Golf car manufacturers making

Better controllers combine with UST, emission laws to push electric car sales

By MarkLeslie

From front to rear, whether electric or gasoline-powered, golf cars are getting lighter, quieter and more durable, with more efficient power trains and better electrical control systems.

"A lot of innovations are coming into the product line," said Dave Hardy of Club Car, Inc.

"The electric car manufacturers are using solid state controllers. Gas car manufacturers are going to a better, more efficient power train design. So gas engines are getting better, electric motors are getting better," Hardy said from his Augusta, Ga., office. "They are making golf cars less intrusive on the game and more convenient, to enhance the enjoyment for all the people playing. That's really what it's all about, what we're trying to do."

Ronald Skenes, marketing communications coordinator for E-Z-GO Division of Textron, Inc., said the industry is "constantly working to improve the efficiency of operation ... to get more rounds per gallon, more rounds per charge, more dependability... Golf courses want cars for rental revenue. If they're broken down, they're not bringing in any money."

Golf courses have been buying more electric cars in the past year or so, Skenes said, explaining that solid-state controls have dramatically increased the range of electric cars.

"Whether a car can go two rounds a day is no longer an issue," he said. "Also, because it uses so much less energy for two rounds, it's taking big cuts out of power bills — a 20- to 30-percent reduction because it recharges quicker. Plus, you're extending battery life."

Hardy agreed, saying: "In past years the market seemed to be leaning toward gas. Right now I'd say there's a trend toward electric cars. Electric cars are better and more efficient than they were a few years ago. They have better speed controls, better batteries, better chargers."

"There is probably an equal trend among gas car manufacturers to make them quieter, lower emissions, more fuel-efficient."

GOLF COURSE NEWS

Exclusive industry survey of golf

Company	Model	Type	Engine Manufacturer	Horsepower	How cooled	Length of warranty	Material of frame	Frame Design	Rust-proofing	Type of Springs
Club Car, Inc. P.O. Box 4658 Augusta, GA 30917 Mark McClure 404-863-3000 **Circle #201**	DS	Electric	N/A	2.97	N/A	3 yrs.	Aluminum	I-Beam	Yes	Mono leaf
	DS	Gas	N/A	8.5	Air-cooled	3 yrs.	Aluminum	I-Beam	Yes	Tapered mono leaf
Columbia ParCar Corp. P.O. Box 1 Deerfield, WI 53531 Ben Sherwood 608-764-5474 **Circle #202**	Legacy	Electric	Columbia	2.0	N/A	3 yrs.	Steel	Tubular	Powder coated	Leaf front/Coil rear
	Legacy	Gas	Columbia	8.0	Air-cooled	3 yrs.	Steel	Tubular	Powder coated	Leaf front/Coil rear
	Classic	Electric	Columbia	2.0	N/A	3 yrs.	Steel	Tubular	Powder coated	Leaf front/Coil rear
	Classic	Gas	Columbia	8.0	Air-cooled	3 yrs.	Steel	Tubular	Powder coated	Leaf front/Coil rear
E-Z-GO 1451 Marvin Griffin Rd. Augusta, GA 30913 Ron Skenes 800-241-5855 **Circle #203**	GX-444	Gas	Fuji	8.5	Air-cooled	3 yrs.	Steel	Tubular	Electrostatic	Spring & Coil
	X-440	Electric	GE	2.0	N/A	3 yrs.	Steel	Tubular	Electrostatic	Leaf
	X-444	Electric	GE	2.0	N/A	3 yrs.	Steel	Tubular	Electrostatic	Spring&Coil
Hyundai 23382 Mill Creek Dr. Laguna Hills, CA 92653 James Lester 714-837-1515 **Circle #204**	HGG-1	Gas	Suzuki	8.5	Air-cooled	3 yrs.	Steel	Tubular	Electrostatic	Spring&Coil
	HGB-1	Electric	GE	3.0	N/A	3 yrs.	Steel	Tubular	Electrostatic	Spring&Coil
Melex USA, Inc. 1221 Front St. Raleigh, NC 27609 Bryan Taylor 800-334-8665 **Circle #205**	412 (4-wheel)	Electric	N/A	2.1	N/A	3 yrs.	Steel	Tubular	R.I.M.	Leaf spring
	152 (3-wheel)	Electric	N/A	2.1	N/A	3 yrs.	Steel	Tubular	Aircraft type	Leaf rear; Coil front
	252 (4-wheel)	Electric	N/A	2.1	N/A	3 yrs.	Steel	Tubular	Aircraft type	Leaf spring
Shuttlecraft 2803 Murray Rd. Estherville, IA 51334 Robert Jensen 712-362-5846 **Circle #206**	2000	Gas	Honda	8.0	Air-cooled	3 yrs.	Steel	I-Beam	Paint	Leaf
	2100	Gas	Honda	8.0	Air-cooled	3 yrs.	Steel	I-Beam	Paint	Leaf
	2500	Gas	Honda	8.0	Air-cooled	3 yrs.	Steel	I-Beam	Paint	Leaf
Yamaha Motor Corp. 6555 Katella Ave. Cypress, CA 90630 Joe Stahl 714-761-7602 **Circle #207**	Fleet Master G9A	Gas	Yamaha	8.85	Air-cooled	3 yrs.	Steel	Tubular	EDP	Coils over shocks
	Fleet Master G9E	Electric	GE	2.97	N/A	3 yrs.	Steel	Tubular	EDP	Coils over shocks
	Fleet Classic G8A	Gas	Yamaha	8.85	Air-cooled	3 yrs.	Steel	Tubular	EDP	3-link rear suspension
	Fleet Classic G8E	Electric	GE	2.97	N/A	3 yrs.	Steel	Tubular	EDP	3-link rear suspension
	Sun Classic G5A	Gas	Yamaha	8.85	Air-cooled	3 yrs.	Steel	Tubular	EDP	Strut front/3-link rear
	Sun Classic G5E	Electric	GE	2.97	N/A	3 yrs.	Steel	Tubular	EDP	Strut front/3-link rear

progress in both gas, electric

Since more rounds are being played nationwide, and golf cars are used more than in the past, manufacturers are targeting durability. At the same time, laws regulating emissions have focused research on ways to improve body an engine efficiency.

DURABLE AND EFFICIENT

Hardy said Club Car switched this year to bayflex. "It's a molded plastic material that's very flexible and durable, yet reparable," he said. "We had used metton, which ... is fairly durable and flexible, but it is difficult to repair.

"Everything **was** fiberglass. Now you're finding metton, bayflex, polyprophelene, and a lot of different materials being used in bodies and body designs that are much more durable, much more flexible, and yet are capable of maintaining the finish the manufacturer is looking for."

Skenes said engineers have also improved gas engines.

Referring to the years-long debate over two-cycle and four-cycle engines, he said E-Z-GO "leap-frogged over the rest of the industry" with a twin-cylinder design it has introduced in its utility vehicles. With its twin-cylinder overhead cam engine, it is "a whole new concept for that type of vehicle," Skenes said.

He said the two-cylinder's advantage over the single-cylinder engine is "it's a much smoother running engine and quieter.

Yet it will not be introduced into the E-Z-GO golf car line until "some time in the future," he said.

Meanwhile, in a *Golf Course News* survey, all golf car makers expressed the No. One selling point of their vehicles.

- Shuttlecraft U.S.A.'s Robert Jensen said the best points of his Models 2000, 2100, and 2500 are their styling and Honda engines.
- Bryan Taylor at Melex USA, Inc. pointed to the electronic speed control system of his models, plus their ease in maintenance, durability, and narrow clearance circle.
- James Lester of Hyundai Golf Cars, U.S.A. said Hyundai-engineered reliability and the comfort of more leg room, coupled with an automotive-style ride, are his cars' top selling points.
- E-Z-GO's Skenes said his gas model is dependable and electric models are the most efficient on the market.
- Ben Sherwood at Columbia ParCar Corp. said the Legacy gas and electric models feature a clam shell body design for easy maintenance and cleaning, and a safety directional key switch. The Classic models, he said, are set apart by an angled bag rack and safety direction key switch.
- Cary Rivers said Club Car's DS gas model has a highly durable and quiet engine and the DS electric model is "lightest weight and highest efficiency."

The manufacturers using bronze bushings said they made that choice because it is longer-lasting, of higher quality and allows for better lubrication.

Those using rubber cited the better ride it gives and also claimed durability, while Lester said Hyundai's rubber and steel bushings match with its welded high-tensile strength tubular steel frame.

Only two companies — Club Car and Shuttlecraft — use I-Beam frame construction. The rest use tubular.

STATE OF THE MARKET

Hardy said the last year has "generally been a very healthy one."

Pointing to the downturn in real-estate oriented golf course development, he said there is nevertheless "a lot of new course construction. And the existing courses are doing very well, at least in the purchase of new golf cars."

car manufacturers

	Type of Bushings	Type of Steering	Type of Brakes	Weight	Turning Radius
	Urethane$Bronze	Rack&Pinion	Rear drums	447	6-9
	Urethane&Bronze	Rack&Pinion	Rear drums	622	6-9
	Bronze or Rubber	Rack&Pinion	Shoe	590	8-0
	Bronze or Rubber	Rack&Pinion	Shoe	655	8-0
	Bronze or Rubber	Rack&Pinion	Shoe	629	8-0
	Bronze or Rubber	Rack&Pinioin	Shoe	694	8-0
	Rubber	Rack & Pinion	Auto adjusting	685	9-9
	Rubber	Rack&Pinion	Auto adjusting	521	8-9
	Rubber	Rack&Pinion	Auto adjusting	562	9-9
	Rubber&Steel	Worm&Pinion	Mech'l brake cable	617	10-2
	Rubber&Steel	Worm&Pinion	Mech'l brake cable	529	10-2
	Bronze	Worm — auto type	Mechanical	643	9-3
	Bronze	Worm — auto type	Mechanical	652	8-3
	Bronze	Worm - auto type	Mechanical	684	9-7
	N/A	Rack&Pinion	Disc	670	9-6
	N/A	Rack&Pinion	Disc	670	9-6
	N/A	Rack&Pinion	Disc	670	9-6
	Rubber&Steel	Worm gear mech'l	Drum	606	9-3
	Rubber&Steel	Worm gear mech'l	Drum	606	9-3
	Rubber&Steel	Worm gear mech'l	Drum	662	9-6
	Rubber&Steel	Worm gear mech'l	Drum	662	9-6
	Rubber&Steel	Worm gear mech'l	Drum	662	9-6
	Rubber&Steel	Worm gear mech'l	Drum	662	9-6