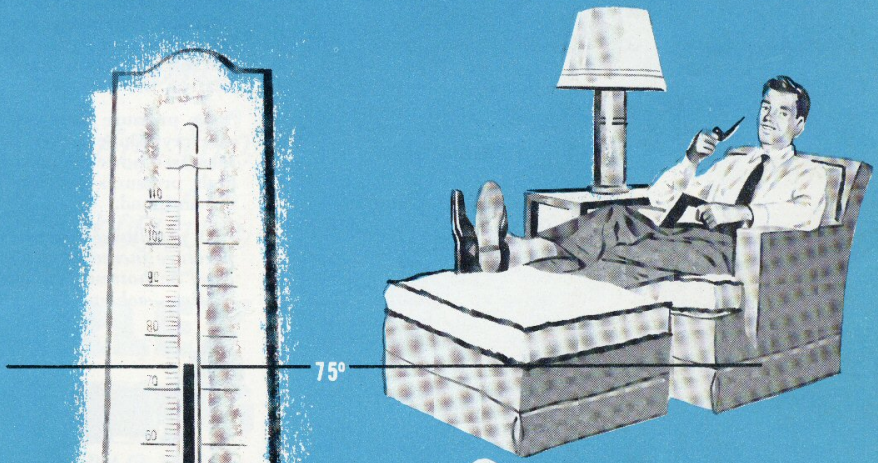

Consumer's guide to Air Conditioning Economy

Installation of a complete comfort cooling system for your home (or your office) will entail consideration of a number of most important factors. Among these are type and capacity of the system, location of equipment, desired room temperature, expense of operation and continuity of high level performance. Most of these questions will be answered by your contractor; but since you have to live with the system and continue to pay operating costs, you should be fully cognizant of possible cost controls and performance levels. The purpose of this folder is to give you a basic understanding of the last two subjects.

MARLEY®

The Marley Company

KANSAS CITY, MISSOURI

This year, complete air conditioning systems will be purchased by a half-million homeowners. Just how many of the owners will be completely happy with their investments will depend upon how well they are able to evaluate the equipment they buy.

At present, there is no standardized method of rating air conditioning units. The prospective purchaser may find himself confused by the ton and horsepower designations. He will find that three-ton does not necessarily mean three-horsepower. He will also learn that three-horsepower does not necessarily indicate a capacity of three tons.

In some instances, he will find a three-ton unit uses a five-horsepower motor; that the efficiency of the unit may decrease as much as 25 per cent when external temperatures are highest.

To weigh these factors and arrive at a solution that will conclusively point out the best buy for your installation requires only a very elementary knowledge of the operating principles of air conditioning.

Cooling Is the Removal of Heat

In simplest terms, your air conditioning system has one job to do—absorb heat in your home, carry it to a point where it can be discharged into the outside atmosphere, then return for more heat and continue the cycle. The exact method is highly technical so a simple analogy is used here to help you visualize it. The operation of the "heat mine" which expresses temperature in terms of elevation, functions just as does an air conditioning system.

Heat-to-Water Transfer

When the refrigerant (the mine cart) has absorbed a load of heat at the lowest level of the system (the cooling coil), it must carry the heat to another point where it can be discharged. Since heat can only flow to a colder substance, the load must go up the hill . . . the temperature must be increased above that of the final cooling medium.

To do this, the compressor of the cooling unit adds heat by increasing the pressure under which the refrigerant operates. How much heat and pressure are needed (how high the hill) determines the amount of horsepower needed for the compressor motor.

If the temperature is to be raised to the level where the heat can be transferred to water, it will only have to go up to 105°, since 85° water in contact with the condensing coil of the unit will reduce the heat sufficiently to change the gas to a liquid at this temperature. (This point is known as the condensing temperature.) Even in hottest weather, 85° water is readily available to keep the water-cooled system operating smoothly at the 105° condensing level, a very desirable condition.

With the heat transferred to water, the refrigerant (now a liquid) returns to the cooling coils and by release of pressure again becomes a gas with a temperature of 40°. The cooling cycle starts anew.

Heat-to-Air Transfer

If the heat load is to be transferred directly to the outside air, the hill is going to be steeper and higher, requiring more power to carry the burden. In this case, the unloading point (condensing temperature) is dependent on external air temperature. Air is not an efficient cooling medium, so the actual temperature at whi must be discharged will be 40° or more above existing ai

At high operating temperatures, less heat is removed fr accompanying illustration, you see the cart going back to th retained. Obviously, it cannot accept a full load on its nex the refrigerant in the air conditioning system. Unless all the refrigerant on one passage through the condenser, it heat on the next cycle.

Since pressure increases faster than temperature, the hill at every temperature rise. In the air conditioning system, increased power requirement. In extremely hot weather, the high pressures develop that the compressor motor cann discontinued.

It is conclusive that in the air-cooled system, power requ perature increases and operating efficiency simultaneously way: on hottest days when you need cooling most, you wi cooling—achieve less comfort in your home.

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pay more and receive less

Nothing cools as well as water

When you install an air conditioning system, you expect full capacity performance regardless of external temperature; you want lowest operating cost based on cooling ability. And that is what a water-cooled air conditioning system in your home will deliver. It will perform day after day at the same cooling level, with the same power requirement, with the same satisfactory results.

The water-cooled system is designed to operate on a specific performance basis: a ton of cooling capacity per horsepower at 105° condensing temperature. Since the temperature of water used to maintain this design condition never varies more than one or two degrees above that selected for best operation (a permissible variation), the system functions the same with outside temperatures of 90° or 110°.

Peak power requirement for the water-cooled system will remain at a ton per horsepower. It is a figure on which you can base an estimate of maximum operating cost. At times when the temperature of the cooling water is cooler than design condition, the horsepower requirement will decrease.

No other type of air conditioning system can approach this steady, full-performance standard, this low operating cost, this complete owner satisfaction.

Nothing cools water as well as a

MARLEY COOLING TOWER

With the addition of a Marley cooling tower to the water-cooled air conditioning unit, all objections to the water-cooled method are eliminated. Water cost becomes inconsequential; any questions of water restrictions and availability are completely eliminated.

By constantly recooling and reusing the water that cools the condenser of the unit, a Marley cooling tower reduces water requirement more than 95 per cent.

A three-ton air conditioning system that would ordinarily use approximately 150,000 gallons of water in 30 days of 10-hour operation will use less than 4,000 gallons with a Marley cooling tower. Since most water bills are rendered on a basis of cubic feet, this means less than 600 cubic feet of water for a month's operation in hottest weather.

This small amount of water is always available and to furnish it does not tax the facilities of any community. That is why no restrictions are ever placed on water-cooled air conditioning systems using successful conservation devices. In more than 90 cities where water restrictions exist, the supplying agencies endorse the use of Marley cooling towers.

WATER TEMPERATURE IS ALWAYS LOWER

The reason a cooling tower can constantly maintain the low temperature (85°) required for excellent operating conditions and low power requirement is that heat can be transferred from water by evaporation. The controlling factor is not the temperature recorded by an ordinary thermometer. There is another type of temperature reading known as wet bulb temperature which is a combination of existing heat and humidity and which indicates the ability of air to absorb heat by evaporation. That is the one that regulates performance of a water cooling tower.

Wet bulb temperature is always a great deal lower than the dry bulb temperature—on many hot days it may be as much as 40° lower. Water may be cooled by evaporation to a temperature very close to that of the wet bulb. That is why the water used to cool the air conditioning condenser can make a continuous cycle of entering the condenser at 85°, being heated to 95°, returned to the cooling tower and again being cooled to 85°. It can do this regardless of normal or dry bulb temperature.

COMPARATIVE OPERATING COST FOR 1200 HOURS

These figures are based on power cost of 2½ cents per kilowatt hour and water at $1.50 per 1000 cubic feet. These rates are the average of those charged in 20 metropolitan areas.

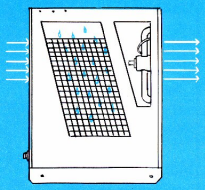
3-Ton Water-Cooled Unit		3-Ton Air-Cooled Unit	
Power Cost for 3 Hp Motor	$79.00	Power Cost for 5 Hp Motor	$131.50
Cost of Water (if conserved by the use of a cooling tower)	3.60	Power Cost for Condenser Fan Motor	9.80
Power Cost for Cooling Tower and Pump	12.36		
Total	$96.46	Total	$141.30

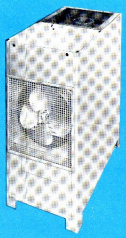
These figures show that the water-cooled air conditioning system is a self-liquidating investment dollarwise, but only operating experience will demonstrate the best dividend your investment will deliver: the complete satisfaction of full-time, full-comfort cooling whenever you need it.

Marley Aquatower*

Many thousands of Marley Aquatowers are in service today —providing condenser cooling water dependably and at low cost. This mechanical draft water cooling tower is sturdily built and compactly designed. Contractors the nation over recommend it because they know it will perform as The Marley Company says it will.

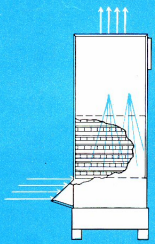
Designed to make it compatible with any surroundings, the Aquatower can be located wherever you like—indoors, outdoors, on the roof or in the basement. Marley manufactures a complete line of Aquatowers—so whatever your condenser cooling requirements may be, there is a Marley Aquatower sized just right to do the job.

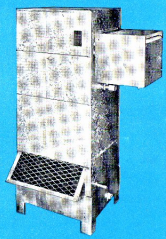




Marley AquaCooler*

This line of water cooling towers is the newest in the Marley line of towers. It is designed especially for indoor installations requiring air discharge ductwork, and is equipped with a quiet-operating blower type fan much like that on your furnace. It is all galvanized to prevent rusting and corrosion. Maintenance is easy and simple. Fan shaft bearings are located on the exterior of the tower where you can reach them easily for lubrication.

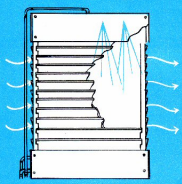


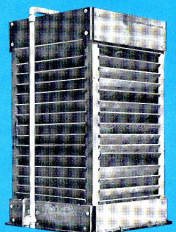


Marley SpraTower

(Natural Draft)

The Marley SpraTower offers the most economical water cooling operation. Since natural air currents do the cooling in this type of tower, it must be located out of doors, well away from buildings or shrubbery which would restrict natural air movement. All parts are fabricated of redwood, the wood that withstands fungus decay and chemical deterioration. Spray nozzles are Marley's patented non-clogging type.





*Trademark Reg.