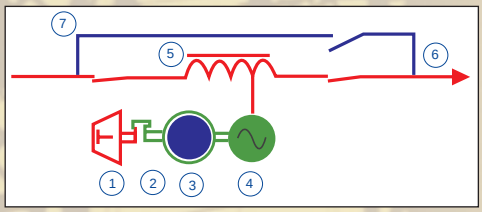
UPS SYSTEMS
SYSTEM OPERATION (50Hz)

Our diesel UPS system has been manufactured for 30 years. It is designed to maintain the quality and continuity of electrical power required by critical equipment.

The main part of the diesel UPS system is the power module, which contains



1 The diesel engine
2 The free-wheel clutch
3 The induction coupling
4 The generator
5 The choke
6 The critical output
7 Bypass (Fig.3)

The power module interacts with the mains and the load by means of a choke. Circuit breakers are provided for input/output and bypass.

The diesel engine and the electrical machines are coupled via a mechanical free-wheel clutch, which allows the electrical machines to run when the diesel engine is idle. As soon as the diesel engine speed exceeds the running speed of the electrical machines the free-wheel clutch automatically engages. The free-wheel clutch design is simple, reliable and does not convey any abrupt forces to the diesel engine.

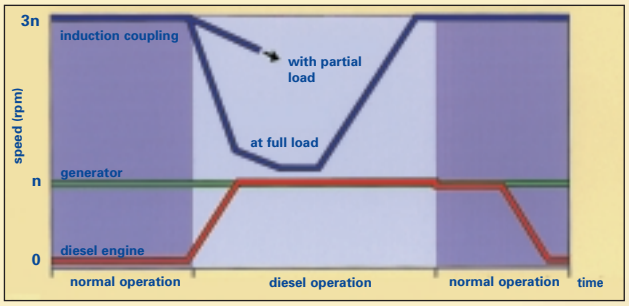
The induction coupling stores kinetic energy. It consists of two rotating parts - the inner and the outer rotor. The inner rotor runs freely within the outer rotor. The latter is directly coupled on one side to the generator and on the other side to the diesel engine via the free wheel clutch. The outer rotor is provided with two electrical windings. An AC winding is used to speed up the inner rotor as in any asynchronous motor. A DC winding is used to decelerate the inner rotor, as in an electrical braking system. By this means storage and retrievel of kinetic energy can be controlled, which in turn regulates the output from the UPS.

The generator is a synchronous machine, which in normal operation acts as a motor and drives the induction coupling. During diesel operation the generator is driven by the diesel engine via the induction coupling.

HITEC Power Protection

Normal operation (Fig.1)

The choke and the generator provide clean regulated power from the mains during normal operation. Together they act as a stabilising filter to prevent power disturbances reaching the load. The generators when acting as a motor, drive the outer rotor of the induction coupling at 1500 rpm. By energising the two-pole AC windings of the outer rotor, the inner rotor attains a speed of 3000 rpm relative to the outer rotor (ie 4500 rpm absolute).



As a result retrievable kinetic energy is stored in the inner rotor of the induction coupling. The free-wheel clutch separates the outer rotor of the induction coupling from the diesel engine which is not running.

Change-over to diesel operation (Fig. 2)

When the mains supply fails or is out of tolerance the input circuit breaker is switched off. At the same time the DC windings of the induction coupling are excited. This causes the inner rotor to decelerate and transfer its kinetic energy to the outer rotor. The energy transfer to the outer rotor keeps the generator turning at 1500 rpm. By control of the DC excitation, the generator speed and hence the output frequency can be kept constant. During the deceleration of the inner rotor the diesel engine starts and accelerates to a speed of 1500 rpm in less than 2 seconds.

Diesel operation

When the speed of the diesel engine equals that of the induction coupling, the free-wheel clutch engages. The diesel engine then becomes the driving energy source, rather than the inner rotor. The AC windings on the outer rotor can be energised to accelerate the inner rotor to 3000 rpm. The diesel engine speed is regulated to maintain a constant load frequency. The induction coupling stabilises the diesel engine speed by controlled excitation of the DC windings. As a result the output frequency can be kept within narrow limits irrespective of load changes.

Change-over to normal operation

When the mains supply returns within tolerance, the UPS synchronises and closes the input circuit breaker. At this point the diesel engine speed is reduced to 1450 rpm to enable disconnection of the free-wheel clutch. The generator then reverts to motor operation, and drives the outer rotor of the induction coupling. The inner rotor is already at its normal speed. The diesel engine idles for a few minutes to cool off before it shuts down completely.

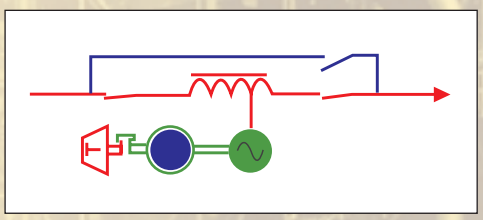


Fig. 1

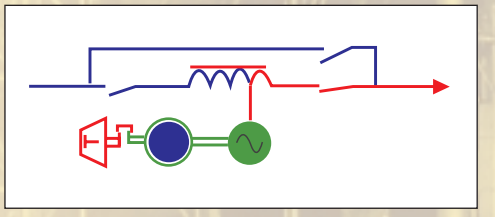


Fig. 2

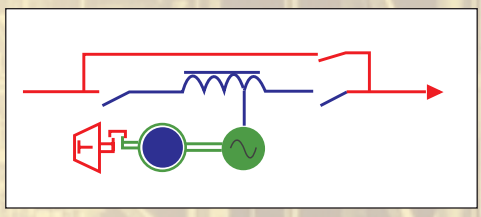


Fig. 3