

## The Dollars & Sense of Solar Hot Water

*By Matthew Brown*

Published in Car Care Business Magazine

Many people wonder what the benefits of a solar hot water system for their business are. This is especially true of carwash owners, who may assume that they do not utilize much hot water, and therefore their need for a Solar Hot Water System is minimal, at most.

However, a good number of carwashes, likely yours, uses hot water for several aspects of their day to day operations. Perhaps you use hot water for mixing your chemical solutions with water to ensure a proper mixture, or for the pre-soak (or the entire car wash), or maybe, during the long winter months, you use hot water for in-floor heating systems for your car bays or parking lot to avoid snow and ice buildup. Maybe you use hot water for all of these, or some other combination.

To top it off, you have likely noticed that you are paying 30 – 75% more to heat your water this year than you did last year, because of the tremendous increases in the cost of traditional heating fuels such as propane, heating oil and electricity.

By reducing the amount of these traditional fuels needed for water heating, a Solar Hot Water System can cut this portion of your operational overhead costs by 30, 40, 50%, or more each and every year. This can translate into savings of hundreds, or thousands, of dollars each and every year. In a highly competitive market, and American consumers consistently requiring their service and product providers to become greener, the addition of a Solar Hot Water System is smart business, serving as a multi-faceted business investment that is guaranteed to pay off – and pay for itself completely in only a few years.

However, it is the immeasurable ways that a Solar Hot Water System can increase your business and profits that truly make these systems profitable and cost-effective in the short, and long, run. Here are the ways that a Solar Hot Water System can cut your operational costs and increase your revenue and profit margin.

1. Reduce your water heating costs
2. Increase customer loyalty
3. Allow you to charge a “premium” price
4. Increased local media exposure
5. Increased national media exposure (larger chain carwashes)
6. Increased employee happiness and loyalty

### **1. Reduce your water heating costs**

Regardless of how much hot water, or how you use it, it must be paid for. First, you pay to use the water, and then you pay for the heating fuel to heat it to the temperature you need it to be. Whether you use propane, natural gas, heating oil or electric to heat you water, the price has risen significantly in just the last year. The chart below illustrates the prices of propane, heating oil and electricity in 2007 and 2008, in order to illustrate the cost increase your business has faced over the last year just in water heating.

Heating Fuel	2007 Price	2008 Price	Price Change (%)
Propane	233.5 cents/gallon	318.5 cents/gallon	+ 36.4 %
Heating Oil	272.5 cents/gallon	477.8 cents/gallon	+ 75.3 %
Electricity	14.4 cents/kwh	15.4 cents/kwh	+ 6.9 %

Most of the national focus on the hardships due to the rising costs of heating fuels has centered around the residential market and customers, but businesses, especially those that rely heavily on hot water have been hit just as hard, if not harder, by these increased prices.

A Solar Hot Water System can help dramatically reduce these heating costs, no matter how much hot water you use in your day to day operations. In fact, a Solar Hot Water System can be sized to reduce your water heating costs by anywhere from 30 to 75%, depending on the initial investment you are interested in/capable of making.

By taking your annual water heating bill and dividing it by the amount of money your Solar Hot Water System will save you every year, you can perform a simple payback calculation, which will indicate how many years your Solar Hot Water System will take to pay for itself.

For instance, let's assume the following:

Annual Propane Usage:           3,000 Gallons  
 Current Propane Price:           \$ 3.185 / Gallon

With this usage, your carwash would pay around \$9,555 per year for water heating – a significant cost to say the least. Especially considering the previous year, your water heating would have cost only \$7,005. That is an increase of more than \$2,500 in a single year. However, with a Solar Hot Water System, your water heating bill could be far more manageable, leaving additional money to apply toward profits, or to reinvest within your business for expansion or growth. For instance:

A Solar Hot Water System with a 50% solar fraction would provide a savings of roughly \$5,000 each year. If this system cost \$20,000 to purchase and install, based on the current price of propane and your annual savings, your Solar Hot Water System would pay for itself in less than 4 years. After that point, you are gaining \$5,000 (or more) in additional expendable income because that cost has been removed from your overhead operational costs. In fact, over the lifetime of your Solar Hot Water System (which is typically 30 years) the system may have a Net Present Value (NPV) of \$200,000, or more.

This additional money may be reinvested into your company, providing the resources for several improvements such as:

- Renovations and improvements to your current facilities
- Machinery and system upgrades
- Hiring of additional staff
- Purchase additional locations/facilities
- Offer additional services & products
- Purchase additional advertising & PR

Each and every one of these additional investments of the money saved through a Solar Hot Water System will assist in growing your company and making it more profitable.

Let's take a look at a sample case study, which can assist in demonstrating how a Solar Hot Water System can specifically benefit a carwash just like yours. We will use the following carwash for our example:

Location: Albany, NY  
Cars per Day: 85  
Days of Operation: 7/week  
Hot Water Use: 10 Gallons/Car  
Cold Water Supply: 50 degrees  
Hot Water Temperature: 110 degrees

Taking these assumptions into account, we can assume that our carwash will use a total of 850 Gallons of hot water per day, which works out to a total of 310,250 Gallons of hot water for a full year. It takes 10 BTUs to heat 1 gallon of water 1 degree Fahrenheit. This means that our car wash uses a total of:

- Gallons of Hot Water: 310,250
- Temp. Rise/Gallon: 60 degrees
- Total BTU Required: 186,150,000 BTU/yr

If we know how many BTUs are created per unit of the most popular heating fuels, we can determine exactly how many gallons of heating fuel that our carwash uses in a year, which can give us a baseline of how much money we can save, and how heating fuel we can offset with the purchase and installation of a Solar Hot Water System. This table below shows the amount of BTUs that are produced per unit of three popular heating fuels for hot water systems.

Heating Fuel	BTU/Unit
Propane	91,000 / Gallon
Heating Oil	140,000 / Gallon
Electricity	3,100 / kwh

Knowing this, we can assume that our carwash would use the following amounts of these different heating fuels each year for their water heating needs, depending on the type of hot water system they currently utilize:

- Propane: 2,046 Gallons
- Heating Oil: 1,330 Gallons
- Electricity: 60,050 kwh

If we use the current prices for these heating fuels listed above, earlier in this article, we see just how much money our carwash is paying for water heating this year, and even compare that to the previous year. The table below shows these figures.

Heating Fuel	2007 Cost	2008 Cost	Total Increase
Propane	\$ 4,778	\$ 6,517	+ \$ 1,739
Heating Oil	\$ 3,625	\$ 6,355	+ \$ 2,730
Electricity	\$ 8,648	\$ 9,248	+ \$ 600

Even using this low amount of hot water per car, and without the number of cars you service increasing, which means stagnating business, not growth, your cost for water heating would have increased by anywhere between \$600 and \$2,700 in a single year. That money must be covered by a loss of profits or by increasing your prices and passing the losses onto your customers. Neither of these choices are good.

However, if this carwash were to purchase and install a Solar Hot Water System to help offset their water heating costs, the savings would be dramatic. And, as the prices of traditional heating fuels rises, it increases the value of your Solar Hot Water System and reduces the payback period.

Typically, a Solar Collector will produce around 1000 BTU per square foot of aperture (sunlight collecting) area per day. This can be used to provide a rough estimate of the performance of a Solar Hot Water System overall, and allow us to gauge the size system that our carwash in Albany would require in order to make a significant reduction in their water heating expenses.

If we are using an Evacuated Tube Solar Collector with an aperture area of 30 square feet we can determine the total number of BTUs that a single solar collector, and a larger solar hot water system, will provide over the course of a year, allowing us to calculate how much heating fuel and cost we can eliminate with our investment.

- Collector Aperture Area: 30 square feet
- Max BTU per day: 30,000 (winter time)
- Overall Efficiency: 85%
- Typical BTU/day: 25,500 BTU
- Typical BTU/year: 9,307,500 BTU

If our carwash uses just over 186 Million BTU per year for water heating, and a single solar collector will produce 9.3 Million BTU per year, we can use simple math to determine the number of solar collectors that will be required for a water heating system for this carwash. For instance, let's examine the number of solar collectors that will be required to provide the following solar fractions.

Solar Fraction	BTU/Year	Number of Collectors	Propane Offset (G)	Heating Oil Offset (G)	Electricity Offset (kwh)
50%	93 Million	10	1,022	665	30,000
75%	139.5 Million	15	1,533	997	45,000
85% (max)	158.1 Million	17	1,738	1,130	51,000

If we are to choose the middle of the road Solar Hot Water, with a 75% solar fraction (replacing 75% of your water heating needs with your solar hot water system), we can determine just how much money our Solar Hot Water System will save our carwash in just one year.

## Silicon Solar – Solar Thermal Articles

- Savings for a Propane water heater = \$ 4,883 (first year)
- Savings for a Heating Oil water heater = \$ 4,764 (first year)
- Savings for a Electric water heater = \$ 6,930 (first year)

The savings for each year after the first year will depend on the prices for heating fuels during that year, though it is safe to assume that the price of heating fuels will increase by at least 5% each year (some years will be more – such as the spike from 2007 to 2008 – and some years may be lower). However, knowing the cost of the solar collectors being installed, and assuming that the price of heating fuels does not increase from year to year, we can develop a very conservative payback period calculation for our carwash's Solar Hot Water System.

If we assume that our solar collectors cost \$1,100 each, for a 30 Tube Evacuated Tube Solar Collector, our total investment for solar collectors would be \$ 16,500, and with installation costs a total of \$ 25,000. By replacing our current Propane water heater, and saving \$4,883 per year in fuel costs, we find that our system has a payback period of only 5.1 years. This figure, again, is conservative, not accounting for any future increases in the price of heating fuels. These price increases will lower the payback period even further.

Additionally, we can lower our payback period even further through State and Federal Income Tax Credits, which our carwash can use to offset some of the initial purchase and installation price of their Solar Hot Water System. Since our carwash is based in New York, we will adjust their system cost based on the Federal Corporate Income Tax Credit. *Further information on Solar Hot Water Incentives at [www.dsireusa.org](http://www.dsireusa.org).*

- Federal Corporate Income Tax Credit: 30%, uncapped tax credit

With a total initial cost of \$25,000 our carwash can expect a Federal Tax Credit of \$ 7,500, which reduces their actual system cost to \$17,500 – notice that the Federal Tax Credit has nearly paid for the installation and balance of system components of the Solar Hot Water System, leaving the Solar Collectors to pay for themselves.

After taking out our Federal Tax Credit, our Solar Hot Water System has a payback period of 3.6 years – again, without factoring in any price increase for heating fuels. There is no other significant investment you can make for your business that will pay for itself in such a short period of time on such a large scale. Additionally, given the estimated 30 year lifetime of your Solar Hot Water System, a system such as the one we have just purchased and installed for our Albany, NY carwash may have a Net Present Value (total lifetime cumulative positive cash-flow) of \$200,000 or more, all of which can be added directly to your bottom line or reinvested in your carwash to create more profits down the road.

Clearly, in this time when heating prices are at all time highs and consumers are demanding more and more green services and products, you can do no better for yourself than to make an investment in a system that will dramatically reduce your operating costs, increase your media exposure and drive up business and customer loyalty – purchasing a Solar Hot Water System for your carwash makes more sense than any other investment you can make when you look at all of the dollars and cents involved in the process.