Alewijnse

Power Management System

Power Management Systems (PMS) play an important role in the distribution of electrical power around a ship. They balance the electrical power distribution by coordinating suppliers and loads.

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Introduction

On a ship the main suppliers of electric power are the generator sets. These are usually diesel engines, mechanically coupled to an electric generator. Several generator sets are required for safety reasons in case one generator set has a temporary fault, in which case another is available to provide power. In this way, electrical power is always available. Other suppliers can include grid converters and battery systems. Where there are battery systems on board, the PMS will also have a role in energy management.

Tasks of a PMS

1. **Starting and stopping of suppliers**
2. **Disconnection of loads**
3. **Coordination of suppliers**

The first task of a PMS is the starting and stopping of the generator sets. In the event that the load is increasing, an additional generator set can be started, and synchronised to the grid. If the load is decreasing, one of the generator sets can be stopped. This can be done manually, but nowadays it is always done automatically.

Instead of starting an additional generator set, an alternative can be to temporarily disconnect one of more systems that are consuming a lot of energy, in order to rebalance the power. (Of course, this can only be allowed for non-critical systems.) This is the second task of a PMS.

When there are two or three generator sets supplying the same grid with a battery system, plus one or two grid converters, then all these systems do not share their power automatically. They have to be coordinated to do so. This is the third and most important task of a Power Management System.

Coordination of suppliers: sharing of power and reactive current

When there are two or more suppliers on a grid, the amount of power that each supplies will not automatically be equal. One of them may supply 90% of its nominal power, while another may only supply 30%. This is not an ideal situation!

So this is where a Power Management System is very useful. The PMS monitors the actual load on the grid and coordinates all suppliers by letting each supply the same level of power relative to its nominal power. If required, asymmetrical load sharing can be implemented.

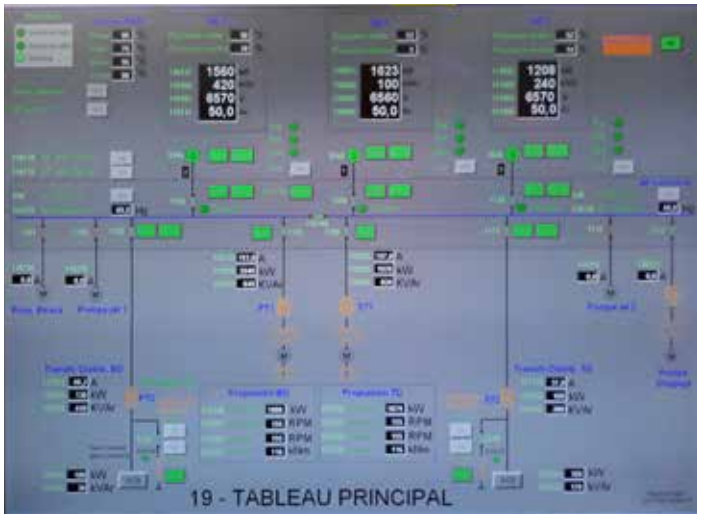
The same with the reactive currents. The Power Management System monitors the actual reactive current on the grid and coordinates all suppliers by letting each supply the same reactive currents relative to its nominal current. If required, asymmetrical reactive current sharing can be implemented.

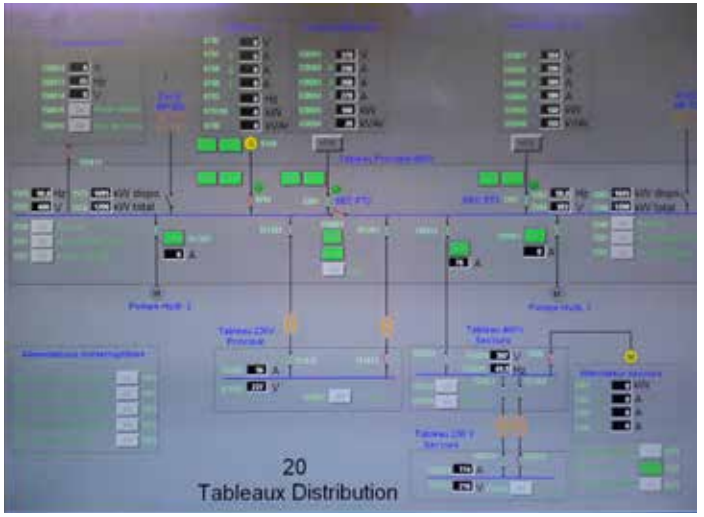
Grid converters

Grid converters can also be coordinated in this way. For example, hybrid systems with shaft generators that supply the electric power by means of a grid converter can be coordinated for the optimal supply of power to the grid.

Battery systems

For sustainability reasons, an increasing number of large battery systems are being installed on ships. They can play a role in reducing fuel consumption and reducing emissions from the generator sets. This is actually energy management, but this function is possible when it is coordinated in the correct way by the PMS.





When fuel usage and emissions are being considered, it should be noted that the diesel engines powering the generator sets will operate at their most efficient with a steady load and in a warm condition (their normal operating temperature). But when the load increases, and sometime later decreases again, the generator sets may end up being started, operating for just a few minutes, and then being stopped again. This will result in much higher fuel usage and correspondingly higher emissions. With a reasonably large battery system on board, a much more sustainable situation can be achieved.

Equipment required for Power Management Systems

A Power Management System requires a PLC. This has to be programmed with the load sharing algorithms, data regarding the handling of inputs and outputs, and connected to the Alarm and Monitoring System. Also required are standard load sharing units for the different suppliers mentioned above. These load sharing units are readily available, comply with international standards, and can be chosen from a number of different manufacturers.

Power Management unit in the switchboard

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