ELIZABETH TOWNSEND, CURTIS INSTRUMENTS

Electric evolution

"IT'S NOT JUST DIFFERENT – IT'S UNIQUE": HOW ONE MAN'S VISION CHANGED THE OFF-HIGHWAY INDUSTRY BY DELIVERING ECOVOLVE, THE WORLD'S FIRST PEDESTRIAN-OPERATED ELECTRIC DUMPER

RIGHT: **The electric dumper is powered by an AC motor controller**

1,500kg
Maximum load of the largest model, the Ecovolve ED1500 (3,307 lb)

Engineers in the Republic of Ireland are brimming with ideas and innovation, and Sean Breen epitomizes this entrepreneurial spirit. Having spent most of his working life in the construction and demolition sector, Breen's lightbulb moment came to him when he identified a gap in the market for an electric-powered dumper.

Throughout his 10-year ownership of Ireland's largest electric plant hire company, Ecoplant, based in Ballybrittas, County Laois, Breen has gathered a wealth of expertise on plant hire equipment such as floor and wall saws, diggers, compactors and remote-control demolition machines. While working on various contracts around Europe, descaling concrete kilns for example, he observed that once the plug-in power tools had done their very efficient job, the only way to

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Curtis Instruments
Hall B5, Stand 214

Ecovolve
Hall FN, Stand 1118/7

ECOVOLVE DUMPERS

11hp
Maximum power output of the ED1500 (8kW). The ED800 and 1000 are 7hp (5kW)

remove the debris was to rely on a much more unwieldy and centuries-old combination of tough manual labor, scaffolding planks and wheelbarrows.

"We needed a cleaner, emissions-free way of getting waste off-site and into the removal skip and I looked at the possibility of using electric forklifts or mortar bins on pallet trucks," says Breen, "but even with these it was a slow and laborious process. And using machines not 100% designed for the job never has a satisfactory outcome – small forklifts, for example, can't cope with rubble-strewn surfaces. So I went in search of a low-profile electric dumper but was amazed to find that there was nothing of the kind on the market. I thought to myself, 'You'd better go and invent one!'"

This was a few years ago, but Breen and other colleagues in the industry were convinced he was onto a winner concept-wise, particularly as the move toward electric power was already gaining pace in the construction sector. But it was a steep learning curve for Breen, who had not anticipated the workload that goes into developing a brand-new product and bringing it to market. He also realized that he was going to need expert help to get the project off the ground.

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Sean Breen, managing director, Ecovolve

A collaborative effort

"Due to my experience, I knew what I wanted from a design and hardware point of view and the features I wanted to incorporate," says Breen. "I was basically looking at a combination of a pallet truck and high-tip dumper, with three wheels to guarantee maneuverability and lower energy consumption compared with a four-wheel model. It needed to be of compact size with a small turning circle to access doorways and underground sites and to work under low ceilings, with a steering system designed to avoid marking floors after operation. Low noise, fume-free and versatile indoor and outdoor operation were also on the wish list."

Armed with a blueprint for the newly named Ecovolve, Breen contacted the government agency Enterprise Ireland, which put him in touch with Ray Teehan (Selective Engineering Ltd) and Dublin City University (DCU) Invent, which works with Irish and multinational companies to identify new product opportunities. This led to a meeting with Kerry Green and David Wilkes from Curtis Instruments, which had been recommended to Breen by a German manufacturer of rear-wheel-drive units used on other pieces of equipment. "I knew I was going to need input from electric vehicle specialists," says Breen, "and the initial meetings with Curtis proved to be very positive. There were other companies willing to supply certain individual components, but I wanted to deal with a partner such as Curtis that could build a complete package, tailor-made to our specific requirements for this unique product, and I didn't consider an off-the-shelf product to be viable."

Beginning the build

After building an 'empty shell' prototype, Breen got together with the engineering support team from Curtis Instruments, who set about designing the systems required to get the Ecovolve operational. "This is when we realized this could all actually work," says Breen. "Many projects end up running out of steam, but thanks to Curtis's industry knowledge, technical support, and the willingness of the staff to put in the time and effort, we managed to move from concept to reality."

"From our point of view, we like to get involved in a new project as early as possible," says Kerry Green, director of European support engineering for Curtis. "This makes it easier to streamline the process from the beginning and avoid a customer going down potential blind alleys before having to retrace their steps. We advised Sean on the optimal system components, to meet performance and cost, and then designed the entire traction, electric steering and battery management control system for the Ecovolve dumper.

"A major advantage from a customer's point of view is that as well as identifying and supplying the required components, we also write

IT'S WHAT'S INSIDE THAT COUNTS

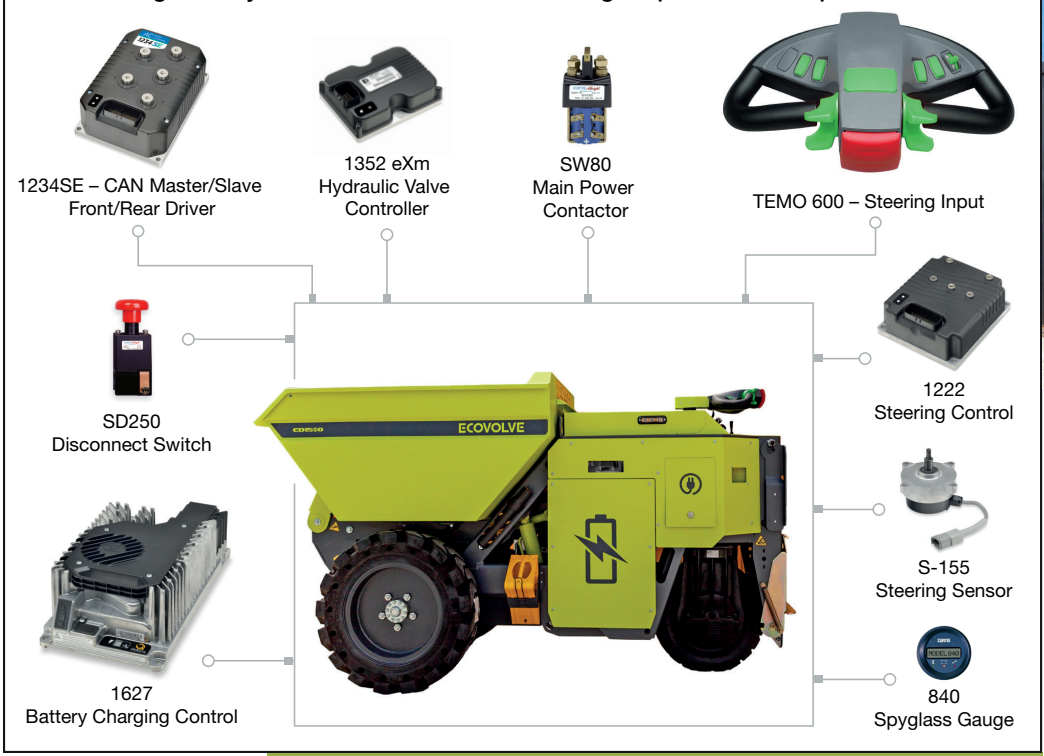
The dumper uses a Curtis AC motor controller, incorporating the proprietary VCL (vehicle control language) application layer, which enables the easy integration of electric steering, battery management and unique control of proportional controlled electric wheel brakes. The VCL enabled Curtis to map the proportional wheel brake control to the automatically controlled regenerative braking current used for the traction motor. The steering controller enables dynamic control depending on dumper speed and mode selection. The steer-by-wire components, including tiller head control and steering sensors, are standard stock items from the huge range of EV components that are held by Curtis in Northampton, UK.

Any new product in the construction sector needs to adhere to stringent safety standards and ensure ergonomic and therefore stress-free operation, and the Ecovolve range more than meets the current criteria. Having access to the steered wheel position via the 1222 CANbus messaging enables dynamic reduction of the traction speed when turning, automatically reducing the risk of loss of control or stability. The industry-proven tiller control gives traction and hydraulic control at the touch of a button or lever. This makes for an intuitive drive and reduces driver fatigue. Sensors on the truck's platform are read by the master controller and change the speed of the truck to accommodate walk-behind or ride-on operation.

On the Web
Watch the Ecovolve ED1000 in action at
www.iVTinternational.com/ed1000

MAIN IMAGE: **The emissions-free dumper is ideal for indoor use**
INSET LEFT: **The brainchild of the Ecovolve is managing director Sean Breen**
BELOW LEFT: **The machine is the only low-profile electric dumper of its type available today**

Curtis Integrated System for Ecovolve ED Series High-Tip Electric Dumpers



Dual Drive technology using the integral CANbus considerably reduces the wiring and increases machine safety, while also calculating the electronic differential for the wheel speeds.

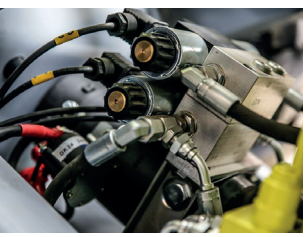
The smallest model is less than 1m (3.3ft) wide, the largest less than 1.2m (3.9ft), making the entire range ideal for work in tight spaces. The high-frequency battery chargers use advanced battery management algorithms to ensure optimum efficiency and low-cost operation, providing enough power for a whole shift on an eight-hour charge for the ED800 and 10 hours for the ED1500.

Ecovolve's products are working on refurbishment projects, hospitals, department stores, cold storage facilities, food processing factories and shopping malls, mainly in the UK and the USA, but also further afield in such far-flung locations as Australia and Dubai. As well as still running his original plant hire business, Breen is devoting a lot of energy to promoting Ecovolve at various trade fairs around the world and is recruiting new dealers to spread the word on these clean, green, electric machines.

"My industry needs to embrace electric power and I am very pleased with the response we have had to this unique new product," says Breen. "A lot of credit must go to Curtis, as without their know-how, this project could well still be at the drawing board stage." **iVT**

"A MAJOR ADVANTAGE FROM A CUSTOMER'S POINT OF VIEW IS THAT AS WELL AS IDENTIFYING AND SUPPLYING THE REQUIRED COMPONENTS, WE ALSO WRITE AND SUPPLY THE SYSTEM APPLICATION SOFTWARE"

Kerry Green, director of European support engineering, Curtis Instruments



ABOVE: **The electric steering and hydraulics are controlled by system application software**

and supply the system application software, which integrates the hardware and software of the entire vehicle control system and plays a key role in managing the electric steering and hydraulic control functionality. It is the interplay between components, the software and application layers that enable new products like this to come to life and stand out with unique features."

Real-world deployment

The successful collaboration between Breen and Curtis resulted in the 1 metric ton capacity Ecovolve Electric Dumper model ED 1000 being launched in 2015. The first ED 1000 was used during the construction of Crossrail in London, where it worked in the narrow confines of newly created tunnels. This was the perfect construction project for Ecovolve to prove its worth in an environment where IC-powered equipment is not allowed. The tight turning circle of just 1.65m (5.4ft) enabled the operator to maneuver easily around rubble and other equipment.

Two further models were subsequently added to the range: a lighter-weight ED 800; and the higher-capacity ED1500, which was unveiled at Bauma Munich in 2016. The ED1500 employs a constant all-wheel-drive system with electric power steering using drive-by-wire technology. For this model, a second AC traction controller is used that is a CAN slave to the master traction controller. The use of the Curtis

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