Howden knowledge article

Industrial air preheaters

Every 1ºC of recovered waste heat can result in $2000 of saved energy per year.

Lowering carbon footprint and operational cost through high efficiency air preheaters

Energy in a low carbon world, the decarbonisation of power, the path to a low carbon future... reading up on carbon within the energy sector you soon get the idea that there is a lot of focus on getting away from it! According to the World Bank, only 22% of Green House Gas (GHG) emissions are currently under carbon pricing schemes, but this will accelerate along with the cost per tonne.

For the refining sector, in particular this is a central issue, with refineries being the second largest emitters of GHG after power plants. Considering that the greater the level of processing the higher the output of CO_2 and the trend to higher levels of upgraded fuels this is a big problem within the industry. On top of that, global heavy oil reserves outweigh light oil reserves.

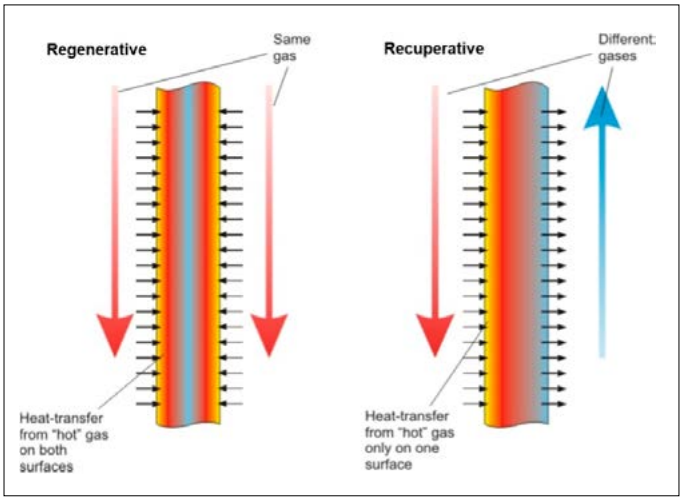
So how are refiners addressing the issue? Energy efficiency plays a key role in reducing carbon emissions. This clearly involves components throughout the whole process; however around two thirds of emissions at petroleum refineries are attributed to stationary fuel combustion units such as fired heaters and boilers.

Preheating the combustion air has a significant impact on reducing the levels of fuel required for firing. Other than fuel cost savings, the result is lower levels of CO_2.

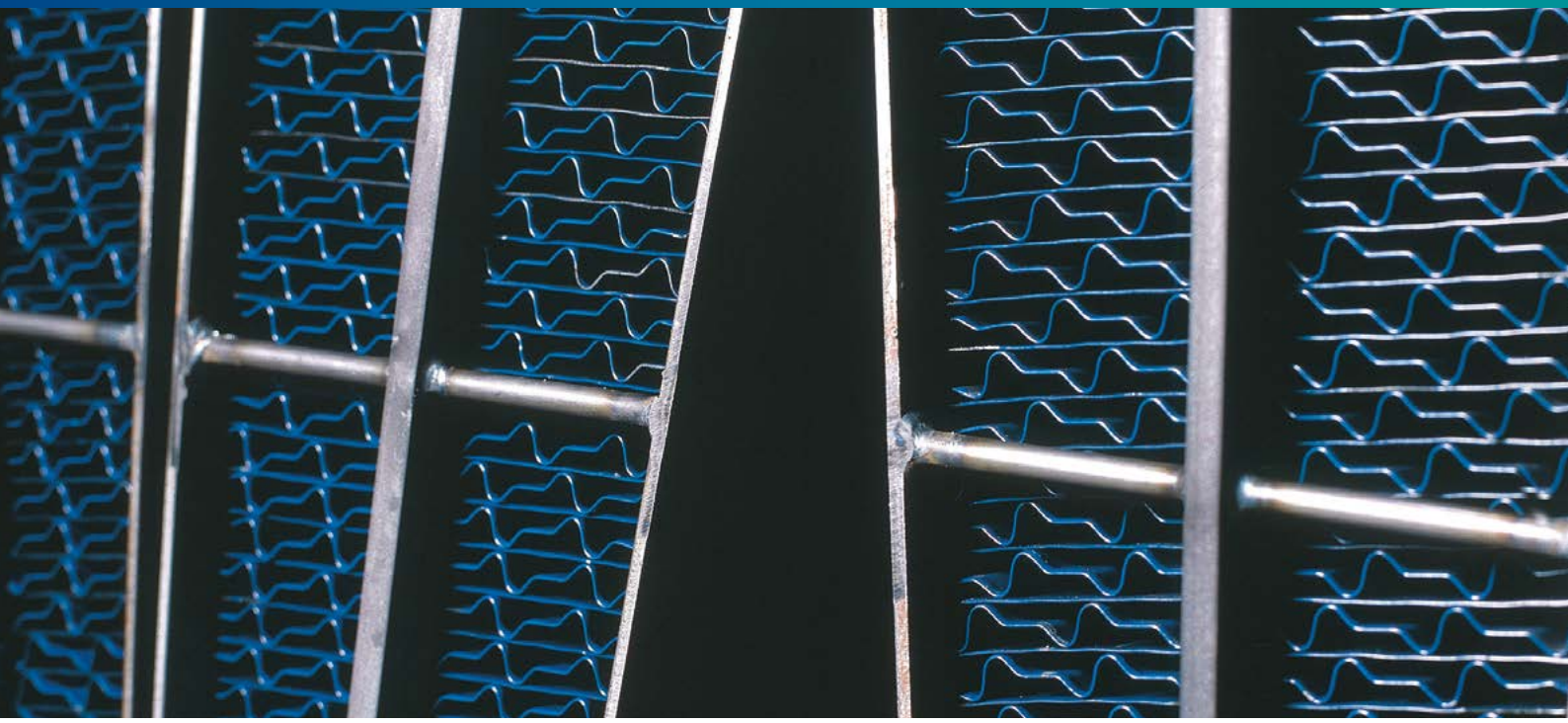
Air Preheaters – a short introduction.

All air preheaters (APH) utilise the waste heat from the exhaust gas as it leaves the fired equipment and transfers this energy to the inlet air used in the chamber to provide the oxygen to fire the fuel. The aim is to increase the efficiency of the boiler, furnace or fired heater by 10–15%.

An APH typically falls into one of two categories – recuperative or regenerative. Recuperative types include tubular (shell and tube) and plate type heat exchangers. These APHs are static and transfer heat from 'hot' gas only on one surface, either the walls of the tubes or plates. Regenerative types rotate slowly at around 1–2 rpm; thin metal heat transfer elements absorb heat from the hot gas stream (on both surfaces) and transfer it to the incoming cold air stream.



Howden's APH is the regenerative type and carries a number of advantages over recuperative such as the negligible effect on heat transfer caused by fouling as the deposits also absorb and release heat. In addition, efficiency is typically significantly higher within a given footprint (to match the efficiency, a recuperative APH would be much larger).



Operational savings through high efficiency air preheaters.

Efficiency is a word used a lot in engineered equipment companies such as Howden as it's a direct response to what we see in the markets we serve. Operators are increasingly under pressure to maximise profits from tight margins, which drives the need to identify and take advantage of savings. This applies to existing facilities as well as those that are in the design stage as best available technologies are sought to deliver incremental gains across the whole plant.

High-energy demanding processes, related to fired equipment, offer real opportunities for operators to recover the waste heat from the flue gas back into the process.

In terms of best available technology, our regenerative design puts us at the top end of air preheating equipment reaching up to 95% thermal efficiency.

A focus on industry leading heat transfer elements.

One area we've been working on consistently for many years that helps to deliver leading efficiency is the elements. These are the metal plates located in 'baskets' inside the heater to absorb the heat and transfer it effectively to the air intake.

There are a large number of element profiles available for use in our heaters. The best element for a particular application depends on several factors and requires experience in the selection process to understand which are the most important. Elements are frequently exposed to very severe fouling and corrosive conditions. High quality acid-resistant vitreous enamelling provides effective resistance to these hazards.

The goal is to achieve the right balance of thermodynamic performance, pressure drop and ease of cleaning for any situation. To enable this we use our specially designed simulation software to model the operating conditions; this gives assurance of maximum efficiency.

Potential savings achievable with short return on investment.

Every 1°C of recovered waste heat can result in $2000 of saved energy per year for a typical application with around 100 tons/h of gas mass flow. Considering some facilities (such as refineries) have many heaters and boilers this can add up to significant savings over operational lifetimes, well beyond the original costs of the air preheaters themselves.

Whether you are an operator looking for lower emissions and costs across the facility or an engineer looking for best in class technologies for new projects, our APH offers a well-proven solution.

Want to know how much you can save?

Contact us for an estimated Return on Investment.

For further information contact our team today:

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