Advanced offshore composites materials – Light weight, high performance composite materials report

umoe advanced composites

STRONG performance – LIGHT materials

Introduction

Umoe Advanced Composites and Umoe Mandal develop and manufacture light weight composite products for the oil & gas and maritime industry worldwide. The companies are sited in Kristiansand and Mandal, in the southern Norway. We are part of the Norwegian Centre of Expertise called NODE (Norwegian Offshore & Drilling Engineering), the world's leading offshore service cluster.

Our vision:
To be the world's leading innovator of lightweight offshore equipment.

Our mission:

To improve our customers profitability and eco-friendliness through the use of composite solutions replacing traditional materials.

Umoe Advanced Composites originated 6 years ago from the parent company Umoe Mandal AS, and was established as an independent subsidiary in 2007. Umoe Mandal has 20 years of experience in building advanced composite high-speed SES (Surface Effect Ship) vessels for the Royal Norwegian Navy.

Fig. 1: Surface Effect Ship for RNoN.

Market trends

In general, we are seeing an increasing interest in the use of composite materials in several markets.

In particular, we are experiencing an increasing interest from the following sectors: maritime (LNG), transportation (CNG), subsea (accumulators) and oil & gas (composite air pressure vessels, choke & kill lines, composite wire sheaves etc.).

The interest for alternatives to steel and other conventional materials originates from the need for long-term reliable materials (non-corrosive), weight-criticality and the need for reduced life cycle costs.

Our new generation Composite Air Pressure Vessels (CAPVs) for heave compensation of drill ships, drilling rigs and offshore cranes, was introduced to the market appr. 4 years ago. Today, oil companies and rig owners are starting to specify CAPVs rather than steel air pressure vessels, due to reduced maintenance & life cycle costs.

Fig. 2: Composite Air Pressure Vessel (CAPV).

Previously, this decision has been made by the individual yard or the suppliers of drilling equipment.

This is a great acknowledgement to our products and an important step forward for the new technology, which opens up new and significant markets, e.g. aftersale/retrofitting.

It is also a trend that customers who have been introduced to products made of composites, find these

materials very attractive - and would like to evaluate further opportunities.

The increasing market interest has resulted in various new products now under development;

New products under development

SES as Offshore Wind Service Vessel; Umoe Mandal AS is currently developing a vessel for offshore service and maintenance operation based on the SES technology. During the last 20 years, the company has developed and produced 9 mine hunters and minesweepers, and is currently in the process of delivering 6 fast patrol boats to the Royal Norwegian Navy. All these vessels are made of Fiber Reinforced Plastics (FRP).

About 80% of the vessel weight of a SES is lifted by an air cushion. The remaining 20% of the lift is from buoyancy. While so small parts of the hulls are in the water, wave induced motions are significantly reduced compared to other vessel types. This allows for a high vessel speed, and greatly improves the seakeeping, making the vessel behave like a much larger ship. The improved seakeeping allows for transfer of personnel and cargo between vessels and offshore installations in a larger operational window. This will provide significant increased availability of offshore wind power installations.

CNG; A growing marked in CNG is maturing both from bio gas (farming waste) and food waste from humans. Another factor is the increasing price gap between oil and natural gas. CNG has now become a cost competitive and green alternative. Umoe Advanced Composites have under development solutions for this marked and we are seeking partners and agents for these solutions.

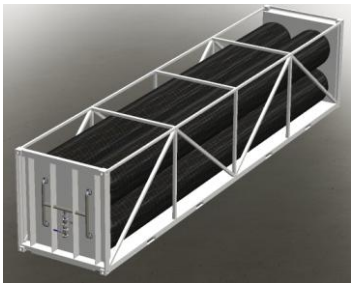

Fig. 3: Composite light-weight solution for CNG transport and storage.

LNG; Following IMO's new and stringent requirements for emissions from ships, and the establishment of Emisson Control Areas (ECAs), Umoe Advanced Composites is looking into the market for LNG together with a reputable national & international partner.

When IMO's new and stringent emission control requirements are in full effect towards the end of the decade, only LNG fuelled ships or ships with exhaust gas cleaning will be able to meet these requirements. Of these two alternatives, LNG will - without doubt - be the best environmental alternative. LNG fuel is additionally believed to be a better economical alternative over the ships lifetime. Consequently, the market for LNG fuelled ships is expected to grow significantly over the next few years.

Computational Fluid Dynamics (CFD)

The last years' improvement of software and computational power has significantly increased the capabilities and possibilities of CFD. This has made it to a powerful and competitive tool that will be a central element in future design of marine structures and vessels.

Umoe Mandal AS has, using the program Star-CCM+, recently proven that a complex process such as a free fall lifeboat drop can be simulated with excellent accuracy. Design parameters such as structural loads and accelerations acting on the vessel occupants have been derived and validated against full scale test results.

Umoe Mandal AS offers a wide range of CFD services covering most gas and fluid-structure interaction. The company can also offer CFD analyses coupled with structural analyses and organize model testing for validation of analyses.

Testing & (type) approval of composite products

In general, all rules and regulations within the classification industry are written for constructions

mainly made of steel, aluminium and other conventional materials. The exceptions are some ISO-rules, ASME X-rules and the DnV-OS-C501 regulations.

Consequently, the approval processes for products made from composite materials are characterised by very strict requirements to various analysis, strength / fatique calculations and most important – extensive full scale testing of the products.

As Umoe Mandal's and Umoe Advanced Composites' vision is to be the world's leading innovator of lightweight offshore equipment, we have in the recent years built up an unique competence on advanced composite testing. Significant resources have been put into building up test cells and laboratories which can facilitate the test requirements and volumes in a safe and efficient manner.

Fig. 4: Test cell for CAPVs..

Today, we have two separate and independent test lines, which can perform fatique and burst testing with temperatures ranging from -40°C up to +70°C.

Fig. 5: CAPV undergoing fatique testing

In addition, we have joined forces with an independent, high-technological materials partner.

For our CAPVs, we have now produced and tested numerous CAPVs in various sizes and pressure ranges. Statistics and results gathered through these tests have been of great value to all parties involved – including the customers – whose can feel confident that the products are well suited for the applications. For future product developments this knowledge will contribute to shorten the way to the market.

Contact information

Umoe Advanced Composites AS

Managing Director,
Raymond Johnsen
Phone: +47 38 27 93 41, E-mail:
rjo@um.no

Manager, Business development,
Jørn Løvdal
Phone: +47 38 27 93 57, E-mail:
jkl@um.no

office@uac.no
sales@uac.no