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With inflation driving up your labor costs, you've got to find new ways to get more work done in less time.

That's what the Cushman Turf-Care System is all about.

At the heart of our system is the Cushman 3- or 4-wheel Turf-Truckster vehicle. With a rugged 18-hp engine, and a transmission designed to allow the optional PTO to attach directly to it, the Turf-Truckster moves people, tools and equipment quickly and economically.

But the real beauty of the Turf-Truckster is that it also helps your crew finish most turf jobs fast, thanks to a full line of optional Cushman attachments.

Each attachment secures to your Turf-Truckster's chassis in minutes, through Cushman's pin-disconnect system. You don't bolt or hitch, but just put the attachment in place,

snap-in two or three pull pins and you're ready to hit the turf.

And every optional Cushman Turf-Care attachment is engineered to get its job done neatly and in as little time as possible.

1. GREENSAVER® AERATOR.

The Greensaver lets you aerate greens, tees or other turf areas up to 10 times faster than walk-type units.

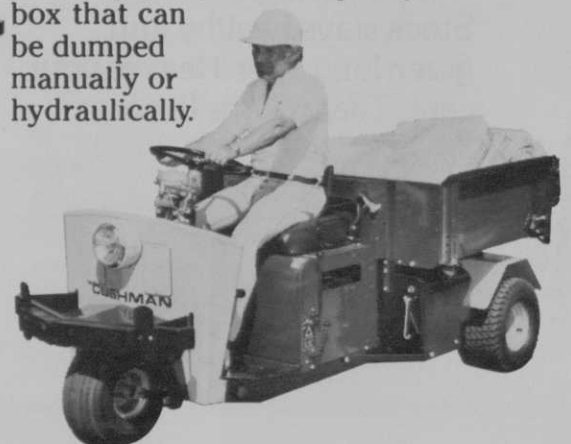


It attaches easily to either the 3- or 4-wheel Turf-Truckster. Choose the drum best suited for your turf: ½"

coring tines, ⅜" coring tines or slicing tines—they are all interchangeable. What's more, both coring drums collect cores as you aerate. Or remove the side plates and return the cores to the turf to be broken up as top dressing.

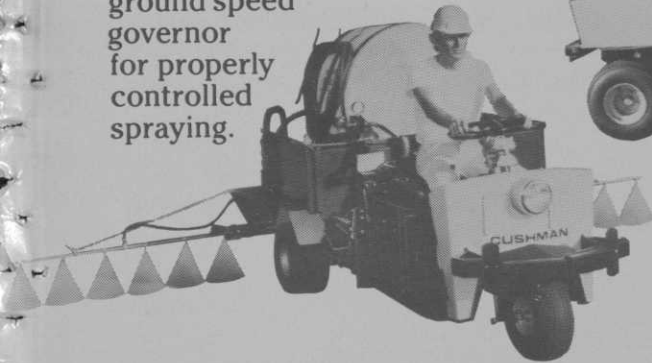
2. SHORT BOX & FLATBED/BOX.

Your Turf-Truckster becomes a flatbed hauler with just two pull pins in place. Bolt on the optional side panels and tailgate to the flatbed, and you've got a 1,000-lb. capacity* box that can be dumped manually or hydraulically.



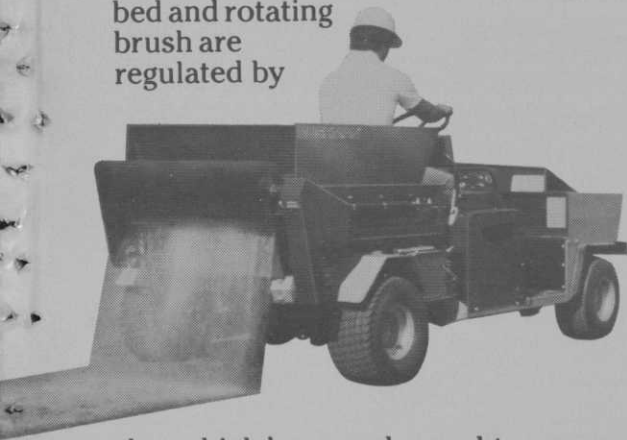
3. SPRAYER.

It's a 100-gallon polyethylene tank that holds liquids for spraying greens, trees, bushes or roughs quickly and accurately. Team it with the Turf-Truckster equipped with a standard 2 to 1 auxiliary transmission, optional PTO and ground speed governor for properly controlled spraying.



4. TOP DRESSER.

Compared to self-powered or walk-type top dressers, this unit pays for itself in the hours it can save your crew. A rubber fabric moving bed and rotating brush are regulated by



the vehicle's ground speed to maintain an even spreading pattern over a 31½" swath. And the hopper holds up to 1,000 lbs. of material from rock salt to powdered fertilizer.

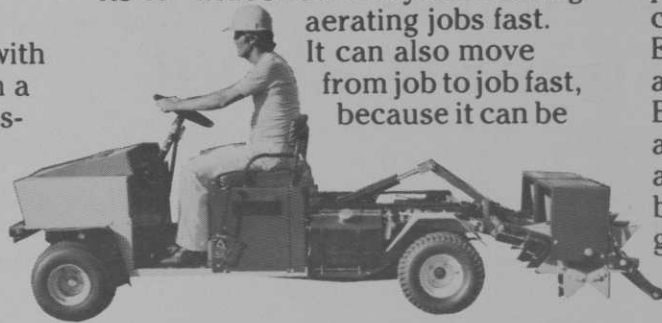
5. SPREADER/SEEDER.

Mounted on the optional Short Box or Flatbed/Box, its cyclone action spreads up to 300 pounds of seed, sand, salt or fertilizer over areas up to 40' wide. The Spreader/Seeder is powered by the Turf-Truckster's optional PTO with extension shaft. And since all controls are operated from the driver's seat, one man can get the job done.



6. QUICK AERATOR.

We call it the Quick Aerator because its 46" wide swath lets you finish big aerating jobs fast. It can also move from job to job fast, because it can be



hydraulically lifted by controls from the driver's seat for ground transport (optional hydraulic system and dump set required). Three tine styles are available for different soil conditions: slicing, coring (2 sizes) and open spoon.

7. GRADER/SCARIFIER.

Now you can groom non-turf areas with your Cushman Turf-Care System. Attach the new Grader/Scarifier to your Turf-Truckster and you're ready to break up compacted dirt on ball diamond infields or golf car pathways. As a professional grading tool, it will keep your grounds even, or create new surfaces. There's a built-on dragmat holder, driver-operated controls and an optional scarifier replacement bar with extra-close 1½" tooth spacing.



8. POWER CONVERTER.

The Cushman Power Converter turns your Turf-Truckster into a mobile power plant for electric tools, floodlights . . . anything with a universal motor that draws up to 120 volts DC. So, instead of bringing every repair job back to the shop, your crew can handle them in the field. The Power Converter is inexpensive, easy to install and makes your Cushman System even more versatile.



9. CUSHMAN RUNABOUT.

If you need a vehicle for moving people and equipment efficiently, consider the Cushman Runabout. Either the two-man 18-hp Runabout, or the one-man 12-hp model. Both give you maneuverability and feature a big pick-up box, and 3-speed transmission. And both Runabout models let your crew get to the job without tying up a golf car that could be on the course earning a profit.



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Irrigation system efficiency

Some things to think about

Irrigation system efficiency is a vague term. Anything can be more efficient as technology develops. About the only thing that keeps most people from being as energy efficient as they can be is the high cost of equipment that's going to save them money. It's hard to spend several thousand dollars, knowing it will be several years before the money is returned and you actually start saving.

Well, the impetus is upon us. It doesn't take so long now before you see the return. Jim Bell, Rainbird Golf Market Specialist, estimates that, on the average, it cost \$.07 per horsepower per hour to run a pump. Now, if you replace it with a pump that is only 10 percent more efficient, say a 10 horsepower pump, it's saving you \$6.30 a night if it goes for nine hours. If you have to water 350 days out of the year, that's about \$2200 a year you're saving. Quite a bit. But take that five years down the road when energy prices have put the cost of operating that pump at \$.21 per horsepower per hour and you're talking about saving over \$6000. That's what everyone is taking a long, hard look at.

John Skidgel, Golf Marketing Manager at Toro, says that they are putting the emphasis on making equipment that will run on less electricity and will save water by applying it at rates that the soil will accept. Bell reiterates this by saying that there are only two problems in watering a golf course . . . wet spots and dry spots. The wet spots come from water that runs off the dry spots. Skidgel is talking about running a system on lower pressures and lower application rates. Toro now has some sprinkler heads with a fairly low precipitation rate, but Skidgel feels that they are going to have to get into larger sprinklers that throw larger diameters. On a golf course, he is talking about a 100 to 200 foot diameter that will still give good coverage. Water is a resource we need to protect, he adds. And when you pump 600 to 700 gallons of water a minute at 125 pounds of pressure, you're going to burn some electricity.

The people who build pumping stations feel the same way. They are looking for modifications that will conserve both energy and water. Kent Curley, President of Aqua Turf feels that the way to do it is to replace only

that water that is taken away naturally. They are at a stage of new types of controls for pumps to utilize a more flexible control system to properly pump only the required amount of water at a specific moment.

There is a lot of energy lost with the constant speed, constant pressure pumps that are used for turf irrigation systems today. When the pump starts, it doesn't know if it has a requirement for 200 gallons per minute of water, or only five gallons per minute. If the pump was only using the proper amount of energy and relating it to the proper gallonage of water, who knows what the savings would be.

Pumps do not operate at a true 100 percent efficiency. It may be down around 60 percent, if you look at the consumption of electricity versus how many gallons of water it is pumping, and the total operating time versus how much water has been displaced.

But, the problem doesn't lie in the fact that technology is not available. Variable speed pumps have been around major industry for a long time. It's just that they don't adapt to the field very well. Some of these units are very complicated, and others are only pretty complicated. It requires specialized mechanics to work on them and they are just not available to everyone. It has been tried, is still being thought about, but so far has not proved practicable for the field situations such as on a golf course.

Many things go into determining the type of pumping station that a particular irrigation system needs. A designer needs to know how many gallons of water the system will be pumping at peak capacity. He needs to know how much pressure, or dynamic head, you have got to generate. Where the water is coming from makes a difference because of elevation that has to be taken into effect. All of these things plus more are taken into consideration and the complete unit is assembled and tested for the specifications it was built to. Then, it can be powered by electricity, gasoline or diesel engine, or whatever.

One thing that they have done on the systems designed by Pumping Systems Inc. is to design a station where the jockey pump shuts off on flow. Jerry Pettengill, President, explains that with the jockey pump pump-

plains that with the jockey pumping a full head before shutting off, it stays off for an hour and a half instead of coming on every twenty minutes.

Normally, the jockey pump comes on at 90 pounds pressure and kicks off at about a 110 or 120. On the PSI systems, it pumps water into a surge tank with a 36-inch diameter that holds 300 gallons of water. For every pound of differential between the turning on of the jockey pump and its turn-off, there is about 0.9 gallons of water stored. With a twenty pound differential (110 minus 90), that equals about 18 gallons of water. By shutting the jockey pump off on flow rather than pressure, it will pump a full head of about 170 pounds, or 80 pound differential, into the tank. If the jockey pump usually ran every 20 minutes, it would now have enough head to stay off for an hour and a half.

What this means in terms of energy conservation and also extending the life of the pump itself is a large savings. It takes about 600 percent of running voltage to start a pump. This is basically converted to heat. You can only start a pump a certain number of times in a given period of time before the heat cuts its life drastically short. Starting a 25 horsepower motor more than 10 times in a hour will damage it through overheating. The larger the motor, the less times you can start it before it overheats.

Bob Whalen, Vice President at PSI also states that proper starting and operation of a motor can cut the energy consumed. He feels that the way to efficiency is through developing systems where if 50 hydraulic horsepower is needed, you should be expending no more than 50 electrical horsepower at the pump station. Pumping stations are normally set up with a number of pumps to give peak operating efficiency at any given pumping rate. What this generally means is that a station with 25, 50 and 100 horsepower pumps will only operate the 25 at about 200 gallons per minute, it would shut off and the 50 would come on at 400, the 25 would come back on with the 50 at 700, they would shut down and the 100 would come on at a thousand gallons per minute and so on up to the capacity of the system.

While this is the norm for pumping

stations, care has to be taken not to overcomplicate the system. For example, if the system calls for two 100 horsepower pumps, you might spend more on extra controls and maintenance if you put four 50 horsepower pumps in. A lot of things hang in the balance of choosing the right system.

The Rainbird Maxi controller is the most sophisticated controller on the market. People in the water short west are taking a hard look at the water savings it can bring. There is talk that meters will even be put on the wells in the desert areas. With a large price tag of around \$20,000 dollars, the simplicity of use and a number of uses that hasn't even been estimated yet, the Maxi seems to be the controller of the future. A user, and it takes about an hour for the most basic training, can program an entire watering cycle in about six seconds. And the machine will have his coffee ready when he gets there to do it.

On the serious side, this machine allows programming to meet immediate watering needs in a very short time. It is nothing to program it to put 30 minutes worth of water on in six shots of five minutes each to avoid overwatering and run-off. And if you want to try two percent less water, just tell it water budget 98 percent and it cuts the entire course by two percent.

Integrating moisture sensors into the program can further automate the system. Most turf managers tend to overwater. It might be scary to hook up to such a system and the pumps don't come on for six days simply because the water is still there even though everything says you've got to water more often. And you breathe a sigh of relief when it does come on just because you know now that it still works.

Toro is looking towards a dollar savings both in parts and labor with their Pressure Modulated Control system. Several superintendents saw the system work at Windcrest in San Antonio at the GCSAA show two years ago. The system has gained acceptance and is going in on several courses around the country.

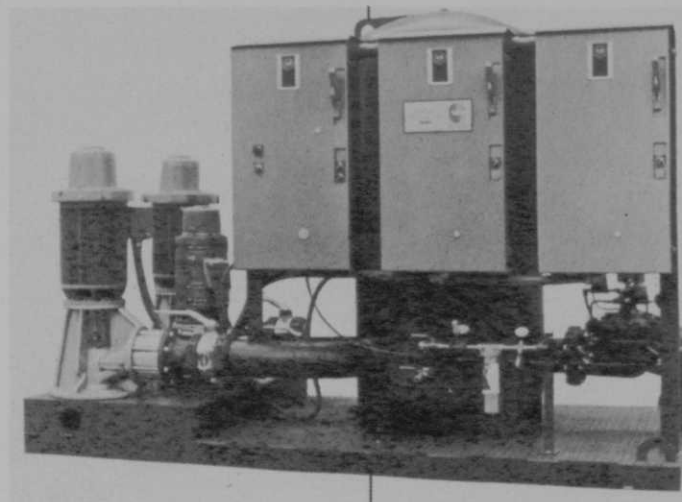
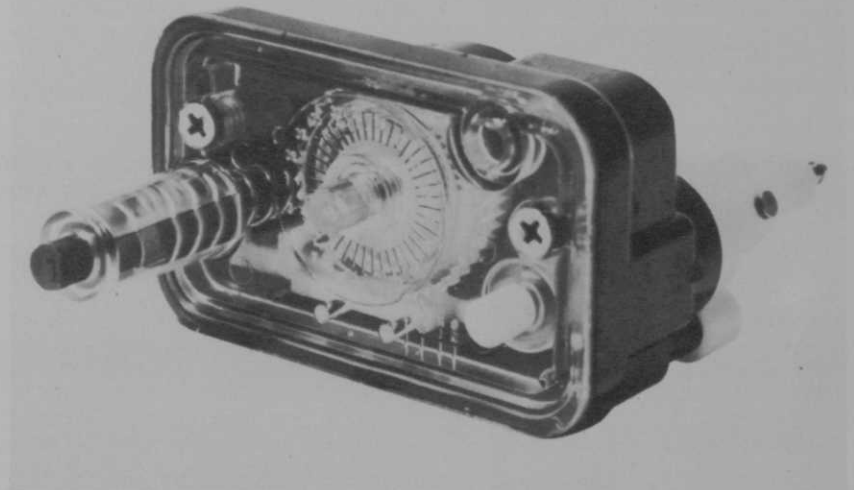
The system is designed to automate quick coupler systems without the cost of wiring. It is estimated to save about 40% labor on installation and can be easily installed by an existing crew. The only limitation right now is eleva-

tion. The system can only handle about 100 feet. The system needs a good 100 to 110 pounds of pressure as about 85 is needed to turn it on.

While the industry is becoming much more sophisticated as the demand for energy and water conservation grows, superintendents as a group

are not keeping up with it. Basic practices in plant/water relationships need to be reaffirmed and practiced. And as one becomes more concerned with this balance and less concerned with just watering the soil, the sophistication of the industry will grow on them.

The Maxi, at right, is Rain Bird's most advanced computer controller. The cycler, middle, is the heart of the Toro MPC irrigation system. One is installed beside each sprinkler. Bottom, Carroll Childers Company, out of Houston, Texas builds pumping systems such as this one.



Tree pest identification



Oak leaf tier



Pine bark aphids



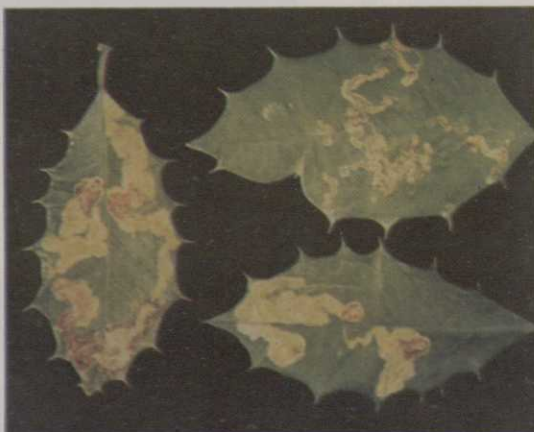
Japanese beetles and damage



Fall webworm damage



Pine sawfly



Holly leaf miner



Succulent oak gall



Pine needle scale on spruce



Cottony maple scale



Birch leaf miner larvae and injury



Magnolia scale



Lace bug



Bagworm on black locust



Solitary oak leaf miner



Aphids



Eastern tent caterpillar



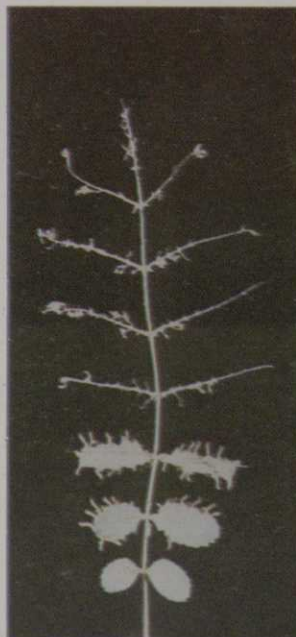
Brown elm scale



Horned oak gall



Euonymus scale



Mountainash sawfly



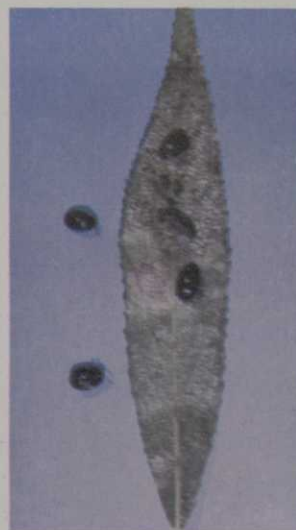
Pin oak sawfly



Dogwood borer larvae



Mimosa webworm



Willow leaf beetle



Spruce mite webbing and damage



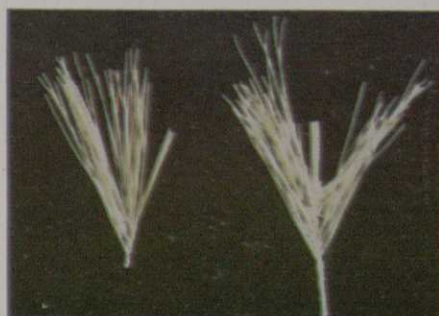
Fall webworm larvae



Gypsy moth larvae



Oystershell scale



Pine tube moth damage



Birch leaf skeletonizer

Prince William windmill cuts electric, water bill

By Joseph Gambatese

Billy Dillon got the idea from farmers in Purcellville, Va., where he was golf professional at Loudon Golf & Country Club. Many of them irrigate their farm with water pumped from a well by a windmill.

Why not, Dillon thought, use the same method to water the public golf course he and Charles Staples had just leased in Nokesville, Va., some 40 miles from Washington? Staples' reaction: Why not?

That is why today, in its second year of operation, a 28-foot windmill over a well behind the 18th tee of Prince William Public Golf Course pumps as much as 15 gallons of water a minute through two four-inch pipes into two small storage lakes in front of the tee.

From these lakes, water is pumped 800 yards through another four-inch pipe to a larger lake which comes to play as a hazard on the fourth, fifth and 13th holes.

A watering system from this lake is nearing completion. It now carries water to sprinkler heads on all 18 tees and 10 greens. The remaining eight greens will soon be tied into the system.



The 28-foot windmill (above) with an 8-foot blade can pump as much as 15 gallons of water per minute into the two lakes in front of the 18th tee of the Prince William Public Golf Course. At left, Billy Dillon (on left) and Charles Staples gave up club golf professional jobs two years ago to lease and operate a public course. They have since been retained to operate another public course and a private course.





"The previous owners watered the course from the two small lakes," Staples recalled. "They barely provided enough water under normal weather conditions. During a recent drought, they went dry. The big lake had water but there was no way to use it. All the greens were lost. We don't want that to happen to us.

Staples was golf professional at the prestigious Aronimink Golf Club, near Philadelphia, site of the 1977 U.S. Amateur and 1962 PGA championships, when he and Dillon decided to go into business together. They had known each other when Staples was at International Town & C.C., Fairfax, Va., before going to Aronimink.

Leasing the golf course from Prince William County was their first venture. The previous owners, Greenwich C.C., were going through bankruptcy when the county bought the 150-acre property. The course was rundown, naturally, and needed a lot of work. Staples and Dillon have done such an impressive job of management that they have since been retained to manage two other northern Virginia courses, Evergreen, a private club 16 miles away, and Goose Creek, a public course another 16 miles beyond Evergreen.

Their first objective was to assure an adequate water supply needed to put and maintain the Prince William course in top condition. They got the 250-foot well dug for \$1,500. They built concrete footings on which they mounted a 28-foot Dempster windmill with eight-foot wheel and tail, which cost another \$1,500 and had to be assembled.

Besides providing adequate water, the windmill saves money in electrical as well as water bills.

"We don't have a program for watering," Staples says. "When and how much we water depends on the weather and the needs of the grass. If there is no rain, we might water every night, or every other night, or during the day to cool down the greens."

Continues on page 20

Superintendent Ron Barley points to the flail mower he likes to mow ditches, banks, roughs and around lakes with.



Barley stands with part of the equipment at Prince William. From left: a Toro diesel Parkmaster fairway mower, a Massey Ferguson tractor with spreader, a Yanmar diesel tractor with front-end scraper, and a post-hole auger.

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Windmill from page 19

Once they had the water problem solved, their overall objective was one of keeping the golf course green and cut. Staples says there are four essential elements in a successful course maintenance program.

1. A good mechanic. "He's indispensable," says Staples of his mechanic, Ottie Ralls, retired from Ford Motor Co. He's in charge of all equipment and does all the mechanical work for both the Prince William and Evergreen courses.

"He can take a motor apart and put it back together again in 20 minutes," according to Staples. "When some equipment goes wrong, he knows immediately what the trouble is and usually can fix it on the spot."

2. Have good equipment available when needed. Staples is able to interchange equipment between the three golf courses he and Dillon manage, keeping down time to a minimum when a breakdown occurs.

"Down time is what kills most superintendents," says Staples. "Golf courses today are almost totally dependent on modern equipment. They used to use all manpower, with 15 or more men working on a course. Today

you can get by with as few as four or five if you have good equipment."

A machine Staples is particularly proud of is a flail mower, which is especially adapted to trimming lakes, ditches and banks as well as rough.

Also his aerifying and topdressing equipment which enables his staff to aerate all 18 greens in 24 hours instead of the two weeks it previously took.

3. Spend more time with your personnel. Motivate them and keep them around longer. "Pay them a little more if you have to," Staples advises. "It usually is well worth the effort."

4. Bulk purchasing of materials. "We buy fertilizer and chemicals about once a year and ask for bids," Staples points out. "As a result, we get a much better price. The first year we bought fertilizer, there was \$8,000 difference between the highest and lowest bidder. If you just buy when you need something, you will usually pay twice as much.

"We recently bought \$12,000 of chemicals for the three golf courses we manage. The highest bid was \$15,500. The same chemicals would have cost over \$19,000 if we had bought them only when needed."

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