

GLOBALLY NEW! ACTIONECO

THE ONE FOR MULTI-ACTION WITH ECONOMY AND ECOLOGY

THE FIRST ONE:

- li-ion battery powered with AC servo drive and electronic control greens mower operating full 8 hours with **ONE** charge costing only **ONE** euro, which results to tremendous energy savings based on high efficiency rate and light weight.

MULTI-ACTION:

- quick exchange of alternative equipment - no tools required
- with 180 degrees swivelling controls and seat, equipment can be pulled or pushed as easy.

ECOLOGY:

- **ZERO** exhaust fumes and **ZERO** hydraulic leaks
- low noise for operator, players and nearby residents satisfaction and confort
- low use of natural resources and high rate of recycling

ECONOMY:

- with electronic cutting height adjustment on move - multiple cutting tasks can be performed by one sweep with **THE ONE**
- with automatic clippings collection and spreading, great time of operation can be saved each day
- savings in investments with equipping THE ONE with number of equipment and in operating costs with increased daily working time
- savings in energy and maintenance.

www.actioneco.com



Electronic traction control and high wheel torques for uphill drive.



Optional equipment available for the increase of the investment utilization.



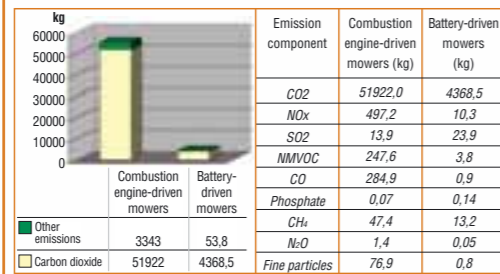
3-wheel drive and turning on spot around centre point between front wheels.

ACTIONECO'S STORY CONTINUES...

ACTIONECO'S ACHIEVEMENTS SO FAR

Actioneco's 3-wheeled greens mowers are ready to conquer golf courses worldwide and to mark the beginning of a new era in golf course grounds keeping. The machines are equipped with next generation drive technology: lithium-ion batteries and AC servo motors. The result is a lightweight structure, battery power that lasts throughout a shift, short recharging time, and up to 80% overall uptime. This can generate annual savings of up to EUR 4,000 – 6,000 in energy costs, and eliminate the need for machine maintenance almost completely. There are no oils and filters to check and replace. All that is required is plugging the recharger lead into a 16-A socket at the end of the working day. An electronic battery control system monitors the recharge cycle and ensures up to 80% of the original battery power even after 2,000 recharge cycles.

The academic thesis of Milja Liukkonen (Lappeenranta University of Technology, 2007, Lappeenranta, Finland) on 'The environmental effects of using greens mowers on golf courses' examined and compared the environmental effects of mowers conforming to the lifecycle analysis (ISO 14040-14043), running on combustion engines, and a battery-operated mower (Actioneco). Picture 8 demonstrates the differences between airborne emissions of mowers running on combustion engines and battery-powered mowers (Milja Liukkonen, 2007, p. 53), and table 4 presents a comparison of significant emissions in kilograms (Milja Liukkonen, 2007, p. 62).



In conclusion, Milja Liukkonen (Lappeenranta, 2007, pp. 70–71) states that carbon dioxide emissions could be cut by 546,900 kilograms per year by switching to battery-powered greens mowers on all of Finland's handicapped golf courses (around 120 in total). This amount is equivalent to the carbon dioxide emissions generated in the production of electricity required for heating 105 residential buildings measuring 120 square metres in floor area each. Moreover, several recent studies have found that fine particles are a significant contributor to annual mortality rates, more so than traffic accidents, for example. Table 4 demonstrates that with battery-powered mowers the amount of fine particles is almost non-existent. Small diesel engines emit high levels of fine particles. Moreover, eliminating these is difficult and expensive. Considering the price of the engine, the cost of the fine particle filters required is high.

- **Actioneco has no hydraulic components or other fluids**, which eliminates leaks of hydraulic oil or other fluids or greases as well as breakages in the hoses, which ruin lawns.
- **The battery-powered Actioneco is almost silent**, making its noise pollution levels minimal compared to mowers running on combustion engines.
- **The result is an environmentally friendly mower for golf courses**, which meets the

requirements of continuous improvement set out in environmental certificates.

- **The goal in developing Actioneco was versatility.** As a result of reaching this goal, investment and operating costs have been cut considerably.
- **The electronic adjustment function for blade height, which can be set by 0.1 mm accuracy** and adjusted during the mowing process, means that a single machine can be used on greens, foregreens and teeing grounds alike. The automated grass collection and discharge system means up to 1.5 hours of time saved per an 18-hole course per day (Milja Liukkonen, 2007, Appendix II.2). As the operating costs are EUR 40 an hour, this means an EUR 60 saving per day, and if the machine is used, for example, 250 times a year, the savings amount to EUR 15,000 per year.

Aleksi Mäkelä (Lappeenranta University of Technology, 2008, Lappeenranta, Finland) states in his thesis in 'Applying the lifecycle analysis to calculating operating costs and comparing competitors' that "Actioneco cuts greens considerably faster than traditional mowers. The difference is so marked that two traditional mowers can be replaced by a single modern mower. The difference is largely thanks to Actioneco's versatility". Aleksi Mäkelä mentions the electronic blade height adjustment and automated grass collection mechanism as the critical properties in this respect. (Aleksi Mäkelä, Lappeenranta, 2008, p. 74).

- **In addition to the aforementioned examples of Actioneco's versatility**, accessories can be added to the machine, without using any tools, in a matter of minutes. Just the basic machine alone is enough for many of the maintenance tasks required on golf courses, which helps to save money in terms of investment costs as well as boosting uptime.

- **The result is a versatile grounds-keeping machine for golf courses** that creates savings in both operating and investment costs, and boosts uptime.

Development work on the Actioneco brand continues. To complement the greens mower, Actioneco is currently testing a 4-wheeled 5-blade fairway machine and planning a new 1-blade push mower.

All of Actioneco's machines are based on the tried and tested solutions featured in the original greens mower developed in 2005.

ACTIONECO

THE ONE FOR MULTI-ACTION WITH ECONOMY AND ECOLOGY

ACTIONECO'S STORY

On a sunny June day in 2004, a father (Mauno) and his son (Mika) overheard a Finnish golf course green keeper quietly complaining about how little golf course machinery had developed in the last 20 years. Mauno and Mika met the green keeper the following day to ask him what he had meant. The green keeper's reply was: "Come along and I'll show you". Mauno and Mika were shocked by what they saw, so a few weeks later, a weekend was allocated for 'test driving' the machines.

For Mauno and Mika, the test drive doubled as their first ever chance to drive a professional 'top-class' greens mower. The industry was completely new to them. The green-keeper demonstrated the lack of development in greens mowers, the hydraulic leaks and clumsy height adjustment. In other words, the machines really had barely evolved in 20 years.

Mauno's product development expertise and his experience of international business development, marketing and management duties within the automotive industry, the port and harbour equipment industry, and the materials handling equipment industry gave him a good foundation on which to build a new product concept for golf course machinery. The idea was to design a greens mower with an electrical diesel engine.

Luckily, a Saturday a few weeks later saw the local paper running a long article about the strong development of lithium-ion battery technology. Mauno reacted instantly. The very next Monday he called the expert behind the article. On Tuesday, he test drove a lithium-ion battery-powered van. On Wednesday, Mauno and Mika were no longer talking about combustion engine-driven machines. They immediately decided to abandon the idea of an electrical diesel-powered machine in favour of a battery-powered electrical and electronic greens mower concept. The test drive really had won them over! It proved that lithium-ion batteries were efficient and capable of long working hours. This was the beginning of a fully electrical, electronic greens mower. And that was the beginning of the Actioneco concept.

During the winter of 2004/2005, three green keepers participated in an intensive development project led by Mauno and Mika - a secret meeting that took place in the home office upstairs in Mauno's house. Several leading experts in electronics and battery technology contributed to the fine-tuning and development of the concept. The experience Mauno had accumulated during his time with the automotive and mechanical engineering industry helped him in developing the mechanical structure. The result was the self-supporting lightweight body that lies at the core of Actioneco's sporty look.

The first prototype was built and tested on a golf course in the summer of 2005. Further tests and development work created conditions for Actioneco's launch on the international market during 2007/2008. Intensive development on the concept continues. Soon, the market will get a chance to try out Actioneco's other battery-powered mowers and machinery.

ACTIONECO

ACTIONECO OY Sopenkorvenkatu 9, FI-15800 Lahti, Finland, fax +358 3 781 8990 • www.actioneco.com

MIKA KESKI-LUOPA gsm +358 40 594 4487 mika.keski-luopa@actioneco.com
 TUULA TAMMELA gsm +358 40 500 2493 tuula.tammela@actioneco.com
 MAUNO KESKI-LUOPA gsm +358 40 554 3851 mauno.keski-luopa@actioneco.com

ONE