

EL-FOREST

The future – the hybrid powered forwarder, with fuel consumption of 7.5 litres an hour

To quote Mr Noel Gallagher of Oasis:

She's electric.

She's in a family full of eccentrics.

She done things I never expected.

And I need more time...

I first saw the hybrid forwarder prototype on a 'research stand' back at Elmia Forest 2005; it caught my eye, but then seemed to drop from the limelight.

In 2006, dismayed at the damage being caused to the ground by machinery in his own forests, and armed with knowledge and feedback from the development of the prototype, inventor Lennart Lundström formed El-forest, along with engineering company Thordab AB, with a mission to redesign the modern forwarder. However it wasn't until 2007, when I learned that Volvo BM joined the company as the largest shareholder, that my interest was seriously re-ignited.

During the last 20 years many industries have been striving to reduce costs and associated fuel consumption, but, with a trend towards larger machines in the forestry sector, this has been difficult to achieve. The objectives for the manufacturers of the El-forest were clear, then – build a machine that offered reduced fuel consumption, reduced CO₂ emissions and reduced damage to both the forest

floor and standing trees (all items of interest to Scottish Woodlands and our clients). The result is the F14 'the environmental forwarder', probably one of the most significant advances in forwarding technology for many years.

After contacting El-forest's well known CEO, Gunnar Bäck, to find out more, I learned that the initial machine produced had been successfully sold to Swedish forest management company Sveaskog and was working in the heavily forested Sundsvall area of the country. With the north of Scotland recently being associated with forestry technical innovation (CTI trucks, floating piers etc) the HIE-backed Highlands & Islands Forest Industry Cluster group was helpful in assisting with travel costs for a brief 'study' visit to Scandinavia to check it out.

With the opportunity of serious machine testing on offer, the travelling group consisted of myself, Scottish Woodlands harvesting contractors Calum Reid and Bruce Douglas, Kevin Thomson from Euroforest, Mike Wilson from power generation company SSE and Matt Watts, a student from the Scottish school of forestry.

After rather too many flights we hooked up with Gunnar in Sundsvall and drove north for a couple of hours, into the forest and onto the



Self-levelling rotating cab, no bogies, and a 30kW electric motor turning each wheel.

harvesting site of machine owners Sveaskog where the F14 was working.

State-owned Sveaskog knows a thing or two about harvesting and machinery. It manages timber sales of around 12.5 million cubic metres annually – 50% from its base of 4.3 million hectares of managed forest, and the balance from external sources. All their operations are conducted according to the Swedish FSC standard and the company has a commitment to increasing the profit gained from forest without decreasing its ecological and social values. Sweden hasn't allowed the pendulum to swing as far to the 'furry side' as it has in the UK, which was very refreshing!

The site the EL 14 was extracting was a 2000-tonne clearfell coupe of Scots pine. Whilst dry underfoot, the site was technically very difficult with short steep snaps and lots of rock outcrops and boulders. Initial impressions looked positive – the F14 is no toy and was hauling 15-tonne log loads with relative ease.

So to the technology then: well, the compact and low revving 4-cylinder Deutz-Fahr Euro-3 60kW engine drives both a hydraulic pump and a powerful generator package, charging separate 12v battery modules. The batteries in turn run a 'safe' 84v electric drive system powering indi-

vidual 30kW electric motors in each of the large six wheels. Through a multi clutch system the batteries can also feed back in a 'boost' to the hydraulic pump on demand, for instance when extra power is called upon by the 9.2m Cranab FC 80 crane. The hybrid transmission system uses well proven CanBus technology to simplify the amount of cables and wiring required.

Whilst this is all extremely innovative, the F14 isn't a one-trick pony, and the hybrid technology was only one of several innovations the machine offered. In a departure from convention, an unusual (at first) looking 6-axle layout, devoid of any bogies, basically consists of a conventional framed steered tractor unit pulling a 2-axle trailer. This helps towards lowering the overall machine weight. However, the heavy-duty centre section has up and down as well as lateral movement and the trailer is uniquely split by a further centre joint to allow for axle articulation. You then have to add into this mix the fact that the rear axle also steers, through a combination (controlled by computer) of rams, and individually speed-controlled wheels. Whilst disconcerting at first, this double-framed steering system allows the rear wheels to follow the footprint of the front and provides a very tight turning radius, offers tremendous manoeuvrabil-



(From the left) The author, Bruce Douglas and Mike Wilson from SSE.



ity and reduces ground damage – a huge step forward, especially in thinnings operations.

The Scottish operators more used to sitting aboard John Deere 1710s were best able to get used to the final innovation – a well insulated, continuously self-levelling, unlimited rotation cab which provided good vision and was loaded with more conventional items such as multi-function computer, and very ergonomic seat and control layouts.

An inevitable (in these situations) minor machine breakdown gave the opportunity for coffees out of the back of Gunnar's Volvo. These cleared a few heads (all the travelling you know), but when the toolbox talk strayed onto the local incidence of wolves and bears in the forest we were standing in, we were all keen to move back into the clearfell and watch the Scottish lads put the machine through its paces. Once given a briefing by Sveaskog's F14 operator we were off.

At first the unconventional steering led to instant reactions attempting to compensate for the rear end moving and it took a bit of self-control to 'leave it alone'. Equally it seemed more natural at first to twist necks rather than rotate the cab, but I am sure all these things would be ironed out over a serious spell at the helm.

Gunnar Bäck eventually 'got' Bruce Douglas's initial comment – "She climbs like a bastard all right" – when he was excitedly and positively describing the smooth feel of the 30 tonnes of tractive force that the F14 delivers electrically. Bruce was equally animated when watching Calum Reid in the cab who ran the F14 through a very rough section (see photo), which many of us felt might have even tipped a conventional machine. Crane opera-



Your flexible friend, being tested to the limit by Calum Reid! The F14 has two centre joints, and it became clear that the centrally split rear trailer was using the logs almost as torsion bars to prevent turnover of either rear axle.

tion was generally smooth although it maybe slightly underpowered, even when drawing on the battery 'boost' under load. Ongoing collated figures from Sveaskog showed an impressive fuel usage of around just 7.5 litres per hour! If you compare that to many modern forwarders and do the maths, the fuel saving is paying for the operator on a weekly basis!

It quickly became clear that the design of the centrally split rear trailer was using the loaded logs almost as torsion bars to prevent turnover of either rear axle – very clever, and fine in Scandinavia where the shortest timber length is 4.5m but per-

haps unworkable with UK 'shorter' cut-to-length systems. We thought this design may cause bunk instability and/or even shed logs on steeper ground. This and a few pointers on where to perhaps strengthen the chassis certainly gave Gunnar some progressive feedback.

Critically though, the F14 was efficiently hauling 14-tonne loads to roadside with the minimum of noise, engine revs and diesel, which has prompted Sveaskog to order a second machine from El-forest. Slightly modified, the new F15 model should be delivered to them this summer. With Volvo already having bought into El-forest, other

manufacturers committing to hybrid R&D programmes or watching carefully, and set against a global desire to reduce emissions and improve efficiency, the EL14 could definitely be 'setting the future standard' of heavy-duty working machines – you read it here first and might see one in Scotland soon!

*And I want you to know.
I've got my mind made up now.
There's lots and lots for us to see.
There's lots and lots for us to do.
She is electric,
Can I be electric too?*

Neil Stoddart
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