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Effects of Motor Load on Generating Sets

When the load on an engine driven generator is predominantly induction motors, allowance must be made for the load characteristics.

The correct choice of generating set requires a sound technical appraisal of the conditions under which the set will have to operate.

The starting peaks will often dictate the size of the generating set required.

If the generator is selected to be just large enough to run the motor at full load, without regard for the starting requirements, then the initial voltage dip, particularly with d.o.l. starting, may be excessive.

In such extreme cases, estimate the effect of the largest motor starting current on the generator and select the latter so that the voltage dip is restricted to a reasonable figure.

The motor starting kVA can be found approximately by multiplying the motor horsepower by the starting factor K the value of which depends on the motor design and on the method of starting

Type of Motor	Method of Starting	K value
Squirrel cage	D.o.l.	7
Squirrel cage	Star/delta	2.5
Squirrel cage (Depending on taps)	Auto-transformer	3 to 4
Squirrel cage	Rotor resistance	1.5

A dynamic pre-load of 50 per cent of the generator rating will increase the voltage dip by about 10 per cent.

The low starting power-factor of the squirrel cage motor means that quite high starting currents can be imposed on the supply generator without excessive motor power input. Peak power input occurs at about 80 per cent of synchronous speed: the power factor is 0.65 and current is about three quarters of the initial peak value.

Peak generator output kW

= 1.1 x rated kVA x rated p.f. (0.8)

= 0.9 x rated kVA (approx.)

For motor characteristics

Peak motor input kW

= Max starting kVA x ¾ x p.f. at peak kW (0.65)

=0.5 x max motor starting kVA

If the generator is fully loaded at peak motor input 0.9 x rated generator kVA = 0.5 x max motor starting kVA

Rated generator kVA = 0.56 x maximum motor starting kVA, or maximum motor starting kVA = 1.8 x rated generator kVA