

RAILWAY LOAD: The suitability of low frequency synchronous converters for railway work is a well established fact. While 60 cycle synchronous converters are used for such purposes, they are rather an exception and their operation is less satisfactory. What should then, under the circumstances, be a desirable way of supplying street railway loads without resort to frequency changers? The latter are out of the question, due to excessive cost, beside the great reduction in the efficiency of the systems, resultant from their use.

Motor generator sets may be and are advantageously used in this connection, and while not possessing the advantages of 25 cycle synchronous converters, have features which make them particularly suitable for use on long distance transmission systems, permitting of a partial or complete control of the power factor of the system depending as to whether induction motors or synchronous motor sets are used.

Wherever large capacity is present, due to long transmission lines, induction motor generator sets of large size can be used to great advantage. For perfect control of the power factor of the transmitted power, synchronous motors should be employed, as in this case the regulating of the field excitation allows of a close control of the power factor of the transmitted energy, allowing the maximum energy for a given current, and under certain conditions will permit of carrying the load at unity power factor in the generating and transforming apparatus and transmission line.

While the synchronous converter is the most efficient of the three means of supplying railway loads, whenever this load constitutes only the minor portion of the total output of the plant, the interests of the lighting and power load cannot be sacrificed for a most efficient conversion of the alternating current to direct current for railway purposes.

In our discussion of frequency we may conclude that for a mixed load of lighting and power with a railway load not exceeding one-third of the total power generated, 60 cycles will be the frequency to select.

We are to take up now two more questions. These are charging current and the regulation of the line. The above factors under adverse conditions will limit certain developments, making them impossible, commercially considered, at 60 cycles. The same development at 25 cycles may present a very attractive proposition using power for a different application.

Let us see how the two frequencies affect our case. What will be the relative magnitude of the charging current and regulation?