



## AN OEM VIEW OF THE NEW STANDARD FOR FOUR-STROKE MARINE ENGINES



The new four cycle-water (FC-W) oil certification standard released by the National Marine Manufacturers Association (NMMA) in August 2004 is designed to protect four-stroke outboard and inboard-outboard engines. George L'Heureux, Small Engines Technical Adviser, at Infineum USA LP, asked Frank Kelley, Fuels and Lubricant Specialist from Mercury Marine and a member of the NMMA Oil Certification Committee, to explain why the specification was needed and to give his thoughts on how Mercury plans to use this new standard.



**Frank Kelley**

**M**ercury Marine began producing four-stroke engines about 10 years ago and since then demand for them has grown, displacing two-stroke engine sales. This shift in production is related to the emissions capability of four-stroke engines and the fact that it is a well developed mature technology. The new Verado engine was recently introduced as Mercury Marine's flagship engine for now and the foreseeable future.

"Our push into the development of four-stroke technology for marine use is really exemplified by the Verado engine and it will be the platform that we will use to develop technology for the future," explains Kelley. "It will continue to be developed for improved fuel economy characteristics, lower emissions, reduced noise and vibration, and better reliability, along with any other characteristics that might enhance the customers' enjoyment of their engine," he continues.



they have become less desirable for use in outboard engine applications. “As four-stroke outboard engine technology becomes more prominent, it is obvious that it will be the standard for outboard engines, and at Mercury we felt that there was a need to develop a standard that would allow consumers to buy oils that were appropriate for their engines,” stresses Kelley.

## **CORROSION REQUIREMENTS**

The most obvious difference between automotive and marine engines is that the latter are constantly exposed to the corrosive effects of water. This means it is vital that marine oils offer a high level of corrosion protection. Marine engines also run at higher rpms for longer periods and at higher torques than automotive engines, which means that it is essential to have a fluid with the correct viscosity and wear characteristics. It is also important for marine oils to retain their lubrication capabilities when diluted with fuel which tends to occur at low rpms, when the engine runs cooler. “If you relate the new FC-W Insight March 2005 standard to automotive standards, the main enhancement is in the corrosion requirement, which is obvious given that it is the most critical different aspect that marine technology faces relative to automotive,” clarifies Kelley. “There are other minor differences. For example, we limited the use of highly viscosity modified oils because the tendency for viscosity modifiers to break down or shear in use, especially under the high revving conditions we experience. We also increased the minimum necessary oil viscosity after shearing to ensure that the critical bearings receive sufficient lubrication.”

The corrosion test for FC-W, which Kelley helped to develop, has probably been the major focus because of the obvious need of marine oils to have high corrosion protection. To pass, test oils must at least match the performance of a reference oil that has been developed to provide a minimum level of corrosion protection in the salt fog test, using test coupons cut from actual cylinder liners. Following the preparation of these coupons it takes 24 hours to complete the test after which time the coupons are photographed and judged relative to a rating system that

assesses how well corrosion was resisted. “This test is really important for marine engines,” he emphasizes. “In many cases it helps to determine the life of the engine. If water is present in the oil or the system it will begin to attack certain components, like valve springs, which means that the engine is likely to fail earlier. Since the presence of moisture is a very high probability circumstance, it is important to try to reduce the effect of any corrosion so that durability can be retained.”

## **CONTINUED DEVELOPMENT**


It is expected that FC-W will serve the market for only a few years. As Kelley explains, “It is extremely likely that enhancements to the standard will be needed because there will have to be continued development in the area of emissions reduction, probably utilizing catalysts similar to those in automotive applications. It’s not terribly far down the road,” he continues, “so I see this as an entry into the standards arena for the engines that we are developing now.” Emissions reduction technology and its impact on lubricant formulation is something that automotive OEMs have been wrestling with for some time and the next phase of specification development, GF-5, is already officially underway and is likely to further restrict the use of certain additive chemistries.

To help their customers choose the right oil for their engines Mercury is already recommending FC-W oils in their owners’ manuals. Mercury’s new synthetic blend, which was developed in parallel with the specification, was released at the same time as FC-W and two mineral

oil versions of FC-W have been tested and are awaiting official certification from NMMA so that they



**The first FC-W license was granted to Mercury Precision Lubricants.**

too can be launched into the market. “Now when consumers can’t locate the OEM oil all they will need do is look for the FC-W logo and they will know that the lubricant will protect their engines,” he concludes. 

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OEMs have in the past specified their own oils for use in their engines, and as long as the consumer was using the right OEM oil for their specific engine then the correct level of protection was assured. However, if the boat owner was unable to purchase the specified OEM oil, there was usually little choice but to provide guidance in automotive terms on what to use in its place. “In our case, our owners’ manual said ‘use Mercury oil or an API SG or SL automotive oil’ or whatever was in vogue at the time. We recommended the use of a good quality automotive oil even though we understood that those oils would have different characteristics to those which we were looking for to lubricate our engines.” The reality is that as automotive oils have evolved to meet the specific requirements of today’s vehicles,