Royal Institution of Naval Architects

2017 Maritime Innovation Award

GustoMSC

The 2017 Maritime Innovation Award is presented to GustoMSC BV for their Moon Pool design.

The introduction of a moonpool in the hull of any vessel brings a number of challenges including increased resistance and sloshing effects, The Callirrhoe solution adopted by GustoMSC gave savings of 37% in resistance compared to other types of mitigation designs. This solution will translate into significant fuel savings and reduced environmental emissions when in transit

GustoMSC has a long history in drillship design. Modern drillships usually feature moonpools through which the drill string and drilling riser pass to reach the seabed. GustoMSC does not treat a moonpool as an inconvenient hole in the hull of the ship, but instead tries to take advantage of the shape to increase the performance of the vessel. In recent years GustoMSC has invested in the research of moonpool performance and design and their efforts are showcased here with three examples; the Callirrhoe, Galene and Euryale moonpool technologies.

Callirrhoe

An inherent disadvantage of a moonpool is that it interrupts the hydrodynamic watertight shape of the vessel's hull. If no measures are taken, during transit, the water inside the moonpool will oscillate creating potential risks to the equipment in the moonpool and adding resistance to the propulsion system. Not only does the mean resistance increase, but there is also an oscillating part of the resistance with high standard deviation.

To mitigate these effects, GustoMSC engaged in an extensive R&D process involving potential flow calculations, CFD calculations and model tests. The outcome of this process was the Callirrhoe Moonpool Technology (patent pending). Callirrhoe, a water nymph in Greek mythology, means beautiful flow, which represents how the adverse effects of the moonpool are alleviated. Most common moonpool mitigation devices try to block the water flow from entering the moonpool. To the contrary, the Callirrhoe moonpool is comprised of a special hydrodynamic shape which not only allows, but also directs the water flow through the moonpool in a controlled way. By doing so, sloshing completely disappears while at the same time the moonpool added resistance is reduced by 37% compared to a conventional mitigation device [Ref. 1].

Galene

During stationary operations, the moonpool will respond to incoming waves in the so-called piston and sloshing modes. Due to the special underwater shape of the Galene moonpool (patent pending), the water motions inside the moonpool are significantly decreased. Galene reduces the water response by shifting the natural periods of the moonpool to lower values and consequently reducing the response as wave spectra with lower peak periods, also have less energy. The uptime gain in operability can be as high as 13% compared to a conventional moonpool, depending on type of operation and location. [Ref. 2]

Euryale

Modern dual derrick drillships are designed to full drilling capabilities on one well center, while the second one, usually termed "auxiliary well center" can only be used for top-hole drilling or running casing. This is due to the fact that the auxiliary well center is not equipped with riser tensioners and the access of riser joints usually passes through the primary well center. Driven by the need for full dual drilling, GustoMSC redesigned the layout of a drillship by arranging the two well centers side-by side in the transverse direction. This was enabled by a change in the moonpool orientation. The Euryale moonpool (patent pending) is a transversely oriented moon pool allowing the well centers to be transversely arranged, and providing full accessibility to both well centers at the drill floor from forward and aft deck areas. By reducing the moonpool length, the Euryale moonpool also mitigates sloshing phenomena during transit of the vessel [Ref. 3].

The GustoMSC moonpools are designed without mechanical and/or temporary structures underwater that are difficult to maintain, prone to failure and need to be designed for large hydrodynamic forces in the moonpool. Also there is no need for protruding parts into the moonpool, which may interfere with the drilling process or damage the drill string or riser.

The GustoMSC moonpool technologies give the ship a significant fuel and emission savings potential, increased uptime and allow to mobilize the vessel faster between locations.

The application of the Callirrhoe and Galene Moonpool Technology is not restricted to drillship designs. Offshore construction vessels, mega yachts, cruise ships and naval vessels could benefit from this technology.

References

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