tape with a considerable overlap as a safety measure. The sheeting is left quite slack on the base of the lake to allow for the weight of backfill and water to take its effect.

Now it is generally accepted that the type of sheeting is not everlasting if left open to sunlight and spiked golfing shoes. Therefore, we recommend that an overlay of between 4"-9" of soil, or sand, is run on top of the polythene as a protective layer. This can be done by manual or mechanical means, the latter being obviously quicker, so long as sufficient care is taken to ensure that the lining is not damaged by either human feet or machine wheels or tracks. Generally however, this can easily be done. This overlay will not only provide protection for the polythene, but will also prevent the rare occurence of water getting beneath the sheet and forcing it up to the surface.

The sides of the lake above the projected water line can then be soiled and seeded to marry in with the surrounding fairways and rough. All that is then necessary is to fill the lake with water if a natural source is not available, and this is quickly done from a hydrant point in the irrigation system. Such a point should be included in a watering system where artificial lakes are to be built as periodic topping-up may be necessary.

One or two more additional points which may be of interest to you:—

1. There is a danger that outfall drains from fairway schemes may come into the lake and possibly flow under the polythene. This is easily remedied by introducing short lengths of alkathene pipe onto the end of the tile drain and bringing it through the polythene. A thermal weld is produced at the point where the pipe breaks the sheet and so perfects the seal.
2. We have found that a blinding layer of shingle on top of the soil or sand backfill prevents any debris floating in the water and so clouding it. A useful fact especially for lakes around the clubhouse which can be planted and stocked with fish.

Now to the economics of all these operations:—

Let us take construction first—say a proposed lake of some 2000 square yards and 5 feet deep. The bulk excavation of this lake would cost about £300 but as already described, such an expenditure can be offset against the earth movement costs of building a green or tee. General trimming and final preparation would run out at £50. Now using Butyl lining, the supply and laying process would cost about 80p—to £1 per square yard, whereas polythene sheeting would be between 25p and 40p per sq. yd. The cost of the backfilling with sand at a depth of 3"-4" would be around £250 and then the water filling is just an incidental.

So using polythene sheeting one could have a fairly large lake or reservoir for about £1,500 or 75p per square yard. Now compare this with a bunker of say 60 square yards. At least £10—£15 to construct, and with good quality sand £50—£60 could be expended in all. Thus £1 per square yard to compare with 75p for a lake.

On the question of maintenance of these hazards, there is a minimal outlay. The occasional topping-up and removal of surface weeds, and perhaps a spray with a selective herbicide, should it be found necessary. But a bunker—a high labour content in maintenance. Raking, cutting the banks and surrounds, and weeding—as regular items and also the replacement of sand probably each season. Obviously, all these can work out at quite a sum taken over a year.

Of course, I am not saying that we should replace bunkers with water hazards, but I feel that there is a strong case on economic grounds alone to include some water hazards

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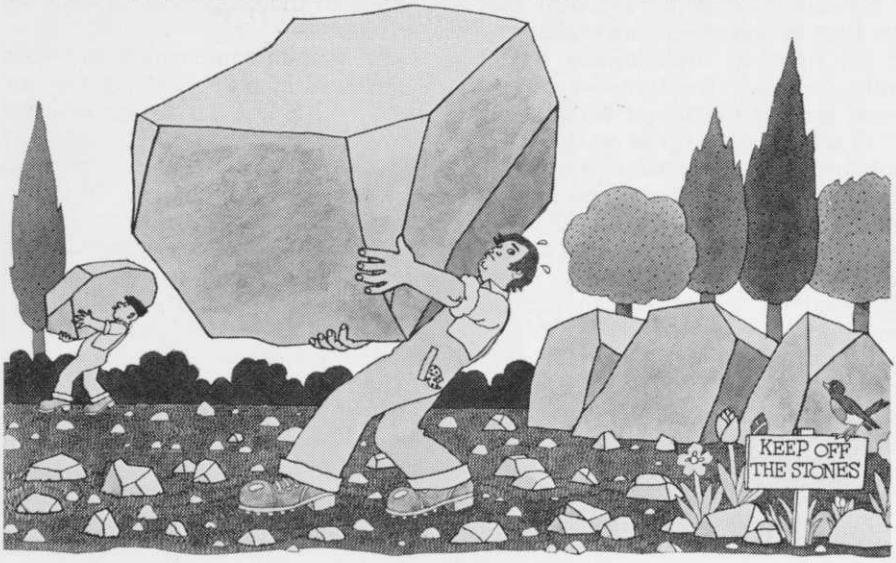

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on a new or existing course during constructional activities.

An artificial water hazard brings a new dimension to the design and construction of a golf course. It brings a new dimension to the problems which the golfer faces and can add a beautifying feature to a particular part of the course. In all, they have an enormous potential in becoming much more important components of many more courses. I certainly hope we shall see many more of them.

Questions on

ARTIFICIAL WATER HAZARDS

Q. Could Mr. Swan develop the commercial aspects that the water would cost the club several thousand pounds a year and with the nationalisation of water with the Water Resources Act, what is that going to mean to the average Golf Club.

A. When we investigated the economics of the supply alone from the Water Board, they gave us that figure of 40p a thousand gallons, and on the calculations of the average amount that you would use in the summer, then it would work out about that figure. I have really no idea what it might come to following the reorganisation.

Q. We have just finished constructing a course and introduced a small reservoir around one of the tees and are using this to take water off for an automatic system, and we went through the usual channel of finding liners, touched on a rubberised one which was going to cost around £2,000. So we went for the polythene in the end, but since then I've heard of another product and wondered whether you had had anything to do with it, this bitumastic solution which is pumped in by tanker as the water is filled up, because we are on chalk which does not hold any water anyway naturally.

A. It is something we have not used. I think on some of the courses in Spain they have sprayed a type of latex onto the surface of the walls at the base of the lake to hold the water. It is something we have not at present used in this country, we have, in fact, only used the two types of lining and we have found, in fact, polythene to be very successful indeed.

Q. Could you enlarge on the thickness of the polythene ?

A. It is a 1000 gauge. I think on the little brochure I gave out it will give the actual thickness (Q. about 4-5 millimetre ?). It is not as thick as that. I have some samples so we can look, if the questioner would like to see me afterwards.

Q. Surely in the long term, an artificial base is bound to suffer from the effects of trees and their roots ?

A. Yes, I would agree, if you have a lot of large trees about, then obviously the roots may go into it. I mean we have not had any evidence of this at all because we have never put a lake in, close to a tremendous amount of very mature trees. We have never had any experience of the polythene being punctured or the butyl being punctured from the outside at all, but I mean theoretically, certainly it is possible; but it is something we have not had any experience of at all.

Q. In constructing lakes, I always find it a problem to decide how deep to make one's artificial lake, but obviously you don't to make it too deep from the cost consideration. At the same time I am quite sure one must not make it

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too shallow, because if it is too shallow, you do greatly accentuate the week problem, and what sort of happy medium have you found in your experience.

A. Well, we have found that we have built one or two fairly shallow and we have found that one or two people have gone in, with the polythene lining, and punctured it with their spikes. It has got to be deep enough to deter the golfer from going in after his ball, obviously it has got to be shallow enough not to present too much of a danger problem. The golfers may stay out of it, but there may be children who play around unnoticed by the greenkeeper, who could easily go in and the deeper it is the worse it is from the danger point of view. You have to have a compromise between the amount of water you require to, say, irrigate the course, the capacity required within the lake and some compromise between the surface area and the depth. It all has to tie in with the overall design. Down at Foxhills we have got about 5 foot and we have never built one shallower than about 3'6".

Q. I have been to a golf course which has been recently constructed and they made a lake there, and the banks on the lake were very high. Now when it was completed, it was done with polythene, and when the banks were completed and the banks started to grow, it looked very nice, but after 2 years of the banks being there, they started to slide down the polythene into the lake. This is what has happened and the polythene has been left open. Do you have a solution ?

A. The banks must not be constructed more than 1 in 3 because in order to get the soil to stay on there, you have to have gentle banks. Polythene is a smooth surface itself and therefore it is easy for sand or soil to slip down. Now either you build gentle banks, or if you are in a position not to be able to have gentle banks, as you are, you would be better either not putting soil on the banks which is obviously a bit dicey with polythene, or else using some other type of surface to put on the banks. You can get types of concrete blocks which you can put soil or sand in and seed over the top, which are specially designed for surfaces where soil won't stay on because the angle is so great. This is a possibility. Having used polythene and now you have it exposed, you can either try and put the soil back and make sure it holds, or you have to cover up in some way, so have to use some other form of seeding.

(Mr. Swan Senior)

If the banks are rather acute or severe then you could fill the bottom of the lake with a greater depth of soil. If the banks are sheer, then you raise the level of your fill inside, so that, in fact, that will hold any slip of soil down the surface of the polythene. Obviously if there is a 45° angle, you can raise the amount of fill on top of the lining by 1' or 1'6" therefore making the water slightly shallower. This then alters the angle of your bank and holds the material from slipping.

CUTTING THE FUEL BILLS AND THE GRASS

K. R. Buckeldee

Product Training Manager Ransomes Sims and Jefferies Ltd.

Although the immediate threat of petrol rationing has receded much higher fuel prices now seem certain, and fuel saving in all spheres becomes increasingly important.

Golf clubs must be wondering how they can cut their fuel bills as much as possible and still keep their grass in good trim.

Ransomes of Ipswich have suggested some answers.

There is not much that can be done immediately at manufacturer level to increase economy, but a great deal can be achieved at the customer/operator/service level. Fuel economy is affected by the state of the machine, and its engine, and its usage.

Most motorists are seeing lower petrol consumption since the introduction of the maximum speed limit of 50 mph.

A similar saving can be made with a mower by reducing speed, using less h.p. and less r.p.m. In the case of governed engines, a reduced load can be achieved by cutting in a lower gear. The removal of trailing seats is another obvious way to save excess power and therefore fuel.

Cylinder cutters are more efficient users of fuel than rotary or flail cutters, which put higher loads on the engine.

Frequency of cut can be reduced. Increasing the interval between cuts from say seven to ten days would save fuel. Leaving grass uncut for as long as 14 days would not, as the extra growth would demand a higher power output and more fuel than two easier cuts.

Fuel can be saved by a slightly higher height of cut, which keeps the blades out of the 'mat', and prevents soil scalping, which demands more work from the engine and therefore more fuel.

Keeping out of the 'mat' and stopping scalping will also have the effect of keeping blades sharper longer, an important factor in fuel saving when the efficiency of the machine itself is considered.

Correct adjustment of chains and belts to prevent slip, and lubrication to keep bearings free, all have their place in keeping fuel consumption down.

Correct cylinder adjustment with only a slight rubbing contact between the two cutting surfaces is also of prime importance. The idea is to make the motor mower as easy to push as a hand mower, that it so demands the least possible power from the engine.

The final area for fuel saving is the engine. Here attention to detail can bring considerable savings. Cleanliness is important. Making sure there are no leaks in taps and pipes and careful filling with no spillage may seem obvious precautions, but savings can be made this way.

The carburettor must be checked for cleanliness in the filter and float chamber and absence of leaks.

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If the air cleaner element is dirty, it has the same effect as running the motor with the choke out, starving it of air, and wasting fuel. Evidence of this is thick black smoke from the exhaust. Excessive use of the choke should also be avoided.

The ignition system is very important. Spark plugs should be clean and gaps correct. Ignition cable and suppressor caps should be checked for cracks, contact breaker points checked for cleanliness and correct gaps, and the ignition timing should be correctly set.

It is not recommended to fit the fuel economisers on sale as no benefits have been found from these when subjected to controlled tests.

Diesel engines have a more precise fuel system, but attention must be paid to fuel injector pumps, injectors, air cleaners and pipework.

The same attention to usage and the efficiency of the rest of the machine as in the case of petrol engines will result in the same fuel saving.

Although rotary and flail mowers are less efficient users of fuel over large areas than cylinder mowers, in small areas where appearance is unimportant, fuel may be saved by leaving grass to grow over a longer period of time and then cutting it down with a mower of one of these types.

If a rotary is used, keeping the blades sharp will save fuel, as will making sure flail shafts are balanced and the flails sharp.

But to maintain an acceptable finish and a proper standard of hygiene in areas of grass used by the public, cylinder mowers are most efficient and the best means of conserving fuel.

There is no single way to cut bills but close attention to detail in the care and maintenance of the machine and its engine, and thoughtful usage will in many cases result in considerable savings.

NEWS

Lloyds & Co. Letchworth Ltd., announce the appointment of SISIS Equipment (Macclesfield) Limited, as Concessionaires for their range of Professional grass cutting machinery, in Scotland.

Information about the products of both Companies can be obtained by contacting the SISIS Scottish Office at 24 The Esplanade, Kirkcaldy. Fife, telephone Kirkcaldy 62325.

Richard Scotcher has been appointed general manager of the recently formed company Ransomes Grass Machinery (Scotland) Ltd, which markets Ransomes grass machinery and other horticultural equipment from branches in Edinburgh and Glasgow. . . .

A major irrigation contract for an automatic scheme at York Race Course has been gained by the **Plastic Tube and Conduit Co. Ltd. of Aldermaston, Berks.** They are the sole U.K. distributors for the world famous RAINBIRD irrigation and watering equipment, which will be used throughout this scheme. P.T.C. Co. Ltd. have designed the complete system which will be installed at York, as part of their comprehensive design and advisory service, available to all clients whether horse race courses, golf courses, parks or other areas of use.

The scheme has been designed to keep the York course in excellent condition, as far as possible, throughout the racing calendar, providing every possibility of good meetings for the enjoyment of the racegoers. When designing the scheme the P.T.C. had to take into consideration the general