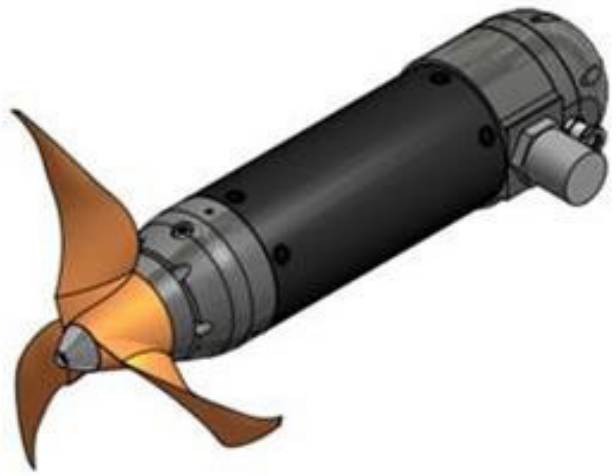
HIGH EFFICIENCY THRUSTER

Pending U.S. Patent



HIGH END-TO-END EFFICIENCY

LOW NOISE SIGNATURE

HIGH TORQUE

DEEP OCEAN OPERATION

- 11,000 meter depth capabilties

Overview: Thrusters are used as the principle form of propulsion and maneuverability for submersible vehicles and are often powered by electric motors. Mission profiles for these autonomous undersea vehicles (AUVs) and remotely operated vehciles (ROVs) will often include both high velocity operations and low velocity station keeping. Since space and weight capacity may place constraints on allowable battery size, high end-to-end efficiency is desired, however, existing thrusters are optimized over limited vehicle velocities and tend to have narrow efficiency peaks that constrain vehicle motion options.

Technology: WHOI has created a new line of high efficiency direct drive thrusters for use on marine vehicles. These high efficiency, low noise signature thrusters maintain a flat efficiency curve to accomodate both high velocity and station keeping requirements. End-to-end efficiencies of greater than 40% at low power (fig. 2) and 30% at high power are achieved at velocity ranges from 0.1 meters per second to greater than 1.5 meters per second.

These thrusters utilize recent advances in motor-winding technology, and the electric motor is enclosed within a waterproof, oil-filled housing attached by an integrated drive shaft to the outer surface of the thruster through multiple high-grade bearings and seals. The result is a durable design that is efficient and has a low noise signature. Off the shelf motor controllers allow operators to take continuous advantage of rapid improvements in the motor controller industry.

Offering proven performance through field testing, these thrusters are meant for use on any aquatic vehicle (preferably submersibles), and are rated for use at depths of up to 11,000 meters.

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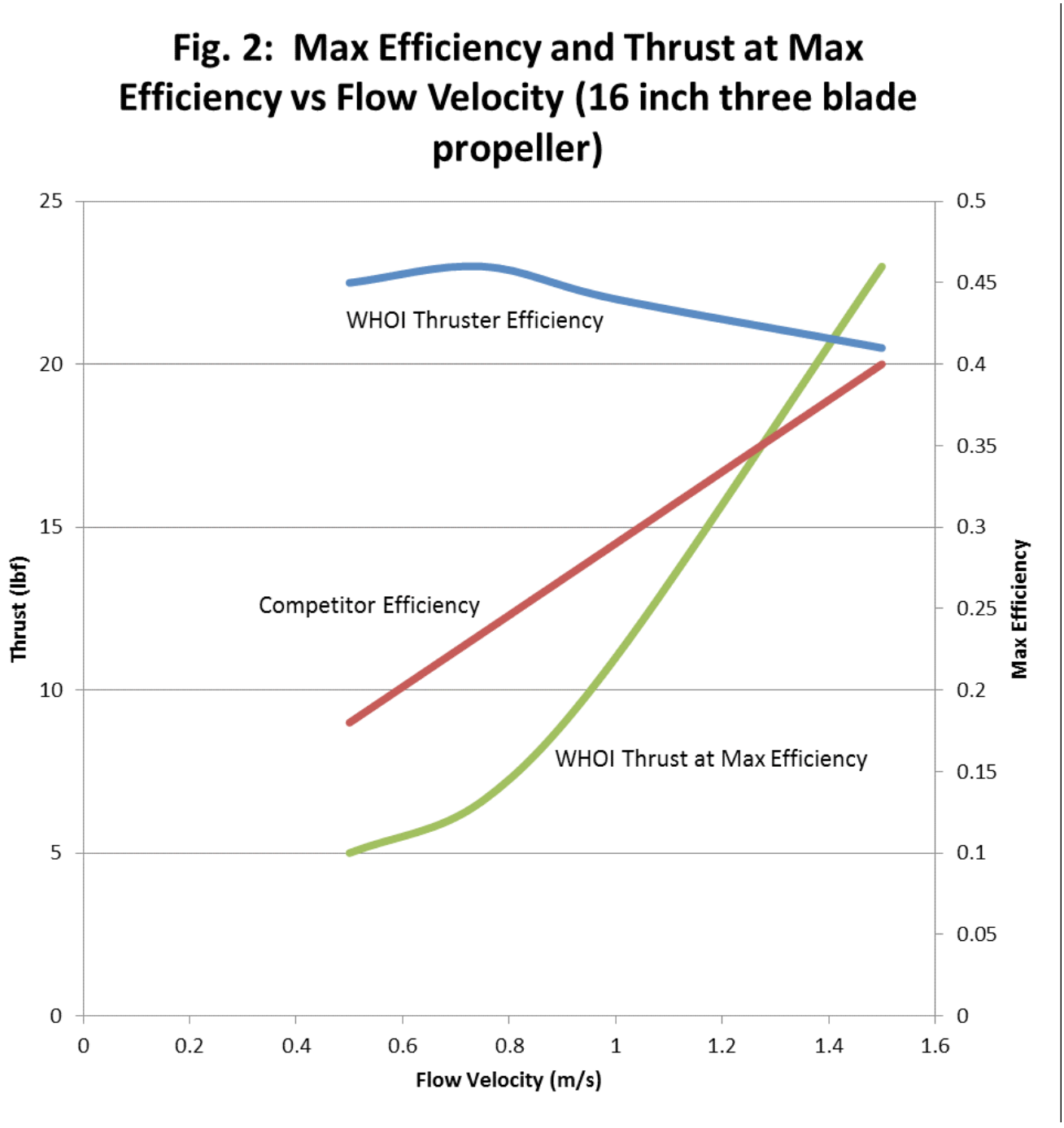

Figure 2 presents the maximum efficiency achieved by the thruster vs. flow velocity during flume testing using the 16", three blade propeller. The efficiency of a competitor's thruster is also shown for comparison. Thrust at this efficiency level is shown to be below 25 lbf and higher thrust levels are associated with slightly lower efficiency.