

How to Approach Decarbonisation in Industrial Bakeries

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Details:

Home > Articles > How to Approach Decarbonisation in Industrial Bakeries

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Industrial bakeries have enough waste heat to materially decarbonise their heating systems and save money at the same time, but doing this cost-effectively requires proper measurement and whole-system analysis. Oven waste heat is typically enough to offset the entire steam boiler output and then some. Heat pumps can enhance heat recovery by utilising latent heat from moisture in oven exhaust, and condensed water can be recovered for use in washing. However, steam demands don't necessarily align with waste heat availability or temperatures, so understanding the pattern of heat use and measuring key factors enables the business to decarbonise in a structured way rather than treating waste heat recovery in isolation.

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Where Heat Is both Used and Wasted in Industrial Bakeries

Industrial bakeries have several heat demands including ovens, proofers, crate washing, hot water and humidification. They also have several sources of waste heat, for example ovens, air compressors and chillers, and even the warm water from crate washing. Improving heating efficiency reduces the long-term cost of decarbonisation.

What Oven Waste Heat Can Really Do

There is enough heat available in the oven exhaust to use for several purposes over and above preheating combustion air, if the heat recovery is enhanced using heat pumps. A heat pump can make it possible to use the latent heat from the high level of moisture in the oven exhaust. The condensed water can also be recovered for use in washing. The oven waste heat is typically enough to offset the entire steam boiler output and then some.

Why Whole-System Analysis Matters

It is not quite as simple as that though. The steam demands for a bakery don't necessarily align with all the waste heat availability and temperatures don't always match. Understanding the pattern of heat use and the availability of waste heat helps in determining the best approach to reducing heating cost and carbon emissions. Measuring key factors enables the business to decarbonise in a structured way.

A Practical Way to Plan Bakery Decarbonisation

Considering just one piece of the decarbonisation puzzle in isolation can make it harder and more expensive to achieve the best result in the long term.

So, we encourage a whole system analysis first, with decisions around technology second.

A good approach to finding the best and most realistic solution is:

1. Identify all useful waste heat sources and heat sinks (heating demands).
2. Measure the heat demand and waste heat availability over at least one typical operating cycle
3. Use data analysis to determine the optimum combination of heat recovery and renewable heat options that can be implemented over time to achieve your decarbonisation goals in a cost-effective way.
4. Develop a business case and implementation plan.

How Northmore Gordon can help:

Northmore Gordon can do the hard work for you; it is what we do. We analyse energy use, assist with obtaining government support, optimise the business case using potential revenue from environmental certificate schemes, and help to deliver the project.

Using this guidance

Check the site's operating conditions, data quality, project stage and current program settings before turning the dated discussion into a scope or investment decision.

Related guidance

Energy audits

Measurement and verification

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Why can industrial bakeries realistically decarbonise their heating systems while saving money?

Industrial bakeries have enough waste heat to materially decarbonise their heating systems and save money at the same time, but doing this cost-effectively requires proper measurement and whole-system analysis. Oven waste heat is typically enough to offset the entire steam boiler output and then some. Heat pumps can enhance heat recovery by utilising latent heat from moisture in oven exhaust, and condensed water can be recovered for use in washing. However, steam demands don't necessarily align with waste heat availability or temperatures, so understanding the pattern of heat use and measuring key factors enables the business to decarbonise in a structured way rather than treating waste heat recovery in isolation.

What are the main heat demands and waste heat sources in an industrial bakery?

Heat demands in industrial bakeries include ovens, proofers, crate washing, hot water and humidification. Waste heat sources include ovens, air compressors and chillers, and even the warm water from crate washing. Improving heating efficiency reduces the long-term cost of decarbonisation. A whole-system analysis identifies where these demands and sources are located, how they interact, and when they occur during operating cycles. This information forms the basis for determining the best combination of heat recovery and renewable heat options that can be implemented over time to achieve decarbonisation goals cost-effectively.

What four-step process does Northmore Gordon recommend for planning bakery decarbonisation?

We recommend: 1) Identify all useful waste heat sources and heat sinks (heating demands); 2) Measure the heat demand and waste heat availability over at least one typical operating cycle; 3) Use

data analysis to determine the optimum combination of heat recovery and renewable heat options that can be implemented over time to achieve decarbonisation goals cost-effectively; and 4) Develop a business case and implementation plan. This sequenced approach ensures that technology decisions follow whole-system analysis rather than preceding it, helping bakeries avoid selecting equipment before understanding their actual heat patterns and compatibility requirements.

Why is whole-system analysis important rather than considering waste heat recovery in isolation?

Steam demands for a bakery don't necessarily align with all waste heat availability, and temperatures don't always match. Understanding the pattern of heat use and the availability of waste heat helps determine the best approach to reducing heating cost and carbon emissions. Considering just one piece of the decarbonisation puzzle in isolation can make it harder and more expensive to achieve the best result long term. A whole-system analysis reveals how components interact, enabling the business to sequence investments strategically and avoid expensive solutions that don't account for timing mismatches or temperature incompatibilities between heat sources and demands.

How can heat pump technology enhance waste heat recovery in bakeries?

Heat pumps enhance heat recovery by making it possible to use latent heat from the high level of moisture in oven exhaust, which would otherwise be lost. This capability extends the utility of waste heat streams that might not otherwise be at the right temperature for direct use. Additionally, the condensed water from this process can be recovered for use in washing. Integrating heat pumps into a whole-system design requires analysis of electrical constraints, operating schedules and maintenance implications to ensure the technology delivers reliable performance while supporting decarbonisation goals.

What measurement data should a bakery gather before deciding on decarbonisation technology?

A bakery should measure heat demand and waste heat availability over at least one typical operating cycle to understand both the pattern of energy use and the availability of waste resources. Key factors include temperature, flow rate, timing and reliability of waste heat streams, as well as the thermal requirements of heating demands throughout the day or shift. This data reveals incompatibilities between when heat is generated and when it is needed, shows whether waste heat is sufficient for intended uses, and exposes opportunities for heat integration or storage. Arranging measurement before equipment changes is essential to preserve baseline evidence for future performance verification and funding pathways.

How does Northmore Gordon assist bakeries beyond analysis?

We analyse energy use, assist with obtaining government support, optimise the business case using potential revenue from environmental certificate schemes, and helps to deliver the project. Our measurement and verification services establish baselines and verify energy savings after implementation. Carbon advisory services including opportunity assessment and transition planning connect emissions information with engineering and procurement decisions. We also provide feasibility studies for renewable heat options and electrification, helping bakeries develop realistic investment cases that reflect their specific operating patterns and commercial constraints.

What broader decarbonisation resources does Northmore Gordon offer for industrial food processing?

The Greenham case study demonstrates a staged approach to industrial decarbonisation across multiple sites and technologies including biomass boilers and cogeneration. Guidance on energy-improvement programmes for the food and beverage sector covers refrigeration, thermal processes, compressed air and operational efficiency. Carbon advisory services include diagnostic workshops, opportunity assessment, transition planning and feasibility studies. We also publish process-heat and electrification guidance, helping industrial operators assess renewable heat options

and heat recovery strategies before selecting technology, ensuring decisions align with whole-system operating requirements.