

BENEFITS

Space savings

Of all the benefits associated with the Total Power Solutions range of UPS and standby systems it is the space savings which tend to have the most profound effect. When comparing the TPS approach with the more conventional static UPS-battery-switchgear and standby diesel systems it is easy to see where major savings in plant room layouts can be achieved.



Each static UPS room has to be air-conditioned to maintain the optimum operating conditions. At the same time the UPS environment is different from that of the battery thus demanding separate UPS and battery rooms.

Where recombination cells are utilised (sealed lead acid) the temperature within the battery room has to be controlled to $20^{\circ} \pm 2^{\circ}$. This calls for sophisticated air-conditioning systems and means that a separate battery room must be provided.



Where separate standby diesels are utilised then provision must be made to accommodate not only the diesels but also their associated exhaust systems, ventilation systems, fuel requirements and any acoustic treatment.

When the overall power system comprises static/rotary UPS modules, plus standby diesels, there will be a requirement for separate switchgear at each of these interfaces. The DC switchgear must be kept separate from the UPS/diesel and distribution AC switchgear.



The Total Power Solutions concept



Where the Dual Output system is utilised the only plant room requirements are those which would have already been made for the standby diesel. This approach removes the need for much of the switchgear, which is associated with the conventional approach, thus removing the majority of the 'interfaces' within the power distribution system.

Cost savings

It is clear that any saving in plant or net lettable space will have a direct effect on the cost of the overall power system. This can be seen when assessing the range of services which need to be provided for a battery backed UPS/standby diesel system, as these are substantially greater than those for an equivalent Dual Output system.

Static/rotary UPS requirements

Plant-room: air conditioning, installation, AC switchgear and paralleling panels.

Standby diesel room: . . . ventilation, exhaust, acoustic treatment, installation and switchgear.

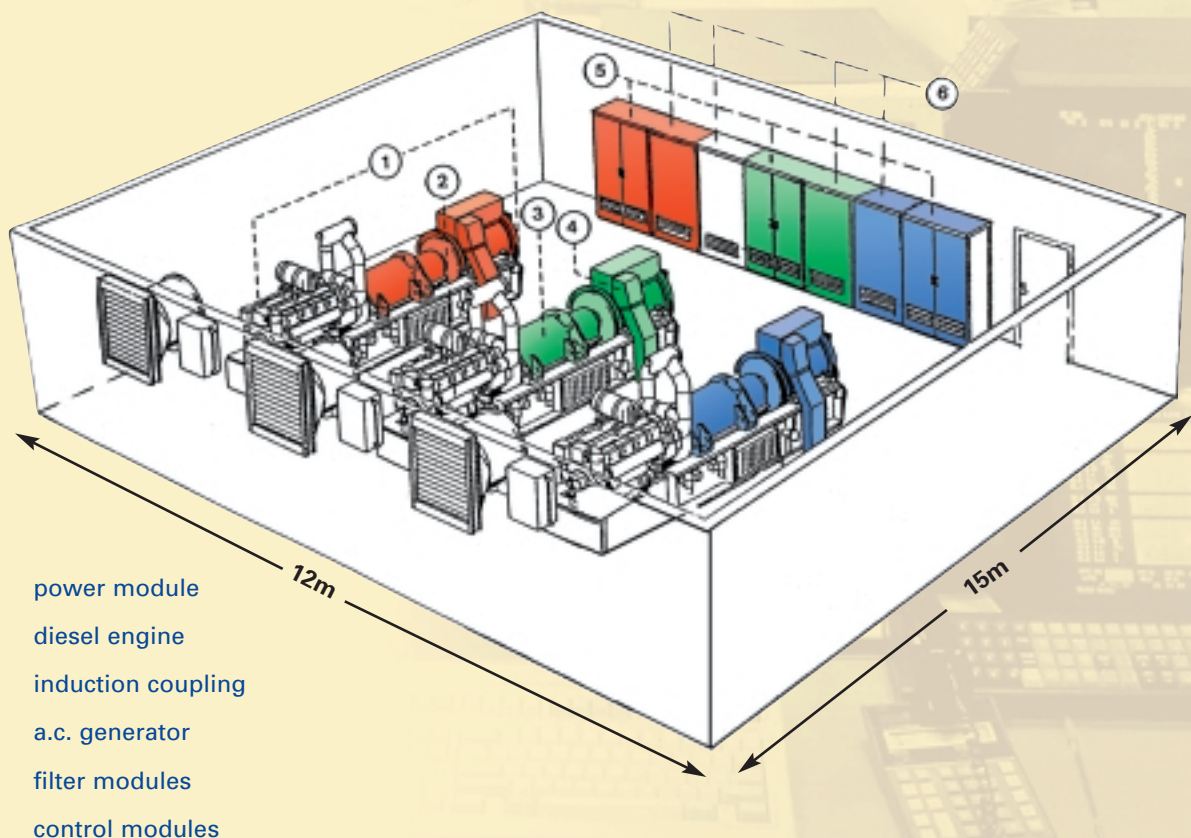
Battery room: air conditioning, battery monitor, DC switchgear and installation.

Dual Output system requirements

Plant-room: ventilation, exhaust, acoustic treatment, switchgear and installation.

In practice the Dual Output system can provide a reduction in space of up to 40 % and a reduction in system cost of up to 20% over the more traditional static/rotary UPS systems using batteries and standby diesels.

Typical layout for Dual Output installation (3 x 1500 kVA modules)

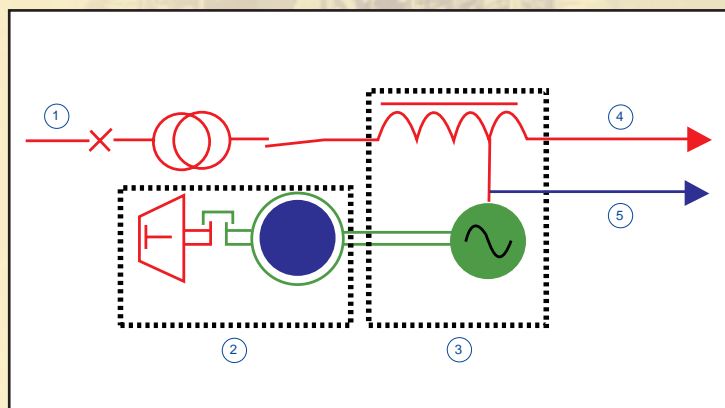


System reliability

In the past improved reliability has invariably led to an increase in cost. This no longer needs to be the case using a Dual Output system. Now, reliability and cost effectiveness can be synonymous.

This has been achieved by reducing the number of components in the overall power systems which in turn reduces the number of electrical interfaces.

To demonstrate this we show (opposite) the major components which are connected between the 11 kV supply and both critical and non-critical outputs.



- | | | | |
|---|-------------------|---|---------------------|
| 1 | mains | 4 | critical output |
| 2 | emergency back-up | 5 | non-critical output |
| 3 | filter | | |

Improved harmonic reduction filter

The unique Hitec Power Protection filter system shows a low impedance path to output current harmonics other than the fundamental (50 Hz) thus allowing them to circulate through the choke and a.c. generator path without imposing themselves upon the mains supply. This design precludes the need for input harmonic filtering to meet any Electricity Council recommendations for harmonic reduction.

Input power factor correction

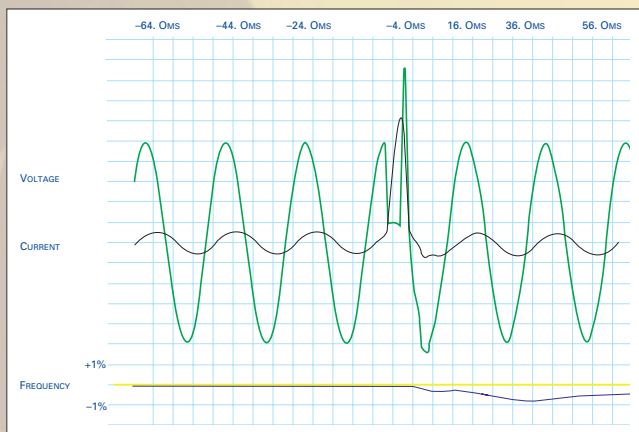
Our unique filter network acts as a kVAr generator during normal operation. By providing all of the kVAr demands of the critical load to ensure that only kW are demanded from the mains supply. This ensures that the input power factor is always UNITY.

Input short circuit resilience

With the Dual Output choke impedance being rated at 50% the fault contribution of the system back into the mains supply is limited to 2 per unit (pu). In the event of a short circuit at the input terminals of the Dual Output system the fault current is limited to 2 pu which has no impact upon the output voltage regulation of the system.

Output short circuit resilience

With output short circuit capabilities of 15-20 times the normal critical current, it is possible to clear downstream faults whilst maintaining the critical output voltage within close tolerance.

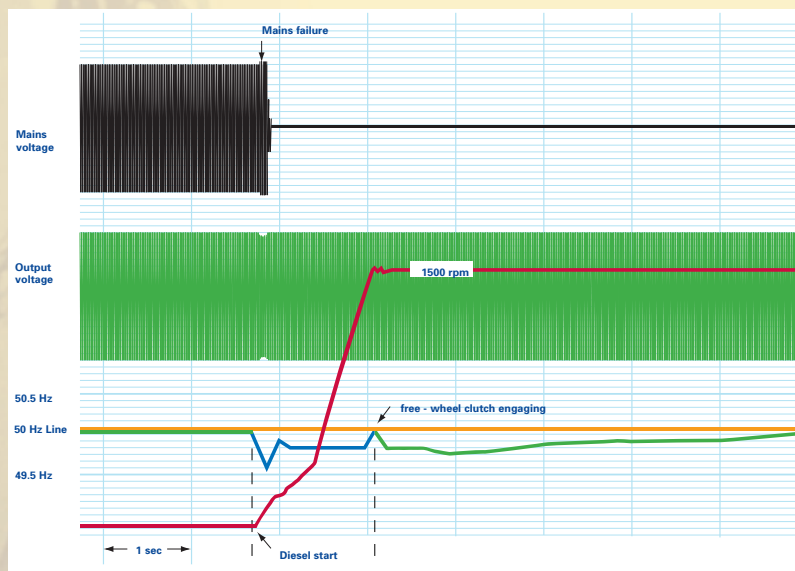


1600 kVA Dual Output system with 50% load.
Three-phase short circuit using 400A motor start fuse

Improved diesel start reliability

The improved ride-through characteristics associated with the new induction coupling (1992) assures ample stored energy (up to 10 sec.) to allow the system to ride-through the majority of mains voltage fluctuations without causing the diesel engine to start. The ride-through also allows two diesel starts if required.

Recording of a mains failure at 100% load, Dual Output system, 1000 kVA



In practice diesel start reliability is assured by:

- 1 utilising redundant start circuit
- 2 gravity feeding of fuel to the diesel engine
- 3 starting the diesel on no-load
- 4 pre-heating the diesel to its optimum temperature

More details of the technical capabilities of the Dual Output system are given in the Total Power Solutions manual, together with information relating to the design of an overall system capable of providing all the power requirements of a site.