BUSINESS hq The Herald

COMMERCIAL FOCUS
STAR REFRIGERATION
ALLEN ASSOCIATES

How does the whisky industry lower its carbon footprint while keeping its processes going? It calls in the experts, writes **Anthony Harrington**

APPLY THE HEAT AND PUMP UP THE VOLUME

TRANSFORMING an industry that's traditionally had to use significant amounts of energy into a zero-carbon operation is not a simple matter. The whisky industry is one of Scotland's most famous exports and is a huge contributor to the Scottish economy. The pandemic caused the country's 2020 exports to drop somewhat, from £4.9 billion in 2019 to £3.8 billion last year. However, Scotch still accounts for around 75% of all our food and drink exports.

The country has around 130 malt and grain distilleries, giving it the greatest concentration of whisky production in the world. Every one of these distilleries needs to bring in heat to brew up its magic. With Scotland committed to becoming a zero-carbon economy by 2045 the industry has a problem. How does it lower its carbon footprint while still bringing in enough energy to keep its processes going?

Until recently natural gas was the low cost option with a relatively low carbon footprint compared with other fossil fuels available to the sector. However, natural gas is hardly a carbon-neutral alternative. To get closer to zero carbon a number of distilleries have already looked at or installed heat recovery systems.

Given the complexity and sensitivity of the distilling process, installing heat recovery equipment in any spirits distillery requires considerable process expertise. Stirling-based process engineering consultancy Allen Associates has been using its know-how in process engineering to help famous brands around the world optimise their production and, where possible, recover heat for elsewhere in the process.

■ Scott Allen, the managing director of Allen Associates engineering consultancy. ***www.allenhpe.co.uk***

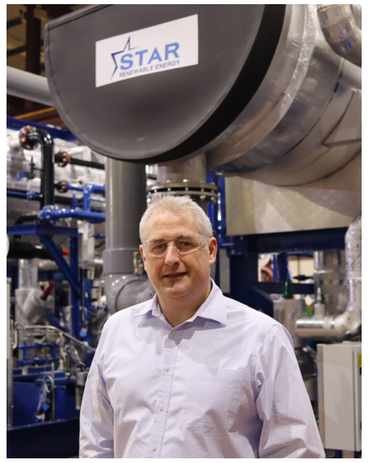
Managing Director Scott Allen says: "It's difficult for a distillery to decarbonise its processes as gas is a relatively low-cost fuel. The distillery's problem is not only how to achieve net zero, but also how to get to net zero without a large increase in fuel costs."

He points out that alternative green fuels like hydrogen will have their place. However, they are likely to be significantly more expensive than natural gas, at least in the early years. So distillers have to find an approach that is bearable, from an affordability standpoint, and heat pump-based solutions are a good way to go.

"If there was a way we could harness the waste heat and boost it back up to be re-used in making steam instead of consuming new fuel (whatever it's source) we might just have the golden ticket."

It was these twin demands that led Allen Associates to the heat pump and district heating experts Star Refrigeration.

As Dave Pearson, Group Sustainable Development Director at Star Refrigeration notes, even as a heat pump specialist, "we would be mad to attempt to integrate our solution into a complex distillery process alone".



■ Star Refrigeration Group Sustainable Development Director, Dave Pearson. ***www.star-ref.co.uk***

Pearson explains one of the attractions of applying heat pumps to a distilling process is the heat pump will also reduce the amount of waste heat released to the environment.

"The defining complexity for any heat pump solution is the pressure the pump has to run at. If we select the right working fluid, heat pumps in distillery implementations only have to run at around half the pressure they would in some of our other implementations. This makes the device a lot easier than, say, trying to heat a town to 90 degrees, which we have done before," he says.

The problem with most approaches to recovering and reusing heat from the distilling process, is that, as Pearson puts it, heat flows 'downhill'. Ordinary heat recovery processes can't use the captured heat to bring a fluid up to the level of the heat recaptured. So, if the waste heat being captures is at 80 degrees centigrade, for instance, it can heat liquid at 20 degrees to 70 degrees. But it can't get it all the way back to 80 degrees and it absolutely cannot get it heated to 120 degrees and warmer.

Put a heat pump into the process, however, and the heat pump can take the 80-degree waste stream and capture the heat using it to heat spent steam (condensate) back up to 120 degrees and above. Due to the relatively narrow gap in temperatures the efficiency will allow over four times as much heat to be delivered as primary energy used. That's the big difference a heat pump can make.

"In brief, a heat pump is a refrigeration process. We take a working fluid and manipulate it through a cycle of expansion and compression. When we compress the fluid, it heats up. Heat can be drawn from it and it expands and cools the product."

"Led by Allen Associates, we set up the system so in simple terms it recovers waste heat from the still condenser and we inject the heat back into the body of the still. This massively reduces the demand on the distillery's existing heating system," Pearson explains.

Green Stills

> Heat pumps can make the change to net zero more palatable for distillers as they transition to next-generation fuels

"Heat pumps can save a distillery around two thirds of the heat energy they are currently using in the still house. As such, in our view, heat pumps can make the change to net zero more palatable for distillers as they transition to next-generation fuels and ultimately these systems can make distillers carbon resilient," Allen says.

Pearson points out a distillery could transition today from using natural gas to a zero-carbon solution by switching to a clean electricity source for steam production but the running cost penalty would mean having to pay around six times more for their energy than they are currently paying.

"We can create a 'ReadyNow' win-win for distillers, which will give them the benefits they are seeking in terms of reducing their carbon footprint, based on efficient use of well-established utilities.

"Heat pumps require electricity that can come from renewable sources or even a hydrogen fuel cell . . . who knows what the future may bring?

"What I can say is that harnessing renewable energy via a heat pump in distilling can be up to four times more efficient than using the fuel direct."■