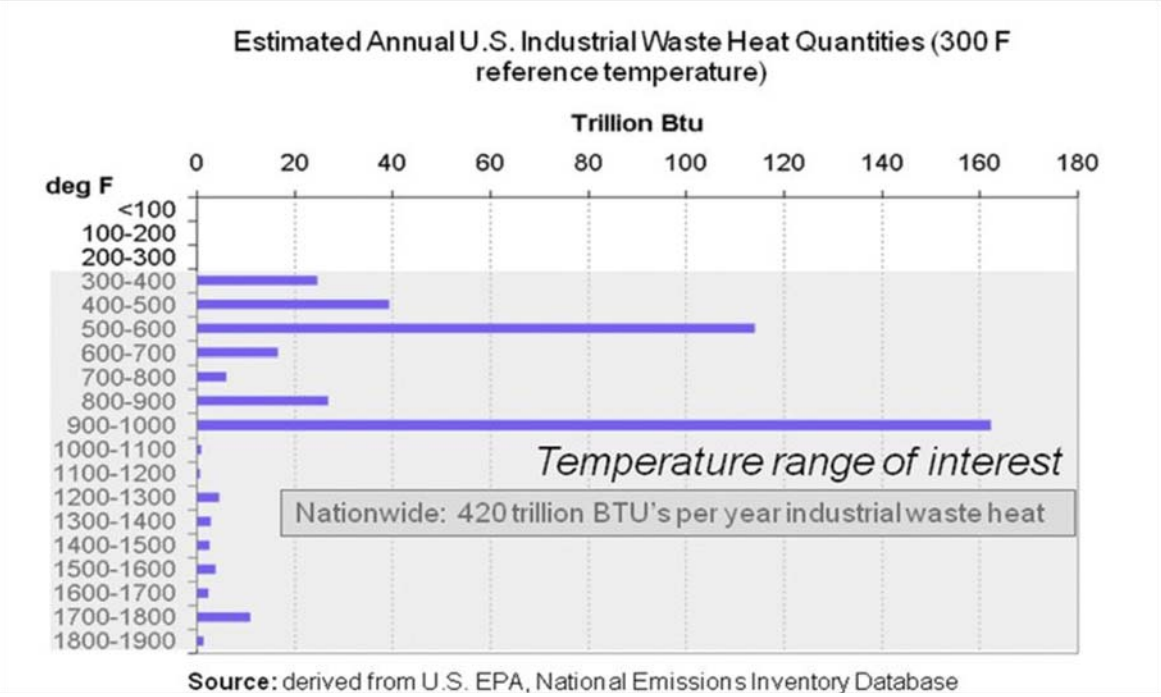
Waste Heat Recovery : It's Time is Now

Emissions, global warming, energy costs, plant efficiency, carbon footprint. All of these issues have spurred industry, government, and the private sector to embrace energy efficiency with an ever increasing fervor. And while this author is very much in favor of solar, wind, geothermal, biomass, and other renewable energy generation technologies, I do believe that the solution to the problem of balancing our growing energy requirements against diminishing fossil fuel supplies will not be provided by one technology. Rather, it will be a mix of technologies each of which will take advantage of alternative fuel supplies. Therefore, I feel it behooves us to better understand and appreciate the losses associated with waste heat, and to embrace it as a potential fuel supply. After all, it's right in front of us and it's *FREE* !

According to the U.S. Environmental Protection Agency (EPA), industry generates approximately 420 *TRILLION* BTU's of industrial waste heat annually.



To put that number into perspective, the 2010 estimated average U.S. household annual electrical consumption was 11,496 kWh. Converting BTU's to kWh, 420 trillion BTU's is equal to 1.23 x 10^{11} kWh. By division, we can determine that the annual waste heat equates to enough energy to power approximately 10.7 million average U.S. households.

Now, please understand that not all of the waste heat is easily convertible into a usable form. However, if only 25% could be utilized, that would still power over 2.5 million average households!

So, why aren't we using more of this free, wasted energy? The answer is simple - reclaiming that energy and converting it into a usable form is ***more expensive*** and requires ***more effort*** than conventional energy production methods especially when working with smaller sources of waste heat. However, in light of the pressure from the environmental front, we have no choice but to embrace these challenges.

To begin our understanding of these challenges, let's examine each one in turn.

Cost of Waste Heat Conversion

No doubt about it, waste heat recovery and conversion to usable energy has a cost. If process heat is the only requirement, the costs will be on the low end of the scale. Conversely, if maximized electrical production coupled with maximized waste heat usage is desired, costs will definitely escalate to the other end of the scale. While typical capital costs for conventional electrical generation equipment will be less than $1000.00 per kW, waste heat generation equipment costs can be double or triple that amount.

However, the customer has to offset the capital expenditures against life-cycle costs while always bearing in mind that ***THE FUEL IS FREE !***

The Effort - Education, Education, Education

As mentioned above, cost is a consideration and part of evaluating the process. But, knowledge of the particulars is absolutely essential to the success of the project. The more knowledge, the better the decision making process.

Know the Existing Waste Heat Conditions

This is the first order of business. Prepare a listing of waste heat mass flow, stack temperature, gas constituents or chemistry, and operational particulars (hours of running, peaks, valleys, etc.).

Also, because processes may require cooling, understand heat sink availability at the site. This may be cooling water, cooling towers, or potential cooling loads.

What is the Desired Output or Product

Is the desired output electrical power, hot water, process steam, cold water, or other? Provide as many particulars of each desired product as possible. For example, not just maximized electrical generation, but 480V, 60 Hz, 500kW electrical.

Economic Model

If possible prepare an economic model detailing current operating costs, projected capital costs, equipment life-cycle costs, projected operational requirements, maintenance interval considerations, government and regulatory incentives, regulatory requirements.

Better to list all known factors than to face a show stopper half way through the project !

It is evident that the buyer must acquire a great deal of information to make a good decision and to ask the right questions. Therefore, it may be in the client's best interest to consider the services of a specialist in waste heat recovery and use. Consulting candidates should possess 1) a varied experience in waste heat recovery; 2) knowledge and application experience in a broad spectrum of recovery and usage technologies; 3) a diverse, cross-industry process knowledge; 4) a focus on what's-best-for-the-customer rather than canned-product sales.

Always keep it in mind that, with waste heat recovery, one product does not necessarily suit all circumstances. Typically, several technologies will have to be employed if the intent is to maximize waste heat energy usage. Therefore, it never hurts to be creative and to ask the 'what if we' type questions.

Summation

Waste heat is not going away anytime soon, and recovery of this valuable energy resource should be a priority component of our efforts to increase industry efficiency and reduce exhaust stack emissions. And, while waste heat recovery and cost-effective usage of the energy has it's unique set of challenges, proper planning and creative engineering will allow industry to more efficiently utilize what is currently just an asset escaping into the atmosphere.

For further information, visit our web site @ www.marineandpower.biz.