COMBINED COOLING, HEAT AND POWER (CCHP) FOR FOOD AND DRINK PROCESSING.

Cutting costs for fruit and vegetable processors.

Looking to cut down on your energy bills? Have a look at our guide to how CCHP can boost the efficiency of your processing plant.

BUILT FOR IT.

What is CCHP?

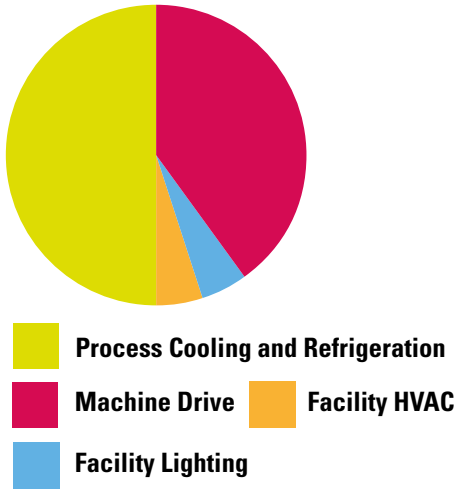
CCHP stands for Combined Cooling, Heat and Power and is sometimes known as trigeneration which is the simultaneous generation of electricity, heating and cooling. It involves capturing the huge amounts of heat that is wasted in conventional power plants and using this waste heat to provide energy, heat and to produce chilled water which is then used for cooling.

CCHP plants can reach efficiencies of more than 80%, while coal and gas-fired plants struggle to achieve more than 40%.

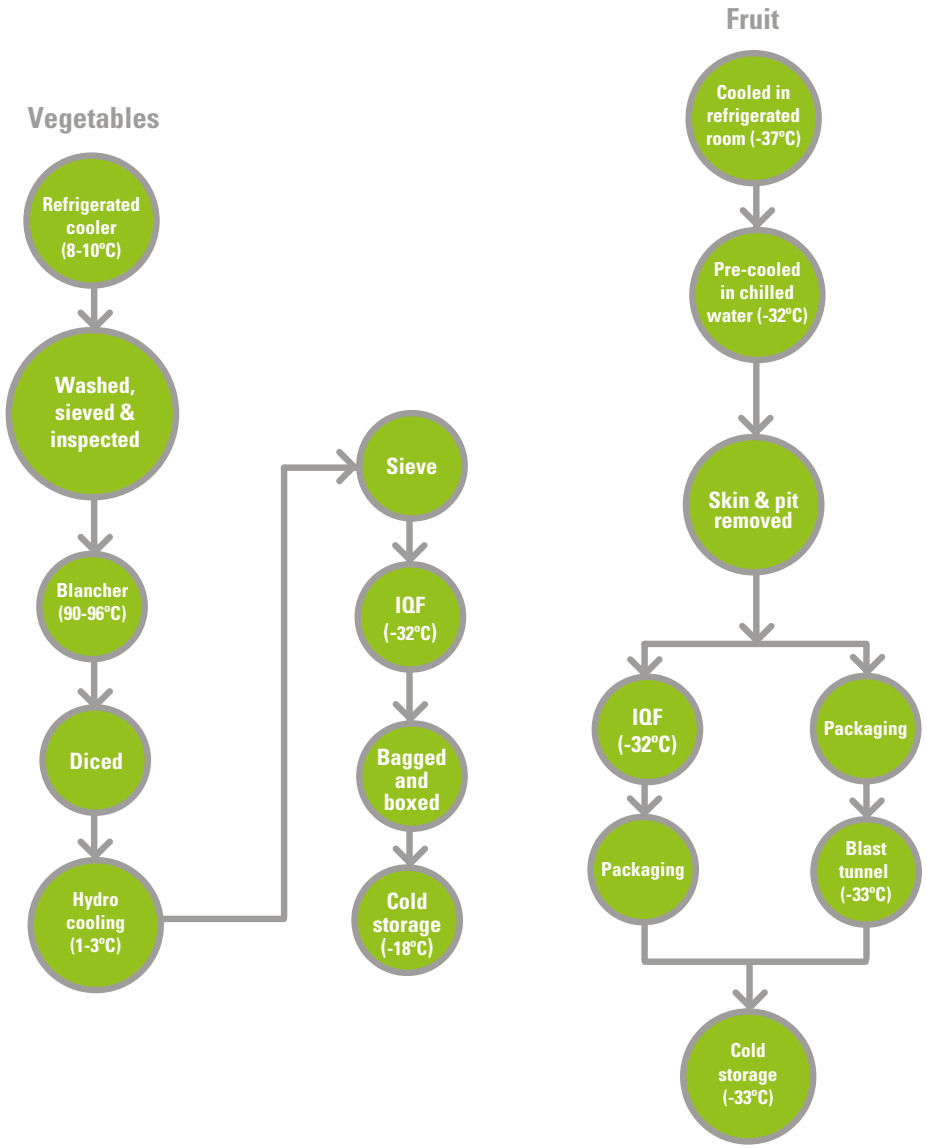
FACT – *There are well over 2,000 CCHP schemes installed in the UK, with the capacity to generate 6,170MWe of electricity and 22,225MWth of heat.*

FACT – *The average efficiency of UK CCHP schemes is 70%*

Electricity use in a frozen fruit, juice and vegetable plant[1]



Vegetable and fruit processing flow diagrams[2]



Fruit and vegetable demands

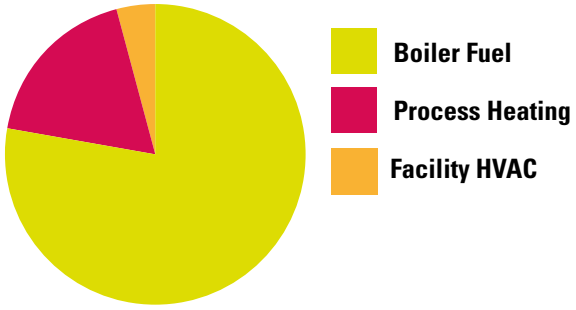
Though it may not seem obvious to those outside of the industry, the fruit and vegetable processing industry consumes surprisingly large amounts of energy.

Some 15%[3] of all the energy used by the UK food and drink manufacturing industry is used to process fruit and vegetables, emitting the equivalent of almost 60,000 tonnes of carbon.

While a large amount of the energy is used in refrigeration and freezing, many stages of processing also require considerable heating. This includes flash steam peeling or blanching, which both require vegetables to be exposed to hot water or steam. Dehydrating vegetables - such as potatoes - also requires large amounts of heat. At the same time, processing plants also use large amounts of electricity. This provides refrigeration and compressed air, as well as running lighting, ventilation and all the processing equipment, such as canning and packaging equipment.

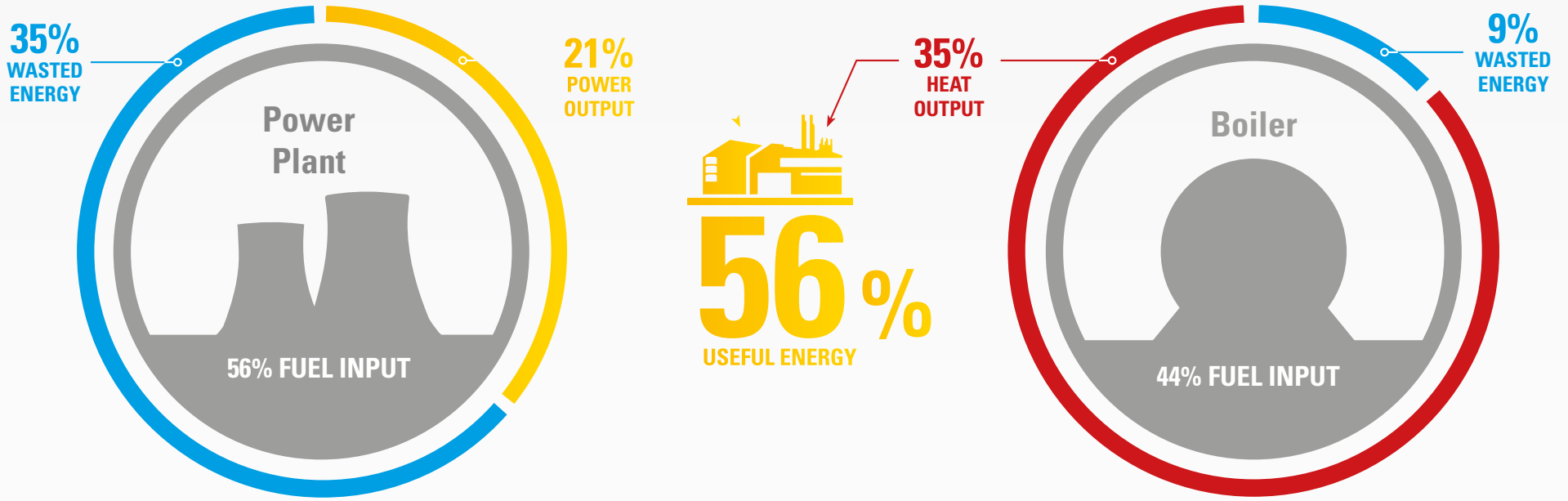
The exact demands will vary from site to site as well as what the plant is producing. This high, regular demand for cooling, heating and power makes the fruit and vegetable processing industry an ideal candidate to take advantage of CCHP.

Natural gas use in a frozen fruit, juice and vegetable plant[1]

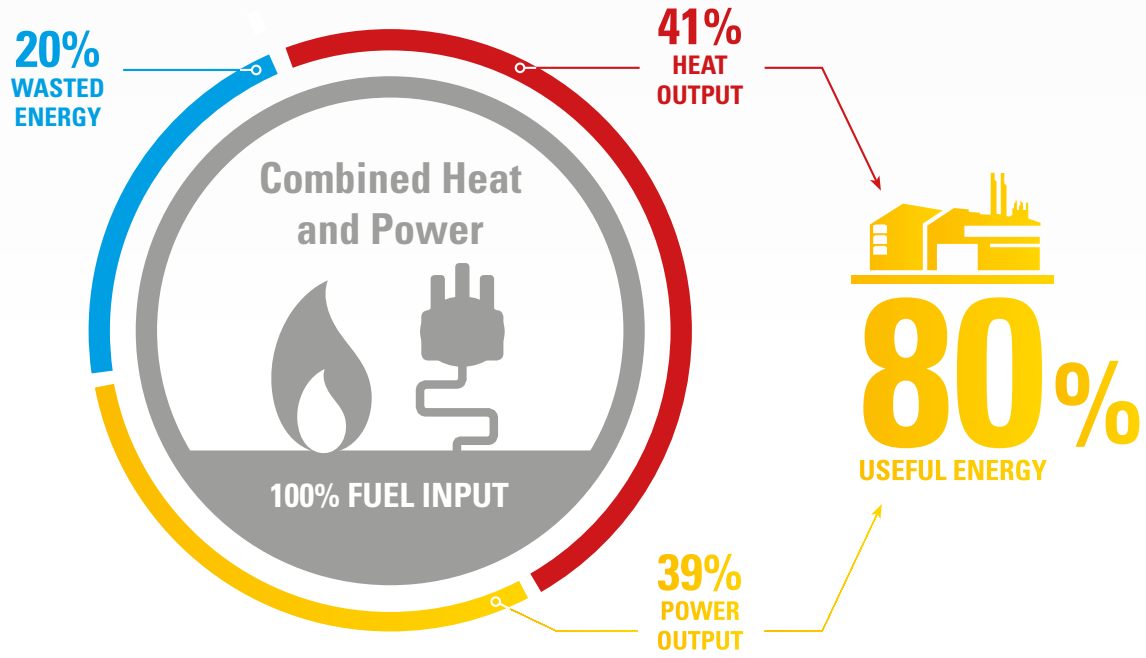


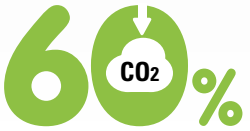
Output for CCHP compared to conventional power plants

Conventional boiler power plant



Combined cooling heat and power plant





Cleaner, Greener:

Although CCHP still produces carbon dioxide, reducing the amount of fuel needed to run your plant will cut your emissions by a minimum of 10%, and potentially as much as 60%.[4]

With the benefit of a high quality and secure energy source system on site, your business can dramatically reduce its dependency on the national grid for power.

Payback:

Larger plants with substantial energy demands will make their money back from their investment faster, but you can probably expect to be making a profit on a new CCHP system within as little as three years of having it installed.[5]

Cooling:

CCHP or trigeneration can provide extremely efficient cooling. This can eliminate the need to run energy-intensive refrigeration systems.

Trigeneration uses an absorption chiller to convert heat into cooling energy. This is economical and environmentally-friendly, as it eliminates harmful refrigerants and reduces overall air emissions.

As an absorption chiller has no moving parts, the opportunity for wear and tear is low, resulting in minimal maintenance costs. Additionally, there are now absorption chillers available on the market that can be powered directly with the CCHP exhaust, removing the need for an intermediate exhaust gas heat exchanger.

The exact savings trigeneration can offer will depend on several factors, such as the size of the operation and the products being processed. However, given that approximately half of the electricity generated for a frozen fruit, juice and vegetable plant is used for process cooling and refrigeration, sites such as these are ideally positioned to take advantage of this innovative technology.

How do I know if CCHP is right for my plant?

1. Know your annual heat and power requirements
One of the best ways to do this is to carry out a full energy audit. Since processing plants usually run for long, regular periods the demand for cooling, heat and power is high and steady - perfect conditions for running an efficient CCHP system.

2. Work out how much you currently pay for both heat and electricity generation
Knowing your billing figures will allow you or a consultant to put together a precise cost comparison for different CCHP systems.

3. Determine what size system you need
In most sectors that have constant, steady demand it is advised that CCHP systems be sized to only provide the baseline heat. Otherwise you risk producing more heat than is needed, reducing the system's efficiency.

4. Contact a reputable supplier
CCHP systems are a major investment and so working with a skilled, experienced supplier is vital. The cheapest purchase price may not necessarily deliver the most cost effective operation over an extended period, and it's important that you secure an operations and maintenance contract at the time of installation.

Industry example: [6]

Customer

Family-run fruit and vegetable processor and packer

Product

Anaerobic digester* and 273kW CCHP plant

Capital Cost

~£1m

Annual Operating Costs
(Including AD plant)

£10,000

Annual Savings

£170,000-£200,000
(including operation and maintenance costs)

Payback Period

~5 Years

*An anaerobic digestion plant breaks down organic materials to produce renewable energy.

About Finning:

Finning has a global reputation for developing CCHP solutions that are durable, economic and reliable.

As well as providing high-quality systems and maintenance contracts, we offer a free feasibility service assessment to help you determine if the technology is right for you. To take advantage of this offer, visit **http://www.finningpower.co.uk/applications/chp/assessment.aspx**

References

[1] Energy Efficiency Improvement and Cost Saving Opportunities for the Fruit and Vegetable Processing Industry | An ENERGY STAR® Guide for Energy and Plant Managers. Ernest Orlando Lawrence Berkeley National Laboratory
https://www.energystar.gov/ia/business/industry/Food-Guide.pdf

[2] Energy Efficiency Opportunities in Fresh Fruit and Vegetable Processing/Cold Storage Facilities. Bryan Hackett and Sandra Chow, BASE Energy, Inc. and Ahmad R. Ganji, San Francisco State University.
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[3] Fruit and Vegetables & UK Greenhouse Gas Emissions: Exploring The Relationship. Food Climate Research Network
http://www.fcrn.org.uk/sites/default/files/fruitveg_paper_final.pdf

[4] The CHPQA Standard Issue 5, the Department of Energy and Climate Change
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335471/CHPQAStandardIssue5.pdf

[5] Why Use CHP? The Local Government Association
http://www.local.gov.uk/climate-change/-/journal_content/56/10180/3510573/ARTICLE

[6] Improving Your Resource Efficiency, SYSTAIN Lincolnshire business support
http://www.pect.org.uk/downloads/E-M-Keys-59.pdf