



## **DYNAMIC POSITIONING CONFERENCE**

### **BASICS OF DP**

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# Safety Technology for DP Class 3 Vessels

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## General

This paper intends to present the design philosophy regarding the layout of the main components included in the IMO DP Class 3 system for a deep water drilling semi-submersible unit. Such components include diesel generators, switchgears, frequency converters and thrusters. Included in this design philosophy is also the layout of cable and pipe main routings. The paper does not include DP management and control systems, nor the positioning reference system.

## Introduction

The design basis for DP Class 3 system is intended to prevent any major failure violating the station keeping capability. We do not expect major failure to happen with the DP3 system developed for a vessel. However, if such failure would occur, it is the duty of engineers and designers to collaborate to design the integrated DP Class 3 system as safe and reliable as possible and to minimize the consequences of such event.

Safety Design Philosophy implies amongst others:

- ❑ Well defined design
- ❑ Well defined failure modes
- ❑ Well defined failure mode effects

Safety Technology is specially considering:

- ❑ Grouping Design Philosophy for Major Components
- ❑ Planned Design Philosophy for Cable and Pipe Main Routing

### Safe Technology for GVA 5800 design

Safe Technology will here be described for a GVA 5800. The layout and routing has been based on our experience from 3 newbuild and one converted DP units as well as a number of engineering projects. One of the main objectives has been to endeavor a simple and installation friendly system.

The basis for a DP Class 3 vessel is to design a system that will allow the vessel to stay on location in the worst failure mode defined by IMO. For a DP3 system, this includes fire or flooding of an engine room, a switchgear room or any other active or passive component causing similar serious effects. This means that the DP analysis shall consider the worst possible station keeping failure mode. The remaining thruster capacity shall be able to keep the unit on location for the environmental design criteria defined for the unit.

For the GVA 5800, the four engine room layout has been chosen to optimize the built-in power as well as creating a well-balanced weight distribution for the upper hull. The diagonally connected thruster layout have been selected to optimize the remaining thruster capability in the worst possible failure mode.

In the Table below, a comparison is made between the number of engine rooms and the required built-in power for a IMO DP3 vessel. The failure mode described is one engine room or switchgear room lost.

No of engine rooms	No and size of diesel generators	Tot power installed	Utilization with one engine room down	Req. thrust capacity in failure mode	Remaining power for drilling shut down and hotel in failure mode
2	8 x 7.1 MW	56.8 MW	28.4 MW (50 %)	21.0 MW	7.4 MW
3	9 x 4.7 MW	42.3 MW	28.2 MW (67 %)	21.0 MW	7.2 MW
4	8 x 4.7 MW	37.6 MW	28.2 MW (75 %)	21.0 MW	7.2 MW

As per the grouping design philosophy for the GVA 5800, we group together 2 diesel generators in one engine room, a switchgear/high voltage room, a frequency converter in diagonally located columns and a thruster diagonally located in each pontoon end.

By utilizing four such groups it is possible to optimize size of thrusters and diesel generators, see Table above.

This implies that whichever major failure that occurs, the loss of thruster capacity will never jeopardize the ability to stay on location, and the design will thus meet the requirements set forth by IMO DP Class 3 regulations. The available power from the diesel generators shall also be sufficient to supply the marine systems and the hotel, as well as the required power for shutting down the drilling operations in a safe and reliable way.

Based on the layout with four engine rooms/switchgear rooms, it is also possible to achieve a well-segregated cable and pipe main routing in a simple way.

## **Safety Design Philosophy**

- **Well defined design**
- **Well defined failure modes**
- **Well defined failure mode effects**

# Safety Technology

- **Grouping Design Philosophy**
- **Planned Design Philosophy for  
Cable and Pipe Main Routing**

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