By blending high-tech capability and detailed low-tech artistry, designers and owners can deliver more interesting courses.
top materials laboratories, some advances are as simple as finding a new way of looking at old things. Studies testing crushed rubber in the intermediate layers of greens and tee boxes have shown enhanced nutrient retainage and reduced leachate runoff. As owners, communities and regulatory agencies place a larger emphasis on environmental sensitivity, crushed rubber may serve as a poster child for recycling and creative application of materials.

Finally, advancements in soil-amendment technology have made it possible to tailor the soil conditions of specific microclimates on a golf course to the agronomic requirements of the selected turfgrass. Adding specific nutrients to provide a healthier growing environment for the turf can reduce maintenance costs and improve environmental conditions by decreasing the number of fertilizer and pesticide applications on the course.

**On the level**

Remember when lasers were the stuff of science fiction? Today they are part of everyday life in golf course renovation. In restoration projects, where the goal of the project is to modernize green subsurface profiles for easier and more economical maintenance while maintaining the contours of the existing design, lasers allow us to easily record the pre-existing contours and rebuild the greens to their precise elevations. We also use laser levels to insure that pinnable slopes on greens do not exceed 2 percent. At today's green speeds, we believe anything more than that can be too fast and, ultimately, detract from playability.

**Right as rain**

If there is one aspect of design that has gained the most from technology, it's irrigation. We've come a long way from the center-pipe systems that courses employed for years, and irrigation improvements should be considered for every renovation project.

Modern irrigation systems provide precise coverage, allowing tight control over water dispersal. Technicians can tune each head to deliver only the water needed for its coverage area, resulting in water conservation. Greenside rough can get more water while swales and chipping areas get less. The financial and environmental benefits of improved irrigation systems can go a long way toward paying off the cost of the renovation project itself.

**Turfgrass trends**

University-level turf management programs are pushing the envelope in turfgrass sciences. New varieties of turfgrasses can reduce maintenance costs greatly.

Seeded bermudagrass may provide an efficiently manageable playing surface in the transitional climate zones where traditional bentgrasses and bermudagrasses struggle. Roundup Ready bentgrass, with its immunity to certain herbicides, may allow for the effective control of Poa annua invasions. And paspalums can tolerate high levels of salt in irrigation water, allowing for greater use of brackish, effluent

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Construction processes
Nobody likes to see huge dump trucks rumbling up the fairways and around the green sites of their golf courses. Even a targeted renovation project is going to require some serious construction work on the golf course. To undertake a project that addresses all the tee boxes and greens formerly required closing the entire course for a season or more.

Today, thanks to improved construction processes, we can often keep much of the golf course open during renovation. Rather than using heavy, two-axle trucks to haul materials, we can use light trailers and conveyors to load mix into greens and tees, reducing damage to the golf course and the inconvenience of the project to members and golfers on other parts of the course.

When properly applied, technology saves time, money and helps produce long-term results that may have previously been unobtainable. But technology alone will not create a successful renovation. A skilled designer must combine new systems, materials and methods with a keen eye for aesthetics and playability.

Perhaps the best benefit that technology offers during golf course renovation projects is the ability to save money and free up resources to do the detail work around tees and green sites. And no matter how advanced we may become, the best detail work is done by hand with rakes and shovels. Those are the touches that make a golf course memorable and special.

By blending high-tech capability and detailed low-tech artistry, designers and owners can deliver fun and interesting courses that will make money and keep golfers coming back for years.

Author Jerry Pate, a PGA professional, has several victories, including the 1976 U.S. Open. Pate has also been active in golf course design for more than 20 years and is president of Jerry Pate Design. In addition, he owns a wholesale distributorship that services seven Southeastern states.