

(Clause 7)

ABNORMAL LOADING

B-1 LOSS OF BLADE UNBALANCE

The turbine rotor is balanced dynamically to enable smooth operation of the machine. An emergency condition can occur when one or more turbine blades break loose from the rotor, which would impose a large dynamic force on the foundation at the bearing locations. The forces corresponding to a missing last-row blade for each turbine section are supplied by the machine manufacturer in the form of unbalance forces or equivalent static forces. Since the turbo-generator is tripped in such a condition these forces occur for a short time required for the coasting down time of the machine. It is sufficient to check the foundation for strength under these forces.

B-2 SHORT CIRCUIT FORCE

When a line-to-line or line-to-ground short circuit occurs at the generator terminal, it imposes a huge torque on the TG foundation. The short-circuit moment has the form (see Fig. 4).

$$M(t) = Ae^{-0.4} \sin \omega t - Be^{-0.4} \sin 2\omega t + Ce^{-0.15}$$

where

ω = angular frequency of the mains.

A, B, C = coefficients specific to generator design.

The forcing function is generally supplied by the Machine Manufacturer. It is advisable to perform a dynamic analysis of the foundation. Sometimes, only the equivalent static force is supplied which assumes an infinitely rigid foundation and can make the foundation design highly conservative.

In the absence of vendor supplied data, the following information may be used.

In the short circuit equation, the coefficient A, B, and C may be assumed as:

- A = 10 times normal power torque
- B = 5 times normal power torque
- C = normal power torque

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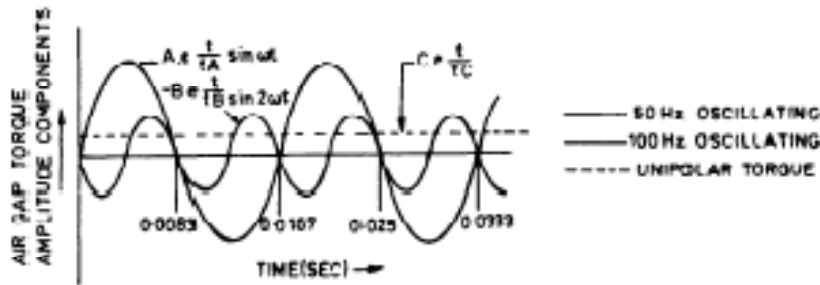


FIG. 4 SHORT-CIRCUIT MOMENT DIAGRAM