



DECARBONISING PROCESS HEAT

HEAT RECOVERY & HEAT PUMP APPLICATIONS FOR FOOD & DRINK MANUFACTURING



Agenda

1. Welcome & Introduction

Guy Robertson, Energy Market Manager, Ramboll UK

2. Technical Solution to Decarbonising Process Heat (Devro Case Study)

Amey Karnik, Head of Industrial Decarbonisation, Ramboll UK

3. Process heat decarbonisation – an owner's perspective

Muir Sneddon, Sustainability Director, Saria Food & Pharma

4. Q&A

Introductions



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Heat Pumps Provide 'Quick Wins'

- Whilst we support and are engaged in the development and delivery of longer-term solutions such as the development of green hydrogen supplies, we want to support all UK businesses with cost-effective technologies that can achieve carbon abatement in the short-term.



- We believe that the combination of heat recovery and heating and cooling integration using heat pumps should be prioritised, promoted and supported across the UK food and drink manufacturing sector.



"Light industry has a higher energy-saving potential than heavy industry, accounting for 70% of total energy savings the industrial sector"

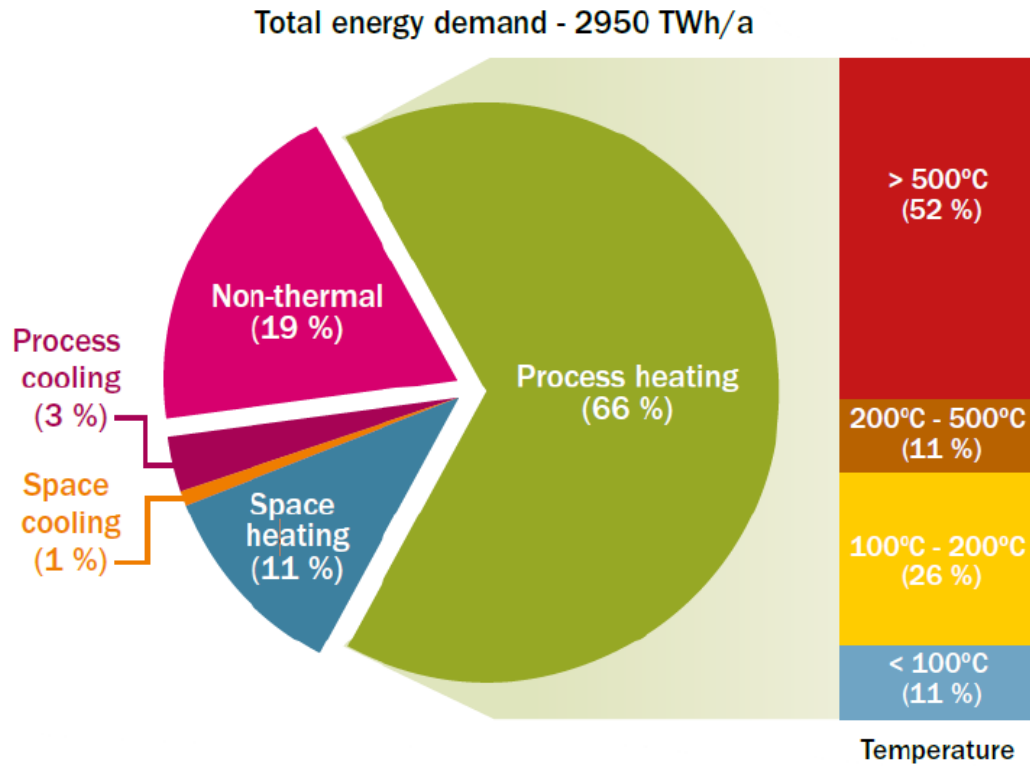
Source - International Energy Agency, Energy Efficiency Report, Nov 2022



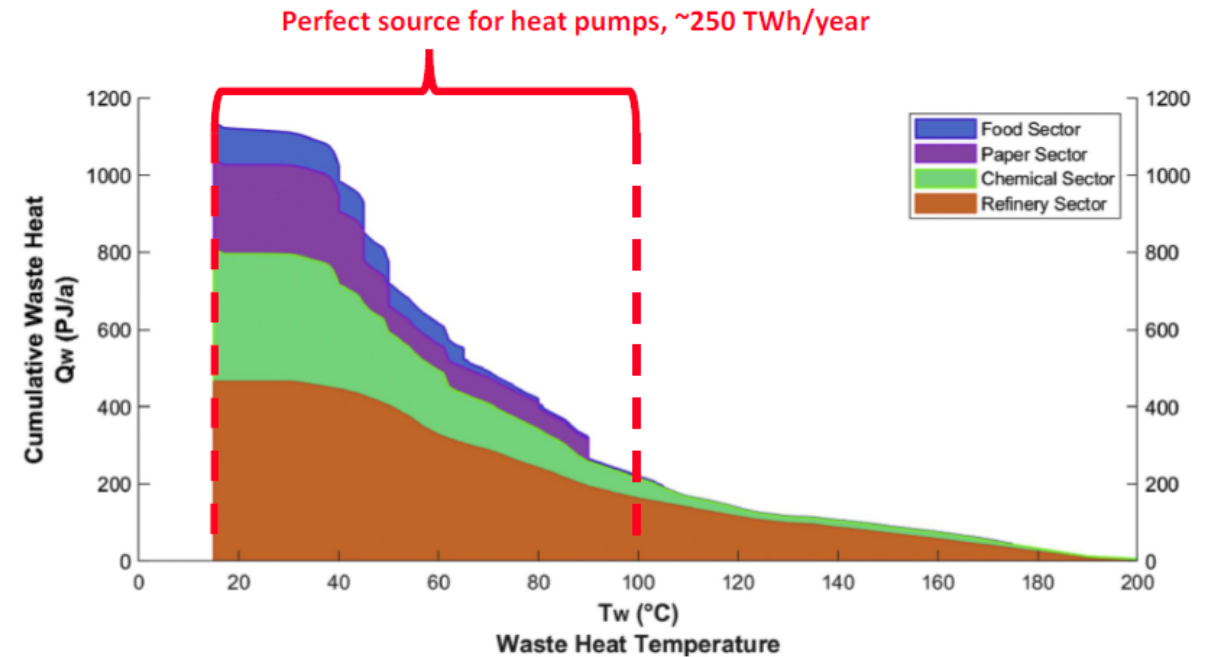
"Heat pumps could supply 37% of industrial heat...one of the few commercially available and viable solutions that can be implemented at scale this decade."

Source - World Business Council for Sustainable Development, Sep 2022

PROCESS HEAT IN THE FOOD & DRINK SECTOR ...



Available waste heat in Europe



2. TECHNICAL SOLUTION TO DECARBONISE PROCESS HEAT

(Devro Case Study)

Challenges on the Ground



The key challenges include process integration, financial metrics misalignment, absence of carbon pricing mechanisms, on-site resistance, and infrastructure hurdles.



Process integration

Decarbonisation can change the way that energy is used on site, requiring modifications to energy infrastructure and process interfaces.



Resistance at site level

Any proposed changes in day-day operations or ways of working are often challenged at the site level as being overly complex and disruptive.



Conventional financial KPIs and lack of internal carbon pricing

Majority of the industry still uses conventional KPIs (<5 years payback, 10% IRR etc) for project approvals. This combined with lack of internal carbon pricing delays the project approvals.







Infrastructure challenges

Upgrading infrastructure and expanding the electrical grid to accommodate increased electrification and distributed energy resources is expensive and logistically challenging.



Bankable Solution

Client Brief

- No risk to the production 
- No modification to the the core process 
- Short term implementation 
- Acceptable financial KPIs 



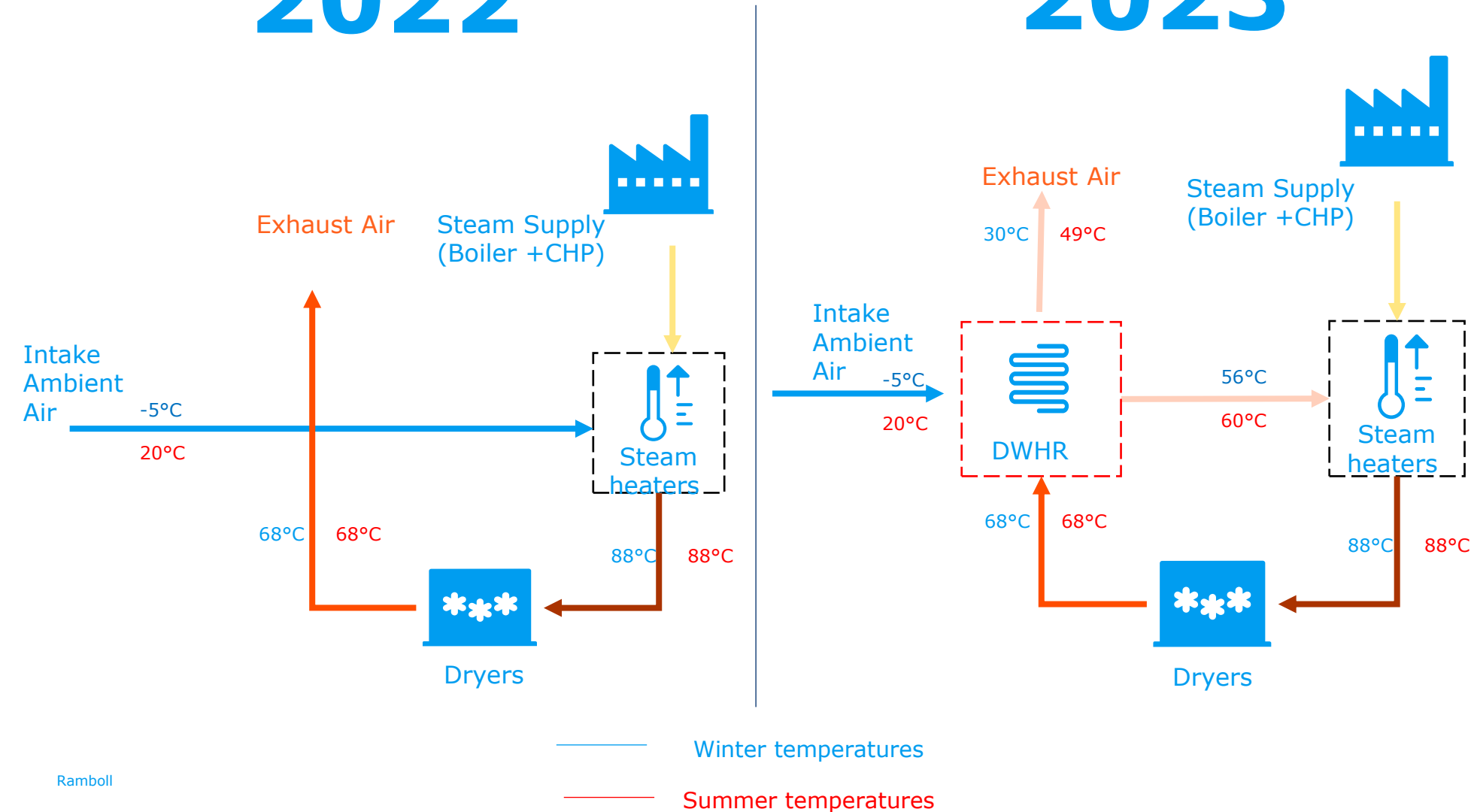
Business as Usual 2022

Heat Recovery 2023

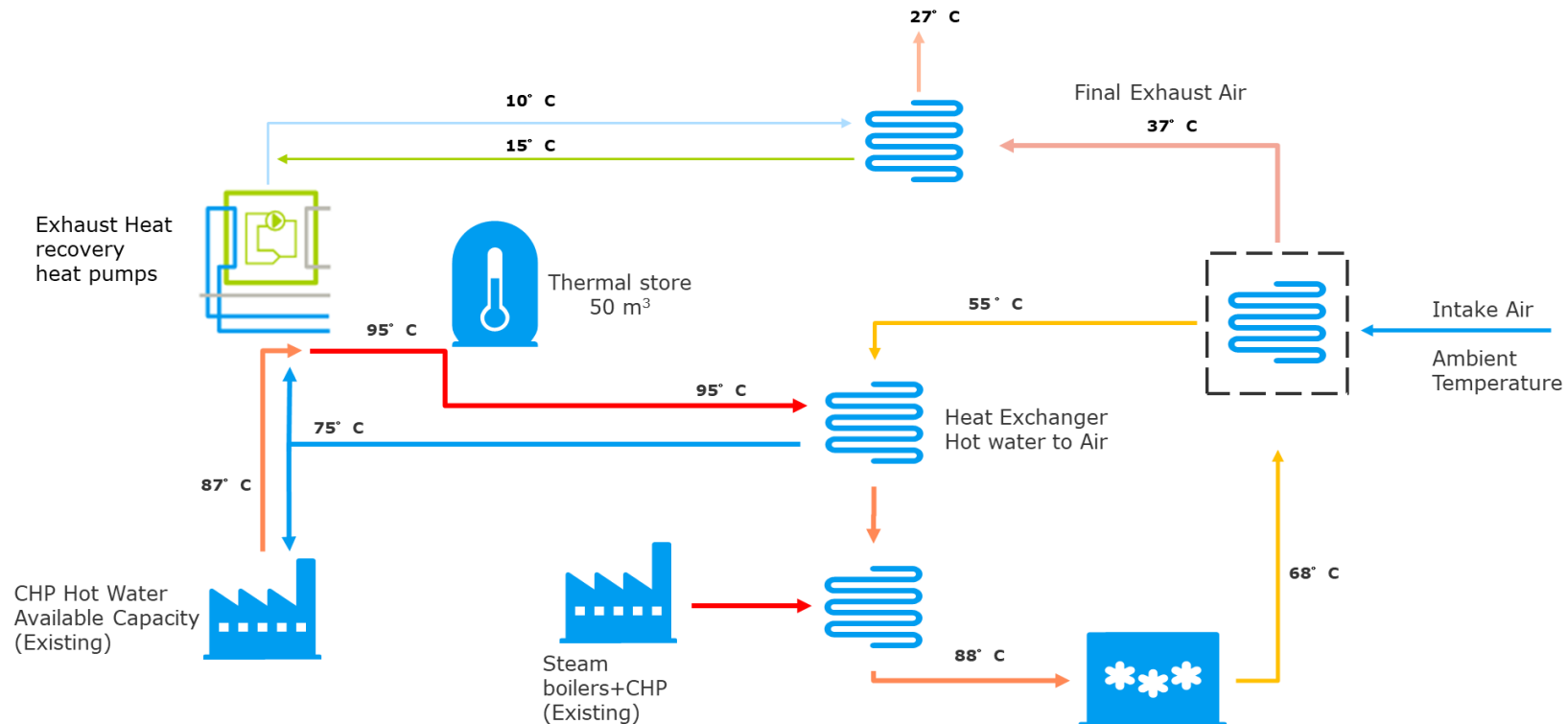
Evolution of the Concept

Phase 1: Heat recovery from exhaust

- Site survey
- Identification of data gaps
- Agreeing the data monitoring and logging requirements with Devro
- Identifying the interface points
- Confirming the feasibility followed by stage 3 design and procurement support



Heat Pump 2025

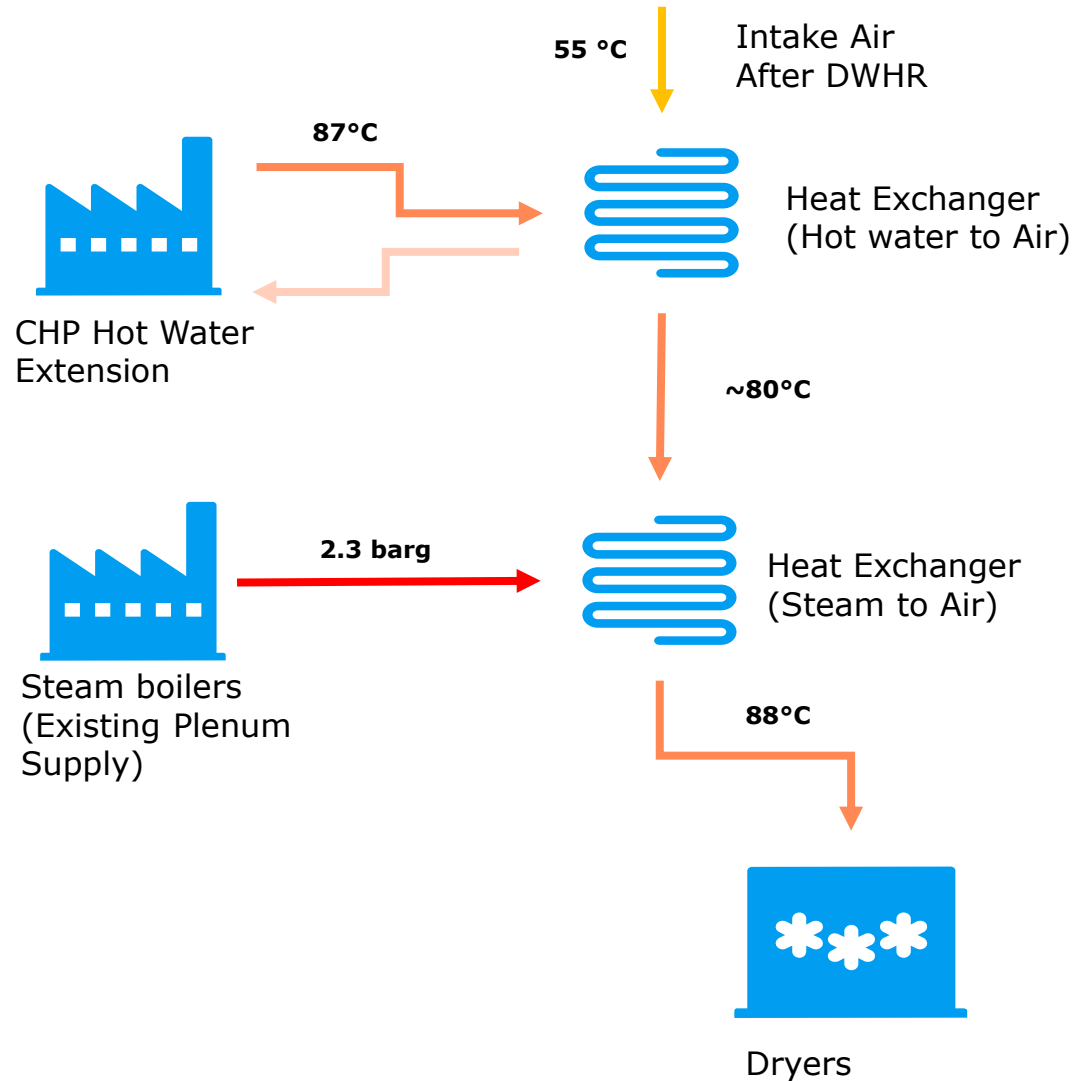


Evolution of the Concept

Phase 2: Heat pump and de-steaming

- Integration of Heat Pump, thermal store and CHP heat recovery
- De-steaming majority of the heat supply and switching it to LTHW
- Feasibility study, RIBA stage 3 study and Proof of Concept trial was conducted in 2023-2024
- C.70% reduction in carbon emissions from boilers
- C.35% reduction in overall carbon footprint
- The project is now fully funded and under implementation

Proof of concept trial was conducted



Proof of concept was conducted to test switching of process from steam to LTHW. The concept provided valuable insights on:

- Ramp up rate
- Recirculation rates within dryer
- LTHW temperature requirements
- Resilience requirements

Original design was finetuned based on the outcomes of the Proof of Concept

Lessons learned

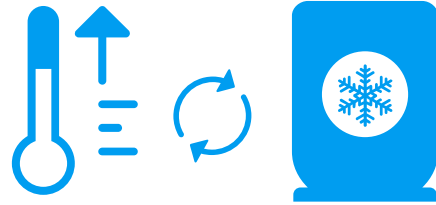


Heat pumps with thermal stores can be a cost-effective route to significant carbon reductions

Breakeven heat pump efficiency is dependent on several factors including utility prices and efficiency of existing equipment – typically it is in the range 250-350%.

Correctly sized thermal storage can be used as a buffer to smooth spikes in heating and cooling demands, reducing the required equipment size and capital costs.

The buffer can also be utilised to optimise operating times to avoid high utility cost periods and provide load balancing service to the grid.



Transition to combined heating and cooling solutions

In contrast to most domestic and commercial heat pump applications, in industrial settings heat pumps can deliver the combined role of boiler and chiller simultaneously, significantly improving overall efficiency and boosting the business case.



Data monitoring is critical

Monitoring and logging plant operation data over time to develop a robust hourly profile of heat demand, temperatures, waste heat availability, etc., significantly reduces project risks.



Government support

Main barrier to deployment is high capital cost and resulting long payback – this is where targeted support from government can be very effective.

3. PROCESS HEAT DECARBONISATION

– AN OWNER'S PERSPECTIVE

DWHR installation at the Moodiesburn facility



Feedback from the implementation of dryer waster heat recovery project

Dryer Waste Heat Recovery project:

- Feasibility study – Q1 2022
- RIBA Stage 3 concluded August 2022
- DWHR Phase 1 completed May 2023
- DWHR Phase 2 online November 2023

Focused approach has delivered a successful outcome:

- C.12.5% reduction in year 1 (only from dryer waster heat recovery)
- Significant further carbon reductions have now been realised due to operational set-up changes.
- Proof of Concept for switching to LTHW has given confidence to Devro in the heat pump project.
- Heat pump project is expected to be operational by Q4 2025.

Challenges and Key Factors Behind the Project's Success



Challenges included processes not changed for many years, unknown operational parameters, external technical influence and utility pricing



Data monitoring

Comprehensive measurement and collection of data were key to ensure the correct design considerations were made. Understanding the unknown were essential learnings.



Utilising local resources with SMEs

Any proposed changes in day-day operations or standard ways of working will be challenged at site level; by including local resources to work alongside the SMEs this removed any barriers and created a strong **Team** to deliver the positive outcome.



Managing internal and external stakeholders

Capex approval within Devro (<3 years payback, 10% IRR etc) for most projects. The introduction of internal carbon pricing is providing a new approach to decarbonisation projects. Future pricing strategy for utilities will be vital.



Ensuring swift progress with "can do attitude"

Post Investment Review: "Honest communication and collaboration between contractors and all stakeholders are essential for the success of any project".

4. Q & A

Bright
ideas.
Sustainable
change.

RAMBOLL