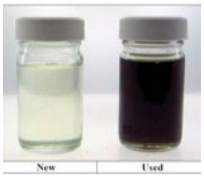
Navy SBIR/STTR Success

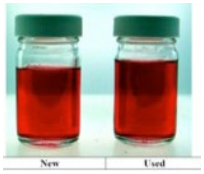
Synthetic Lubricating & Hydraulic Oil

A next generation lubrication and hydraulic oil specifically developed to boost hydraulic performance and reduce wear for an array of mechanical components aboard all classes of submarines and surface ships.

Legacy oil



Synthetic oil



METSS Corporation

Founded 1994

Solving challenges using mechanical engineering and materials/polymers science to design practical solutions for military and industrial customers

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TOPIC NUMBER:
N04-160

SBIR INVESTMENT:
$1,830,205

DON SAVINGS:
$100,000,000

THE TECHNOLOGY

METSS developed MIL-DTL-32353 (2190-S) synthetic oil to replace the Navy's existing MIL-PRF-17331 (2190 TEP) petroleum-based oil, primarily to reduce long-term maintenance costs, decrease operational failures, improve safety, and widen the performance boundaries of submarines and ships. This technology enables Fleet commands to operate in colder environments, run their engines at higher temperatures, and react faster to threats because synthetic oil improves overall motion control, propulsion, weapons, and acoustic systems.

THE CHALLENGE

The legacy lubricant (2190-TEP) was never designed for hydraulic systems that precisely convey pressure-forces required to operate sea-connected valves, open torpedo/missile doors, control steering and diving planes etc. The legacy oil was purely developed for lubricating gears, bearings, and rotating surfacing to reduce friction (heat) and wear. The challenge was designing a compatible fluid that improved lubricity, but also avoided thermal and oxidative degradation in hydraulic systems. The photographs show before and after results of legacy oil (L) and synthetic oil (R) after hydraulic testing. Color change indicates significant degradation of the tested oil. Oil degradation leads to reduced mechanical system responsiveness, decreased system component life-span, and can negatively impact a submarine's noise profile.

THE NAVAL BENEFIT

The METSS Synthetic oil reduces onboard fire hazards, maintains stability over large temperature changes, and resists moisture contamination (corrosion) and oxidation. Significantly extends duration between oil changes by at least factor of two, and results in less corrective machinery downtime due to carbon and varnish build-up.

THE TRANSITION

Acquisition Sponsor: PEO SUB, NAVSEA 07. Thus far, thirteen Los Angeles-class submarines have committed to fully adopting METSS's technology through engineered overhauls between 2016 and 2021. Columbia-class submarines are expected to install METSS 2190-S at new construction in 2021.

THE FUTURE

US Atlantic and Pacific Fleet Commanders have approved development of ship alterations for integration of the METSS oil on all classes of submarines. Surface Fleet integration of synthetic hydraulic and lubricating fluid is anticipated as the submarine force fully implements the changeover. NAVSEA's PEO Submarines estimates that 4-6 submarines will be refitted with 2190-S per year for the next ten years.

"Following more than a decade of development and in the fleet use, METSS recognizes the tremendous support and effort of NAVSEA and the SBIR Program's Office investment to enable the successful technology transition of the next generation lube oil aboard all class of submarines"

Brian Collett, METSS Director-R&D Operations (US Navy submarine veteran, USS Alaska SSBN 732 Gold Crew, 1988-1993)

"Implementation of synthetic hydraulic and lubricating fluid in US Navy submarine systems to-date has demonstrated considerable gains in life cycle cost savings, maintenance reduction and improved system reliability and operational availability. As the US Navy adopts synthetic fluid across additional submarine and surface platforms, we hope to further drive down procurement costs and expand the advantage." Steven Marzelli, Technical Warrant Holder - Hydraulic Systems