Step three in a professional crop storage system

Cost-effective crop monitoring equipment to ensure the highest crop quality

Automatic fan controllers for energy efficient crop cooling and drying

Barn Owl Wireless Control and Monitoring System

From hand-held monitors to a web-based wireless monitoring and control system, we have a wide range of solutions to your crop monitoring and automatic fan control requirements.

Turn over to select the right one for you.
Professional Crop Monitoring

**Crop Monitoring**
This is critical to your business. The highest quality crops earn the highest price.

Crop monitoring gives early warning of possible quality problems with your grain and gives you the time to take action before the situation gets worse.

Crop monitoring shows whether drying and cooling has been effective and targets have been reached - which can save energy by avoiding unnecessary fan use.

**What to monitor**
Changes in temperature are the best indicator of grain quality, so temperature measurement is essential.

Ambient air humidity measurement will indicate the suitability of air for drying grain.

Testing for insect presence will confirm if monitoring and control has been effective.

**Temperature**
Safe long-term storage requires regular monitoring and control of crop temperature. Ideally, temperatures should reach 5°C to reduce the viability of disease, insects and moulds.

Measuring temperature shows if the cooling system is effective and gives early warning of problems - a rise in temperature can indicate insect activity.

**Humidity**
Knowing the humidity of the air that will be used for drying grain is essential to ensure that drying targets are reached as quickly and energy-efficiently as possible.

Damp air will not increase grain moisture, but it will reduce the efficiency of drying systems if damp air is allowed to enter the grain bulk.

**Insects**
If you monitor stored grain for insect activity corrective action can be taken and costly rejections avoided.

Low temperatures suppress insect breeding and prevent activity. Cooling below 15°C prevents saw-toothed grain beetles developing; below 10°C stops grain weevils; below 5°C prevents storage mite activity.

If you are storing grain for any period of time, it is important to understand the risk areas of grain temperature and grain moisture. As the graphic above shows, any grain that is not dry enough and cool enough will be at risk from insect infestation or fungal growth.

There is a safe storage zone (the hatched area on the graphic) which allows moist grain to be stored if it is cooled to about 5°C or very dry grain to be stored at temperatures up to 15°C.

The best option is to dry the grain to your target moisture and then cool it to as low a temperature as ambient conditions will allow.

**Why is it so important to monitor stored crops and control ventilation fans automatically?**

- Dry and cool quickly - avoid quality problems and extend storage life
- Improve crop quality - avoid rejections or deductions
- Easier store management - know when and where to use fans
- Save labour time and cost - speed up monitoring and avoid unnecessary trips to remote stores
- Reduce energy costs - only use fans when ambient air can do some good
- Be in control - so you can decide when to sell your grain

www.martinlishman.com
Minitemp Temperature Monitor

**Benefits**
- The simplest way to measure crop temperature and conform to quality assurance schemes
- Easy to use - just push into the grain and take a reading
- Fast response sensor - so several readings can be taken in a short time
- An inexpensive crop monitoring solution

**Disadvantages**
- Labour-intensive. Large stores can take a long time to monitor
- Readings must be written down and transcribed to records
- No link to fan control, so fans must be switched manually

Simple Multi-Sensor Crop Monitoring

Create a simple multi-sensor monitoring system using a Minitemp monitor, a Multi-sensor selector and up to 12 static crop sensors. The sensors connect by cable (any length) to the selector which can be conveniently located at ground level near to the store door.

**Benefits**
- Provides multiple temperature records quickly and ensures readings are always taken in the same place
- Saves time walking across the grain surface and makes it quicker to decide where to locate cooling fans
- A relatively inexpensive crop monitoring solution

**Disadvantages**
- Still quite labour-intensive.
- Readings must be written down and transcribed to records
- No link to fan control, so fans must be switched manually

Crop Temperature Monitoring in Bulk Stores

**When?**
Record the crop temperature readings once per week until the stored grain has been cooled to 5°C (which should be achievable by December); and then every two weeks thereafter.

**Where?**
Take one temperature reading for every 100 tons stored 3 to 5 m deep. Use an imaginary 6m x 6m grid over the grain surface and take a reading in the centre of each grid square. This helps to always take readings in the same place and shows actual changes rather than location differences. In deeper grain, take readings using a 10m x 10m grid.

If Pile-Dry Pedestals and Fans are used to ventilate grain, measure the temperature at the mid point between groups of 4 Pedestals since this is the last point to cool.

**How deep?**
Measure crop temperature within the top 1.5-2 m of grain depth. This is where any change in temperature will be seen.
It is important to regularly measure the air inside the grain store if you are ventilating with Pile-Dry Pedestals, or the outside air if you are blowing air in from the outside using underfloor ducts.

Measurements should be taken when fans are operating and at the beginning and end of each day when air temperatures can change quite rapidly.

If fans are used when the air is warmer than the grain, the grain temperature can increase again. This wastes energy and means the grain cannot hold more moisture, so is more effective at drying.

If ambient air is drier than the stored crop then it can dry it. If it is wetter than the crop then it will not cool it.

Do not be concerned if there is occasional rain or damp periods during the cooling period. It is quite difficult for this air to re-wet the grain.

To ensure drying targets are reached energy-efficiently, it is essential to know the humidity of the air that will be used for drying grain.

Damp air will not increase grain moisture, but can reduce drying system efficiency if it enters the grain.

If ambient air is drier than the stored crop then it can dry it. If it is wetter than the crop then it will not dry it.

The ability of air to dry grain depends on the relative humidity (RH) of the air and its temperature. Warm air can hold more moisture, so is more effective at drying.

The relationship between grain moisture content and the air RH varies with air temperature. The point at which grain can be dried by air of a particular RH and temperature is the equilibrium relative humidity. These points can be joined on a graph to give a guide to see if air of a particular RH can be used to dry grain.

This information is a guide only and is given more comprehensively in the HGCA Grain Storage Guide. Log on to www.hgca.com if you do not have a copy.
Automatic Fan Control

Comparing Manual and Automatic Fan Control

The consequences of cooling grain with manual fan control are shown clearly. In the 3 days highlighted the air temperature increased from A to B. The grain continued to cool for a while but then increased again from C to D. The result is the same grain temperature but 3 days of wasted energy.

Automatic control has ensured that when the air temperature increases from A to B the fans switch off until the air temperature drops below A again. During that time the grain temperature remained at C but continued to fall when the fans switched on again automatically. The result is 3 days of energy saved and the grain cooled more efficiently.

Case Study: Cutting the cost of grain cooling

Soaring energy prices have made grain drying and cooling expensive, but research has been undertaken which shows that using a Temperature Differential Controller can reduce cooling energy costs by up to 40%.

As part of the project, co-ordinated by HGCA, farms were surveyed to find out if grain cooling targets were being achieved. At Stewart Vernon’s farm in Darlington, the results of using a Martin Lishman Temperature Differential Controller installed in one grain store were compared with turning Pile-Dry Fans on and off manually.

The resulting grain temperatures were similar in both stores, but the savings in electricity costs in the automatically controlled store reached 40%.

As well as the benefit of energy savings, the comparison of management methods demonstrated the importance of being aware of air temperature in relation to grain temperature. In particular, the project proved that suitable cooling air can be available at all times of day, as well as at night.

Automatic Crop Cooling

Static Mounted Temperature Differential Controller

- Fast, energy-efficient crop cooling - saves up to 40% in energy costs
- Displays crop and ambient temperature
- Controls any quantity of single or 3 phase fans, including building extraction fans
- Includes 2m rigid crop temperature sensor and air temperature sensor, manual and frost stat override facilities

The Temperature Differential Controller automatically controls any type and quantity of fans to cool crops during ventilation. Sensors measure the air and crop temperature. If the crop temperature is 5°C more than the air temperature, the fans are switched on. This occurs only when the air can cool the grain, so cooling is faster and uses up to 40% less energy.

Benefits of Static Unit

- Can provide significant energy savings when cooling grain
- Easy to use - pre-programmed, but settings can be changed
- Can operate any quantity of single or 3 phase fans
- Relatively inexpensive components

Disadvantages

- Installation costs can outweigh the advantage of lower component cost (depending on existing set-up)
- No logging facility
- Controller is static, so cannot easily be moved when fans are moved

Installation of Static Temperature Differential Controller

The controller connects to the fan via an automatic starter. Multiple fans are controlled using additional starters fitted with a time delay. The location and arrangement of the components depends on the existing electrical set-up in the building. Some typical arrangements are shown below.

Items Supplied:

- The basic unit comprises the controller with temperature sensor display, air temperature sensor with 10m extension cable and 2m crop temperature sensor with 20m extension cable. Product Code: FC049/A
- Also available (with Product Codes):
  - 3m crop sensors (FC055)
  - Extension cables (FC046/length)
  - Automatic fan starters for: Pile-Dry F2/F3 1ph fan (FC006 c/w timer (FC007)
  - Pile-Dry F2/F3 3ph fan (FC008/9/A c/w timer (FC209, 9/4/A)
  - Starters for other fans available.

Portable Temperature Differential Controller

All the features of the static unit (above), plus:

- Fully portable, allowing controller to be moved around the store or between stores, according to where crop ventilation fans are being used
- Avoids extensive electrical installation work. Only requires a power supply suitable for the fans being controlled and appropriate fan extension cables
- Includes all fan power plugs and sockets and built-in heater connection sockets

The Portable Temperature Differential Controller solves the problem of sharing ventilating fans between crop stores on the same site or different sites, with just one controller. The portable controller can be easily moved between stores when the fans are re-located.

Benefits of Portable Unit

- Very simple and inexpensive to install
- Highly portable for use in different buildings
- Easy to use - pre-programmed, but settings can be changed
- Can provide significant energy savings when cooling grain

Disadvantages

- May require installation of a modern-style single or 3-phase 32 amp power supply socket
- Limited to automatic control of between 3 and 5 fans per controller, depending on fan current rating
- No logging facility

Installation of Portable Temperature Differential Controller

The controller requires connection to a 32 amp power supply. The fans are connected to the controller using suitable extension cables (see right).

Items Supplied:

- The unit comprises board mounted temperature differential controller with temperature display, 32amp power input socket, plugs, starters and timers and output sockets for fans, 1 x air temperature sensor with 10m extension lead, 1 x 2m crop temperature sensor with 20m extension lead. Product Code: FCBM + fan quantity + fan type
- Also available (with Product Codes):
  - 3m crop sensors (FC055)
  - Extension cables (FC046/length)

www.martinlishman.com
Automatic Crop Cooling with Monitoring

Static Temperature Differential Control with Monitoring

**Items required:**
- Static temperature differential controller c/w temperature sensor display, air temperature sensor & 10m extension cable, 2m crop temperature sensor & 20m extension cable.
- Code: FC048/A
- Multi-Sensor Selector
- Junction box with 12 crop sensor sockets & connecting lead to controller. A selector connects each sensor in turn to the controller & gives the sensor reading.
- Code: Multiswitchbox
- Additional Crop sensors: 2m (FC054), 3m (FC055)
- Additional Extension cables: (FC046/length)
- Automatic fan starters:
  - Pile-Dry F2/F3 1ph fan (FC006); c/w timer (FC007)
  - Pile-Dry F2/F3 3ph fan (FC008, 8/A); c/w timer (FC009, 9/A)
- Starters for other fans available.

Portable Temperature Differential Control with Monitoring

**Items required:**
- Portable temperature differential controller board-mounted unit c/w temperature sensor display, 32amp power input socket, plugs, starters, timers & output sockets for fans, air temperature sensor with 10m extension lead, 2m crop temperature sensor with 20m extension lead, built-in Multi-Sensor Selector with 12 crop sensor sockets.
- Product Codes: FCBM (fan quantity + fan type) & FCBMMS12
- Additional Crop sensors:
  - 2m (FC054), 3m (FC055)
- Additional Extension cables: (FC046/length)

Temperature Differential Control with StoreVent fan control

**Items required:**
- Depending on the StoreVent fan quantity and size, the additional automatic starting function can be provided either by installing additional separate automatic starters with the static or portable controller or by adding another built-in starter to the portable controller. Product Code: Please enquire.
Automatic Crop Cooling & Drying

Static Mounted Thermo-Humidistat Controller
- Simple automatic control of drying and cooling
- Displays ambient air temperature & relative humidity
- Includes air temperature and humidity sensors
- Controls any quantity and type of single or 3 phase fans, including building extraction fans
- Controls fans using pre-set limits
- Ideal for simple humidity control of drying fans

Benefits of Static Thermo-Humidistat Unit
- Simple fan control using air humidity & temperature
- Makes the best use of ambient air for drying and cooling
- Can operate any quantity of single or 3 phase fans

Disadvantages
- No logging facility
- No crop temperature measurement, so no differential control
- Controller is static, so cannot easily be moved when fans are re-located

Items Supplied:
The basic unit comprises the control panel with RH and temperature sensor display, setting adjustment pads, air temperature and humidity sensors. Accuracy: +/-0.2°C at 25°C, range: -10-70°C; +/-5%RH over 0-100% RH. Product Code: FC003

Also available (with Product Codes): Automatic fan starters for:
Pile-Dry F2/F3 1ph fan (FC006); c/w timer (FC007)
Pile-Dry F2/F3 3ph fan (FC008, 8/A); c/w timer (FC009, 9/A)
Starters for other low volume fans available. Starters for large underfloor fans may require specification by a local electrician.

The Thermo-Humidistat Controller controls fans so that only air good enough to cool or dry the crop is used for ventilation. Sensors monitor ambient relative humidity and temperature and automatically start the fans if conditions fall below pre-set limits. The controller connects to the fan via an automatic starter. Multiple fans are controlled using additional starters fitted with a time delay. The location of the components will depend on the existing electrical set-up in the building.

Benefits of Static Barn Owl Unit
- Comprehensive automatic control of drying and cooling
- Eight pre-set control programmes, including 3 drying programmes & temperature differential control
- Includes displays of crop temperature, ambient air temperature & relative humidity
- Available in single or dual channel, individual or multi-fan versions to control any quantity & type of single or 3 phase fans, including building extraction fans

Disadvantages
- No logging facility
- Controller is static, so cannot easily be moved when fans are re-located

Items Supplied:
The basic unit comprises the controller with RH and temperature sensor display, air temperature sensor with 10m extension cable and 2m crop temperature sensor with 20m extension cable. Fans can be switched using pre-set programs to off, manual or 2 cooling and 4 drying automatic modes. Accuracy: +/-3%RH over 0-90% RH, +/-5% above 90%; +/-0.5°C over 0 - 70°C, full range: -55° to 125°C. Product Codes: BARNOWLCONTSA (single channel) BARNOWLCONTSD (dual channel)

Also available (with Product Codes):
3m crop sensors (FC055)
Extension cables (FC046/length)
Automatic fan starters for:
Pile-Dry F2/F3 1ph fan (FC006); c/w timer (FC007)
Pile-Dry F2/F3 3ph fan (FC008, 8/A); c/w timer (FC009, 9/A)
Starters for other low volume fans available. Starters for large underfloor fans may require specification by a local electrician.

The Barn Owl Controller uses ambient humidity & temperature and crop temperature sensors to control crop drying & cooling with any type and quantity of crop store fans. Programmes include temperature differential, humidistat control & 3 drying options. The Dual version controls more than one fan using two different control programs giving independent control of fans in different parts of the store.

Static Mounted Barn Owl Temperature & Humidity Fan Controller

Which Automatic Fan Controller to Use

Temperature Differential Control
Temperature Differential Control achieves high quality grain and safe, long-term storage. Even if your grain has been through a drier, it is essential to cool it afterwards quickly and efficiently with temperature differential control to avoid insect infestation.

You can store fairly wet grain for quite long periods providing it is cool, fresh and well ventilated. Spoilage due to moulds and insects will occur very quickly in warm grain.

Thermo-Humidistat
Drying grain using ambient air can be quicker and more likely to succeed using Thermo-Humidistat control.

Measuring grain moisture and using pre-set humidity limits on the controller ensures that ventilation fans don’t draw damp air into the grain and are only used to dry the grain. Remember that ambient air cannot be guaranteed to dry grain and the speed of drying will vary according to ambient conditions.

Barn Owl
This controller combines the benefits of our controllers in one unit, and includes 3 drying programmes. These take the guess-work out of drying grain with ambient air. Each option allows only air of appropriate humidity to ventilate the grain.

Since the controller also includes crop temperature measurement, the control can revert to temperature differential control after drying has been completed.
**Portable Thermo-Humidistat Controller**

All the features of the static mounted unit, plus:

- Fully portable, allowing controller to be moved around the store or between stores, according to where crop ventilation fans are being used
- Avoids extensive electrical installation work. Only requires a power supply suitable for the fans being controlled and appropriate fan extension cables
- Includes all fan power plugs & sockets and built-in heater connection sockets

The Portable Thermo-Humidistat Controller solves the problem of sharing ventilating fans between crop stores on the same site or different sites, with just one controller. The portable controller can be easily moved between stores when the fans are re-located.

* for use with F2 Pile-Dry Fans

**Benefits of Portable Unit**

- Simple fan control using air humidity & temperature
- Very simple and inexpensive to install
- Highly portable for use in different buildings
- A more efficient way to dry and cool grain

**Disadvantages**

- May require installation of a modern-style single or 3-phase 32 amp power supply socket
- Limited to automatic control of between 3 and 5 fans per controller, depending on fan current rating
- No logging facility or temperature differential control

**Items Supplied:**

Board mounted thermo-humidistat controller with temperature display and RH display, 32amp power input socket, plugs, starters and timers and output sockets for fans, 1 x air temperature sensor, 1 x air RH sensor

Product Code: FCBM/TH + fan quantity + fan type

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**Portable Barn Owl Temperature & Humidity Controller**

All the features of the static mounted unit, plus:

- Fully portable, allowing controller to be moved around the store or between stores, according to where crop ventilation fans are being used
- Avoids extensive electrical installation work. Only requires a power supply suitable for the fans being controlled and appropriate fan extension cables
- Includes all fan power plugs & sockets and built-in heater connection sockets

The Portable Barn Owl Temperature & Humidity Controller solves the problem of sharing ventilating fans between crop stores on the same site or different sites, with just one controller. The portable controller can be easily moved between stores when the fans are re-located.

* for use with F2 Pile-Dry Fans

**Benefits of Portable Unit**

- Drying and cooling programmes all in one controller
- Very simple and inexpensive to install
- Highly portable for use in different buildings
- A very efficient way to dry and cool grain

**Disadvantages**

- May require installation of a modern-style single or 3-phase 32 amp power supply socket
- Limited to automatic control of between 3 and 5 fans per controller, depending on fan current rating
- No logging facility

**Items Supplied:**

Board mounted barn owl controller with temperature display and RH display, 32amp power input socket, plugs, starters and timers and output sockets for fans, 1 x air temperature and RH sensor with 10m extension lead, 1 x 2m crop temperature sensor with 20m extension lead

Product Code: FCBM/BO + fan quantity + fan type

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**Installation of Portable Thermo-Humidistat Controller**

The controller simply needs connecting to a 32 amp power supply. The fans are connected to the controller using suitable extension cables, as shown:

32Amp wall socket

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**Installation of Portable Barn Owl Temperature & Humidity Controller**

The controller simply needs connecting to a 32 amp power supply. The fans are connected to the controller using suitable extension cables, as shown:

32Amp wall socket

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**Extension leads across surface of grain to fan located on Pedestal**

**Extension cables to air and crop sensors**

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Professional Crop Storage Systems
Wireless Automatic Crop Cooling, Drying & Monitoring

Barn Owl Wireless
Wireless and Remote Crop Monitoring and Automatic Fan Control with Data Storage and Management

The most advanced automatic fan control and crop monitoring system available

Why Choose a Wireless System?

- No data or sensor cables
- No manual crop temperature measurement
- No driving to remote stores to switch fans on and record temperatures
- Verifiable quality assurance records easily accessible whenever required
- Read-only online data access for storage customers
- No computer software installation
- Modular system with no limit to the quantity of sensors or controllers
- Remote locations managed from the same webpage
- All fans controlled independently

10 Simple Steps to Comprehensive Crop Store Management

1. Crop sensors with radio transmitters
2. Temperature data transmitted
3. Data collected by Gateway
4. Data transmitted using mobile phone technology
5. Data reaches Barn Owl webpage showing all stored data
6. User accesses Barn Owl webpage and views data
7. User selects fan control options on the Barn Owl webpage
8. System transmits control options to Gateway
9. Gateway initiates automatic fan controller
10. Fans controlled automatically by the system

www.martinlishman.com
Wireless Automatic Crop Cooling, Drying & Monitoring

Barn Owl Wireless can be configured for all types of under-floor ducts:
To give grain temperature updates and control the fans required for further cooling or drying

Every time you log on to Barn Owl Wireless:
Get live colour-coded grain temperature updates from your Pedestal store, identify which areas need further cooling or drying and select the fans required

Wireless Automatic Fan Controllers
Using Barn Owl Wireless the user can select from different automatic drying and cooling control programs and specify individually how each fan is to be controlled. Manual operation is also possible. Fan overload warnings are displayed automatically on the webpage.

Wireless automatic fan controllers are available as either static or portable units for independent control of up to six fans. Larger quantities of fans can be controlled by more controllers or additional automatic starters.

Ambient temperature and RH sensors can also be supplied built in to controllers rather than stand-alone.

Static Wireless Controllers
Static controllers are ideal for connection to StoreVent building air extraction fans, large crop drying fans, fan control panels or other static fan installations. An automatic starter is required for each fan being controlled.

Portable Wireless Controllers
Portable controllers are ideal for use with portable Pile-Dry Pedestal Fans. The portable board mounted unit comes complete with all plugs, sockets and automatic starters for control of up to 5 single or 3 phase fans, thus avoiding extensive electrical installation work. All that is required is connection to a 32 amp power supply socket.

Wireless Monitoring Components

Wireless Gateway
The Gateway should be located in the highest point of the store or a high point on the storage site. It is a gsm-internet link to handle all sensors and controllers in one location. If there is more than one building on the site a wireless Bridge unit will be needed for each building. This will enhance sensor data transfer between them. The Gateway and the Bridge require a 240v power supply.

Wireless Sensors

Crop Temperature Sensors
Battery powered radio transmitter unit attached to a 2m rigid crop sensor, normally placed at the mid-point between groups of 4 Pedestals (the last point to be cooled). Extra sensors can be added for closer spacing. Wireless crop sensors can also be read using the hand-held Martin Lishman Minitemp temperature monitor.

Ambient Temperature Sensors
Ambient sensors provide the air temperature readings which are compared with the crop readings for temperature differential control.

For drying control a combined ambient RH and temperature sensor would be located where average air conditions inside the building can be measured.

Both these sensors would require connection to a 240v power supply.

Professional Crop Storage Systems
**Professional Crop Storage Systems**

*Four steps to improving your crop storage*

1. **Pile-Dry Pedestals & Fans**
   - *The highest grain quality with the fastest cooling system*
   - *The only low volume system able to dry grain*
   - *Backed by research and 40 years experience*
     - see the Martin Lishman Pile-Dry Pedestals and Fans brochure for further details.

2. **StoreVent** Crop Store Air Extraction System
   - *Building ventilation to maximise the efficiency of all crop cooling and drying systems - ensures sufficient air exchange to maintain cool, fresh air in the crop store at all times.*
   - *Can be linked to Martin Lishman automatic fan controllers.*
     - see the Martin Lishman StoreVent brochure for further details.

3. **Automatic Fan Control & Crop Monitoring**
   - *Portable and Static Automatic fan controllers for energy efficient crop cooling and drying*
   - *Cost effective crop monitoring equipment to ensure the highest crop quality*

4. **Trouble-Dry Hot Spot Spears & Fans**
   - *Portable and economic cooling - a simple solution to a common problem*
   - *An emergency solution to hot spots where Pile-Dry Pedestals are not in use*
     - see the Martin Lishman Trouble-Dry brochure for further details.

**SPECIFICATIONS**

Martin Lishman control and monitoring systems are available to suit different storage situations. Talk to your local dealer or contact Martin Lishman to discuss the best system to meet your requirements.

Martin Lishman monitoring and control systems are produced and distributed nationally and internationally exclusively by Martin Lishman Ltd. We reserve the right to alter product specifications at any time without notice.

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