
Singapore Harbor

Ship hull coatings and economic advantage of smoother hull

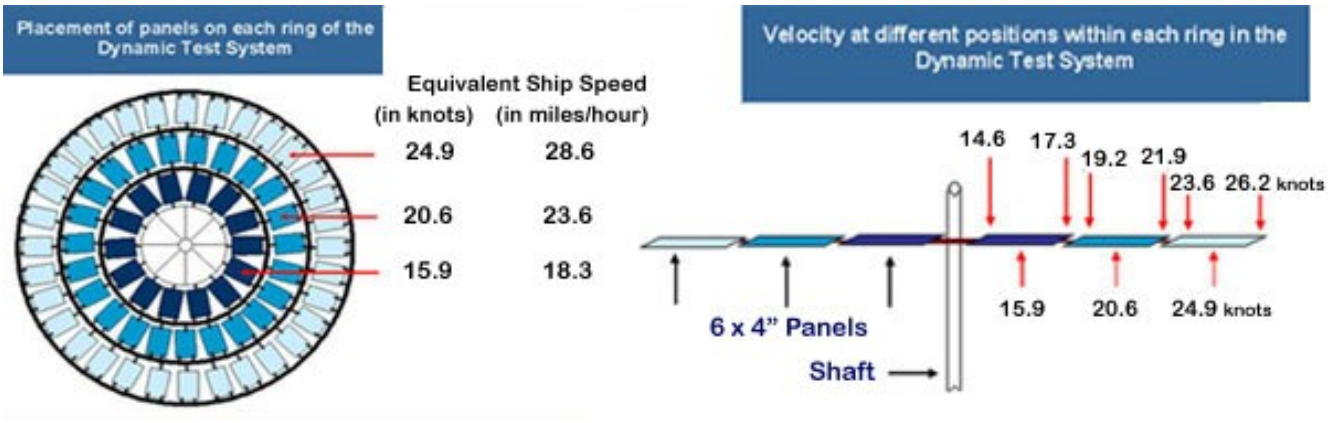
Numerous scientific papers have demonstrated, mostly under laboratory tests, computer simulations and 'semi-field' conditions, that the topography of the surface are major factors that contribute to drag; and hence the speed of the ship as it propels through the water. For this reason, we have always taken for granted that a sleek, smooth surface is always better for business. But, no one has actually shown how better a smooth surface is compared to one less smooth under real operating world conditions.

Why is it important? Well, it is a matter of money. The shipping business after all survives, barely at times, through the revenues of the constantly moving fleet, carrying goods from port to port. Given the tough and often uncertain world of the shipping business, any fuel saving can dramatically impact the 'bottom line.' This is why the recent paper in the journal Biofoulingby Dr. Michael P. Schultz, Program Director of Ocean Engineering at the U.S. Naval Academy in Annapolis, Maryland is quite important, perhaps not as much for the academic value, but the insight it gives to the ship owners and the formulators of future coatings. Even in the absence of barnacles on the surface, a fouling free surface still has some performance issues to overcome. And that a smoother surface has quantifiable economic advantage in lower fuel consumption is an important consideration in the selection of coatings. The differences is quite dramatic if one compares a hydraulically smooth surface coatings with added fuel cost over baseline of US$ 0.45 million per ship/year to an ablative AF coating with no fouling at US$ 3.33 million per ship/year. Compare these two situations against a conventional AF coating with fouling which translates to US$ 43.8 million per ship/year of added fuel cost. A more in depth summary of this paper can be accessed at PaintSquare.

For the paint chemist, this economic data further justify all the painstaking work of designing smoother, foul free, environmentally acceptable, tougher coatings. The chase has always been on for a better mouse trap long before this paper, but it does make it much more worthwhile when one knows for sure that there is a true economic value for the ship owners.

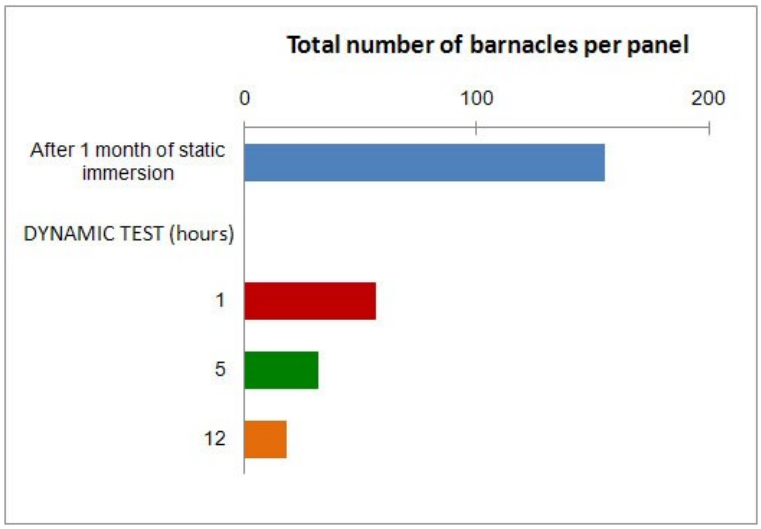
Validating if a coating does have improved characteristics is troublesome. Laboratory tests are available to measure drag. But, the shipping industry, as we all know, is a conservative bunch and always wants to see true to life performance indicators. Short of a ship test, what can be done? Product development is a long, arduous and hit or miss process

The nearest simulation of the movement of seawater in the open sea is Poseidon's dynamic test system situated in the warm tropical ocean of Tuticorin Bay, South India. Here, a coated panel is placed horizontally on a frame and the panel rotates while submerged beneath the surface at speeds ranging from 15 knots to 25 knots. This system is useful in determining the erosion of the coating due to fluid shear forces. It is also useful, when placed in an alternating static, then dynamic test (1 month duration each) to measure the performance of the coating against hard fouling attachment while measuring erosion effects.



Since the test platform, supplied with power through underwater electric cable, is in the open sea under tropical conditions, the tests can be undertaken on a year round basis. This is particularly useful test paradigm to measure the performance of a smooth surface in shedding barnacles off the surface when subjected to different speed.

An example of the shedding of barnacles off the surface after a dynamic run is shown in the figure below. The barnacles accumulated on the surface after one month of static and shed off the coating after different periods of dynamic test.



Measuring drag using this system might be a little more complicated and it will be great if we can collaborate with an ocean engineering team that can device the sensors that can be placed on the surface to measure the hydrodynamic drag. Anyone interested in this challenge?

Conference Update:

Poseidon Sciences participated as a speaker at the last ACC 2011 (Asia Coatings Congress) in Ho Chi Minh City, Vietnam. The topic of the presentation included methods to validate the performance of ship coatings using dynamic test systems and novel coatings concept for antifouling in nets/subsea monitoring equipment. To read more about the ACC 2011 and the abstract of the presentation, please click HERE.

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