

## Firmly in control

*Electric Lift trucks have been getting steadily more reliable over the years and one of the companies behind the scenes that is responsible for making that happen, is Curtis Instruments. Simon Duddy talks to Curtis about the secrets of that reliability.*

**M**any of you will remember how lift trucks typically used to struggle with gradients. Rather than stopping dead, forklifts would creep down the slope. Modern lift trucks have got a great deal more precise and this has boosted health and safety as well as efficiency. One of the companies responsible for this development is Curtis Instruments, which manufactures motor controllers and instrumentation.

The company believes it is at the forefront of controller technology, with greater reliability the key benefit delivered.

David Wilkes, sales director at Curtis Instruments explains: "The product reliability of the AC range has been phenomenal, better than we'd hoped. We were not the first company to develop AC induction motor controllers, and we learned from the mistakes of others. Most controller problems are caused by overheating, so our aim has been to eliminate overheating."

Curtis claims the excellent heat management of its controllers sets the company apart. While some competitors are said to need heat sinks and cooling fans to help the motor controller work optimally, the Curtis system is self-regulating. So how has this been achieved?

Kerry Green, European support manager at Curtis Instruments puts the success of the controllers down to two key developments – Auto Characterisation and Vehicle Control Language (VCL).

"With a Vector Controller, if you don't have a very accurate motor model your efficiencies are down. That means you waste a lot of energy resulting in excess heat. If you start to heat things up you get early failures," Green explains.

"So we spent a lot of time on Auto Characterisation. We were the first company in the world that could auto characterise a motor successfully with a motor controller on a vehicle. Before that, if you wanted to use a new motor type, you had to model it on a dynamometer rig and it could take weeks."

Auto characterisation allows a manufacturer to evaluate a

number of motors very quickly, critical when developing a forklift. It is not unusual for a forklift manufacturer to test and evaluate a number of motors in search of the optimised part for their truck.

"If a motor doesn't give the desired performance, within an hour we'll have another motor and a fully characterised system, so the guys can be out testing again. We can build such an accurate motor model using auto-characterisation, the efficiency of our system is very high, it runs cool, and the batteries last longer. This was the first major achievement on the controllers."

The second development was Vehicle Control Language, which is somewhat analogous to a PC's operating system and application software. The operating system in the controller takes care of the motor control and safety functions. On top of that Curtis loads application software that customises the controller to the vehicle.

"Previous to this, you basically took motor controllers out of the box, and it performed the way it performed," says Green. "With our system, if a truck has special functions, we or the customer can write the VCL code, and download it to the controller using flash memory. For example, with multidirectional trucks there is a lot of hydraulic control, where you can rotate all of the wheels by 90 degrees, and then drive in another direction. This has to be managed and the customisable logic on the controller allows this be achieved to an optimal level."

Also with the logic on the controller, the truck manufacturer can remove un-needed components, such as PLCs, and banks of relays, so there are fewer things to go wrong, which again adds to reliability. Enhancing reliability further are IP65-rated controller housings to eliminate moisture issues, and ESD protection.

Green continues: "The next step on the AC was to incorporate software to control dual drive motor applications, which is quite common in forklifts. This allows two controllers to operate side-by-side, connected via CANBUS, which is also a standard feature in our controllers. With the dual drive function, the controllers will read the steer angle and drive the front motors differentially allowing enhanced performance and safety within confined turning spaces."

Curtis also takes a full system approach and supplies traction controllers, pump controllers, and steering controllers. In fact, the company supplies the whole electronic system outside of motors and batteries, although it tests and recommends motors for particular applications.

The firm also provides dashboard instrumentation within IP67-rated enclosures, and allows the customer to design their own screen design, which Curtis will download into the product before despatch.

"Like the controllers," says Wilkes. "We can mass produce standard hardware and the customisation is enabled with the software. This approach and the innovation and reliability of the products are helping us gain market share, which we want to continue, with the Asian market a particular focus."

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