Cooling Towers

Operating Costs Reduction

MITA has always been developing its products with special attention to energy consumption and maintenance costs.

The choice to use motors directly coupled to axial fans for the entire range allows system efficiency optimization by reducing the electrical input and the installed power, as well as minimization of maintenance costs.

Operating costs saving appears to be evident by comparing MITA's choice with alternative solutions involving centrifugal fans or belt driven axial fans:

- *lower installed and input electrical power;*
- *less maintenance operations to the drive system.*

A further reduction in consumption can be easily obtained by using a frequency converter to optimize the operations of the cooling tower: hence the choice of using only suitable motors for this specific mode.

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MITA offers, as an optional equipment for its units, a control system with integrated frequency converter: **MCS MITA CONTROL SYSTEM.**

During the coldest months further savings can be obtained exploiting the shape of MITA axial units: a minimum cooling performance can be achieved thanks to the natual air flow (natural draft), i.e. even when the fan is not operating. In some cases it can be enough for the period cooling's demands.

Moreover the use of corrosion-free materials for the construction of MITA units involves a considerable reduction of costs associated with maintenance operations. Above all from the point of view of prevention and reduction of corrosion phenomenas occurring on metal surfaces.

The maintenance regards therefore only those parts subjected to a natural wear caused by the use of the unit itself (fill pack, drift eliminator panels).

Considering that the average life of these components is about 5/7 years, the costs for manteinance operations are really low.

Beside this, the maintenance operations related to the fill pack and the drift eliminators panels are easy to perform thanks to some construction features (such as man-sized access doors or totally removable side-walls) suited to reduce the time for this operation.






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List of common routine maintenance operations related to the motor fan:

Maintenance operations*	**MITA solution: motor directly coupled to axial fan**	**System with belt driven axial-fan (consisting of engine, transmission with belts and pulleys, support)**	**System with belt-driven centrifugal fan (consisting of engine, transmission with belts and pulleys=**
Frequency**			
Check on the general conditions of the fan, search for anomalous noises and/or vibrations	monthly	monthly	monthly
Check on belt condition and tension	unnecessary	every 1/3 months	every 1/3 months
Belt replacement	unnecessary	yearly	yearly
Motor bearings lubrication	unnecessary	every 3/6 months	every 3/6 months
Pulleys alignment	unnecessary	yearly	yearly
Support motor bearings lubrication	unnecessary	monthly	unnecessary
Fan shaft bearings lubrication	unnecessary	unnecessary	every 6/12 months
Check (and possible lubrication) on the adjustable motor base	unnecessary	every 6/12 months	every 6/12 months

* Costs related to necessary plant shutdown must be taken into account additionally
** Approximate schedule

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Operating Costs Reduction

MCS

M I T A • C O N T R O L • S Y S T E M

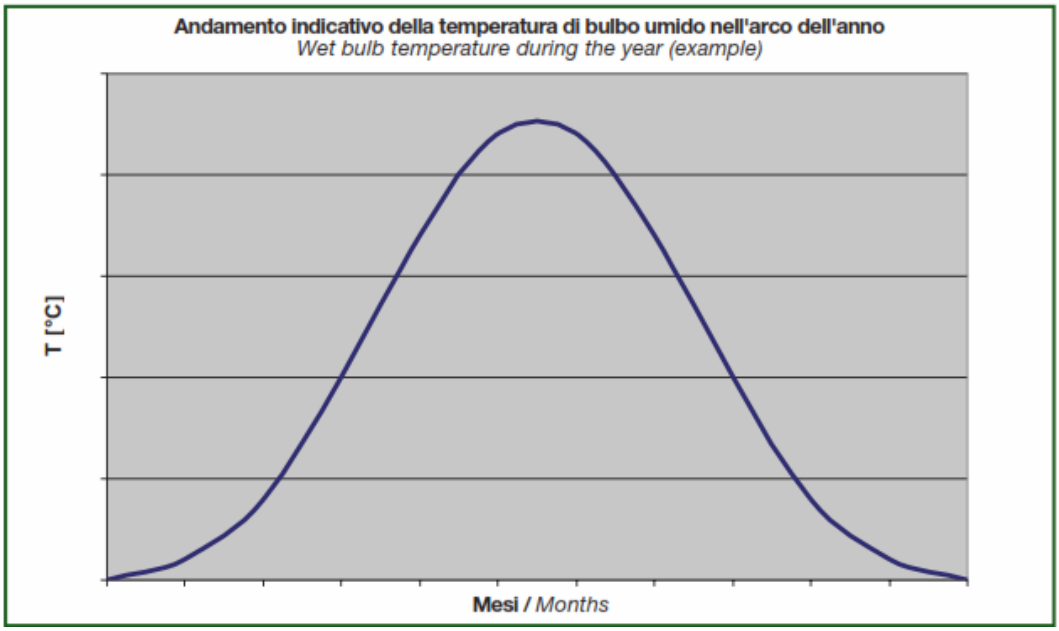
Cooling while saving: a new integrated control system

MITA offers for its units a control system with integrated frequency converter: **MCS MITA CONTROL SYSTEM** as optional equipment.

The minimum outlet temperature theoretically obtainable from an evaporative cooling tower is the wet bulb temperature of the atmospheric air measured in the area in which the unit is installed.

The correct design of a cooling tower is done considering the highest wet bulb value during the year, without taking into account the variability of this temperature.

Mita Control System (MCS) constantly checks the thermal efficiency ensuring the design performance at variable wet bulb temperature, and it optimizes the cooling tower operation to prevent any waste during the daily function, all year long.



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MCS is a simple, reliable and efficient system, which can be installed on the unit or remotely, including HIP frequency converter in a suitable cabinet with protection IP55, complete with a temperature measurement sensor.

MCS allows the following benefits:
- electric energy saving;
- reduction of wear on electromechanical components and subsequent decrease in maintenance costs;
- reduction of water consumption;
- reduction of costs related to water treatment;
- noise decrease.

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Operating Costs Reduction

Example of the impact of operating costs according to wet bulb temperature trend, considering a cooling tower with the following design features:

- cooling capacity: 1.163 kW
- water flow rate: 100 m3/h
- inlet water temperature: 40°C
- outlet water temperature: 30°C
- wet bulb temperature: 24°C (ref. Italy)
- MITA cooling tower type: PME 2403 E

Operating costs with MCS:

Wet bulb T [°C]	Dry bulb T [°C]	Annual working days	Electric consumption [kW/h]	Electricity cost [€]	Water consumption [m^3/h]	Water cost [€]	Water treatment cost [€]
24	32	4	4,53	29	3,04	97,3	24,3
23,5	31,3	5	3,93	31,4	3	120	30
23	30,7	7	3,46	38,8	2,97	166,3	41,6
22,5	30	10	3,1	49,6	2,95	236	59
22	29,3	14	2,76	61,8	2,91	325,9	81,5
21,5	28,7	18	2,5	72	2,9	417,6	104,4
21	28	22	2,28	80,3	2,87	505,1	126,3
20,5	27,3	26	2,08	86,5	2,85	592,8	148,2
20	26,7	29	1,91	88,6	2,83	656,6	164,1
19,5	26	31	1,75	86,8	2,81	696,9	174,2
19	25,3	32	1,62	82,9	2,79	714,2	178,6
18,5	24,7	31	1,52	75,4	2,78	689,4	172,4
18	20,9	29	1,42	65,9	2,64	612,5	153,1
17,5	20,3	26	1,33	55,3	2,63	547	136,8
17	19,8	22	1,24	43,6	2,62	461,1	115,3
16,5	19,2	18	1,17	33,7	2,61	375,8	94
16	18,6	14	1,11	24,9	2,59	290,1	72,5
15,5	18	10	1,06	17	2,59	207,2	51,8
15	17,4	7	1	11,2	2,58	144,5	36,1
14,5	16,8	5	0,95	7,6	2,57	102,8	25,7
14	16,3	4	0,91	5,8	2,56	81,9	20,5

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Comparison between operating costs with and without MCS:

	Without MCS [€]	With MCS [€]	Difference [€]
Electric energy total cost	3.203,2	1.048,16	-2.155,04
Water total cost	8.116,48	8.041,12	-75,36
Water treatment total cost	2.029,12	2.010,28	-18,84
Total cost	13.348,8	11.099,56	-2.249,24
Yearly Total Saving			**€ 2.249,24**

In the analyzed case, MCS system cost is taken up in a year:

Price of MCS suitable for the selected cooling tower (PME 2403 E)	€ 1.880,00
Yearly total saving with MCS	€ 2.249,24
Difference	**€ 369,24**

Operating costs reduction in five working years using MCS:

First working year	€ 369,24
Second working year	€ 2.249,24
Third working year	€ 2.249,24
Fourth working year	€ 2.249,24
Fifth working year	€ 2.249,24
Five Year Total Savings	**€ 9.366,20**

Notes:

- evaluations considering heat load presence, constant water flow rate and temperature difference throughout the year, 8h/day work shift, 7 days/week;
- the calculation of consumption and savings with the use of the integrated system MCS must be interpreted in terms of an "estimate". They are based on the average annual wet bulb temperature trend in the installation area, in the set range of values;
- water consumption in the circuit is calculated considering concentration factor “2” (i.e. quantity of purged water equal to evaporated water);
- for simplicity, the saving of electric energy is calculated on the installed motor power.

Costs :
- 0,20 € per kW/h;
- 1,00 € per m^3/h water;
- 0,25 € per m^3/h treated water.

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