

CHOOSING BETWEEN ELECTRIC AND HYDRAULIC POWER FOR MODERN WINCH APPLICATIONS



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Fleet operators of tugs and research vessels or those adding new machinery frequently ask, "Should I specify an electric or hydraulic drive for powering deck machinery?" Markey Machinery Company is a 100+ year-old supplier of hawser, traction, and research winches; windlasses; capstans; and other marine deck equipment. From a century of experience gained via the application of hydraulic, electric, diesel, and even steam power, Markey offers this paper to outline the comparison between electric and hydraulic drives and their consideration in common fleet operations.

Energy Efficiency: Electric winches utilize power directly from generator-sets. Their motors convert electric power into rotational force as opposed to hydraulic winches which rely on fluid power to perform work. Producing fluid power requires the addition of a motor-pump and associated hydraulic systems between the generator-sets and the winch. This extra power conversion step generates waste energy and requires between 25%-30% more electric power to produce the same level of winch performance.

Fluid power drives are favored for high-powered intermittent uses, such as cranes. A customer with new build or existing vessels with generator sets sized for crane loads that exceed their winch needs is a candidate for a hydraulic winch. We advise customers contemplating a single fluid power system for multiple applications to invest freely in hydraulic design work.



Markey DEPC-48 Electric Hawser Winch, as installed on the tug "FREEDOM"

Size and Weight: The adage that hydraulic drives eliminate the need for a speed reducer and pound for pound produce greater power than electric drives is true, but only in some cases. A hydraulic winch with a direct drive radial piston hydraulic-motor that is re-powered with an equivalent horsepower electric motor/ planetary reducer and variable frequency AC motor controller and braking resistors will occupy more space and add more weight than the hydraulic drive components removed from the original winch. However, to convert an equivalent electric winch to hydraulic power requires the addition of a hydraulic motor-brake as well as a source of fluid power. By including the oversized electric motor-pump, fluid reservoir, and associated hydraulic and electrical components, the system adds more weight and occupies more space than the equivalent all-electric motor-reducer with drive cabinet.

Customers outfitting vessels large or small could use the weight and space savings of electric winches to carry more fuel for extended steaming or fulfill other critical mission requirements.

Control Complexity: Take a look at wheelhouse controls, remote stations, or local winch controls. Observe the proportional joysticks, switches and pushbuttons, touch screen displays with graphical user digital input programs, and secure, remote data communications using the Web to manage hawser wear and monitor winch performance. You will note that modern winch control systems are indeed electric, even if the winches are hydraulically powered.

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Hydraulic systems add a level of complexity that electric powered winches do not have, in that the electric controls govern hydraulic valves - which control the winch motors. Specifying a hydraulic winch or choosing a manufacturer that only offers hydraulic winches runs the risk of adding unnecessary complexity and cost to the winch system. Eliminating hydraulics simplifies the man-machine interface and enables automated controls like Render/Recover® to perform quickly, reliably, and effectively.

Routine Maintenance: Customers making decisions about their machinery investment increasingly consider the total costs of ownership. Hydraulic motors, pumps and valves experience wear at the mechanical and fluid interfaces. Filters require periodic replacement, while o-rings and seals require monitoring to prevent leaks and spills. There is simply more that can go wrong, potentially disrupting or stopping winch operations.

In all-electric winches the flow of electric current replaces the fluid. AC-induction motors eliminate brushes and electrons produce no appreciable wear. Beyond the familiar bearing and gear lubrication, typical electrical system maintenance includes periodic inspection and infrequent retorquing of the electrical connectors. Eliminating the hydraulic system cuts the recurring expense of maintenance labor, consumables, and parts, and does away with hydraulic fluid disposal worries.

Environmental and Human Factors: Many of our customers prefer all-electric drives because their business or mission requires them. Environmentally conscious companies specify electric winches to avoid the potential for an inadvertent oil discharge. Fluid leak incidents are costly, disruptive and are a reportable incident with respect to US Coast Guard regulations regardless of the hydraulic oil's environmental status. This embarrassment is avoidable.

A hydraulic pump radiates energy underwater as well as through the air. Military and research applications often require low noise ship operations to successfully perform their mission. Hydraulic system isolation and dampening measures then become a costly add-on. Airborne noise can be combated by personal protective equipment, but a pump located in the midst of deck operations introduces the risk that important communications could breakdown at a most critical moment. The use of all-electric drives minimizes engineering costs and yields tangible benefits to crew health, comfort, and the environment.



*Markey DYSW-32-18 Hydraulic Hawser Winch/Windlass,
as installed on the tug "DANIEL FOSS"*

Installation and Machine Costs: The variation in cost related to installing electric versus hydraulic equipment is significant. The installation of piping, fittings and hydraulic components is 5-10 times more expensive than running wires and conduits. The difference in installation costs isn't obvious when comparing the difference in the price of all-electric, electric-hydraulic, and hydraulic winches. Retrofitting hydraulic installations on existing as opposed to new build construction is particularly costly. When choosing between hydraulic or electric winch drives, the informed decision considers more than machine cost alone. In the experience of Markey Machinery (and the majority of our customers), specifying an all-electric winch drive is the most cost-effective choice.

For more information about winch drive choices and the type best suited for your needs, visit www.markeymachinery.com, send an email to info@markeymachinery.com, or call us at (800) 637-3430 to speak with Markey's knowledgeable staff.

Founded in 1907, Markey Machinery Company, Inc. is a world leader in the design and manufacture of superior quality deck machinery for commercial and scientific applications.



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