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## **Challenges of electric vehicle adaptation**

### **Zero emissions**

Electrification of fleets is no longer simply on the horizon – it is here!

With any new technology, there are always going to be differences of opinions and potential concerns. Electric vehicles are no different. But what are the main questions that we might have when it comes to electrification? Is there a learning curve?

Manufacturers are currently developing new technology for equipment such as backhoes, loaders, excavator's street sweepers and even mowers. These are just some of the completely electric types of equipment that are coming to the market or that are already here. Heavy truck manufacturers are also working towards electric power. All of these will be powered by kilo watt (KW). Equipment that is currently run with horsepower will move to KW. The components of the equipment such as power train engines, drive axels and gear ratios will also have to be converted. There will be a big learning curve for fleet managers to be able to match the equipment to the daily job functions.

Auto manufacturers are currently using the number of miles a vehicle can be driven vs. a similar model that is fueled by petroleum. More factors need to be analyzed such as; in town miles (where a vehicle could regen when breaking for stop lights/signs) vs highway miles. Standard homeowner vehicles will be much different than fleet vehicles. Driver habits and additional equipment used in a municipal vehicle such as radios and laptops will also have to be factored in to make sure that there is enough battery life to make it thru the workday. So, what is the draw from the battery needed to complete the day? From our studies it can be as much as 40% draw of computers and the comfort of the operator (heat or air). When these things are factored in, it makes it hard to move to fully electrical vehicle. Although progress is being made and we are getting closer every year with the Li-ion battery technology.

### **Questions as we must ask to move into the future**

1. How often will I need to replace an electric fleet? Is there enough real-life data rather than anecdotal on the topic yet?

2. Will they be more efficient than a traditional fleet?
3. Is there charging infrastructure available to support an electric fleet
4. How long will it take to charge a fleet vehicle?
5. Can it be charged faster? Does your facility have capability to do a fast charge?
6. How many batteries is it going to take to operate for a full day? What about in case of overtime? Is there room for more battery storage?
7. How long can I operate this piece of equipment idle vs full operation time? In construction equipment the actual time of running the equipment is different than being "on" at the job site. For example, dig time, how long is this piece of equipment actually working? When it's not digging and no hydraulic functions are being used it is just idling, waiting. During this time, it only needs power for the comfort of the operator heat, air conditioning and the radio. Do we haul the equipment to the job site or drive it to the job?
8. In the case of a street sweeper, is there a difference between drive time to the worksite and actually "street sweeping"? Does it take less battery power to simply drive vs being in full operation? Will the components that sweep the street add additional power needs?
9. Mowing sounds easy but as a municipality we have several job sites that are mowed during an 8-hour shift. Our operators haul the units to the job site and then unload the unit and mow. So, we must look at the actual hours of mowing time not a just the hours in a shift.
10. Currently electric units have a high voltage at 220 volts and higher. We will still need a 12-volt system to be able to operate lights and other accessories.
11. How would you convert flow rates and pressures from electric motors, hydraulic motors vs hydraulic horsepower? Converting flow rates and pressures
12. For example; an excavator -would this piece of equipment be able to power a facility during a loss of power? And for how long? With its battery
13. What would be needed to train our current technicians to maintain an electric fleet?