

the comparative losses if the two machines are given the same rating?

1. A two phase machine should have 22% more conductors per slot than the corresponding three phase  $\pi$  connected machine, designed for the same voltage and flux per pole.

2. The magnetizing current is the same in both the two and three phase machines when expressed in percentage of the current, which corresponds to the full load output.

3. The copper loss of the two phase machine is 12% higher than that of the three phase.

4. The leakage factor of the two phase machine averages 25% greater than that of a three phase machine, therefore the power factor is lower.

Actual results show from 1 to 3% lower power factors.

These considerations show that the two phase machine will have a higher temperature rise as a result of a higher copper loss. For the same reason the efficiency of the two phase motor will be lower. The slip of the two phase machine will also be greater. Tests and theoretical calculations show 20% greater slip.

Thus we see that the two phase induction motor is a poorer motor for the central station company, due to a poorer power factor. It is also less advantageous to the power user, as a smaller efficiency means a larger motor input for a given output. The higher temperature rise will result in a shorter life and larger slip will mean a greater fluctuation between synchronous, partial and full load speeds.

While the three phase service should be made standard, two phase motors may be used by the aid of three-phase-two-phase transformers. This, however, should be discouraged, as such transformers require special taps, which make them more expensive, especially so when core type transformers are used. It also means the carrying of a stock of these special transformers as spare units. The above consideration as well as the larger capacity of transformers required in cases of phase transformation makes the two phase motor objectionable and its use should be discouraged.

This will conclude the remarks as to the advantage of a three phase as compared with a two phase system.

We will take up now the discussion under the heading of frequency.

**FREQUENCY:** The frequencies most widely used on this continent are those of 60 and 25 cycles. While other frequencies are made use of these are the predominating ones. Let us, therefore, analyze **them** with a view of determining their adaptability for such developments as are under discussion in our paper. We shall make our analysis **not** from the transmission point of view alone, but analyze the **generating and** distributing systems as well.