Top 10 Technologies: Material Handling â€” Fueling Energy Savings

As hydrogen fuel cell technology becomes more developed and integrated into more lift trucks, gains should be realized not only in energy savings, but also improving just-in-time fulfillment, which drives efficiency beyond just the process in question, while resonating well throughout an organization’s supply chain.

Let’s start with some simple facts about the use of hydrogen fuel cells in lift trucks. Using a proton exchange membrane stack, these power supplies rely upon liquid-cooled hydrogen fuel, which comes in liquid form, but is transitioned into gas by in-plant refueling equipment. These stacks can be purchased already integrated into the truck or retrofitted in varying power levels that are customized according to the class of truck. This functionality outlines three benefits of hydrogen fuel cells in fork trucks. First, there’s the energy savings incurred when compared to electric models. Not having to connect a fleet of vehicles to battery chargers for 30 minutes twice a day tremendously helps lower consumption rates.

Limited floor space is also addressed. Not only do hydrogen refueling stations (which closely resemble automotive gas pumps in size and stature) consume less space within a facility, but they can also be located throughout the plant as opposed to the larger space required for battery-charging equipment. And although they seem complex, many of these fueling systems are pretty simple as they’re comprised of three main components: a compression system to aid in the liquid-to-gas conversion, buffer storage and a dispensing mechanism. In some instances, drop-down hoses from ceiling-mounted piping can also be provided to save even more space.

Finally, productivity levels are enhanced by avoiding the downtime associated with battery charging, and the slowed operation of a weakening power source. While battery charging can range from 15 to 45 minutes, the average fuel cell currently in use or development can be refueled in about three minutes.

The Challenges Although the benefits are strong, the adaptation of hydrogen fuel cells in fork trucks could be slowed by initial investment costs. Additionally, maintaining vehicles with these types of power supplies present some unique challenges.

Fuel cells run in the neighborhood of $13,000 more than their traditional counterparts, but only one is needed per truck. Comparatively, electric models use two batteries, yet fuel cells still cost almost $10,000 more. However, looking at the typical usage patterns of a Class 3 forklift, implementation of a hydrogen fuel cell

vs. an electric battery would save up to 10,000 labor hours during the equipment's lifetime, according to fuel cell manufacturer Ballard Power Systems. The U.S. government also grants tax breaks equaling up to 30 percent of the purchase price—for the cell, forklift and/or fuel delivery system.

From a maintenance perspective, these more complex lift truck power sources may create a demand for training that helps simplify some of their nuances. For example, consistent air flow is required to cool the fuel cell stack, as well as supply oxygen for the hydrogen reaction needed to create the electricity to power the truck. If air flow to the fuel cell stacks becomes obstructed, it can impede efficiency and, in severe cases, cause the fuel cell to shut down.

Repeated restrictions can shorten the life of these very expensive stacks. Preventive maintenance is as important to the fuel cell as it is to the truck itself. These types of operational mechanisms create special challenges, as do additional training, infrastructure and safety investments associated with handling hydrogen.

As is the case with most new technologies, there are incentives and drawbacks with hydrogen fuel cell implementation. However, in looking at the positive takeaways that can be realized, hopefully the benefits for the industry can be seen and advanced in helping to get wider spread adoption. In turn, the prohibitive cost hurdles that might prevent early adapters from getting onboard can be mitigated.

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