



June 2009

SubSea Solutions Newsletter

"The Chronicles"

Rapid Cost-Effective Worldwide Underwater Repair Solutions

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Worlds Toughest Fixes-
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June proved to be another month of milestones for the **Subsea Solutions Alliance**. With our television debut coupled with revolutionary service solutions performed together with our OEM partners, the diver / technicians of the **Subsea Solutions Alliance** yet again demonstrated that thinking "in the water as opposed to out" saves time, money and creates value for ship owners and operators in more ways than could be previously imagined.

The **Subsea Solutions Alliance** was very busy performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed.

- 2 Thruster repairs were performed in Europe
- 1 thruster was exchanged with a new OEM procedure for a cruise vessel in the Caribbean
- 2 propeller repairs with underwater Straightening was completed in Europe
- 1 propeller repair with cutting and grinding was completed in the Far East
- 2 propeller upgrades with cutting and edge restoration were completed: One project in Europe and one in North America
- 1 seal repair was performed in Europe

- 1 major steel repair was performed underwater in Europe.

Whatever the situation in any port around the world, if you have a problem we have a solution!

- Rick Shilling

Subsea Solutions Alliance

Thruster Repairs- OEM in-water repairs

Innovative repair alternatives



Keeping vessels in operation in today's market is a must. The Original Equipment manufacturers (OEM) know all too well that repairs cannot affect vessel operations. As such, the OEM's are embracing in-water repairs to meet their challenging customer needs.

On a recently delivered container vessel with a secure and profitable charter in place, a hydraulic defect was found

with the Hyundai bow thruster. Working closely with the OEM, a factory authorized repair was executed by the **Subsea Solutions Alliance** in a European port. The **Subsea Solutions Alliance** utilized it's flexible dry door technology to form a "dry environment" in the bow thruster tunnel in order to open up the lower unit and execute this repair. The repair required the lower unit back cover to be removed and parts exchanged to eliminate the malfunction. With a continuous video monitoring system and a "4-way" communication system in place, the diver / technicians from the **Subsea Solutions Alliance** could communicate and effect the repair under the direct supervision of the OEM's attending engineer. These hydraulic system repairs are designed to bring the unit back into operation eliminating the operators need for additional tug boats in the vessels next ports of call. Scheduling and execution was performed in such a way to minimize any schedule impacts to the vessel and allow the vessel to maintain it's valuable charter.

With so many vessels off charter and available as immediate replacements, in water repairs have become the only alternative to keep vessels in operation and maintained without any impacts to the charter.

The **Subsea Solutions Alliance** together with Rolls Royce Corporation performed a revolutionary tunnel thruster exchange on a cruise vessel in the Caribbean . A complete lower unit was exchanged in ONE port stay (12 hours) without the need for dry doors while the vessel was in operation. This lower unit exchange procedure was developed in close cooperation between Rolls Royce and the **Subsea Solutions Alliance** using equipment patented by Rolls Royce for this specialized operation. This procedure supports the developing exchange programs being put in place between Rolls Royce and the cruise clients. Keeping cruise vessel's afloat and in service with condensed scheduled shipyard periods for maintenance requires a cost competitive alternative for thruster overhaul. This break through in thruster exchange programs will allow cruise operators to take full benefit of in-water thruster exchange programs at competitive costs.



In-water Propeller Repairs

OEM propeller upgrades and repairs

The **Subsea Solutions Alliance** participated in two revolutionary propeller repairs this past month with Wartsila Propulsion. These propeller upgrades harmonized the engineering capabilities of Wartsila Propulsion together with the unique underwater capabilities of the Subsea Solutions Alliance.

A cargo vessel called Subsea Propeller Inc. to evaluate a repair procedure for a propeller that had cracks in the blades. Based on the locations and depth of the cracks, the classification society put a condition of class on the propeller; thus making it impossible for the operator to return the vessel to its owner. Since the propeller metallurgical properties included a high lead content a welding repair of the cracks was not a viable option. Cropping, grinding and propeller edge restoration was the only option available.

To minimize the cost of the repair and to keep the vessel in service as long as possible an underwater propeller repair was suggested. Wartsila Propulsion's hydrodynamic department calculated the necessary sections to be removed and developed the necessary templates for grinding. Under the supervision of the OEM, the **Subsea Solutions Alliance** performed an in-water propeller upgrade based on the study performed by Wartsila Propulsion. This is the first time a propeller upgrade of this type has ever been performed while having the vessel in the water and propeller fully submerged. The propeller upgrade removed the condition of class, improved the hydrodynamic performance of the older designed propeller as well as improved the vessel's speed performance.

The tooling that is engineered and built by the **Subsea Solutions Alliance** provides a major advantage to the customers since most diving companies use cup stones and grinding discs to establish blade edge profiles. The **Subsea Solutions Alliance** uses state of the art hydraulic milling machines that are light weight and can remove material faster than a speeding bullet. Our self propelled robotic cropping tools can cut 60 mm material at a rate of 5 meters per/ hour. Putting this revolutionary tooling system in the hands of our highly skilled diver / Engineers the **Subsea Solutions Alliance** can easily turn what would be a 30 to 40 hour job for other diving companies into a 8 to 12 hour job. This saves off hire time and big bucks for the ship owner as we say at the **Subsea Solutions Alliance**.

The techniques described above can easily be applied to any HEAVY RUNNING propeller. With integrated engineering together with trained diver / propeller technicians, the Wartsila Propulsion / **Subsea Solutions Alliance** team is available to support your propeller needs any time and in most ports of call around the world.

In addition to the propeller upgrade mentioned above, Wartsila and the **Subsea Solutions Alliance** performed propeller blade upgrades to a

series of tunnel thrusters found on a cruise vessel. During sea trials the propellers indicated a singing condition. After Wartsila Propulsion performed an engineering study to remove the singing, they provided the necessary templates for grinding, so the diver / propeller technicians from the **Subsea Solutions Alliance** could execute the restoration of an anti-singing edge.

Unfortunately for the cruise operator, during the sea trials one of the main propellers sustained damage which required cold static load straightening underwater to restore it to it's "as new" condition. As with the other propeller upgrades mentioned above all of the work performed by the **Subsea Solutions Alliance** was executed in time to meet the cruise operators schedule.

Finally, the **Subsea Solutions Alliance** performed a repair to a five blade propeller with a large absent tip section in the Far East. The vessel was a large car carrier with an absent section with a mass of approx 80kgs. The broken blade was cropped to remove any linear defects and stress risers. The location and mass calculated for smaller sections to be removed from the two opposing blades to restore static mass balance to well within the ISO 484/1 Class 1 mass imbalance tolerance was performed and executed with minimal hydrodynamic losses to the propeller.

The most common practice for mass balancing a propeller with "typical" diving companies is to remove the same section from the opposing blade or in the case of a 5 bladed propeller to remove the same section from the other 4 blades. This method of mass balancing will solve the problem of vibration, BUT is very likely to result in a decrease in thruster and may cost the customer hundreds of thousands of dollars more in repair costs if the tips are cut below .7R (for Low skew propellers) / .85R (for high skew propellers) radius on the propeller. In these cases, class will condemn the propeller forcing the ship owner to buy a new one. In cases where the cuts are within ISO 484/1 tolerances and they are cut using "traditional balancing methods", the cost to weld new tips on is significantly increased. **Subsea Solutions Alliance** employs certified service engineers on every propeller repair giving us the ability to perform complicated hydrodynamic and mass balance calculations on site to ISO 484/1 standards. This technology coupled with our underwater laser measuring devices give our diver/ engineers the ability to have pin point accuracy of there cut lines; thus allowing us to remove the minimum mass from only two opposing blades in low stress areas of the blade surface.



Seal Repairs on a schedule Keep the water out and the oil in!

The **Subsea Solutions Alliance** was called upon to repair an aft stern seal on a cruise vessel working the Mediterranean Sea cruise itinerary. With limited hours per day available to work due to the aggressive schedule of the vessel, the **Subsea Solutions Alliance** was able to execute the seal repair on board the vessel with no schedule impact and controlled costs. By studying closely the symptoms being exhibited by the seal and coordinating closely with the manufacturer, Wartsila UK, an in-water repair solution was performed.

The cruise operator reported a full improvement after the intervention and also reported no loss of revenue due to delays on their scheduled voyage. Another success story delivered by the expert diver technicians of the **Subsea Solutions Alliance**.

The Subsea Solutions Alliance (SSA) is a consortium of underwater ship repair specialists including: All-Sea Enterprises Ltd, Miami Diver Inc, Parker Diving Inc and Trident BV. With a dedicated staff of over 130 divers globally, SSA has revolutionized the methods of repair for ship equipment underwater. Through a common shared system of dive equipment, specialty tools, and dive personnel the SSA is able to mobilize quickly anywhere throughout the world with diver / factory trained service technicians for most OEM equipment. From the replacement of aft propeller shaft seals to the exchange of thrusters to straightening large bends in propellers, SSA has become the OEM's choice for all types of complex repairs. With class approved techniques and a highly trained staff in both underwater ship repair and propulsion equipment maintenance, SSA is the clear choice for vessels operating in sensitive environments and on critical trade routes.

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