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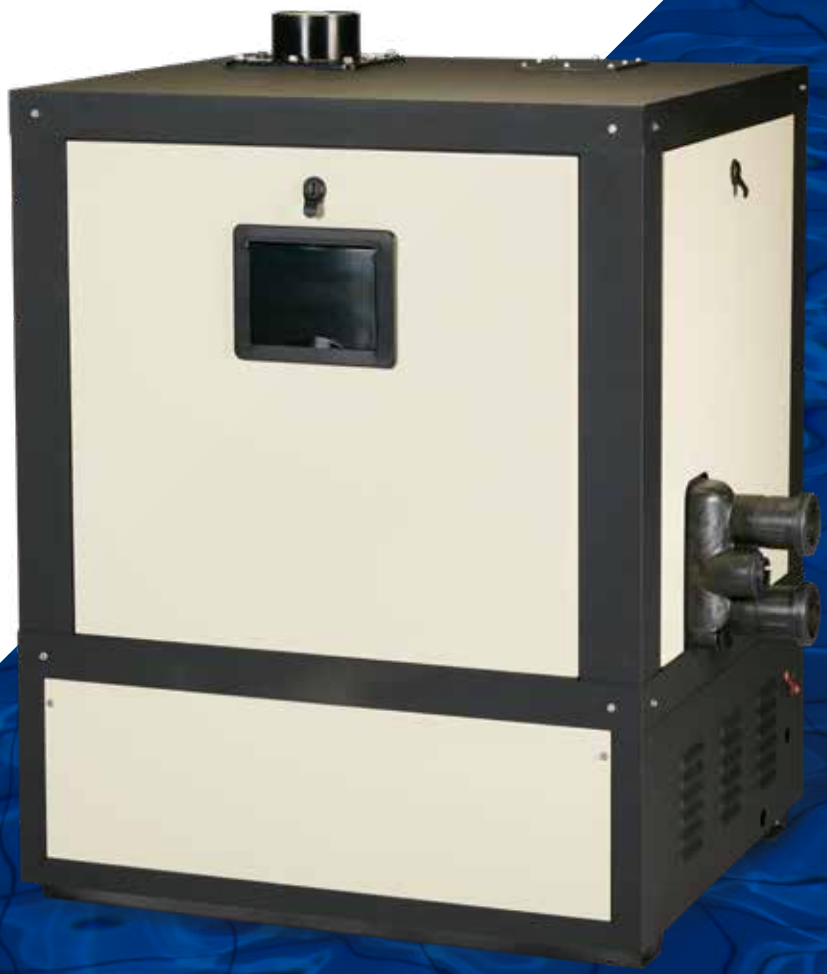
WHITE PAPER

DOING NOTHING HAS A COST:

The Case for High Efficiency Pool Heaters



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DOING NOTHING **HAS A COST:**

The Case for High Efficiency Pool Heaters

Any pool operator knows that keeping swimmers happy is of paramount importance, and this includes ensuring that your pool is clean, clear, and warm year-round. Balancing these needs within a limited operating budget is a challenge that we all face. One way of achieving this objective is by installing a high-efficiency heater on your pool. Older heater technologies from 7 to 10 years ago might have started their service life at around 78% efficiency. But over time, those same heaters are probably now only about 60% efficient—as heat exchanger tubes fill with build-up and burners get clogged. You may not be looking to replace heaters in your pool or spa, but consider that they're wasting energy, and your money, because they aren't nearly as energy efficient as they could be. But which one is right for you?

REASONS FOR DECREASED EFFICIENCY

As we discuss heater efficiency, it is probably best to start by explaining how heaters work and why they become less efficient over time. As pool water passes through the heater, its combustion chamber ignites the gas, heating copper tubes arranged above the burner. The heater's heat exchanger conducts heat to the water, which increases the water temperature. The water then returns to the pool and re-circulates for consistent heating. This simple process provides quick, controlled heat.

The heat exchanger's key job is to capture heat from burning gas and transfer it to your pool's water—the more efficiently, the better. But, the combination of operating heat and pool water chemistry is very tough on exchangers, leading to corrosion and failure. Features like a direct-fire titanium heat exchanger help to ensure that your heater has a long life even under challenging conditions. Titanium is the most corrosion-resistant material in the industry, and will ensure that your heater experiences minimal downtime due to corrosion.

Why do heaters experience reduced efficiency over the course of time? Here are a few reasons for decreased efficiency:

Build up on heat exchanger tubes: Heat exchanger tubes may build up with chemical residuals and calcium that causes the unit to have reduced water flow. When the flow is reduced then the heater loses its ability to heat the water, making it less efficient than originally designed. This causes the unit to consume more energy to heat the same amount of water in the pool.

Reduced water flow: It's all about water flow. If the water flow is too fast, you get condensation. If the water flow is too slow, the heater is not warming the water efficiently. NOTE: A pump that isn't working properly can contribute to a heater's inefficiency due to irregular water flow. This might be an opportunity to look at a variable frequency drive to ensure the water flow through the heater remains consistent. Additionally, a dirty filter or one that hasn't had a backwash in some time would also add to lesser flow through the heater.

Condensation: Propane and natural gas, when burned, produce water as a by-product. If the heat exchanger is too 'cool' the humid flue gases will condense on the fins of the exchanger tubes. Condensation on the heat exchanger causes the carbon to adhere to the heat exchanger. The condensate collects then drops on to the burners. The combustion is then compromised as 'raining' condensate that may interfere with combustion. This poor combustion turns into 'soot' and the 'soot' collects on the fins, which causes the flue gasses to be impeded. Not only will the condensation cause inefficiencies in the heater functionality, but will also cause oxidation on copper from low return water temperatures.

Low gas pressure: Low gas pressure can cause damage to the internal parts of the heater causing build up that leads to blocking of the heat exchanger.

Lack of proper ventilation: Can cause what is called 'sooting' and thus not allow the heater to work to its maximum efficiencies. The soot layer is like insulating the heat exchanger and prevents efficient heat transfer to the water.

THE CASE FOR A HIGH-EFFICIENCY HEATER LIKE PENTAIR'S ETi® 400:

The easiest way to compare a standard heater to a high-efficiency heater is to compare the efficiency percentages. A standard heater that is considered 84% efficient means that if you spend a dollar on your gas bill, the heater turns 84 pennies into pool heat, as any heat not going into the pool is wasted up the exhaust. Compare this to the ETi 400 heater which is 96% efficient. For every dollar of gas, the ETi 400 turns 96 pennies into pool heat. If you are paying for the gas, you want to convert as much as possible to heat, while wasting as little energy as possible.

Costs of Reduced Efficiency: Let's take a 30,000 gallon pool as an example of how less efficient heaters affect operating costs.

Let's say you have a 30,000 gallon pool that requires a 20 degree temperature rise using a natural gas heater (note: 1 gal of water weighs 8.33lbs)

30,000 gal x 8.33 lbs. = 249,900 lbs. of water in the pool that will need to be heated
249,900 lbs. x 20 degree rise = 4,998,000 BTUs required (BTUs is a measurement / hour)
So you need 4,998,000 BTUs to raise the water 20 degrees, or 208,250 BTUs per hour.
(4,998,000 ÷ 24 hours = 208,250 output BTU per hour required)

Going back to our original example of a new 400,000 BTU heater that is 96% efficient, or in other words, has a 384,000 BTU output.

With a 384,000 BTU output, it will take 13 hours to raise that 30,000 gallon pool 20 degrees.

As we all know, gas companies charge by the therm. So to figure out how much it will cost to heat, you need to know that 100,000 BTU's = 1 therm.

TitanTough™ direct-fire titanium heat exchanger.

If we know that it takes 13 hours to heat a 30,000 gallon pool with a 20 degree temp rise using a 400,000 BTU heater that is rated at 96% efficient (i.e. 384,000 BTU output), then to figure out the cost of the gas required to heat that pool with that heater:

Hours of heat up time X input BTU's / by 100,000 X cost of a therm
13 X 400,000 = 5,200,000 total BTU's
5,200,000 ÷ 100,000 = 52 therms used
If the cost of a therm of gas is $1.20/therm then:
52 therms X $1.20 = $62.40

or $62.40 to raise that 30,000 gal pool by 20 degrees in that 13 hour period.

But if we had a 400,000 BTU heater that was rated 84% efficient, then you are looking at a heater that outputs only 336,000 BTUs so:

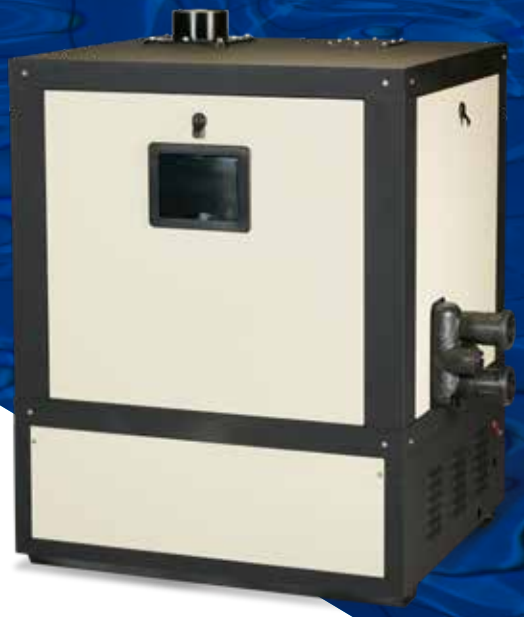
5,200,000 BTUs required ÷ 336,000 = 15.5 Hours
15.5 x 400,000 = 6,200,000 BTUs
6,200,000 BTUs ÷ 100,000= 62 therms
62 therms x $1.20 = $74.40

This means that it **costs the facility 19% more** to heat the same body of water with the lower efficiency heater.

Lower emissions: There are also environmental factors to take into consideration. As a high-efficiency heater more effectively adds heat to your pool water, less carbon dioxide goes out the exhaust. Over a year heating a 75,000 gallon pool, a heater that is 96% efficient, for example, will produce 9,699 fewer pounds of CO_2 than a conventional heater that is 84% efficient. That's almost equal to preventing the yearly emissions from a typical automobile.

Easier Maintenance—"Plug & Play": Today's commercial pool heaters face changing conditions as many installers have not been trained in commercial application techniques. Plus, facilities find that pool cleaning staff, lifeguards and facility managers are all adjusting heater settings frequently. So having a unit that is completely enclosed and is ready to go enables peace of mind that the unit is not improperly adjusted.

Today's newer heaters are much easier to install and maintain as they are designed to be more of a 'plug and play' including such features as sealed combustion reducing the chance for internal issues to occur such as condensation.



INTRODUCING PENTAIR'S ETi® 400
HIGH-EFFICIENCY POOL AND SPA HEATER

Pentair's new ETi 400 High Efficiency commercial heater is the world's first pool heater with a direct fire titanium heat exchanger. These units are also ultra-quiet and easy to install both indoors and out. The fast heat-up times and easy category IV venting with PVC pipe make them easy to install and, as a bonus, they come with a 3-year warranty!

When you want quality, strength and durability, you want the corrosion resistance of titanium. The ETi 400 is the world's first heater with the TitanTough™ direct-fire titanium heat exchanger for long-lasting, thermal and energy-efficient heat.

- Longest-lasting heat exchanger ever built
- Incredible 96% thermal efficiency—more heat gets into pool water faster, resulting in best-in-class energy savings
- Can now be converted from Natural to Propane Gas by purchasing a Propane Gas Conversion Kit

PRODUCT COMPONENTS

- **Stands up to the toughest conditions:** 1,800°F flame temperatures and pool water chemistry are all in a day's work for titanium
- **Design elements that boost durability and efficiency:** No welds, crimps or joints that reduce corrosion resistance. Tubing is shaped for maximum flow and efficiency
- **Industrial chemical processors lean on titanium:** When handling concentrated chlorine compounds, industrial processors rely on the corrosion resistance of titanium piping and heat exchangers

UNMATCHED DURABILITY AND EFFICIENCY

- **Easy to vent properly:** Fully sealed Category IV direct-air vent does not require large room openings for combustion air
- **Ultra-quiet operation:** Great for you, great for your neighbors
- **Install in left or right orientation:** Rotatable front door allows control pad to be rotated 180 degrees, so this heater can be plumbed on the right- or left-hand side

PENTAIR

1620 Hawkins Ave | Sanford, NC 27330 | 800.831.7133 | pentair.com

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