

Efficient and economical mowing

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For the turf industry, mowing equipment has evolved over the years

as regulations and innovation continue to change the paradigm. Grounds professionals continue to seek out ways to control budgets while still trying to deliver high quality results. While costs continue to rise on equipment, many professionals purchasing equipment have come to understand that the “purchase price” is not all that needs to be considered. This element is always a critical part of the purchase transaction, but should not be the primary factor in the purchase.

When turf professionals look at the total aggregate life of the equipment being purchased, there are many more elements that should be factored in. In fact, the “purchase price” becomes one of the smaller elements in the total picture of ownership of the equipment. Too often during the purchasing process decisions are made solely on the lowest price with little attention paid to long-term costs of labor, maintenance/service, downtime, fuel, or other factors that will influence future budgets or other soft factors such as human factor and politics. Many times decisions that are strictly based on lowest price alone will not end up satisfying the needs of the end user over the lifetime of the machine.

Hours vs. miles

Mowing equipment generally is measured in the number of hours of use. While hours of use may mean something to grounds professionals, many of those making decisions around the purchase of new equipment have had a hard time relating to what hours on a mower exactly mean. Most people use miles on their own personal automobiles as a frame of reference. So how do you factor what truly should be the life expectancy of the equipment you are purchasing and how do you advocate for replacement?

In an article published in 1986 in the USGA Greens Section publication, they provided the logic for this comparison that “a



The legendary George Toma mowing at one of his 53 Super Bowls.

car would have to travel approximately 60 miles per hour to have the same wear factor as turf equipment.” Consider these adverse factors for equipment used in the grounds industry:

- Operated at full RPM for the majority of the day
- Have adverse working conditions such as dust, grass clippings, debris, moisture and terrain
- Works at a slower ground speeds, which are not ideal for cooling of the equipment

Using the logic provided by the USGA¹, if you are operating a rotary mower for a week and it logs 24 hours during this time, 34 weeks a year (northern assumption), this gives you a total of 816 hours each year. If you are in a warm southern climate, your weeks and hours of use may be considerably more. If you use the 60 miles per hour figure, your mower will have traveled the equivalent of 48,960 miles every year. If you keep this mower for six years it would have an equivalent total of 293,760 miles on it. You can quickly see how this would impact your maintenance and service costs and why there would be a case to replace the equipment.

In the turf industry, productivity for mowing equipment is measured as the rate at which work is performed. Most manufacturers will display this in terms of acres per hour. There are a few variables that impact productivity. These are the speed at which the mower operates at and the width of the cutting unit. Another note to be aware of is that as speed increases it can have an adverse effect on the quality of cut on the grass. Knowing these factors, it is a simple rule-of-thumb math calculation to figure out how many acres per hour the machine will mow.

$$\text{Acres per hour} = \frac{\text{Inches of cut} \times \text{speed in mph}}{100}$$

A more technical equation would be :Acres/Hour = (((Mowing Width [in inches])/ 12 Inches per Foot) X ((Average Mowing Speed) [in Miles per Hour]) X 5280 Feet per Mile) / 43560 Square Feet per Acre¹.

For the more technical equation you would divide the “5280 Feet per Mile” by your efficiency estimation before calculating.

¹USGA Green Section Record, November/December 1986 Issue.

²Working 9 to 5? by Charles (Bud) White

³Estimation

One thing to consider when factoring mowing productivity is that operators generally encounter elements that do not allow for them to mow continuously. Elements such as overlaps, stops, turns, trimming, and maneuvering around obstacles all impede the mower's speed. While the equation above assumes 100% efficiency, a more realistic measure would be to 80-85% efficiency to allow for the above factors. The more productive the equipment, the better grounds professionals can manage labor costs per acre.

Surprises can be received one of two ways, either good or bad! Most people will admit that they like good surprises more than bad. With equipment ownership, if "purchase price" is the only consideration then hold on for more experiences trending towards the bad surprises. Looking at acquisitions based on the best value expands the impact of that piece of equipment "purchase price" further into your operation. Considering operational costs such as fuel consumption, maintenance and service, downtime, and labor are keys to understanding the true economics of the mower.

The cost of fuel continues to be a moving target in many states. Increased gas taxes, supply and demand challenges, and consumption are just a few impacts that can cause volatility in fuel. Mowing equipment fuel consumption is determined by a number of factors:

- Mowing equipment is evolving to be designed with the proper engine to meet the requirements of the machine. While the old rule of thumb in engineering was to design a machine and then an engine that would handle the "worst-case" experience, the E.P.A. enacting Tier 4 on the industry has brought more focus on proper outfitting of engine power to the application. This provides a more fuel-efficient machine for the operation.

- Engine horsepower needs to factor in many characteristics that the main traction unit and cutting units need to perform in the various cutting conditions. For example, will the machine be cutting under a heavy load frequently (elevation or thicker grass stands).

There are rotary mowers and reel mowers. Generally, reel mowers require about half the horsepower of rotary mowers. Consideration for how the cutting units are driven is important. Hydraulically driven equipment will generally consume twice as much power as mechanical devices. The way equipment is designed will directly impact how efficient the machine operates. A properly designed cutting unit will use aerodynamics to help discharge grass properly versus one that is poorly designed. Fuel consumption of the poorly designed product will be higher because of the mechanical load.

Mowing equipment operates at a lower ground speed, so selecting an engine with proper cooling is critical. Products such as air-cooled engines, in some cases, will consume more horsepower and fuel versus liquid cooled. Liquid cooled diesel engines can be more fuel-efficient than their gas powered counterparts.

To factor fuel costs, most manufacturers provide information on a machine in terms of fuel consumed per hour. Simply multiply fuel consumed by hour by the cost of fuel per gallon and you can then multiply this by the hours of use.

$$\text{Total Fuel Costs} = \text{Fuel Consumption (per hr)} \\ \times \text{Fuel Cost (per gal)} \times \text{Hours of Use}$$

Innovation and technology converge

As innovation in mowing equipment continues to advance, we are seeing more hybrid and electric technology start to replace the large traditional gas or diesel engine. Many of these hybrid machines introduce a marriage of electrical components with smaller horsepower engines. These machines may reduce fuel consumption (15-20%), while also reducing noise levels of the machine. Many hybrid machines use electric motors to operate the cutting units. This reduces the need for hydraulic components on the machine. Hydraulic components are wear items over the life of a mower and need to be properly maintained or the machine will lose the efficiency and possibly impact the quality of cut. Wear on hydraulics also increase the potential of leaks and exposure to turf damage that could increase cost as well as customer satisfaction. Hybrids also incorporate technology that allows the operator to have a better understanding of how their equipment is performing.

Recently, some mowing equipment has become all electrically operated, reducing indirect fuel cost entirely. While this technology is primarily focused on reel mowers, it allows for innovation to be focused on how the machine directly impacts the quality of cut and turf.

Hybrid and all-electric machines will tend to have a higher acquisition cost than traditional mowers. Considering the best

value will show that over the long run of the equipment there will be significant savings in a number of the operational areas.

Do I have to change the oil again?

One of the largest single expenses for mowing equipment is equipment maintenance and servicing. Remembering the impact of hours versus miles, one can quickly understand the need to stay on top of routine maintenance and service. If equipment is not properly designed for the intended use, maintenance costs can quickly escalate. There are a number of factors that need to be considered with maintenance and servicing, including cost of parts; availability of parts; labor costs; and downtime (loss of productivity).

There are two types of maintenance and service. One is predictive and focuses on routine maintenance the manufacturer recommends for the piece of equipment. The other is reactive and is generally one of those “bad surprises” we talked about earlier. Both of these have a major impact on operational costs. When you look at the recommended manufacturers maintenance and service intervals, not all are created equal! The more the frequency, the higher the cost. The larger the hydraulic system the higher potential cost in hoses and fluids.

The annual cost of maintenance and servicing can quickly escalate to be more than the acquisition price of the equipment

LABOR COSTS

Many operations are finding it increasingly difficult to find qualified individuals to operate their equipment. This can lead to inexperienced operators on a machine that results in reactive maintenance costs or potential damage to the facilities.

Compensation continues to evolve as many areas are seeing a rise in minimum wage and generational work focus changes. Based on geographic location the labor market conditions can be a constraint. Factors to consider when looking at labor costs include:

- Hourly rate
- Employee FICA contributions
- State and Federal taxes
- Any possible pension or profit sharing contributions
- Workmen’s compensation costs
- Vacation or sick pay
- Medical, dental or life insurance contributions
- Educational or training allowances

A key to labor costs is maximizing hours of operation on a machine to get the work done by that employee. Consider the impact of loading and unloading, paid breaks, transportation, cleaning, and fueling equipment, which all reduce the effective time mowing. For mowing, labor utilization is the amount of time that employee actually spends mowing. To figure out labor costs:

$$\text{labor cost per acre} \div \text{the total labor cost} \\ = \# \text{ of acres the employee mowed during that time}$$

if it is not properly maintained. Using sound maintenance and servicing practices along with proper record keeping can help a grounds professional decide when it is the proper time to look at replacement. These documented practices can also be an advantage when it is time to trade in the unit.

What to do now

Too often grounds professionals experience this question when they have a mower not operating properly and they have personnel expecting to work. All equipment will experience downtime whether routine service or a breakdown occurs. The objective for any operation when this happens is to minimize the amount of time the equipment is out of service. For planned downtime on equipment, many operations will choose to redirect their labor costs by having them perform other duties within the operation. That works if your employee has the proper qualifications and knowledge to perform the work.

Those that experience an unplanned break down may have a “circle the wagons” event to try and get the machine back up and running. When this occurs the operation will incur costs not only associated with the machine repair (labor & parts) but also:

- Downtime costs of that employee (hourly rate)
- Possible overtime to get the work that was to be finished done (hourly rate)
- Potential impact on the customers on expectations
- Additional usage on other equipment to try and supplement
- Additional purchasing of back up equipment
- Additional cost to get the necessary parts for the fix expedited shipment

Downtime should be discussed and agreed between the grounds professional and management team so that everyone understands the true cost associated with it.

SUPPLIER QUESTIONS

What are a supplier’s service capabilities?

How many certified technicians do they employ?

Do they have mobile service techs?

What is the value of parts that they stock at their location?

What do they offer for parts shipment?

Ask for references from your supplier(s). Follow up and consider asking: How long does it take for them to respond to a service request? Have you visited their service shop? Was it professional and clean? How soon do you get a part if I need one? How was the purchase process? How is your machine(s) operating? What type of training did they offer?

There are many more questions, and these should be based on your region and overall expectations. Service by your supplier should bring some weight to the final decision as you look at operational costs and try to minimize the amount of downtime you experience.

To this point, we have discussed the key operational costs into the total ownership cost for the acquisition of mowing equipment. One additional cost that should be considered is the ownership costs associated with the acquisition.

For operations, the ownership cost can impact the business in many ways. There are generally three key impacts that should be considered. Depreciation, investment, and tax cost. Unlike operational costs that are fluid and can escalate, ownership costs tend to be more “fixed.”

Larger mowers or those designed with more expensive components may have a higher ownership cost but lower per acre operating costs. The rate at which the higher ownership costs are “paid back” depends on the amount of operating savings and the degree to which the equipment is used versus alternative options.

Depreciation simply means the calculated manner in which the value of a fixed asset is decreased with time to become zero or negligible. This is critical for most operations when it becomes time to move the cost from the balance sheet to the profit and loss statement for that mower. If the mower has “book value” (year(s) value still left to depreciate), then the unit must have a trade-in value equal to the book value or the business will take a loss. There are also some tax benefits available for private entities if they choose to depreciate.

The government also offers incentives in terms of accelerated depreciation or varying percentages of depreciation based on business structure. The best council on figuring depreciation expenses is to check with your financial officers of the business to see what method they use.

A very simple method to figure out depreciation cost would be to take the purchase price and divide it by the expected useful life of the equipment (this would assume the book value would be zero).

A dollar in hand today is worth more than a dollar tomorrow! This phrase refers to the time value of money. This is the assumption that a dollar in the present is worth more than a dollar in the future because of variables such as inflation and interest rates.

As financial people look at investments for equipment, they have to consider the fact that a purchase of a mower today consumes cash that may produce a better return if invested elsewhere. Individuals may consider leveraging finance and leasing options that may give you a better return. This is after all the operational costs are considered for that mower. While the work may still be required, there may be other options, such as outsourcing the work, which produces a better return for ownership.

To calculate the investment cost, multiply the purchase price by the interest rate available on the other investments and multiply that by the number of years of expected use of the mower. Then divide the investment cost by the hours of mowing life.

It is critical as you start the selection process to make sure that you have the appropriate mower for the desired results for your operation. To do this you need to engage your equipment supplier(s) and make sure that you are comparing “like” products. Today’s mowers can offer many different configurations that may not be the same from manufacturer to manufacturer. Explain to your supplier(s) the current situational needs you are trying to accomplish

and the desired results you want to obtain. Work with them to make sure you are comparing units that are set up with the same configuration. If you require a demonstration of the machine, make sure you provide setup requirements including your desired height of cut and machine configuration. Make sure the units are tested under the same conditions on the same area.

Public agencies should also consider an additional cost exposure, transactional costs! This cost is associated with the hard dollars spent to procure the desired equipment for their constituents. Many public agencies that utilize bids, RFPs, and tenders all experience additional costs of acquisition by personnel in their procurement office that prepare and guide these processes.

Many procurement individuals are now using cooperative purchasing agreements. These allow them to utilize contracts that have already gone through the competitive bidding processes by a lead agency and are now open to their members to utilize. This reduces transactional costs for many procurement agencies that may be limited in staff or budgets.

Quality doesn’t cost more, it pays! Use the key points in this article to understand the crucial elements of your mowing equipment and evaluating the true cost of ownership. **IST!**

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