RECREATION MANAGEMENT
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Greener Grass Awaits

Environmental & Fiscal Responsibility Team Up in Synthetic Turf

By Tammy York

Although artificial turf has been around for a while, it didn't really take off into the mainstream market until around 2005. As the years progressed, synthetic turf gained in popularity and more fields were installed every year in parks, schools, colleges and professional playing fields. The artificial turf fields that were initially installed had a life span of eight to 10 years.

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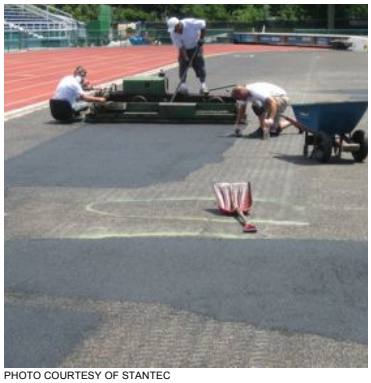
That means the number of fields that are coming up per year for replacement is increasing. "In the next five years and on into the future, we are going to see a lot of municipalities and institutions that need to replace their synthetic turf fields and infill," said Mark Novak, Stantec consulting SportGroup leader for the United States and Canada, focusing on the design of athletic and recreational facilities. "These fields typically had eight-year warranties. In some cases, they were originally installed a decade or more ago, and they have fulfilled their useful lifespan."

At the same time the number of fields needing to be replaced is increasing, there is also a high level of interest in being environmentally responsible with what happens to the old fields. This emerging trend of figuring out how to best recycle the various components of the field is something every field manager should be concerned with because it affects the costs associated with replacing the artificial turf field. And, as landfill space decreases and costs rise, the feasibility of just sending the field to the landfill quickly pales in comparison to generating some revenue and savings by reusing or selling the compone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nts of the field to a recycler or waste to energy plant.

"A typical field is about 600,000 pounds of material. In 2011, 180 fields were removed in the United States, and 90 percent of those went into a landfill," said Mark Mitchell, president and owner of Mitchell Machine Works, which specializes in design-build machinery for the manufacture, installation and removal of synthetic turf. "In 2012, an anticipated 250 to 300 fields will be removed. In 2013, the number jumps again with approximately 500 to 700 fields being removed."

Why the Fields Need To Be Replaced

"Synthetic field turf replacement is needed in the older fields because the carpet fibers are failing," Novak said. "The first areas of the field which show wear and tear are the goal mouths, lacrosse creases, areas between the hash marks on the football field, various areas where you take penalty shots, and in areas where you see a high occurrence of repetitive use."

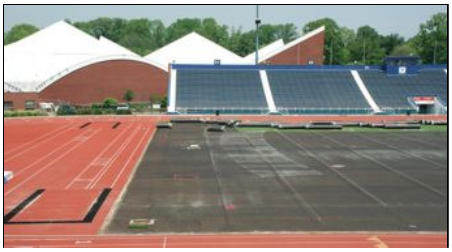
In the high-use areas of the synthetic turf fields, the fibers that are used to simulate natural grass will show wear and tear, start to fall out of the carpet, or be split and broken, giving the appearance of a scouring pad. The fiber degradation and infill compaction negatively affect the playability of the field in those areas.

"It's not a great solution to just fix the areas with the problems. Because over time the ultraviolet light tends to dull the field and when you replace just one area you will have extreme color differences," Novak said. "You are just putting a band-aid on the real problem."

Turf & Infill Removal & Repurposing

"Most of the fields that are eight to 10 years old and in some extreme cases even 12 years old," said Hank Steinbrecher, chair of the Synthetic Turf Association which promotes the use of synthetic turf, "…were made of the polyurethane backing with a monofilament type fiber, and the infill was created from sand and rubber. Right now, there is a growing interest and considerable market opportunity for recycling synthetic turf fields in an environmentally responsible manner."

Polyethylene, nylon, sand, rubber and polyurethane are five extremely different components, and one of the significant problems to recycling the field is overcoming how to separate the components. Since necessity is the mother of invention, there are several types of machines that have recently popped up on the market that cut the field, collect the carpet, and separate the infill from the fiber by using vibration, water, air or a combination of these methods.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Machines on the market for removing infill range in creativity. Some machines literally act as a vacuum cleaner and brush and vacuum the infill out of the fibers. Originally, these machines were developed to rejuvenate the crumb rubber and sand infill, and were not designed to remove all the infill

in the field. Therefore the use of these machines typically results in only a 60 to 70 percent reduction of infill in the field.

Other machines on the market remove the infill as the turf is being rolled up from the field. In some cases, the fields are cut into 15-foot wide panels before being processed. The panels are in fed into a machine that rolls the carpet and extracts the infill.

Removal of the infill is important, because companies that grind, melt and recycle polyethylene into another product must have a clean stream of polyethylene. Contaminants such as debris, sand and rubber can dull the grinding blades as well as create a substandard product.

Reclaimed infill can be cleaned and repurposed on a new synthetic field or used to top-dress the outlying natural turf fields once it is tested for metals and lead. For new fields, an alternative to the traditional rubber and sand infill is coconut husk infill. This slow-to-degrade infill can literally be dumped out and composted at end of its lifecycle.

PHOTO COURTESY OF STANTEC

The East Delta Sports Complex in Portland, Ore., was one of the first outdoor installations of a synthetic turf field. It was installed in October 1997 and removed 11 years later.

"Our original intention was to remove the infill and then pull the synthetic turf up free of any infill," said Debra Kneeshaw, lead park technician with the City of Portland Parks and Recreation Department. "However, the infill was basically cemented into the carpet. We had to cut it into sections and shake it out. We collected about 140 yards of infill and then tested it for metals and lead. Once the infill passed the health and environmental tests, it was top-dressed in a thin layer on our natural turf fields." Kneeshaw supervised the replacement and recycling processes of the synthetic sports field.

Old synthetic turf and the infill could be repurposed for batting cages, driving ranges or warm-up areas. The field can also be repurposed by creating something new from the base materials.

"The old way of replacing a synthetic turf field was to cut it up and ship it to a landfill. This cost about $35,000, depending on where you were in the United States," Steinbrecher said. "It doesn't make any sense to tear it out and not recycle it. You're not making any money off of the resource when you could save money by reusing the infill and make money by selling the plastic to a plastic manufacturer or waste-to-energy plant."

The polyethylene is reclaimed by sheering off the fibers from the polyurethane backing. Then the fibers are ground and used in the creation of oil. The plastic is melted under heat to break down the hydrocarbon molecules. Once that is done, the molecules are then in an oil form and can be collected and shipped to a refinery for further processing. This technology is available in several places, but is expected to expand as the market develops and the feasibility for recycling a synthetic turf field back into oil increases.

Both the polyethylene and the polyurethane backing can be ground up and sent to a waste-to-energy plant to be used as fuel for the creation of electricity.

Working on Recycling

The Town of Lexington, Mass., has fields that have reached the end of their 10-year lifespan. The original fields included an eight-year warranty and the city invested in an additional two-year warranty. The finance committee was educated and reminded about the eventual need to replace the fields and that there would likely be a need for improvements as well.

The three fields are used for high school field hockey, lacrosse and soccer, as well as youth soccer and youth field hockey. In the springtime, the fields are also used for baseball and softball team tryouts. In order to avoid taking the entire budgetary hit at once, the three fields were ranked in order of usage from heaviest to lightest. The first field in the complex is the most heavily used, with both organized and pickup games, and therefore is slated for the first replacement.

PHOTO COURTESY OF FIELDAWAY

"We are seeing if we can reuse the infill, and we are looking for places that will take the carpet instead of sending it to a landfill," said David Pinsonneault, CSFM, CPRP, operation manager for the City of Lexington. "Our infill is a sand and rubber mix. If we can reclaim that, we should be able to save 20 to 30 percent. With regard to the carpet, we just want to make sure that it doesn't become waste so we are looking at options for recycling. We don't anticipate savings, but for us it is more about the environmental impact."

The synthetic turf fields help shift activities away from the natural grass fields and that takes the pressure off of the natural grass fields. This allows for Pinsonneault's team to steadily improve the natural grass fields.

Need a New Base?

For fields that are brand-spanking new or simply need to be completely redone, a new Cradle to Cradle Certified base can be installed. One new-field substrate product offers closed-loop recycling, and is manufactured into interlocking panels with food-grade, 100 percent pure polypropylene, a 100 percent recyclable and non-toxic material.

The material "… handles the shock absorption and drainage on the field," Sawyer said. "It saves a tremendous amount of energy. When you compare how much energy is used to install a stone base versus this base, and track back all of the energy costs to the quarry stone, digging the field base out and filling it in—there is a tremendous amount of savings. For example, we can reduce the overall energy costs of constructing a field by 50 percent. As well as the energy and CO2 costs, since the entire base system is on two trucks rather than the 135 trucks needed with a stone base."

What Lies Beneath

PHOTO COURTESY OF FIELDAWAY

When you are replacing your field, it is a good time to test the field for proper drainage. To see if water is percolating through the stone as it should, you should have your consultant do a dual-ring as well as a flood test.

stone base. The center ring is filled with water and allowed to drain into the stone below. This gives you information on only the vertical drainage of water from the inner ring and gives you a good indication if you have problem with your stone base.

The flood test is exactly how it sounds. An area of the field is flooded. The flood line is marked and then you record how much time it takes for the water to dissipate. Then you repeat this process again. And it gives you an indication of how quickly the stone is draining. If you have problems with the drainage, these will need to be addressed before you proceed with the field replacement.

Whether you are starting with a new field or replacing an old one, the right underlayment can have an impact on long-term costs. You can find products made from recycled materials that are capable of lasting through two or three turf replacement systems. Be sure to ask your synthetic turf supplier about the underlayment and its lifecycle.

Keeping G-Max Values Low

One of the safety concerns with playing fields is the g-max value. The g-max value is a measurement of the shock-attenuation performance of the field, or how hard it is. The g-max value is a ratio of the maximum acceleration experienced during impact to the normal rate of acceleration due to gravity, or in simpler terms: Is the force of the impact absorbed by the field or the player's body?

The higher the g-max value, the poorer the shock-attenuation performance of the surface. This will affect the playability of the field and the safety of the players. A typical synthetic turf field when built has g-max values around 100, which is equal to perfect natural grass. As synthetic turf fields age and if they are not well maintained, the g-max values can climb to 160 and higher. At 200 g-max value you can fracture your skull.

PHOTO COURTESY OF A-TURF

"We are seeing a prevalence of 160 g-max values on fields," Sawyer said. "Parks and schools don't have the maintenance budgets anymore and think that they don't have to maintain it since it is artificial turf. But when you have the field that has band, track, football, soccer and lacrosse on it and the infill is being packed down—if it isn't properly maintained, the g-max goes up."

"You never want to see your g-max value reaching 200. You want to be in the 90 to 160 g-max value range to ensure that the field is safe and playable," Novak said. "When you replace the field, the amount of work and costs involved isn't as much as installing a new field. You can make the field better by adding a pad underneath the field to mitigate the shock-attenuation and protect the laser-graded base."

This pad below the carpet layer will also protect the stone underneath, Novak added. "When you do a future field replacement, it will cost less money because you won't have to fine-tune the stone," Novak said. "There are different pads on the market, including poured in place pads that are expensive but last a long time. Shock pads are another alternative and are created from polypropylene panels or rubber. These can vary in height from 10 to 13 to 25 mm. There are claims that the pad can extend the life of the field, but this hasn't been proven in any studies."

More Shock Absorption, Less Turf and Infill

One of the systems currently on the market is a shock-absorbing layer that goes over the top of the rock base much in the same fashion as interlocking tiles. "By using a shock-absorbing layer underneath the field you can shorten the height of the turf and use less rubber and sand infill," said Dan Sawyer, CEO of a manufacturer of shock-absorbing underlayment. "When you lay turf over stone, you have nothing to absorb the shock and therefore you need taller turf and lots of sand and rubber infill."

If a shock-absorbing layer is used underneath the field, the height of the turf can be decreased as well as the amount of sand and rubber infill needed to produce safe g-max values. For example, when you use a shock-absorbing layer you could save at least a half-inch of turf fiber height, which is significant when you consider that it is saved over 80,000 square feet. This significantly reduces the amount of polyethylene, sand and rubber needed to complete the field.

PHOTO COURTESY OF A-TURF

Shock-absorbing layers can be reused rather than recycled. This eliminates the need to transport the polypropylene material to recycling plant, the energy to recycle the material and the energy to transport it back out to the consumer market. By eliminating the need to recycle the material, you also eliminate the CO_2 produced during transportation.

The shock-absorbing layer provides several benefits to the field turf manager and the players utilizing the field. The shock-absorbing layer protects the laser grading of the stone base so that future installations of synthetic turf and infill can just be laid over the top of it since the rock base is protected from the removal equipment by the padding. It also protects the players when they hit the field because it provides an extra layer of shock absorption. In addition, it reduces the height of the carpet, as well as the amount of infill that is needed, which in turn reduces the amount of material that would be needed for the replacement field, and it can be recycled in the future.

Cradle to Cradle

The Cradle to Cradle Certified program is a multi-attribute eco-label that assesses a product's safety to humans and the environment and design for future lifecycles. The Cradle to Cradle framework focuses on using safe

materials that can be disassembled and recycled as technical nutrients or composted as biological nutrients. The materials and manufacturing practices of each product are assessed in five categories: Material Health, Material Reutilization, Renewable Energy Use, Water Stewardship, and Social Responsibility.

One manufacturer has developed a sustainable solution to recycling synthetic turf fields, with a plant located in Dalton, Ga., that utilizes reclaimed material for energy production by using the turf fibers as a fuel. This is also known as a waste-to-energy plant where the various waste components are burned to create electrical energy. Another way the turf is recycled is for the turf system to be converted back into the resin/polymer state and then molded or extruded into new products such as carpet backing, mats, rugs and sheet goods. This reduces the demand for virgin materials.

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"The industry is being very aggressive in manufacturing products that are more sustainable and can be recycled easier," Novak said. "As the number of fields that need to be replaced increases, the various recycling avenues should increase as well. This will make it easier and more cost-effective to recycle the field. The Synthetic Turf Council has created an end of life task force to educate the public about the advances that have been made and what to look for in the future."

"The field doesn't need to be thrown away, there are just too many millions of pounds going into landfill," Mitchell said. "The specifiers and the turf managers can mandate what is to happen to the fields. That is what will be the driving force of the fields being recycled."

"It seems that everyone thinks being environmental costs more. However, I might spend 5 to 7 percent more today because I know the first time I replace my synthetic turf field, I'm going to get a return on my investment both financially and environmentally. Plus, the next guy who takes over my job doesn't inherit an environmental nightmare," Sawyer said. "You can save money by being environmental. You just might not be able to save it right now. We need to start building things now for more sustainable future. We really can't be throwing old synthetic turf fields in landfills anymore. We don't want our kids to inherit all of this garbage."