



Airius Destratification Ceiling Fans

Airius Europe Ltd is an air circulation specialist focusing on the process known as thermal destratification through the use of our patented thermal destratification ceiling fans.

The Airius destratification method offers substantial annual energy savings on heating and cooling costs by maximizing the performance of existing HVAC systems and equipment.



Thermal Destratification

Thermal destratification is the equalisation of the air temperature throughout a building or enclosed space via our quiet economic directional ceiling fans. The significance of this is that Airius destratification fans prevent all the hot air in a room, factory or warehouse naturally rising to the ceiling and all the cold air sinking to the most important area i.e. the floor.

The benefits of destratification are clear:

- Between 20% 50% reduction of heating bills
- More comfortable working environment
- Works alongside existing HVAC systems
- Significantly reduced cooling bills
- Minimal running costs
- Lowered carbon footprint
- Simple to install
- Rapid ROI average 12 24 months
- Utilizes heat from internal manufacturing processes, internal lighting and heat generated by the sun striking external parts of a building.
- No HVAC ducting is required Airius fans move air more efficiently and more economically and at a fraction
 of the cost.
- Reduced wear and tear on existing HVAC equipment.
- Reduced internal condensation

Suitable for any building with ceiling heights from 2.5m to 31m, Airius destratification fans will successfully save energy and control temperature in many applications including factories, warehouses, offices, supermarkets, showrooms, schools, leisure centres, greenhouses and aircraft hangers. Airius has a destratification ceiling fan that will suit your facility whether it be a commercial, industrial or retail facility.

Our Address



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Free Hanging Airius Destratification Ceiling Fans

The free hanging Airius destratification system is an extremely efficient jet fan that is suspended just below ceiling height. Each ceiling fan takes in the hot ceiling air and transports it to the floor in a slow moving column of air to create a better working environment and reduce total energy consumption.

Each free hanging Airius destratification ceiling fan is capable of equalising between 65 and 220 square meters of floor area.

Airius destratification fans can blow air at any angle without the need of ducting. The bracket attached to the top of the Airius unit can be adjusted to blow warm air directly off mezzanine floors or from areas when there is a concentration of heat to areas where heat is needed.



Free Hanging Model blowing warm air at an angle – look no ducting!!!!

Ideal applications for the Airius Free Hanging units include:

- Factories
- Warehouses
- Greenhouses
- Theatres
- Meeting rooms
- Exhibition halls
- Leisure centres
- Multiples

- Supermarkets
- Sports halls
- Retail outlets
- Show rooms
- Hospitals
- Libraries
- Prison facilities
- Aircraft hangers

Height	Diameter	Weight	Watts	Volts	Coverage	Ceiling Height
22 ins / 560mm	13 ins / 330mm	9 lbs / 4.1 kg	13 - 15	230	65-90m ²	Up to 3.5m
16 ins / 410mm	13 ins / 330mm	7 lbs / 3.2 kg	13 - 15	230	65-90m ²	Up to 3.5m
22 ins / 560mm	13 ins / 330mm	9 lbs / 4.1 kg	15 - 17	230	65-90m ²	Up to 5.5m
22 ins / 560mm	13 ins / 330mm	9 lbs / 4.1 kg	30 - 35	230	65-90m ²	Up to 8.5m
24 ins / 610mm	15 ins / 380mm	14 lbs / 6.4 kg	42 - 45	230	90-135m ²	Up to 14m
32 ins / 813mm	18.25 ins / 464mm	22 lbs / 10 kg	125 - 150	230	125-175m ²	Up to 18m
33.25 ins / 845mm	19.5 ins / 495mm	32 lbs / 14.5kg	390	230	140-220m ²	Up to 31m
	Height 22 ins / 560mm 16 ins / 410mm 22 ins / 560mm 22 ins / 560mm 24 ins / 610mm 32 ins / 813mm 33.25 ins / 845mm	Height Diameter 22 ins / 560mm 13 ins / 330mm 16 ins / 410mm 13 ins / 330mm 22 ins / 560mm 13 ins / 330mm 22 ins / 560mm 13 ins / 330mm 22 ins / 560mm 13 ins / 330mm 24 ins / 610mm 15 ins / 380mm 32 ins / 813mm 18.25 ins / 464mm 33.25 ins / 845mm 19.5 ins / 495mm	Height Diameter Weight 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 16 ins / 410mm 13 ins / 330mm 7 lbs / 3.2 kg 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 24 ins / 610mm 15 ins / 380mm 14 lbs / 6.4 kg 32 ins / 813mm 18.25 ins / 464mm 22 lbs / 10 kg 33.25 ins / 845mm 19.5 ins / 495mm 32 lbs / 14.5kg	Height Diameter Weight Watts 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 13 - 15 16 ins / 410mm 13 ins / 330mm 7 lbs / 3.2 kg 13 - 15 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 15 - 17 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 30 - 35 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 30 - 35 24 ins / 610mm 15 ins / 380mm 14 lbs / 6.4 kg 42 - 45 32 ins / 813mm 18.25 ins / 464mm 22 lbs / 10 kg 125 - 150 33.25 ins / 845mm 19.5 ins / 495mm 32 lbs / 14.5kg 390	Height Diameter Weight Watts Volts 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 13 - 15 230 16 ins / 410mm 13 ins / 330mm 7 lbs / 3.2 kg 13 - 15 230 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 15 - 17 230 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 30 - 35 230 22 ins / 560mm 13 ins / 330mm 9 lbs / 4.1 kg 30 - 35 230 24 ins / 610mm 15 ins / 380mm 14 lbs / 6.4 kg 42 - 45 230 32 ins / 813mm 18.25 ins / 464mm 22 lbs / 10 kg 125 - 150 230 33.25 ins / 845mm 19.5 ins / 495mm 32 lbs / 14.5kg 390 230	HeightDiameterWeightWattsVoltsCoverage22 ins / 560mm13 ins / 330mm9 lbs / 4.1 kg13 - 1523065-90m²16 ins / 410mm13 ins / 330mm7 lbs / 3.2 kg13 - 1523065-90m²22 ins / 560mm13 ins / 330mm9 lbs / 4.1 kg15 - 1723065-90m²22 ins / 560mm13 ins / 330mm9 lbs / 4.1 kg30 - 3523065-90m²22 ins / 560mm13 ins / 330mm9 lbs / 4.1 kg30 - 3523065-90m²24 ins / 610mm15 ins / 380mm14 lbs / 6.4 kg42 - 4523090-135m²32 ins / 813mm18.25 ins / 464mm22 lbs / 10 kg125 - 150230125-175m²33.25 ins / 845mm19.5 ins / 495mm32 lbs / 14.5kg390230140-220m²

*The square meter and ceiling height figures quoted are for guidance only.



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Suspended Airius Destratification Ceiling Fans

The Airius suspended ceiling fans accommodate ceiling heights from 2.5 to 11 meters and are adaptable to changing floor plans. Further models are planned.

The Airius product is easy to install and very power efficient, using single phase power that requires between 13 and 76 watts depending upon the model.

Typically the Airius suspended destratification ceiling fan is used in an office or retail environment and is designed to capture wasted heat before it escapes into the void above the ceiling. This gives the benefit of warming at floor level and evenly distributing warm or cool air from existing HVAC systems evenly throughout the interior area to improve the working environment. The Airius suspended destratification ceiling fan is ultra quiet so as to avoid any additional noise pollution in the work/retail space.





The Airius Suspended Ceiling Unit



Ideal applications for Airius Suspended Ceiling units include:

- Offices
- Retail environments
- Multiples

- Showrooms
- Hospitals
- Libraries



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Save energy, increase profits...at no cost?!

We at Airius know that operating in the current financial climate is growing ever more difficult. We are all under intense pressure to reduce our energy costs and reduce our Carbon Footprint whilst being told to conserve precious capital and increase profits. ... quite a trick at the best of times!

In response to what might appear to be an impossible situation Airius Europe Ltd are pleased to announce the launch of the all new Airius Ness Share™ Complete Service Package.

Airius Europe Ltd has partnered with NESS (National Energy Subscription Service); specialists in subscription packages in the energy market.

Airius are now able to offer customers the ideal way to benefit from reduced energy costs, reduced carbon emissions and a vastly improved internal environment without any capital costs whatsoever.

The **Airius Ness Share™ Complete Service Package** is highly relevant in today's energy market, as no capital is required to make immediate savings and new technologies can be quickly implemented to cut energy waste.

Airius Ness Share[™] Complete Service Package is the zero cost managed service for improved energy efficiency.

The Airius Ness Share[™] Complete Service Package includes:

- The supply of all the Airius systems required
- Full installation
- Ongoing Maintenance
- Annual energy audit/Energy Monitoring and equipment inspection
- Guaranteed energy savings

Customer Benefits:

- No Cash/Capital required
- Immediate reduction in operating costs
- Zero financial risk
- Guaranteed energy cost reduction

For more information go to: <u>www.airius.co.uk</u>, email us at: airflow@airius.co.uk, or call on: 01202 554200





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Client List

Airius have sold over 45000 destratification fans into all types of buildings from offices, retail stores, warehouses, factories, leisure centres, sports halls, schools, churches to aircraft hangers. Any building that uses HVAC systems needs Airius destratification fans to improve warm/cold air circulation and save energy. For a full UK customer list please refer to our website at www.airius.co.uk.





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Customer Testimonials - For a full list of our testimonials please refer to our website at www.airius.co.uk.

C Brewers & Sons Ltd - Eastbourne - East Sussex - UK

"I confirm my order for a further 4 x model 25's for use in our Tonbridge branch. The staff in Folkstone are very happy with the performance of the units there, the thermostat has been turned down way beyond the point that I thought was humanly possible! I will put pen to paper and write a letter as a satisfied customer."

Nick Brewer - Director.

Traidcraft PLC - Gateshead - Tyne & Wear - UK

"In September 2008 we installed nine Airius destratification fans in our distribution department. At the same time we also installed two high efficiency space heaters as replacements for existing heaters. Prior to these changes, in winter the difference between temperatures at floor level and roof level was approximately 5/6 degrees C. The difference now is approximately 1/2 degrees C and this has resulted in a reduction of approximately 25% in our gas consumption between October `07 to March `08 and October `08 to March `09. As you can imagine we are very pleased with the outcome."

Martin Kelly - Facilities Manager

Tiso Ltd – Edinburgh - UK

"Our Edinburgh Outdoor Experience store has a single floor store layout opening out into high roofed area with a ground floor café and gallery sales area; this open space had two issues; the gallery space being too hot during the summer months whilst the ground floor café was too cold for customers during the winter months. We originally controlled the temperature with large AC units but the result was never satisfactory at either level. We installed 5 Airius destratification fans moving air from the high level on the gallery and pushing it down to the ground floor level, this brought the temperature on the gallery down to a comfortable level during the summer and resolved the cold customer issue in the café throughout the winter. The Airius system was installed during the summer whilst the AC system was closed down for servicing and we were happy to find the environment now comfortable without the AC running. We were interested in the destratification effect during the winter months, as part of some trials we shut down the AC heating system and tested several thermostatically controlled wall heaters and found the temperature across both levels more than satisfactory with the temperature well balanced. This has now led to the entire AC system being decommissioned with a considerable reduction in electricity consumption. We now consider destratification systems as a key part of our refits and store design for new openings, this helps us achieve improved customer comfort, operating efficiency and contributes towards reducing our carbon emissions."

lain Calder - Property Director

Turbomeca Ltd – Fareham – Hampshire – UK

"Further to our telephone call I can confirm that we are very pleased with the 2 installations of Airius fan units. *Installation 1: Installation of three Airius fans (Model 35) in main workshop area in November 2008. We have quantified our savings based on last year gas bill and have saved approx £500.00 on the quarterly bill. *Installation 2: Installation of two Airius fans (Model 15) in new canteen area. Units have only been running approx 3 weeks and we hope to generate similar savings. As discussed earlier I am more than happy to show the installations to any new customers."

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Site Services Manager - Turbomeca UK Limited



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British Waterways - Tamworth - Staffordshire - UK

"In regards to the Airius units fitted, they have proved a great success by balancing the heat profiles in the large office area's, particularly with the top floor, where the ceilings are very high. The complaints of cold spots have ceased. It has allowed the cut off temperatures to be controlled at a reduced level and may allow a further reduction still for the next heating season. As mentioned, we had an audit by Carbon Trust and whilst the electric heating we have at Fazeley was not classed as efficient, the surveyor carrying out the audit acknowledged we had taken as many practical steps as were possible by the use of startup controls, temperature control and the Airius units to make the best use of the heat the system produced. It is envisaged we will be installing further units where we know we have a need to bring the warm air back down from the high ceilings for the benefit of those sat at floor level!! I am still investigating the electricity use savings, but this will have to be done by unit consumption, rather than cost with the increases we have all sustained in electricity prices, it is difficult to determine by cost. I'll keep you advised of the outcome."

Nigel.D.Joyce MCIOB Dip.HI Senior Building Surveyor, British Waterways, West Midlands Waterway

Newmarket Motors Co. - Cork - Ireland

We surveyed the VW Showroom as the owner had expressed that he was having problems with the uneven temperatures between the upstairs offices and downstairs offices and showroom. Staff upstairs were too hot and the staff downstairs were working with their coats on at times. The Showroom has 3 sides of Glass, floor to roof. They have 4 A/c units with the temperature set at between 30 - 330 with 4 blowers on to maximum. We recommended that 3 Airius Model 25 units be fitted throughout the showroom, directly facing the floor and away from Air Conditioning Units. These have since been fitted and we are awaiting the Electricity bills to show definite reductions. In the meantime, the temperature on the A/C units have been reset at between $18 - 22^{\circ}c$ with the 4 blowers on the low setting and 2 of these are turned off intermittently for approx 2 - 4 hours per day. Staff on both floors commented on the lovely comfortable heat in comparison to before these were fitted. These have been monitored during cold spell of weather that we are experiencing at the moment."

Sean Browne - Director

Dempsey Dyer Ltd - Pontefract - West Yorkshire - UK

"We installed an Airius Destratification System in our PVC Window Manufacturing Unit over 12 months ago. The unit has 6m eaves with a ground floor area of 12500 ft2. Prior to its installation the gas powered space heaters were running throughout the working day in the winter months to maintain the air temperatures required by the production unit. Ground Floor Temperatures were cool but temperatures at mezzanine level to which the warm air had risen were warm. Hence the continuing output requirement from the heaters. In the period following the installation, the air temperature zones were reversed with warm ground floor temperatures and cool mezzanine level temperatures. The heaters therefore were running less frequently as they are linked to a thermostat 2m from ground level. The result is lower heating consumption, a warmer working environment and a happier workforce. The Airius system does what it says on the tin!"

Tom Dyer - Director - Dempsey Dyer Ltd.

Timberline Gardens - Colorado - USA

"The AIRIUS System reduced our energy costs by 26% and paid for itself in one winter season. The units increased the air circulation throughout the planting benches, eliminated non-productive cold corners and increased our winter plant growth. As you predicted, our concrete floors and walkways became a heat storage bank, supplying free heat during the night. As a result of installing your system, the consistent temperature increased our winter plant growth in ways we had never seen before. Calla Lilies bloomed 25% more than in previous winter months and our philodendron showed exceptional growth.... The AIRIUS System helped us grow healthier plants. We've now installed the system throughout our greenhouses...."

Kelly Grummons - Chief Horticulturalist.



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Case Study Morrisons Knottingly - Wakefield

Mitton Mechanical approached Airius to conduct a trial in the Morrisons Knottingly store in 2007. The trial was hugely successful and over 100 stores have now been retrofitted with Airius units.

Morrisons Supermarket

- Knottingly Store

Morrisons, the fourth largest supermarket chain in the UK, are always looking for ways to reduce their energy costs and carbon footprint and ways to increase customer comfort.



Supermarket operators and their HVAC consultants have been trying to resolve the age old problem of cold chiller aisles and uncomfortably warm clothing aisles for many years. Costly and

inefficient ducting systems, under cabinet heaters and heat retrieval systems have failed to solve the problem to date.

Mitton Mechanical, a Morrisons contractor, approached Airius in late 2007 to conduct a trial in the Morrisons Knottingly store in Wakefield. Airius units were placed at 4 metre intervals in three chiller aisles in the hope of reducing the stratification from 6-8°c to 1-2°c thus making the chiller aisles more comfortable (without adversely affecting the chiller units). More comfortable chiller aisle should increase the aisle spend as less shoppers rush through a cold area. A side benefit is to eliminate freezer/Cabinet "fogging".

The trial was hugely successful and over 100 Morrisons stores have now been retrofitted with the Airius units. The Airius units are now on the standard specification list for all new stores and will be retro-fitted as part of the normal refurbishment program.

Morrisons, and Mitton Mechanical, are a pleasure to work with. Their eagerness to reduce energy consumption and increase the comfort levels for customers puts them at the very top of the Green supermarket list. Morrisons (and the Co-op) walk the walk whilst many other supermarket operators' chains simply talk.....

Morrisons are now 1 of only 12 companies, and the only supermarket in the UK to be awarded the prestigious Carbon Trust Standard for making real reductions in their carbon emissions and energy usage.







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Case Study Impress Metal Packaging Ltd

Impress installed 34 Airius number 35 fan units into their factory to save on heating costs and their investment was repaid 3 times over in the first winter they were installed.

IMPRESS GROUP - AIRIUS TRIAL RESULTS

Trial based on an area of approximately 3,000m² and a spend of £21,268 (the cost of installing 34 Airius units at their Norwich (UK) factory)

Copy of e-mail received from Paul Mattin, Plant Engineer, Impress Group BV:

From: Paul.MATTIN@uk.imp-group.com [mailto:Paul.MATTIN@uk.imp-group.com] Sent: 26 August 2009 13:54 To: gbridges@airius.co.uk Subject: Report

Hello Guy,

Please find attached report. I have already forwarded the findings to our environment manager and I have also spoken to two other plants in Germany and France.

Regards,

Paul Mattin Plant Engineer



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Trial Data and Analysis:

	Qty Ltrs	Cost £	
Aug-07	0	0	
Sep-07	0	0	
Oct-07	17000	7080	
Nov-07	17000	7242	
Dec-07	33999	16302	
Jan-08	33999	16591	
Feb-08	44104	27054	
Mar-08	50999	25595	
Apr-08	17000	9239	
May-08	34000	19291	
Jun-08	17000	9943	
Jul-08	0	0	
Aug-08	0	0	
Sep-08	0	0	
Oct-08	0	0	
Nov-08	17000	9348	
Dec-08	34000	17126	
Jan-09	34000	15535	
Feb-09	34000	15212	
Mar-09	34214	14196	
Apr-09	17069	6706	
May-09	13687	5714	



ANALYSIS OF DATA:

Oil prices dropped by an average of 9.5% in 08/09 compared to the previous winter period 07/08. This will enhance the actual savings The mean temperature for East Anglia during winter 07/08 was 5.7°

The mean temperature for East Anglia during winter 08/09 was much cooler at 3.4°

The heating system thermostats are set to 16°, resulting in an increase in the requirement for heating in East Anglia of 22%

This analysis excludes the purchase and installalation costs of £21,268 in the first year

	Litres	Cost £		
Winter 07/08 (pre-fans) total oil usage =	265,101	138,337		
Winter 08/09 (post-fans) total oil usage =	183,970	83,837		
Actual reduction in Oil use and savings, winter 08/09 =	81,131	54,500		
Restated savings, taking account of lower Oil price 08/09 =				
Restated Oil use and savings, taking account of lower mean temperature 08/09				
= 265101+22% = 323423, -183970 =				
The cost of electric to run the fans is £793 per winter season £63144, -£793 =				

The overall savings taking into account lower temperatures and prices in winter 08/09 = 45.07% The full cost of the Airius units is re-couped within a matter of months - first winter savings of £62.251 measured against a total spend of £21.268

For more information on the Airius range visit: www.airius.co.uk or call: (44) 1202 554200



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07/08. This will enhance the actual savings

139,453

49,322

63,144 62,351

£62,351





Case Study Pharmaceutical Warehouse

Airius destratification fans were supplied to a major pharmaceutical manufacturer to be installed into their large warehouse where drugs have to be stored within critical temperature parameters.

Thermal Imagery of Controlled Temp Warehouse

The accompanying thermal images were developed from the temperature controlled warehouse of a major pharmaceutical company. The company's new 50,000 sq ft warehouse facility in Louisville, KY did not pass the Food and Drug Administration's required Temperature Validation Tests with the originally designed HVAC system.

As can be seen in the 'Base Case' image without AIRIUS® fans, the top levels of the pallet racking were exposed to 73°F air, too high a temperature for the inventory.

This was a major problem, the facility was due to open and the space was badly needed. The HVAC contractor had tried everything they could think of and had no answers for the problem short of starting over with a re-designed system.

A senior facility engineer had been told of the AIRIUS Thermal Equalizers® by an AIRIUS sale agent and suggested the use of them for this application. The HVAC Contractor was very skeptical that the devices could raise the cold air levels and maintain them. AIRIUS personnel were called in to review the situation and it was determined for this large application that 50 AIRIUS Model 25-120V Thermal Equalizers® would be required and were air freighted at the customer's request within 2 days.

The facility quickly agreed and the installation was a success. In spite of the fact that the Thermal Equalizers were originally developed to de-stratify heated air, and the fact that cold air naturally sinks, it can be seen by comparing the 'Base Case' image to the 'Base Case With 50 AIRIUS Fans Installed' image that the use of the AIRIUS fans has balanced the level of cooler air in the room to the point where the upper rack levels are no longer in jeopardy – Thermal Equalization!

The elevation graphic shows a complete equalization of temperature around the pallet racks supporting literally billions of dollars of inventory from floor to ceiling meeting FDA regulations and approval.

This AIRIUS installation allowed the warehouse to pass FDA Validation Testing and helps ensure the safety of the products for the manufacturer and the consumer. It has been reported to Ray Avedon of AIRIUS, LLC that the temperature variance from the bottom of the 18' racks to the top with the fans running over the last year is only $\frac{1}{2}$ to 1°F

This case is a graphic example of how the AIRIUS Thermal Equalizers can work in air conditioned environments as well as heated environments and testifies as to how well they truly do equalize nearly 100% of the air temperature in a given space.

The results of this original installation; AIRIUS is now specified in the next two warehouse projects, one in 2007 and another in 2008, for this same pharmaceutical company.

Our Address

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Case Study Pharmaceutical Warehouse

Airius destratification fans were supplied to a major pharmaceutical manufacturer to be installed into their large warehouse where drugs have to be stored within critical temperature parameters.

Base Case – Summer at 95° F outside temperature

Close-up of vertical temperature plane through the middle of the product pallets.



Base Case – Summer at 95°F outside temperature With 50 Airius Fans



Close-up of temperature plane through middle of pallets in path of fan air flow.



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Report

www.bsria.co.uk

Testing and CFD Study of Airius Destratification Fans

Report 50454/1 February 2007

Carried out for: Airius Europe Ltd

57 Wimborne Road Bournemouth Dorset BH3 7AL

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To download a copy of the BSRIA report please visit the Airius website at www.airius.co.uk, or alternatively you can view the report on the BSRIA website at http://www.bsria.co.uk/services/testing/certificates/list-by-company/airius-europe/

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1 INTRODUCTION

Airius Europe distributes a range of novel destratification fans. These fans are thought to be unique in that the fan is enclosed in a casing, which incorporates guide vanes and a nozzle so that the air is thrown in a narrower jet.

This report presents the results of tests carried out on the model 10 and model 25 fan as well as computer simulations of the fans in operation.

The test work firstly involved measuring the flowrate through the fans, so that these could be accurately set in the CFD models. The flowrates were measured in accordance with ISO 5801, in a Type A configuration (free inlet and outlet).

The jet of air from the fans were then measured to ensure the throw from the fans was correctly represented in the CFD simulations. These measurements are beneficial since the geometry of the nozzle and the presence or absence of swirl can influence the jet spread.

© BSRIA Report 50454/1



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2 AIR JET MEASUREMENTS

2.1 TEST METHOD

The jet of air created by the model 10 and model 25 destratification fans were measured using hot wire anemometry. Close to the fan discharge where airspeeds were highest, a vane anemometer was used since these speeds exceeded the range of suitability of the hot wire anemometers.

The tests were conducted under approximately isothermal conditions and the fans were tested in a horizontal position. Eleven anemometers were attached along a vertical pole. A grid of points (9x10) was marked out on the floor, covering an area of $1.2 \times 4.2 \text{ m}$. The pole of anemometers was then moved from grid point to grid point and all eleven readings were taken at each pole location. This gave a total of 990 air speed measurements (9x10x11). Both fans were tested in this manner.

In order to check the CFD code can correctly predict the spread of the jet, comparisons were made between the measured air speeds and isothermal CFD calculations. Figure 4 shows a comparison of air speeds using colour coded planes through the axis of the jet. The left side show the experimental measurements (grid points are marked on the floor), the right side shows the CFD calculations. A very close correspondence is seen.



Figure 1 Measured airspeeds (left) and calculated air speeds (right) for model 10 fan





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3 CFD MODEL SETUP

The flovent CFD code was used to simulate airflows and temperatures three-dimensionally in the example buildings. Steady state results are presented (ie temperatures and airflow patterns after sufficient time for all values to stabilise to constant values).

3.1 LABORATORY (SHED TYPE BUILDING)

The geometry of the building used to test the model 25 fan is shown in Figure 5. The building is loosely based on one of the BSRIA test laboratories. Floor plan dimensions are 10m x 30m and fan height is 7.5 m. Various test rigs are distributed around the space. One side of the building is glazed at high level.

Fabric losses are based on an outdoor temperature of 2°C and U values of the structure set to coincide with Part L of the 2002 building regulations. To further help the space to stratify a 1.5 cm gap is modelled under the loading door and a similar open area is assumed at high level. By including these openings in the model, cold air tends to flow under the door and contribute to the stratification. Lighting is assumed to amount to 20 W/m². This is implemented as 20 heated blocks at ceiling level, each one releasing 300 W.

An oil-fired heater provides further heating. This is assumed to supply 60 l.s⁻¹ of air at 80 °C. In actuality the heater provides a much greater flow at a lower temperature, but this creates a strong jet that helps to mix the air and reduce stratification. The objective of this work was to investigate the ability of the Airius fans to destratify the space, so the modelled building was deliberately set to encourage stratification.

When simulating the influence of the fans, three, model 25 fans, were arranged along the centre line of the building. Hence a floor area of $100 \text{ m}^2 \text{ per fan}$, is tested. A further simulation was then carried out with four fans (hence 75 m² per fan)



Figure 2 Modelled geometry

3



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4 CFD RESULTS

4.1 LABORATORY (SHED TYPE BUILDING)

In Figure 7 temperature contours are plotted. A colour coded vertical plane through the building shows how temperatures vary with location. The colours relate to temperatures as indicated in the legend. Cold air leaks under the door and spreads along the floor, creating a large region under 17°C. A stratified temperature distribution is predicted with warm air floating towards the roof.

Figure 8 shows the corresponding result with the three fans operating. Since the contour plane passes through the fans, the warm jets can be seen projecting downwards. At the opposite side of the building from the door, destratification is almost complete. Close to the door, the steady flow of air into the building maintains a cold spot at ground level, but the improvement is obvious.





Temperature (degC)

Figure 4 Temperature contours with three fans installed





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Figure 9 below shows the same building with four fans operating. A further improvement over figure 8 is seen; with an even more uniform temperature distribution.







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We are so confident that the Airius system will benefit your building that we offer a full 120 day money back guarantee, no questions asked. We are proud to be the ONLY supplier of destratification Fans in the UK to offer this guarantee. Subject to terms and conditions.

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