

## **Mechanization on golf course: comparison of two italian realities**

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### **Abstract**

**In the last years a several golf courses were introduced in Italy thanks of the recent increase of golfers. At the same time there are many new machines and products now, and there will be in the next few years, to further mechanize golf course maintenance. Our study had the scope to analyze the grade of mechanization in two italian golf courses.**

**The chosen courses had a different location: the first in south of Italy and the second in the north of Italy. The comparison between the two courses have done particularly with regard to:**

- **the amount of the machines available for the maintenance of the course;**
- **their technological standard;**
- **the best management practices in terms of minimizing water, fertilizer and pesticide through use of Integrated Pest Management and native or naturalized vegetation wherever practicable.**

**Results showed the same number of machines available for both two courses.**

**Relating to the comparison about their technological standard it was clear that no one of the golf courses had machines with high technological standard.**

**Unfortunately the results showed also in both golf courses a waste of water, for the irrigation, an extreme use of pesticides and fertilizer. So for the future, a host of mechanical products will be forthcoming to help golf course operators reduce effort, time and costs. Moreover a number of best management practices to putting in practice might well be to prevent the pollution of the environment.**

**Keywords:** machine, maintenance, environment.

### **Introduction**

A current view of the less informed that golf is an elitist sport and only suitable for the elderly. Nothing could be further from the truth: there is evidence that golf is played at all ages and all seasons. From a health point of view golf is recommended as the best antidote to the physical problems caused by a sedentary life too. Based on a recent survey conducted by statistical CONI can assume that every 100.000 where there is average propensity to play golf at least 70 people: this average figure may rise even up to twice (140 inhabitants) in areas where socio-economic conditions and cultural facilitate further access to the game of golf. In Italy, during the last years, the number of the golf courses is strongly increased from few courses to 300 around thanks of the recent diffuse interest of italian golfers.

At the same time, that enthusiastic interest for the golf has improved the technological standard of the machines for golf course management and increased the sale of these products.

## Materials and methods

The trials were carried out in two courses chosen because of their different location: the first in the South of Italy and the second one in the North of Italy.

**Table 1 - Features of golf courses**

		
<b>Golf Course</b>	<b>Metaponto Golf Club</b>	<b>Monza Golf Club</b>
<b>Location</b>	Metaponto (MT)	Monza (MI)
<b>Date of birth</b>	1991	1927
<b>Number holes</b>	18	27
<b>Total area</b>	70 ha	around 100 ha
<b>Total lenght</b>	6384 m	around 9120 m
<b>Club house</b>	yes	yes

The comparison between the mechanization of both golf courses have done particularly with regard to the main tasks:

- mowing;
- watering;
- fertiliser distribution;
- pest control;
- thatch removal;
- aeration;
- top-dressing;
- bunker raking and levelling.

In the following table it has been reported the usual equipment for the maintenance of a 18 hole golf course which has taken into account in order to evaluate the amount of machines of the courses examined and, at the same time their technological standard.

**Table 2. Usual equipment in a 18 hole course**

Task	Equipment
Mowing	3 mowers for green, tee and avantgreen with 3 cutting units
Aeration	2 green self propelled soil perforators and 3 soil perforators for fairway
Top dressing	3 machines to collect soil and 2 sand distributor
Thatch removal	1 self propelled or towed de-thatching
Pest control	2 dedicated sprayers
Fertilizer	Centrifugal distributor
Bunker raking and levelling	1 levelling blade and 1 rank

Moreover during the trials it have done a comparison of the frequency of the principal tasks considering the season and the respect of the best management practices, and the share, in terms of costs, of the principal tasks.


Relating to the best management practices in this paper we reported the timing of operations throughout the year.

### Results

During the trials we registered the technical characteristics of the principal machines of both golf courses and collected the features of overall golf equipment.


**Table 3. Features of walk green mower – Golf Club Monza**

Machine	Golf Club Monza
Walk greens mower	Single cutting unit
Engine power	Kawasaki, 4 cycle, 2,8 kW
Weight	92,4 kg
Height of cut	2,0 - 25,4 mm
Width of cut	53,3 cm
Ground speed	2 - 5,6 km/h



**Table 4. Features of riding fairway mower – Golf Club Monza**

Machine	Golf Club Monza
Riding fairway mower	3 cutting units
Engine power	Kawasaki, 4 cycle, 20,9 kW
Weight	Around 500 kg
Height of cut	6 - 25,4 mm
Width of cut	254 cm
Ground speed	0 – 13 km/h




**Table 5. Features of riding rough mower – Golf Club Monza**

Machine	Golf Club Monza
Riding rough mower	3 cutting units
Engine power	26,1 kW, diesel
Weight	Around 500 kg
Height of cut	1,6 - 25,4 mm
Width of cut	150 cm
Ground speed	0 – 13 km/h




**Table 6. Features of bunker rakes – Golf Club Monza**

Machine	Golf Club Monza
Bunker Rakes	3 wheel drive
Engine power	13,4 kW, 4 cycle, diesel
Weight	368 kg
Width	150 cm
Ground speed max	17,7 km/h




**Table 7. Features of aerators turf – Golf Club Monza**

Machine	Golf Club Monza
Aerators turf	6 tine heads
Engine power	Tractor mounted, 18 to 26 kW
Weight	Around 560 kg
Aerating Width	152 cm
Ground speed	1,4 km/h




**Table 8. Features of riding green mower – Golf Club Metaponto**

Machine	Golf Club Metaponto
Riding green mower	3 cutting units
Engine power	4 cycle, diesel, 12 kW
Weight	426 kg
Height of cut	2 - 19 mm
Width of cut	150 cm
Ground speed	6 km/h




**Table 9. Features of riding tee mower – Golf Club Metaponto**

Machine	Golf Club Metaponto
Riding tee mower	3 cutting units
Engine power	4 cycle, diesel, 14,6 kW
Weight	659 kg
Height of cut	16 - 32 mm
Width of cut	157 cm
Ground speed max	14 km/h




**Table 10. Features of riding fairway mowers – Golf Club Metaponto**

Machine	Golf Club Metaponto
Riding fairway mowers	5 cutting units
Engine power	4 cycle, diesel, 27 kW
Weight	1346 kg
Height of cut	6,4 – 25,5 mm
Width of cut	350 cm
Ground speed	18 km/h






**Table 11. Features of rough mower – Golf Club Metaponto**

<b>Machine</b>	<b>Golf Club Metaponto</b>	
<b>Rough mower</b>	<b>3 cutting units</b>	
Engine power	Tractor mounted, 15 kW	
Height of cut	25 – 105 mm	
Width of cut	180 cm	
Ground speed	18 km/h	

**Table 12. Features of bunker rake – Golf Club Metaponto**

<b>Machine</b>	<b>Golf Club Metaponto</b>	
<b>Bunker Rake</b>	<b>3 wheel drive</b>	
Engine power	12 kW, 4 cycle, diesel	
Weight	422 kg	
Width	147 cm	
Ground speed max	16 km/h	

Moreover we analyzed the level of the mechanization and the maintenance of machines in both courses with particularly regard to the mowing equipment. The results have been described by the following table.

**Table 13. Level of technical standard and maintenance**

<b>Technical standard</b>	<b>Green Rowing</b>	<b>Fairway mowing</b>	<b>Rough mowing</b>	<b>Tee and collars mowing</b>
Golf club Monza	High	Medium	High	Medium
Golf club Metaponto	Medium	Medium	Medium	Medium
<b>Maintenance</b>				
Golf club Monza	Medium	Medium	Medium	Medium
Golf club Metaponto	Medium	Low	Medium	Medium

At the same time we reported in the table 14 the timing of the operation done during the year in the both courses in order to keep in evidence the different care in the maintenance of turf.

**Table 14. Timing of the maintenance operations**

Operation Timing	J	F	M	A	M	G	J	A	S	O	N	D
<b>Greens mowing</b>												
<i>Metaponto (6 times week)</i>		█	█	█	█	█	█	█	█	█	█	
<i>Monza (3 times a week)</i>	█	█	█	█	█	█	█	█	█	█	█	█
<b>Fairways mowing</b>												
<i>Metaponto (2 times a week)</i>		█	█	█	█	█	█	█	█	█	█	
<i>Monza (3 times a week)</i>			█	█	█	█	█	█	█			
<b>Roughs mowing</b>												
<i>Metaponto (3 times a month)</i>		█	█	█	█	█	█	█				
<i>Monza (2 times a month)</i>			█	█	█	█	█	█				
<b>Tees and collars mowing</b>												
<i>Metaponto (3 times a week)</i>		█	█	█	█	█	█	█	█	█		
<i>Monza (3 times a week)</i>		█	█	█	█	█	█	█	█	█		
<b>Greens Aeration</b>												
<i>Metaponto (once a year)</i>	█											
<i>Monza (twice a year)</i>			█						█			
<b>Irrigation</b>												
<i>Metaponto (every day)</i>		█	█	█	█	█	█	█	█	█		
<i>Monza (at least twice a week)</i>					█	█	█	█	█			
<b>Pest control</b>												
<i>Metaponto (2 times a month)</i>	█	█	█	█	█	█	█	█	█	█	█	█
<i>Monza (once a week)</i>	█	█	█	█	█	█	█	█	█	█	█	█

## Conclusions

Concerning on the technological standard of the equipment, we are focused on the mowing equipment and the results showed better technological standard and maintenance in the Monza Golf Club than in the other one even if none of them was characterized by a high level of technology and maintenance of machines. Particularly we noticed a better conditions of use and maintenance of Monza Golf Club equipment probably stems from the high frequency of the operations.

Anyway with that level of mechanization in both courses also the time and effort required to do the job permits course operators to tath operation more often without damage to the green.

Relating to the maintenance operations it was clear that in the Monza Golf Club, because of longer rainy season usual in the north Italy, it was necessary a smaller amount of water than the Metaponto Golf Club where we calculated more than 800 m<sup>3</sup> of water for green, tee and fairway.

The timing of the maintenance operations showed a higher frequency of pest control in a Monza Golf Club than the other course improving the risk of soil pollution.

The maintenance area is where pesticides are loaded into application equipment, mowers and other pieces of equipment are serviced, and pesticides, fuel, fertilizer, and cleaning solvents are stored.

This is where pollution of soil, surface water, or ground water is most likely to occur. Contamination can occur when pesticides are spilled, containers or equipment cleaned and the rinsewater dumped on the ground or discharged into surface water, or improperly cleaned containers are stockpiled or buried. Proper management of the maintenance area is an important part of responsible chemical and pesticide use.

So for the future, a host of mechanical products will be forthcoming to help golf course operators reduce risks, effort, time and costs. Moreover a number of best management practices to putting in practice might well be to prevent the pollution of the environment.

### **Reference**

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**Each author contributed in that paper in the same measure**