11 top tips for energy saving in meat chilling

By

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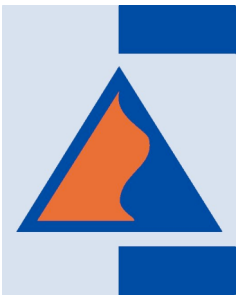

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1. ENERGY MANAGEMENT PROGRAMME

Set up an energy management programme. Details can be found at www.carbontrust.co.uk.. Define the targets of the programme. It is essential that the programme has the full support of management and its aims are understood throughout the plant. Start by looking at refrigeration. It often consumes the majority of electricity in abattoirs (typically up to 70%)

2. ASSESS ALL REFRIGERATION SYSTEMS

Familiarise yourself with the refrigeration equipment and the main components. Check the systems' components match the documentation. The more you understand the operation of the plant the easier it is to identify potential savings.

3. METER ENERGY CONSUMPTION

Electricity bills provide a basic record of overall kWh consumption. Install sub-metering or use energy loggers to measure energy consumption of individual refrigeration systems. Ensure the associated equipment e.g. compressors, fans (evaporator and condenser), electric defrost heaters, lighting pumps, of each system are all measured.

Relating energy consumption to throughput can highlight problem areas and also opportunities.

Compressor drive motors tend to use the most energy, followed by fan motors.

4. MEASURE THE CURRENT PROCESS PERFORMANCE

Before making any changes check the chilling performance of each refrigeration system against its specification. The primary carcass chillers tend to have the highest energy consumption so start here.

Measure and record;

- air temperature and relative humidity in the chiller
- surface and deep leg temperatures for a range of carcases throughout the day
- air speed at several points throughout the chiller
- ambient air temperature
- weight of carcases throughput

Recording data over a week gives more detail of how performance varies with production throughput and ambient temperature.

By comparing current and previous performance measures any adverse effects can be highlighted.

5. ANALYSE BASELINE DATA

Examine the chilling performance and energy baseline data to determine how each system uses energy throughout the production cycle. Identify the key features of the energy consumption profiles, especially periods of high and low energy consumption and determine reasons for them. Track trends against throughput and look for unusual events.

6. INCREASE THE EFFICIENCY BY IMPROVED COMPRESSOR CONTROLS

The compressors consume the most energy in a refrigeration plant. To save energy here, the evaporating temperature should be as high as possible and the condensing temperature as low as possible while still maintaining the required control temperature. Remember that for every 1ºC less between evaporating and condensing temperature there is a saving of 2 to 4% in energy costs as the compressor has less work to do.

Seek advice from a good refrigeration contractor about reviewing and upgrading your system controls for more efficient operation including floating head pressure and electronic expansion valves etc.

Now is a good time to re-commission poorly maintained systems

7. OPTIMIZE CONDENSER FAN COIL UNITS

Keep condenser coils and fins clean and free of debris. Blocked condensers increase the condensing temperature – a 1ºC increase will increase energy costs by 2 to 4%.

Make sure that air entering the condenser units is as cold as possible (ideally shaded from direct sunlight on the north facing side of the building).

Upgrade to the most energy efficient fan motors and speed control systems.

When replacing condensers consider installing units that are larger than standard designs to improve refrigeration efficiency.

8. OPTIMIZE EVAPORATOR FAN COIL UNITS

Evaporator fan motors can consume a significant quantity of energy, especially if they run continuously at full speed. You can save up to 70% of fan energy by replacing inefficient fixed speed motors with more efficient variable speed drives.

Always make sure that the coils and fins are kept clean and not blocked to ensure efficient heat transfer.

Check that the frequency and duration of defrosts are only enough to keep ice build up from affecting evaporator efficiency otherwise they will waste energy, add to the heat load and disturb the room temperature control and air distribution.

9. MINIMIZE DOOR OPENINGS

Open or leaking doors waste energy.

Ensure doors are easy to operate and educate staff to keep door openings to an absolute minimum.

Keep strip curtains in good condition and consider investing in air curtains, vestibules or automatic door closing devices especially when freezer temperatures are involved.

10. CHECK INSULATION

Over time insulation deteriorates or becomes damaged. Poor insulation increases energy consumption as external heat is gained through small gaps in the walls, ceiling, doors and floor. Thermal imaging cameras can quickly identify areas that need attention.

Check and replace any faulty insulation on cold refrigerant pipes between the evaporator and compressor (especially on larger suction line pipes).

Also check that door seals etc. are not damaged allowing heat to leak in.

11. IMPROVE THE MAINTENANCE

Review maintenance schedules

•Regular cleaning of condenser coils/fins
•Check for icing up of evaporator coils
•Check refrigerant level -15% loss = 100% extra power
•Door seals/operation/insulation – 15% loss
•Use energy/throughput/temperature data
•Identify trends to spot maintenance issues

USEFUL FREE PUBLICATIONS AND GUIDES

Carbon Trust website:

GIL129 - Refrigeration Fact sheet

CTV002 - Refrigeration technology overview

GIL158 - How to get the best from your refrigeration system

Institute of Refrigeration website:

Guidance for end users

Appointing and Managing Refrigeration Contractors

Purchase of Efficient Refrigeration Plant

Operational Efficiency Improvements for Refrigeration Systems