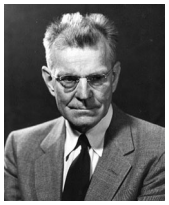
Boiler Facts

Customers stressed by rising fuel costs?

by George Carey

M. King Hubbert was a geophysicist who worked for Shell Oil Company back in the '50s. He predicted in 1956 that U.S. oil production would peak by the early '70s. Virtually everyone inside and outside the oil industry rejected Hubbert's analysis. The controversy raged on until 1970, when U.S. production of crude oil started to fall. Hubbert was right.



M. King Hubbert

Around 1995, a group of analysts applied Hubbert's method to World Oil production, and most of the analysts estimate that the peak will take place between 2005-2008. The experts making their 2005-2008 predictions used Hubbert's pioneering model. Hubbert made his prediction in 1956 at an annual meeting for the American Petroleum Institute in San Antonio. He was quoted later after the meeting, stating that Shell Oil headquarters was on the phone with him right down to the last minute before his scheduled presentation, requesting that he withdraw his prediction.

The issue is not about whether there is any oil. But rather, are there more oil fields that have not been discovered yet? Based upon the analysts' predictions, they are speculating that we have already discovered all the major fields in the world. The concern/possible crisis becomes how fast are we consuming versus how fast are we producing? It appears that we are decreasing in production relative to the ever-increasing consumption from world-wide demands. Third world countries such as India and China are placing substantial strains on the supply of fossil fuels as they attempt to become more industrialized, in addition to ever-increasing demands from Europe and America.

The geo-political situation in the Middle East is also a source of problems because the industrialized nations have become ever more dependent on oil production controlled by The Organization of Petroleum Exporting Countries (OPEC). Add in Mother Nature (i.e.; hurricanes, etc…), which has negatively impacted domestic energy supplies such as oil and natural gas production, oil refining, natural gas processing and the distribution pipelines.

Finally, one new player that has entered into the arena is Wall Street. Speculators are driving the cost of heating oil (as well as natural gas, crude oil and gasoline) to unprecedented levels. The financial institutions have currently invested $260 billion dollars in energy commodities, compared to only $12-13 billion dollars in 2002. Whether this trend continues or not (Congress is currently holding investigatory meetings on speculation-driven rising energy costs), the net result of all of this is there has been a significant increase in the cost of heating one's home. [Editor's note: See also Pat Crow's Washington Report in this issue for more on this.]

What an interesting time to be associated with the heating industry! Remember, everyone still NEEDS heat. While homeowners are becoming more sophisticated with the advent of the internet, they are also receptive to learning about the different options available to them to help reduce the cost of heating their homes. All we have to do is educate them! And not only homeowners, but landlords and property managers of commercial property need this information. This segment of the market is especially interesting because bigger buildings mean bigger fuel bills. The payback period on their initial investment is much quicker, and the savings on their fuel bills don't stop after the first year!

The first steps

So where do we begin? What can we tell these homeowners that will help reduce their fuel consumption? In this article, I am going to limit the systems to hydronic heating, which is something you should educate your customers about…water is the ultimate transfer medium. We can hold so such more energy in water than in air. Remember, air is a great insulator but not very effective at transferring heat. In Europe, hydronics make up about 95% of all their heating systems. In America, there was a study done about 10 years ago and they concluded that hydronic systems made up about 15% and that warm air made up the difference. One interesting note, Europe has been dealing with higher home heating costs for a long time. In America, home heating costs are only starting to escalate!

Improving the efficiency of their heating plant (boilers) is one avenue to pursue. Modern oil-fired boilers have published efficiencies as high as 85-86%. That means for every dollar spent on burning the fuel, you will receive 85-86 cents worth of heat. There are several variables that come into play here with the efficiency game, but one of the most important factors has to do with the proper sizing of the boiler plant. Since the beginning of residential heating systems, boilers have always been sized for design conditions.

The idea there is to make sure the boiler is big enough to keep the house warm during the coldest days of the heating season. A little known fact is that these "design conditions" typically exist for 3-5% of the heating season. In effect, for the remainder of the heating season, the boiler plant is oversized.

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Another interesting "tid-bit" is originally these heating systems were always designed as one big zone. So naturally the boiler HAD to be big enough to heat the whole house. Nowadays, houses are divided into several zones; I question whether the need to size the boiler for the whole house is even necessary. Most people might regard this method as a bit risky, but the point is to make sure the boiler is NOT oversized. So when a heating system is operating at less than design loads, it becomes difficult to achieve the printed operating efficiencies. The boiler needs to operate at a steady state. Obviously it is difficult to operate at this steady state if the load on the boiler is less than its btu/h output.

What makes this situation worse is when the boiler is WAY oversized for the building. Now the boiler will NEVER achieve the efficiency listed on its label. So take a look at your customers' existing boilers, make them aware that by upgrading to a new modern boiler, they will achieve some efficiency gains (more effective use of their money) and then make sure the new boiler is properly sized.

Types of systems

What else can you talk to your customers about? How about the *type* of hydronic system they should have installed in their house. By far, the most comfortable and efficient form of hydronic heating is radiant heat. You should be comfortable talking to your customers about this form of heating. It is prevalent all over Europe (remember, higher heating costs!).

One of the reasons radiant is so comfortable is that your body is a radiator. And as a radiator, whenever it encounters an area that is cooler than its own surface temperature, it loses heat to the cooler surface. A radiant heating system does not heat the air in the space but rather it radiates energy waves to heat objects in the room. Now the surface temperature of the surrounding objects is closer to your body's surface temperature, which minimizes the heat loss from your body. The result is you feel comfortable without feeling any air movement. If you are not comfortable yet with radiant heat, make yourself comfortable. Go to any of the popular radiant manufacturers' training schools, read up on the subject and don't be afraid to ask your local supply house or manufacturer's representative. Installing radiant heating systems correctly is becoming a very lucrative market. As an oilheat service technician or oil company, you should not be left out.

One more thing

Anything else we can discuss with the customer about decreasing their fuel consumption? There are probably several other subjects you can discuss with them, but the last one I want to mention that applies to ALL hydronic systems is outdoor reset. By adding a weather-responsive control to an existing hydronic system or by including it with the installation of a new hydronic system, you will be improving both the comfort of that heating system as well as providing a means to reduce your customers' fuel consumption.

A weather-responsive control adjusts the temperature of the water for the heating system by measuring the outdoor temperature. When the heating system is first designed, there are some design criteria that are selected, such as the size of the boiler, the amount of radiation required to heat the house and the necessary water temperature flowing through the radiation on those design days (coldest days of the year). Whenever the outdoor temperature is warmer than the design conditions, the outdoor reset control will re-calculate the required new water temperature for that given outdoor temperature. By sending out cooler water as the outdoor temperature rises, the heating system will operate without the temperature swings that normally occur in a system that pumps design water temperature year round.

Also, the boiler operates more efficiently by reducing jacket, flue and standby losses. And probably most important, the weather-responsive control should have some type of microprocessor capabilities to automatically adjust the boiler's differential. This feature minimizes boiler short-cycling, which is an "efficiency killer"! Remember that the boiler has the same btu/h capacity whether it is October or February. By having this software logic, the control can efficiently operate the boiler throughout the heating season.

If you have any questions or comments regarding this article please email me at gcarey@fiainc.com or call me at 1-800-423-7187.