

Department of Navy Leadership in Biobased Products Usage

Naval Air Depot Cherry Point Prototypes Alternative Metal Working Fluid

Metal Working Fluids



A machinist applies PanTerra MMPE. Photo by Dykile Whitfield

Naval Air Depot (NADEP) Cherry Point, NC needed to replace an oil (VV-C-850) that was used extensively in machining applications but no longer available. And the alternative they found is biodegradable. Metal working fluids (MWFs), also called machining fluids, cutting fluids, and cutting oils are designed to cool the components, to remove chips from the cutting zone, to lubricate, and to inhibit corrosion during a given machining application.

There are four classes of MWFs: straight oils, soluble oils, semi synthetic oils, and synthetic oils. Straight oils, or neat oils, are not designed to be diluted with water. Straight oils are normally used for heavy duty machining operations. The other three classes of MWFs are designated water-soluble fluids or coolants. The water-soluble MWFs mainly contain oil, water, emulsifiers, a biofouling resistance package, and corrosion inhibitors.

Normally, the higher the oil contents of the MWF, the better the lubricity thus providing a greater capacity to reduce friction. However, the downside of using this material is that it produces less cooling capacity during machining operations. MWFs that contain less oil provide a cleaner work environment and reduce the frequency to replace the MWF. However, the replacement frequency is dependent upon workload throughout. Since straight oils do not contain water, it is rare to encounter biofouling problems, and thus the machine sump does not require replacement of MWFs as often as the water-soluble MWFs. Petroleum oil is considered a hazardous material for its possible cancer producing agent(s). Watersoluble MWFs contain alkanolamines for corrosion protection of the component being processed. However, alkanolamines are one of the ingredients that Occupational Safety and Health Administration officials recommend avoiding because of concern over adverse liver and kidney organ effects in animals. Natural or synthetic sodium sulphonate, another common ingredient found in water-soluble MWFs, acts as a corrosion inhibitor and emulsifier.

There are about 160 machines at NADEP Cherry Point that operate with MWFs that are water soluble, straight oils, tapping fluids, or water. Personnel from the Materials Engineering Division and the Industrial Engineering Division at NADEP Cherry Point prototyped a Cherry Point Prototypes Alternative Metal Working Fluid straight oil called "PanTerra MMPE" as a replacement for VV-C-850 straight oil. The urgency to find a replacement cutting oil was due to the fact that VV-C-850 is no longer manufactured. PanTerra MMPE is a seed oil based straight cutting oil containing molybdenum disulfide as an insoluble compound. Seed oil including canola, sunflower, or soybean oil is used in lieu of petroleum or petroleum-derived compounds in the formulation. PanTerra MMPE does not contain chlorine, sulfur, active sulfur, or petroleum. Since all the ingredients of PanTerra MMPE are manufactured from sources in the United States, it does not depend on the export of materials from foreign markets. It is also a biodegradable and environmentally friendly product. Molybdenum disulfide, known as a dry lubricant, imparts lubricity to machine tools that work under high friction and heat where most other lubricants would breakdown.

The product usage was critiqued and the following observations were noted:

- The flashpoints of straight oils used in the past were 350 degrees Fahrenheit (°F) to 400°F. PanTerra MMPE has a high flash point of 640°F. Because of its high flash point, PanTerra MMPE provided better heat dissipation and produced less smoke when machining.
- The graphite like material from the molybdenum disulfide source allowed metals to be processed requiring less friction and less torque compared to VV-C-850.
- PanTerra MMPE provided better tool life compared to VV-C-850.
- PanTerra MMPE can be used as a tapping oil in addition to heavy duty machining operations.
- PanTerra MMPE provides a safer and healthier environment due to the use of less hazardous ingredients during the manufacturing process.
- Shop personnel promoted PanTerra MMPE as an excellent tapping oil and a better performer than any other straight oil used in the past at NADEP Cherry Point.

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US Navy Calls for Broad Use of Biodiesel at Navy/Marine Facilities



The world's largest user of diesel fuel is taking another proactive stance in reducing its consumption of petroleum. Recently, the U.S. Department of the Navy announced a new policy that will lead to greater use of biodiesel. Principal Deputy Assistant Secretary (Installations and Environment) Wayne Army issued a memorandum that establishes a policy that most U.S. Navy and Marine non-tactical diesel vehicles shall operate on a blend of 20 percent biodiesel fuel (B20) no later than June 1, 2005.

"B20 was an ideal choice for the Navy and Marines because it's easy to use, performs as well or better than diesel and is a safe, sensible way for us to meet our federal requirements to reduce petroleum consumption," said Don Schregardus, Deputy Assistant Secretary of the Navy (Environment). "But we decided to take it a step above and beyond what the military is required to do. By bringing B20 to virtually every Navy and Marine base nationwide, we are significantly decreasing reliance on fossil fuels." Reducing dependence on foreign oil is something Chief of Naval Operations Admiral Clark directed this past August, and more recently in his CNO Guidance for 2005 for the fleet. The January 18, 2005 Navy memo provided guidance for biodiesel use including that it can be supplied by the Defense Energy Support Center (DESC) and used where adequate fuel tanks are available. The policy does not apply to tactical military equipment or deployable commercial equipment intended to support contingency operations.

The U.S. Navy, Army, Air Force and Marines all use B20 at different bases and stations throughout the country, including Ventura County Naval base in Port Hueneme, Calif.; Navy Public Works Center San Diego, CA; Navy Public Works Center Washington, DC; Navy Public Works Center Pearl Harbor, HI; Naval Air Station JRB Willow Grove, PA; Commander of Navy Region Northwest, Everett, WA; and Fleet and Industrial Supply Center Puget Sound, Bremerton, WA.



Base support vehicles and equipment powered by Biodiesel Fuel. Naval Facilities Engineering Command (NAVFAC) Southwest

A PROFILE IN BIOBASED SUCCESS: BIOBASED PAINT STRIPPER GETS THE JOB DONE

Protecting Workers and the Environment...

Biobased Paint Stripper Helps Submarine Repair Facility

When a U.S. Navy submarine comes to Portsmouth Naval Shipyard (PNS) to be repaired and updated, it gets a total overhaul inside and out right down to the smallest detail. For example, doors are removed and stripped of whatever kind of painting (Formica, wood, etc.) they might have. But that's just step one. Eventually, bare metal will be exposed with the removal of the panel adhesive and metal's base paint. For the last two-plus years, most paint crews at PNS have relied on a bio-based product to remove both the paint and adhesive on these doors and hundreds of other painted areas on the sub. "Doors and the like can be taken off the ship and brought into our shops, but many other surfaces cannot, so we need a stripper that we can work safely within confined areas that won't contaminate the sub," says Foreman of Paint Shop 71 Bob Moore. "We have to use chemical strippers



rather than mechanical methods, such as sanding, because of the dust they produce. The internal environment of a sub—especially instrumentation—is extremely sensitive to dust particles that result from sanding and scraping so a chemical stripper is extremely important." Moore says. "In the past we had no choice but to use a harsher methylene chloride product. It worked well but was classified as a Volatile Hazardous Air Pollutant which means it's bad for the environment. It also required extensive controls (for example: ventilation and respirators) to prevent worker exposure," he explains. "So how does the Soy Stripper work?" "Good," declares Bruce Trent, work leader, in Moore's crew. "In certain situations we might have to allow the soy stripper a little more time to work or even give it a second coating, but it does loosen and/or remove both paint and adhesive. There are always plenty of other jobs to do, so if the product takes a little longer we still say buy and produce. The major advantage is that we can do it almost any place on the ship because the health risks are reduced and it's environmentally friendly. This is good stuff. It saves a lot of grief."

The Story Behind the Story
Bob Moore and Bruce Trent and their crew are using this product every day. The story of how a soy-based paint stripper got to be used at PNS goes back to the mid-1990s. Tim Dunn, a chemical engineer with the Environmental Division at PNS, and 23-year veteran of civilian environmental work at the Navy, formed a Pollution Prevention Team for PNS.



A key part of Dunn's and the team's strategy was to first identify major pollutants at the shipyard. "Methylene chloride was on that list and we soon found that a major source of that chemical was coming from paint strippers," he explains. "I appointed Lisa Mahan, then a civil engineer in our Engineering Department and a member of the team, to find an alternative paint stripper for the epoxy paint on our diesel engines." Mahan, now in the PNS Public Works Department, says she looked at all kinds of products with the criteria that they need to be not only environmentally safe, but had to have a flash point high enough to eliminate explosion and not emit toxic fumes into the air. "We never found a paint remover that would work on the epoxy paint on the diesel engines. If it needed a new coat, you could point right over the existing one. Secondly, the bio-based stripper made from soybean did work with coating other than epoxy."

FACT FILE

America's farms are just beginning to tap their potential as a source for natural, renewable bio-based products that offer benefits to worker health, the environment, America's economy and energy security. To learn more about the many bio-based products made from soybeans such as those used at Portsmouth Naval Yard go to the Soy Products Guide catalog at www.untillsoybean.org. Because of the potential for bio-based products to create new markets for soybeans, U.S. soybean farmers have invested more than \$50 million to research, test and promote bio-based products. Much of this work was done through the United Soybean Board (USB), which is composed of 44 U.S. soybean farmers appointed by the U.S. Secretary of Agriculture to invest soybean checkoff funds.

For more information on the use of bio-based products at Portsmouth Naval Yard, contact Tim Dunn at 207-430-3831 or by email at DunnT7@mail.ports.navy.mil



AWARDS

Department of Navy Receives National Energy Security Award

In June of 2005 the National Biodiesel Board (NBB) awarded the Department of Navy the National Energy Security Award for Outstanding Energy Leadership through Biodiesel.

Joe Jobe, Executive Director of the NBB has stated:

"The U.S. Navy is the largest diesel fuel user in the world, and by taking responsibility for reducing its own use of petroleum, the Navy has demonstrated exceptional leadership in advancing the use of biodiesel and other alternative fuels. With the United States importing more than half of its oil needs, turning to domestic energy sources like biodiesel is vital. The U.S. Navy has recognized the importance of increasing domestic energy security by turning to homegrown solutions."

The official press release regarding the Department's reception of this award highlights that:

- In 2003, Naval Base Ventura County in Port Hueneme, California began a pilot program to make biodiesel from its own biodiesel processing unit.
- The Navy Exchange Quarters "K" (adjacent to the Pentagon and Arlington National Cemetery) offers biodiesel (B-20, a blend of 20 percent bio-base and 80 percent diesel) to government fleets and to the general public.

United States Marine Corps Wins Closing the Circle Award for Energy Efficiency

In the summer of 2005 the U.S. Marine Corps received one of the government's highest environmental honors when they were awarded a White House Closing the Circle Award in the category of Energy Efficiency in Transportation - Military.

The following excerpt was taken from the official announcement of winners on April 7, 2005:



"The Marine Corps has exceeded the Energy Policy Act (EPA) requirements for the past five years, led Department of Defense and other Federal agencies in the adoption of biodiesel, introduced and expanded the use of neighborhood electric vehicles, and met the 2005 requirements for Executive Order 13149 in 2003, two years ahead of schedule. During FY 2004 the Marine Corps had a 27.5 percent fuel reduction and a 243 percent compliance with EPA, while using more than 1.2 million gallons of biodiesel. In addition to the 28 neighborhood electric vehicles purchased last year, the Marine Corps is seeking to procure 48 hybrid vehicles for use by its recruiting force and is taking an active step for the future of hydrogen-powered fuel cell vehicles."

— Office of the Federal Environmental Executive
April 7, 2005

