

Vehicles of change

NEW DEVELOPMENTS IN INSTRUMENTATION TECHNOLOGY PROMISE TO HELP OPERATORS AND FLEET MANAGERS INCREASE PRODUCTIVITY AND OPTIMIZE COMPANIES' INVESTMENTS IN FORKLIFT TRUCKS

▶ Mike Miller, director of product management for Curtis Instruments, leads the worldwide product development and marketing of the company's instrumentation products for industrial electric vehicles. As a recognized expert in the field, he has held technical leadership positions at Curtis for 27 years, guiding its global instrumentation and battery monitoring system development programs.

In a recent interview at the Curtis Instruments world headquarters in New York, USA, he shared his personal insights about the present and future of vehicle instrumentation.

Let's kick off by talking about how we arrived at where we are today in instrumentation for the forklift market. For example, what's the state of displays?

From a technical perspective, and also from an instrumentation point of view, forklift manufacturers tended to follow the automotive market, where auto makers had the volume to set trends and drive our choices for display types and technologies.

Over the past 5 to 10 years, that's changed. Now we're driven by consumer products: smart devices, such as iPhones and tablets, that exceed the number of vehicles built. And because the best bang for our buck in displays comes from using what the consumer electronics market uses, almost everything we do now has a liquid crystal display (LCD) at its core. Plus, the price of color displays has come way down to the point where there's almost no difference between monochrome and color.

So a trend we're seeing from this is the integration of historical dashboard elements into full-color LCD message centers that tell you what's going on with the vehicle. And where you used to have some indicators outside of the main LCD, now you can put them all into a single full-color display.

How about the current state of microcontrollers and the overall mechanical package?

For microcontrollers that perform our calculations, drive our LCDs, and essentially do all the work of the instrument, we remain focused on ARM processors, because here, again, we can piggyback on the consumer product and automotive market's volumes and drive our costs down.



ABOVE: Mike Miller, director of product management for Curtis Instruments: "Where you used to have some indicators outside of the main LCD, now you can put them all into a single full-color display"

In mechanicals, Curtis has a 50+ year history of designing instruments for vehicles that will be used in very tough environments. Devices today must be designed to work under conditions of extreme temperature, vibration, shock, UV and electrical noise. We know how to do that very well and can design for the harshest of applications.

Can you give some examples?

Sure. Suppose you're moving frozen foods from an outdoor loading dock into a freezer in Arizona, a US state where desert conditions mean temperatures reach extremely high levels in the summer. With that huge difference in temperature and humidity, the display's going to instantly fog up. We can prevent that with innovative packaging techniques and a breathable membrane that enables the instrument to expel condensation as soon as it starts to form and doesn't allow it to come back in.

Or, as another example, we've developed the know-how for choosing the lens for LCDs to make them readable in sunlight and help them survive long term under UV.

What changes in vehicle technology have influenced today's instrumentation?

A big one is battery technology, because one of the things Curtis is well known for is our ability to measure the state-of-charge of a battery. That's very important, obviously, so you know either how far you can go or how much work you can do before you have to recharge it. Historically, these vehicles have used lead-acid batteries but now some are changing over to lithium-ion. So we have developed new algorithms to measure state-of-charge and history of use, whether the battery is lead-acid or lithium-ion.

We have a product called Acuity, a complement product to our instrumentation that sits on a vehicle battery and measures and reports all of its operating parameters. It lets the operator, service technician or fleet manager quickly understand the battery's status – if it needs to be charged, watered, or equalized – and, most importantly, whether it's approaching the end of its service life and needs to be replaced.

Let's look at the future. If iPhones and tablets are driving you to LCDs, are we also going to see touchscreens in battery-powered vehicles?

Definitely. Swipes, double clicks and all those sort of touchscreen interactions are entering our area, and at the real high end, some vehicles already have them. Curtis will be developing them over the next year. This is a bit more of a challenge, given a working environment that can include dust, condensation, water and gloved hands. But we are developing

solutions to those concerns, so you'll eventually be seeing more instruments that have touchscreens, instead of buttons, on vehicles.

LCDs can display a lot of data. How do you avoid information overload?

Our goal is always to make the operating condition of the vehicle obvious to the operator. As more things are integrated into the display, that puts more of an emphasis on the graphical user interface. And that involves a lot more software and diligence in defining what the driver needs or wants to see at any given time.

We go through a very specific flowcharting process that looks at each stage of operation, from when the operator turns the key, starts to drive, and engages the lift – so that a typical instrument will have anywhere between five and a dozen different screens that come up automatically based on the vehicle's condition, or are initiated by the operator pushing a button or swiping the display.

We try to design our screens and instruments so that the operator can focus on doing the work and only needs to intervene with the vehicle when there is a problem: when the battery state-of-charge gets low and they have to recharge, or the motor gets hot and they need to let it cool down, or some other operating condition where they need to pay attention to the vehicle instead of the work they're doing.

That actually relates to a trend we're seeing in all businesses where data is much more important than ever. So today it's our job to turn data into information so that it's meaningful to the operator. So, for example, it's not enough to just display the motor temperature – you have to say the temperature's too high and specify what needs to be done about it.

So it's about helping operators and companies get work done?

Yes. And so another big trend now is productivity. We can measure and record data and then apply some intelligence to it to inform the user and management of how productive the forklift truck or the operator are, based on factors such as how much time is spent idle, driving and lifting. We can measure all those and provide feedback to fleet managers to tell them whether they're optimizing their capital investment in forklift trucks.

We typically handle the vehicle side of that. But there is also an increasing requirement to integrate warehouse management system (WMS) functions into one display that not only shows operators the vehicle status, but also provides the work information they need to do their job – such as pick a specific pallet and take it to a specific location.

This also feeds into overall fleet management. Our instruments can integrate easily with wireless fleet management systems to provide the information that helps companies manage and optimize their fleets to provide the most productivity at the lowest cost.

What drives the development of a successful instrumentation product?

Customers' needs. Obviously, that is invariably the case for custom-developed OEM products for specific customers. However, in developing platforms for the broader market, we use three inputs: what the competition is doing; what the new technology is; and, most importantly, what the customer is saying. So I'm visiting customers all the time and asking them where they're having problems, and what their needs are, and incorporating that into the definition of our next-generation products.

Does the global nature of the industry have any impact on instrumentation products?

We are definitely operating in a global market, in which companies are trying to develop lift-trucks with engineering and design that can apply to as many geographical regions as possible. And because the manufacturers themselves are global, we've seen trucks designed in the USA, built in China, and then localized for multiple markets.

The impact of this on instrumentation lies in how easily and quickly emerging trends can be identified and then incorporated into new vehicles. The best way a provider can do that is by being where the customers are, everywhere around the world. At Curtis, our global presence, matrix structure and internal cooperation often enable us to share insights about worldwide activities of which our customers might not always be aware. **IVT**

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