^2}{(R_{load} + R_{int})^2}$$

To find this point, we take first derivative from function of power from load-resistance $P(R_{load})$. Equating its derivative to zero, we find that value of load resistance is equal to internal resistance of energy source, $R_{load}=R_{int}$.

This means that maximum power release on load when load-resistance is equal to internal resistance of energy source and current flowing through the load is equal to half short-circuit current. As shown in Fig. 1, the maximum power release on load is equal to half of all possible power of source, and performance index of this source is 50%.

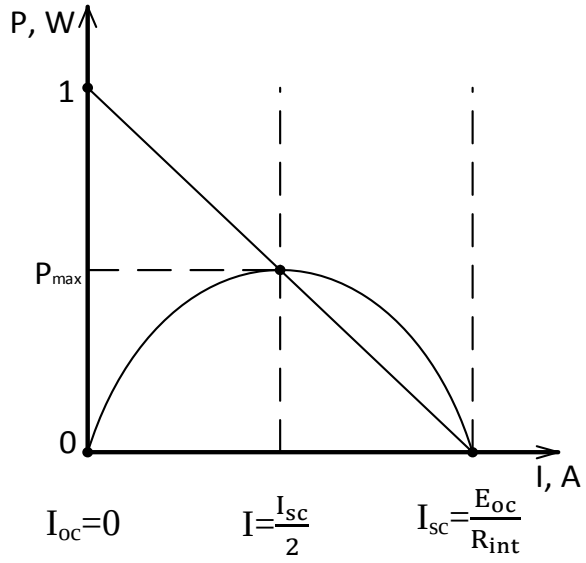

Figure 1