Lifting With Electricity

AC drive technology takes on internal combustion power

‘AC motors offer several advantages including high performance, reduced maintenance and improved energy consumption.’ Jan Lorenz is an engineer with Jungheinrich Lift Truck Corp., 5701 Eastport Blvd., Richmond, VA 23231. Additional information is available at www.jungheinrich-us.com or by calling 888-333-2644.
By Jan Lorenz

For years the workhorse for material handling of heavy loads has been the forklift with an internal combustion power plant. Its noise, emissions and performance were accepted as necessary evils. The rising use of electric-powered forklifts, however, is a significant trend in the forklift industry, and the availability of 80-volt trucks with 5,000- to 6,000-pound capacities has opened up application possibilities.
Two decades ago, the ratio of forklift sales in the U.S. was 55 percent internal combustion and 45 percent electric. Electric vehicles were typically used for lighter duty applications. Today, electric forklift sales are approaching 60 percent of the overall market. This growth can be attributed to several factors including performance and operational improvements, extended range of vehicle capacities, environmental and OSHA concerns and operating cost benefits.

Electric Advancements

The general task of all material handling equipment is to move an item from point A to point B. Internal combustion-powered forklifts have the advantage of power &#151 the ability to move heavy loads quickly and efficiently over any terrain. More specifically, they can climb ramps and grades, they can accelerate faster, they can reach higher top-end speeds and they can lift loads faster.
Advancements in electric forklifts with 48-volt and 80-volt AC motors have generated a lot of interest in the forklift market. AC motors offer several advantages including high performance, reduced maintenance and improved energy consumption. However, the load capacity limits for electric trucks have been a drawback. Operators want the flexibility to convey all loads with a single truck. In addition to advances in performance, operators are getting more comfortable with electric forklifts, realizing they are significantly quieter and operate cleaner. Also, there is less vibration transferred from the engine through the seat, floorboard and steering wheel. Tests have shown reduced vibration keeps operators alert and less fatigued, especially in operations that require extended periods of forklift use.

Popular Details

Several improvements and enhancements have increased the popularity of electric forklifts. Ergonomic controls and digital displays make them user-friendly, and the switch to AC drive technology from DC has provided several operational benefits as well as environmental advantages.
An AC-powered pallet truck still uses a DC battery. However, an inverter in the truck's controller converts DC current to three-phase AC current. AC power is then delivered to the truck's motor, controlling the speed and acceleration of the vehicle. The end-user realizes the following benefits. &#149 Higher Performance: AC motors allow for faster speeds (up to 12.5 mph), better acceleration and gradeability, and lift speeds up to 108 feet per minute. Operators notice a faster and smoother response when changing from forward to reverse and vice versa. This improvement in directional changes increases productivity output. &#149 Reduced Maintenance: Unlike DC motors, AC motors do not have brushes, controller contactors needed for switching the direction of the motor rotation and motor commutators. Having fewer moving parts translates into reduced maintenance costs. In addition, elimination of brushes allows AC motors to be much smaller than comparable DC motors. &#149 Improved Energy Consumption: One of the weak points of electric DC-powered trucks has been the decrease in performance as the battery loses its charge. An AC power system offers the control needed to maintain power even as battery charge runs low &#151 up to 30 percent less energy consumption when compared to conventional trucks. Typical AC systems recover battery energy using three forms of regenerative braking: when the accelerator lever is released (coasting), when the brake is applied and when the directional lever is operated (switch back or plugging). Essentially, the inertia energy that is created by these actions is converted to electrical energy and returned to the battery, extending overall operating times and operating cycles. Industrial truck manufacturers are constantly searching for ways to meet pending EPA clean-air regulations. Using California as a model, where the California Air Resources Board has set standards for emission limits, new trucks take a new approach to emissions. Technical advancements for internal combustion engine trucks, such as three-way catalytic converters, have been designed to meet the standards. However, electric trucks with their zero-emission capabilities provide the buyer with the ultimate solution to environmental concerns. Apart from emissions, the elimination of fuel costs can foster acceptance of electric trucks. For example, an electric forklift may cost $4 in electricity, whereas an internal combustion forklift may need $10 in fuel to accomplish the same amount of work. The initial cost of an electric truck with battery and charger may be higher, but the overall operating costs over time will provide significant savings. Electric vehicles have digital displays that provide operators with instant information regarding the status of their vehicle condition. Speedometer readings, battery discharge gauges, warning messages and multiple-hour meter readings are common on most trucks. Using built-in analyzers and self-diagnostic capabilities, electrical forklifts with digital displays make troubleshooting quick and easy.

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