

Hydraulic Excavator (HYEX) Test and Evaluation

Technology Description:

Advanced hydraulics technologies have the potential to reduce fuel consumption in heavy construction equipment. An experiment was conducted to evaluate the ability of lower viscosity hydraulic fluids as well as an advanced hydraulic accumulator to improve productivity, reduce fuel consumption, and operate more efficiently over a duty cycle.

Benefits: Predicted fuel efficiency gains by 2% to 6% will yield an estimated \$2M annual fuel savings.

Test Evaluation

The U.S. Navy and U.S. Army performed a test of hydraulic excavators (HYEX). The evaluation was done at Naval Base Ventura County (NBVC) Port Hueneme's Dozer Field June 3-7.

Army and Navy excavators were each evaluated with different energy efficient technologies. The Navy HYEX was evaluated using a commercially available Energy-Efficient (EE) hydraulic fluid. Engine speeds, fuel flow rate, temperature and pressure were measured and compared to baseline test results. Commercial oil companies have recently released a number of EE hydraulic fluids that are projected to yield a 2% to 6% savings in fuel efficiency. Energy efficient fluids look to maximize overall efficiency by providing a stable viscosity across all operating temperatures.



Navy Hydraulic Excavator (HYEX) Test at Naval Base Ventura County

The Army HYEX evaluated a hybrid swing drive that recovers energy from boom and swing motions and reuses it, theoretically resulting in higher engine efficiency, improved fuel efficiency and cost savings. Performance requirements were measured and compared to baseline testing to determine overall hydraulic peak power reduction, fuel consumption reduction, and cost savings predictions.

Test Results

- Test data supports commercial claims that EE fluids can provide a 2-6% improvement in fuel efficiency.
- Operators appeared to improve their efficiency supported by increased burn rate of 2% percent and large productivity gains of 19.4%.

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Value to the Warfighter

- Reduced fuel logistics burden at deployed sites
- Reduced warfighter exposure during deployment
- Potential for significant cost savings

Benefits: ROI or Payback

The outcome of follow-on testing will determine the suitability of these technologies for integration into the Naval Construction Force (NCF) tables of allowance (TOAs). Predicted fuel efficiency gains by 2% to 6% will yield an estimated \$2M in annual savings.

Technology Transition Documentation

This technology can be classified as transition per Category 4 - to provide the Government knowledge base or information to make decisions. A test report is available upon request.

This project is the result of a partnering effort by the Navy Expeditionary Combat Command (NECC), the Naval Construction Group 1 (NCG 1) and the U.S. Army's Tank Automotive Research, Development and Engineering Center (TARDEC) to use the training facility at the Naval Base Ventura County, which offers a consistent climate favorable to the testing. The effort is supported by personnel from the NAVFAC Engineering and Expeditionary Warfare Center (NAVFAC EXWC), the Naval Construction Group 1 (NCG 1), Naval Mobile Construction Battalion 3 (NMCB 3), and private industry.

Specific Applications

- Expeditionary Runways
- Paved/Unpaved Roadways
- Building Pad Foundations
- Parking Lots
- Helo Pads

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