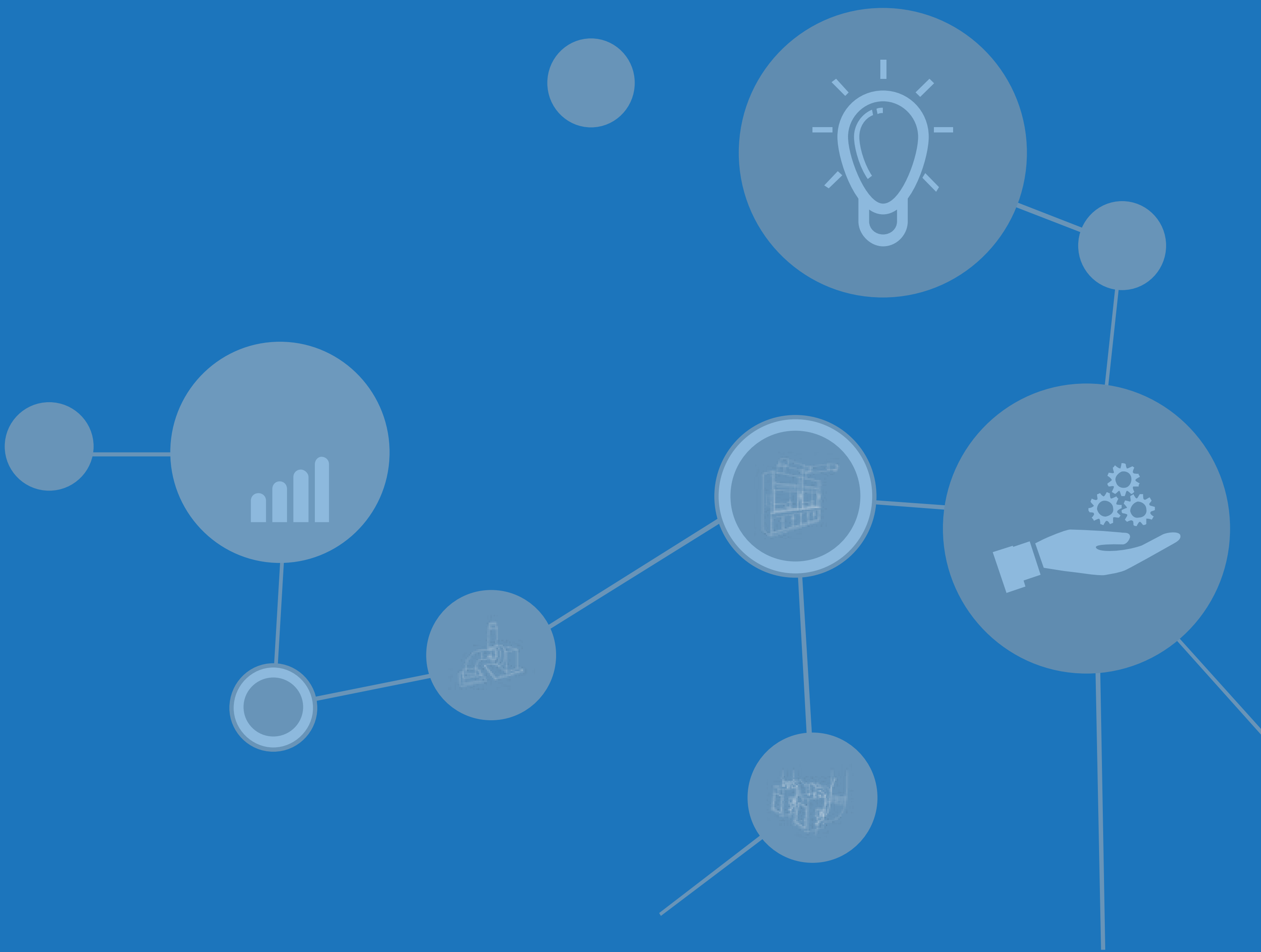
The Ultimate Guide to Fan Specifications in Fume Extraction Systems.

This white paper explores the significance of correct fan selection and its impact on safety and efficiency in fume extraction systems.



AXAIR FANS UK LIMITED

White Paper

Contents

White Paper V1.

www.axair-fans.co.uk | sales@axair-fans.co.uk

Introduction to Fume

Chemical fume extraction is a critical process in maintaining a safe and healthy working environment in industries that handle hazardous substances. To ensure the effective removal of chemical fumes, the correct selection of fume extraction fans is of utmost importance and the reason you've downloaded this document. This white paper explores the significance of correct fan selection and its impact on safety and efficiency in fume extraction systems.

Fume extraction systems are designed to capture and remove chemical fumes, gases and vapours generated during industrial processes. These systems typically consist of fume capture hoods, ductwork, filtration units and extraction fans. The extraction fan plays a vital role in creating the necessary airflow and pressure differentials to extract and transport fumes away from people and the workspace.

For accurate, safe, efficient and responsible procurement of industrial fans, you need some understanding of the selection requirements, and a reputable supplier.

We're here to help with both.

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The Importance of Pressure

In fume extraction systems, ensuring the safe and efficient removal of hazardous airborne contaminants is the primary task. Properly designed exhaust fans are instrumental in achieving this objective. Among the critical factors to consider during the fan selection process, pressure stands out as a key parameter that directly influences the performance and effectiveness of a fume extraction system.

Velocity Pressure

Velocity pressure directly influences the airflow rate in a ducted system, the higher the velocity pressure, the faster the air is moving through the duct. If the air velocity is too high, it may lead to excessive turbulence, noise and pressure loses throughout the duct, therefore it is a useful figure to determine the appropriate duct sizing and design. If air velocity is too low, it could result in inadequate airflow. As air moves through the ducted fume system, it encounters friction and other resistance, causing a pressure drop. Velocity pressure is one of the factors contributing to this pressure drop. If systems are designed poorly, they will consume more energy to maintain the required airflow. Optimising the system design leads to energy savings and more efficient operations.

Static Pressure

In ventilation systems, static pressure is used to measure and analyse the resistance to airflow within a system. It is important as it directly impacts the performance, efficiency, and airflow distribution within the system. When a fan operates, it generates a certain amount of static pressure to overcome the resistance of various components. The static pressure allows the air to flow through the system and reach its intended destination away from the source.

Dynamic Pressure

Velocity and dynamic pressure are very closley related concepts. Both defined by the same equation p=1/2 V2. Velocity pressure is used to understand pressure loss as fluid moves through a duct due to friction. Dynamic pressure is used to understand the force applied by the moving air to duct components e.g grill, louvres, diffusers.

Total Pressure

From these factors, we can calculate the total amount of energy in the air at a given point, which is known as the total pressure. Total pressure is the sum of the dynamic and static pressure. It is measured in Pascals (Pa) and is given the symbol p, or when a fan is involved pF.

Our Mission

To help our customers to be more successful by listening to their needs and working collaboratively with them. We advise and help to integrate the best solutions that increase efficiency, performance and solve a problem.

We're here to support you when you need us.

Our Approach

We understand that in today's fast paced business environment, time is of the essence. That's why we've harnessed the power of efficiency by integrating a singular technical team to handle your enquiries from start to finish. With this streamlined approach, we guarantee no continuous team handovers, rapid response times and highly accurate solutions that propel your success.

Understanding ATEX Requirements

EN 14986:2017 is known as the **"Design of fans working in potentially explosive atmospheres"** legislation and specifies the constructional requirements for ATEX fans used in non-mining Group IIG of explosive gas groups IIA, IIB and hydrogen, categories 1 (zone 0), 2 (zone 1) & 3 (zone 2), and Group IID categories 2 (zone 21) and 3 (zone 22) for use in explosive dust atmospheres.

In applications involving the extraction of chemical fumes in hazardous environments it is essential to select fans that comply with the ATEX regulation. ATEX polypropylene fans are specifically designed and certified to operate safely in potentially explosive atmospheres.

These fans incorporate features such as explosion proof motors, spark resistant construction materials in permissible pairings and their design characteristics incorporate maximum surface temperature limitations to minimise the risk of ignition through the auto ignition of flammable gases. When evaluating ATEX fans for fume extraction system, ensure they are certified for a specific hazardous zone. Consult with experts in ATEX compliance who will carry out a hazardous area classification to determine the presence of explosive dusts or gases.

By choosing ATEX fans you can significantly enhance safety measures and reduce the potential for accidents in areas where the explosive substances may be present.

Dangerous substances refer to any substances present at work that could, if not properly controlled, cause harm to people as a result of a fire or explosion. Whether the work activities create, control, or release flammable gases of vapours, such as exhausting toxic fumes, a DSEAR audit will ensure that you meet the relevant legislation for your industry and reduce the risk of serious injury or explosions.

It is strictly the responsibility of the customer to perform or contract a DSEAR risk assessment before purchasing an ATEX fan or component for hazardous areas. **Learn more about DSEAR here.**

ATEX polypropylene fans are carbon loaded to reduce static discharge in hazardous environments. Carbon loading is a process in which carbon particles or fibres are incorporated into the polypropylene material during manufacturing. The addition of carbon to polypropylene enhances conductivity allowing it to dissipate accumulated static charge more effectively, minimising the risk of electrostatic discharge (ESD). Static discharge can be a concern in certain environments where flammable or explosive substances are present. Where airflow passes through the fan blades, friction can generate static charges on the fan surfaces. In environments with potentially combustible materials, static charges can potentially ignite or trigger an explosion.

ATEX Polypropylene Fans Specifications

Zone 2, EEX-d motor

Category 3 gas explosion group IIB & IIA

Temperature Class T4 - 135°C maximum surface temp of the motor, 40° ambient air temperature.

Learn more ATEX Concepts here.

Examples of chemicals that may warrant the use of an ATEX fan.

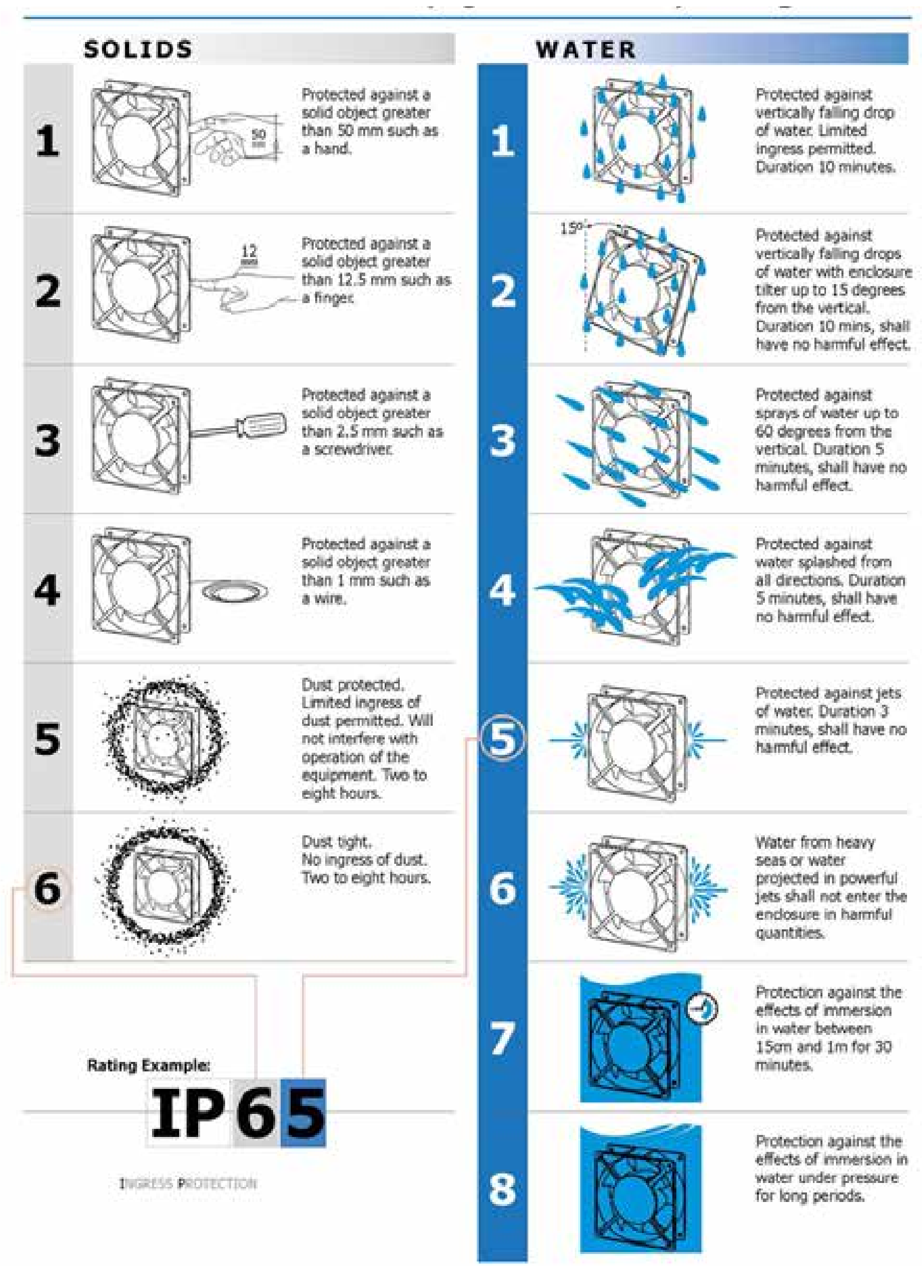
VOC's: Volatile Organic Compounds are a broad group of chemicals that can be found in various industrial processes, these have the potential to form explosive mixtures with air, making them hazardous in certain concentrations.

Solvents: Solvents such as acetone, methanol, toluene, and ethyl acetate are commonly used in industrial processes. These substances can have flammable properties, and when in vapour form, require the use of ATEX fans to prevent the risk of ignition.

Flammable Gases: Such as methane, hydrogen, propane, and butane are highly flammable and require ATEX rated equipment for safe extraction.

Understanding Ingress Protection (IP)

Ingress protection specifies the degree of protection provided by an electrical component against the intrusion of solid objects like dust and/or liquids. It is an Internationally recognised system, and applies to many components and equipment, including fans.



Overall the standard IP55 protection on most polypropylene fans indicates that the fan offers a moderate level of protection against the ingress of dust and provides protection against low pressure water jets from any direction. This level of protection makes it suitable for indoor and outdoor applications where the fan may be exposed to dust or occasional water splashes but not submersion or high-pressure water jets. To increase the ingress protection rating of any corrosion resistant fan for use outdoor, we suggest an outdoor pedestal.

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Fan Selection

Factors Affecting Fan Selection

The selection of an appropriate fan for a fume extraction system is crucial for achieving effective and efficient extraction. One of the most important things we'll ask is for you to consider if you'll ever want to speed control the fan, this will determineif we offer 1~ or 3~ motors. From here we'll ask what's important, and will need additional information, starting with the below:

01. Airflow

Accurate assessment of the airflow requirements is essential to ensure proper ventilation and fume extract. Factors such as the size of the workspace, the volume and nature of the chemical fumes generated, and the fume hood configuration must be considered to determine the required airflow.

02. Pressure

The fan should be able to generate sufficient static pressure to overcome resistance from ductwork, filters, and other system components even in the event of clogging, or when soiled. Proper evaluation of the pressure requirements ensures that the fan can maintain the necessary airflow throughout the system.

03. Chemical & Material Compatibility

Chemical compatibility is crucial to avoid corrosion, degradation, or contamination of fan components. The fan materials must be resistant to the chemicals being extracted to ensure durability and long-term performance. Therefore an analysis of the chemicals present is a must.

04. Noise Levels

Consideration should be given to the noise levels produced by the fan. Selecting a fan with low noise emissions is important to maintain a comfortable and productive working environment, as well as contributing to environmental initiatives and BREEAM assessments.

05. Energy Efficiency

Choosing an energy efficient fan helps to reduce operational costs, lifetime reliability, scope 2 carbon emissions and environmental impact. Fans with high efficiency motors, variable speed drives and intelligent controls can optimise energy consumption based on the actual fume extraction requirements.

06. Regulation Compliance

Ensure that the selected fan meets relevant industry regulations, standards and guidelines for workplace air quality and fume extraction. Compliance with regulations ensures a safe working environment and avoids regulatory issues. This includes both ATEX UK & EU directives.

07. Control Requirements

On/Off, Start/Stop, Interval Start/Stop etc. How will the overall system need to operate?

08. Functional Adaptability

Will the system need to change in the future that may increase the system duties?

Best Practice for Correct Fan Selection

Chemical and Hazardous Area Applications

Conduct a comprehensive evaluation of the workspace, including the types and quantities of chemical fumes generated and the spatial layout. This information will help your fan manufacturer to choose a fan that can withstand the chemicals present.

If the area has potentially explosive gases present, conduct or contract a hazardous area assessment to determine the presence of this gas. This will determine whether an ATEX fan is required. An ATEX gas zone will be given for the area that is used to select a fan - we'll cover this in more depth shortly.

Engage with Fume Fan Experts Early

- Give as much information as possible to make selection easier.
- Download or request technical documentation.
- Collaborate and consult regularly.
- Learn from experts, and develop your own fume extraction expertise.
- Utilise tools to accurately determine airflow and pressure.

Prioritise Energy Efficient Fans in-line with Objectives

If the application objectives focus on the reduction of operational costs, sustainability, BREEAM, or scope 2 emissions, prioritise the specification of energy efficient fans with advanced control features to optimise energy consumption based on actual demand.

In some instances, your fan manufacturer may advise alternative AC fans with inverter drives to ensure better performance, slow start ups or accurate speed control while reducing energy consumption.

Reduce fan energy consumption by up to 20% with energy efficient fume fans.

Consequences of Incorrect Selections

Inadequate Fume Extraction

If the fan does not provide sufficient airflow or static pressure, it may result in inadequate fume extraction. This can lead to the propogation of chemical fumes within the workplace, posing health risks to employees and comprising air quality. Accumulation of chemical fumes in the workspace can lead to respiratory issues, eye irritation, and other health hazards. Chemical fumes can also escape into adjacent areas or contaminate other processes or equipment.

Increased Operational Costs

Inefficient fan operation can lead to increased operational costs. If the fan is oversized or consumes excessive energy, it may result in unnecessary energy expenditure, reduced operating life or generate excessive heat. Conversely, an undersized fan may require additional fans or modifications to the system, increasing installation and maintenance costs, processes or equipment.

Increased Noise

If the fan is selected on incorrect duties, such as the duct velocity, the fan noise may be significantly higher than expected.

Should you Over Specify?

When it comes to fan selection, consultants and specifiers often wish to over specify the suggested fume extraction fan. This includes over protecting on ATEX, choosing stainless steel or high temperature resistance for example. While this can be advantageous, it will inevitably increase the costs of the project. This can out price suppliers and contractors, so we do advise that you make an accurate fan selection from the start to ensure the successful completion and sign off of your project. We do understand the reasons for over specifying however, some of these include the below:

Safety and Compliance: Some specifiers edge on the side of caution by choosing larger, more powerful fans to ensure that the fume extraction system can handle worst-case scenarios.

Unknown Future Needs: Specifiers might anticipate future changes in the workspace or production processes that could result in higher fume volumes. To accommodate potential growth or changes, they may choose to over specify the fan to handle higher demands down the line. Increasing duty with existing ductwork may be difficult after install if the ductwork design has not considered the future functional adaptability.

Assurance of Performance: Over-specifying can provide a sense of confidence that the system will perform effectively under all conditions. Many think it reduces the risk of fan underperformance or system inefficiencies, especially if exact fume volume or properties are uncertain. To overcome this, work with a specialist fume fan supplier who understands extraction system requirements will ensure the right fan is chosen to meet your duty, reducing costs, lowering energy consumption and improving system performance.

Simplification of Selection Process: In some cases, specifiers may find it easier to choose a larger, widely available fan model rather than investing time in detailed calculations. Our team will do the arduous work here and choose a fan that meets your required duty and operating points.

Lack of Information: If comprehensive data on the fume characteristics and volume is not available, specifiers may choose a conservative approach and opt for a higher-capacity fan. Excellent technical teams from suppliers are your lean on support network here who can help you to find what you need.

Client Requirements: Clients or project stakeholders might have a perception that bigger fans are better, leading specifiers to over-specify to meet client expectations or specifications. Talk to your fume fan supplier if you're unsure, This reduces costs, time and improves your technical awareness of product solutions for the future.

While over-specifying fans may provide some benefits, it can also lead to unnecessary expenses, increased energy consumption, and potentially oversized systems that don't operate efficiently. Specifiers should carefully assess the specific requirements of each fume extraction application and aim to strike the right balance between safety, performance, and cost-effectiveness. Conducting proper assessments, gathering accurate data, and consulting with experts can help optimise fan selection and ensure a well-designed fume extraction system that meets the actual needs of the workspace.

Chemical Compatibility

Chemical resistant fans are manufactured from polypropylene. Polypropylene is a semicrystalline polymer meaning its molecular structure, otherwise referred to as its crystallinity, is very compact and in order. The structure remains solid up to a moderat temperature, resulting in a strong and durable material that has a high resistance to many aggressive chemicals.

The resistance to chemicals can vary at different concentrations and with rising temperatures. At room temperature, polypropylene is resistant to most organic solvents, fats and many non-oxidising acids and bases. However, in temperatures rising above 60°, its chemical resistance to certain substances can decrease.

Choosing Corrosive Materials

It is important to consider which type of material is best suited to a corrosive application. Stainless steel fans with a marine grade finish have added corrosion protection and could be a more suitable option in applications that utilise oxidising chemicals especially as strong oxidising chemicals may cause damage to polypropylene. By talking to a specialist fan supplier, they will consider environmental factors to determine the material type that offers the most suitable characteristics.

Notes to consider on polypropylene:

- The melting point of polypropylene is 160°C.
- Low temperature threshold: polypropylene becomes brittle below 0°c.
- At elevated temperatures, polypropylene can be dissolved in nonpolar solvants such as xylene, tetralin and decalin.
- Polypropylene is not compatible with strong oxidants.

Download Compatibility Chart

Ratings of chemical behaviour listed in this chart apply at a 48 hour exposure period to the polypropylene used on our SEAT polypropyelene fans. The below is a snippet of the full document, available to download from the link.

Chemical	Compatibility
Acetaldehyde	A[1]-Excellent
Acetamide	A[1]-Excellent
Acetate Solvent	B[1]-Good
Acetic Acid	B-Good
Acetic Acid 20%	A-Excellent
Acetic Acid 80%	A-Excellent
Acetic Acid, Glacial	A[1]-Excellent

Download Compatibility Chart pdf

Explanation of Footnotes in Download

1. Satisfactory to 22°C
2. Satisfactory to 120°C

Ratings: Chemical Effect
A = Excellent
B = Good, Minor Effect, Slight Corrosion or Discolouration
C = Fair, Moderate Effect, not recommended for continuous use. Softening, loss of strength, or swelling may occur.
D = Severe Effect, not recommended for ANY use.
N/A = Information not available

CAUTION: Variations in chemical behaviour during handling, due to factors sush as temperature, pressure, and concentrations can cause equipments to fail, even though it passed an initial test.

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Technical Info

What is BS EN14175?

BS EN 14175 is a British Standard related to the safety and performance requirements of fume cupboards. It is part of the European standard series EN 14175, which specifies safety and performance requirements for fume cupboards used in laboratories.

The standard outlines essential criteria for the design, construction, and testing of fume cupboards, which are essential laboratory equipment used to contain and exhaust hazardous fumes, vapours, or dusts generated during various laboratory processes.

BS EN 14175 covers aspects such as ventilation, airflows, containment efficiency, noise levels, electrical safety, construction materials, and ergonomics. Compliance with this standard helps ensure that fume cupboards are safe and effective in protecting laboratory personnel and maintaining a controlled environment during experiments and processes that involve potentially harmful substances.

It is essential for manufacturers, laboratory owners, and operators to adhere to the requirements specified in BS EN 14175 when designing, installing, and using fume cupboards to ensure the health and safety of laboratory workers and the surrounding environment.

BS EN 14175 states that duct discharge stacks must extend to 3 metres above the highest point of the building or 1.25 x the total height.

Discharge Stack Heights

When ductwork discharges air or pollutants from a building into the surrounding environment, its height above the building and other structures can impact the airflow pattern and the diffusion of emissions. BS EN 14175 states that duct discharge stacks must extend to 3M above the highest point of the building or 1.25x the total height (whichever is greatest). If stack discharge heights are not sufficient enough, this will mean gases and vapours may enter back into adjacent windows.

Increasing the height of the duct above the building can promote better dispersion of exhaust emissions into the atmosphere. Higher elevation allows the pollutants to mix with a larger volume of air, reducing their concentration in localised areas. This is particularly important for exhaust systems that release harmful gases or pollutants. Some circumstances may dictate a shorter discharge duct if the area, or adjacent buildings are affected by the release of fumes.

Low Airflow & Medium to High Pressure

In what situations would you use a high pressure fume fan?

A high pressure, low airflow fan is typically used in a fume extraction system when there is a need to overcome significant resistance or pressure drops in systems.

This may happen in situations such as systems with long or narrow duct runs, or those with multiple bends or elbows, flexible arms and connectors, or scrubbers that can lead to increased resistance to airflow. In such cases, a high-pressure fan is necessary to overcome the pressure drop caused by the system configuration and ensure that an adequate airflow is maintained throughout the ductwork.

Filtration systems that incorporate filtration units such as highly efficient particulate air filters (HEPAS) can introduce substantial resistance. Again, a high-pressure fan is required to overcome this.

If the fume extraction system is tasked with extracting fumes from confined spaces, such as tanks, vessels or enclosed workstations, there may be limited airflow pathways available. In such situations, a high-pressure fan is used to create sufficient pressure to effectively extract the fumes from the confined space, even with restricted or narrow openings

Low Airflow Against Elevated System Pressures

STORM Fans

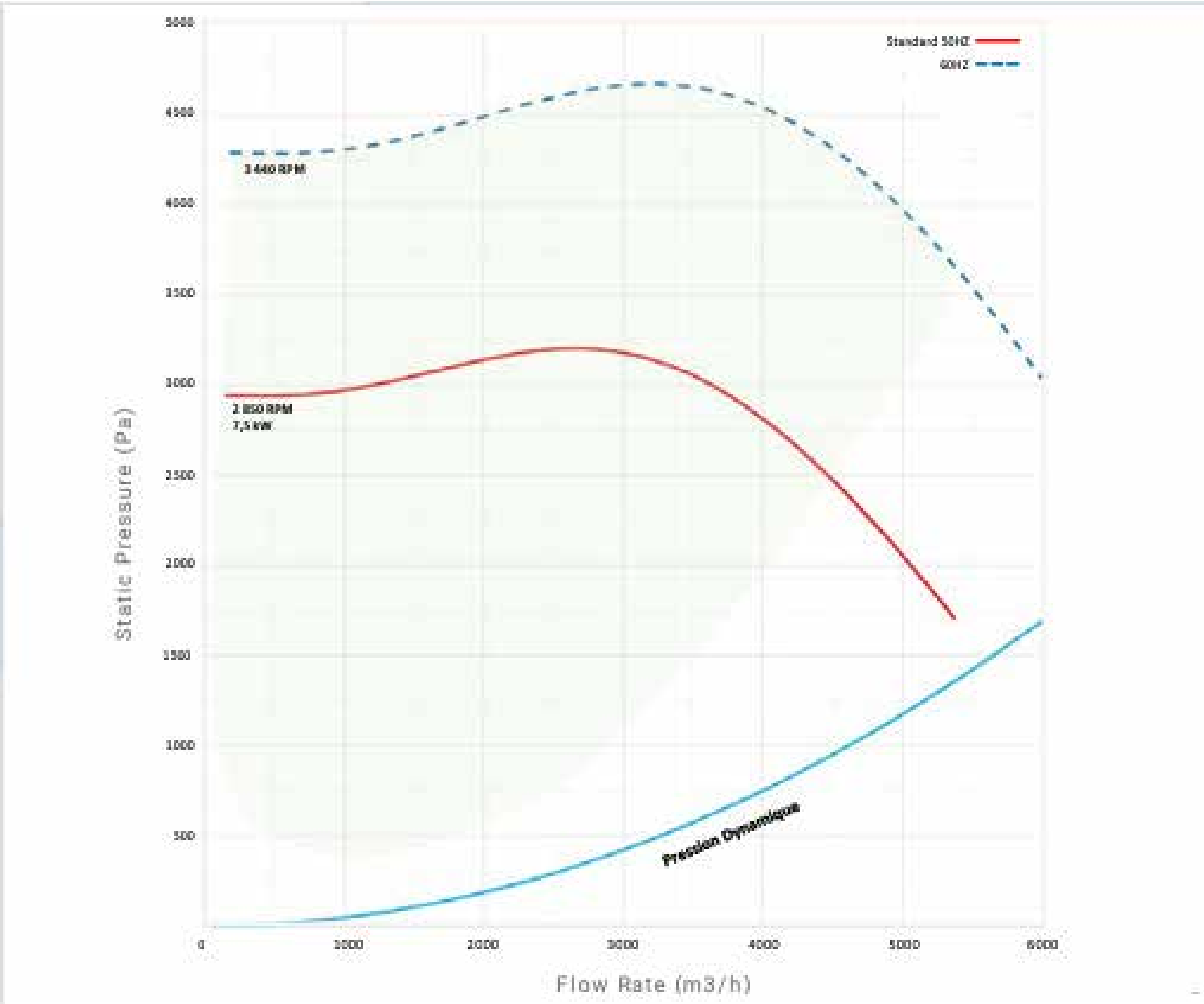
Centrifugal type medium-high pressure fan suitable for operation in corrosive applications such as fume capture arms, gas scrubbers or chemical cabinets. All structural parts are made of polypropylene. From 50-1800m3/h and max. 3000Pa of static pressure.

Available in 5 sizes:

ST10, ST12, ST14, ST16 & ST18

ATEX available in ST12, ST14, ST16 & ST18

Understanding **Performance Curves**



Engineers and designers who select and specify fans should have a good basic knowledge of fan curves, and an understanding of how these are produced is vital for verifying the original fan selection, trouble shooting after the installation, and understanding future flexibility.

Fan curves are simply graphs showing fan performance, normally with air volume on the horizontal “x” axis, and pressure on the vertical “y” axis. To obtain a fan curve the fan is placed in a test rig in which air pressure and volume can be measured and the pressure can be varied by adjusting a damper or venturi of known characteristics. For a fan driven by an electric motor, the input voltage remains the same throughout the test.

Manufacturers typically publish cataloguess containing performance or rating tables for each specific fan size. These tables are printed in a compact format, showing only the minimum information necessary to select a fan to match a desired performance. Performance tables are very easy to use for making an initial selection, you can view ours online.

High Airflow & Low to Medium Pressure

In what situations would you use a high airflow fan with low to medium pressure?

A high airflow, low pressure fan is typically used in fume extraction systems when there is a need to move a large volume of air while overcoming minimal resistance or pressure drops. This includes containment and capture, open duct runs or large fume cupboards where there are no significant obstructions or ductwork restrictions.

In other situations outside of extraction, for example where the primary objective is to dilute and remove airborne contaminants rather than capturing them at source, a higher airflow fan can be used. This helps to create air movement and increase the overall air exchange rate within the space to effectively dilute the concentration of contaminants.

On larger fans your fan manufacturer may recommend the use of an inverter to obtain a soft start and to avoid overcurrents. The inverter should be set to avoid unnecessary loads on the fan due to high acceleration or deceleration. This should be advised when you get to the fan selection stage, or made clear in technical documentation.

High Airflow Polypropylene Fans

S Fans

Designed to exhaust and resist fumes from highly corrosive environments such as laboratory fume cupboards, battery rooms, chemical plants, etc. The UV treated polypropylene construction and thick walls ensure maximum protection against acids and corrosion. 50-15000 m3/H and 10-1800Pa of total pressure.

Available in 6 sizes:

S15, S20, S25, S30, S35 & S50

All sizes are available as ATEX certified

EC available in S15, S20. S25, S30 & S35

Understanding **Handings & Orientations**

Euro	LG 0	LG 90	LG 180	LG 270	RD 0	RD 90R	RD 180	RD 270
BS	L 90	L 180	L 270	L 0	R 90	R 180	R 270	R 0

Handings and orientations matter for fume extraction fans as they directly impact the airflow direction of the fan within the system or to minimise the bends in system design. Incorrect handing or orientation can result in inefficient airflow patterns and poorly captured fumes. Incorrect choices can also affect noise and vibrations levels generated by the fan.

You should advise your fan supplier of the required fan handing and orientation at the point of order. A project can be stalled or delayed as fan suppliers will not process an order without this information. This ensures the product performs as required in your system.

Impeller **Direction of Rotation**

Depending on the desired airflow pattern and the specific requirements of the extraction system, the impeller rotation can be set to LG (Right rotation) or RD (Left rotation).

Multiple discharge positions are available but it is important to ensure that the right handing is chosen before installation. We do not advise that any contractors change the handing themselves, this can lead to the system only achieving 30% of the duty.

Enhancing Precision with BIM, CAD & STEP

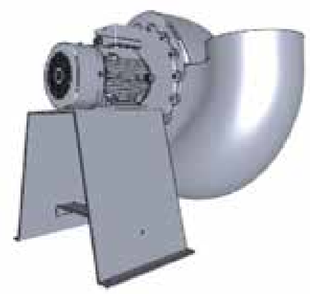
Specifiers can utilise BIM, CAD, and STEP files in various ways during the fume fan selection process to ensure an efficient and accurate design for fume extraction systems.

BIM: Building Information Modelling

BIM files, also known as building information modelling files are digital 3D representations of a product that contain valuable information. BIM files are used extensively in the architecture, engineering and construction industries. They're used for many reasons such as:

Visualisation:

BIM files allow specifiers to visualise the entire building or facility in a 3D model, including the layout of the fume extraction system, ductwork, and placement of fume fans within the structure.



Clash Detection:

BIM facilitates clash detection to identify potential interferences or conflicts between the fume extraction system components and other building elements. This helps avoid design errors and ensures proper space allocation for the fume fans.

Integration with Other Disciplines:

Specifiers can integrate the fume extraction system BIM model with other building systems, such as HVAC and electrical, to ensure coordination and compatibility.

Quantities and Cost Estimation:

BIM allows specifiers to extract quantities of materials and components, aiding in accurate cost estimation for the fume fan selection.

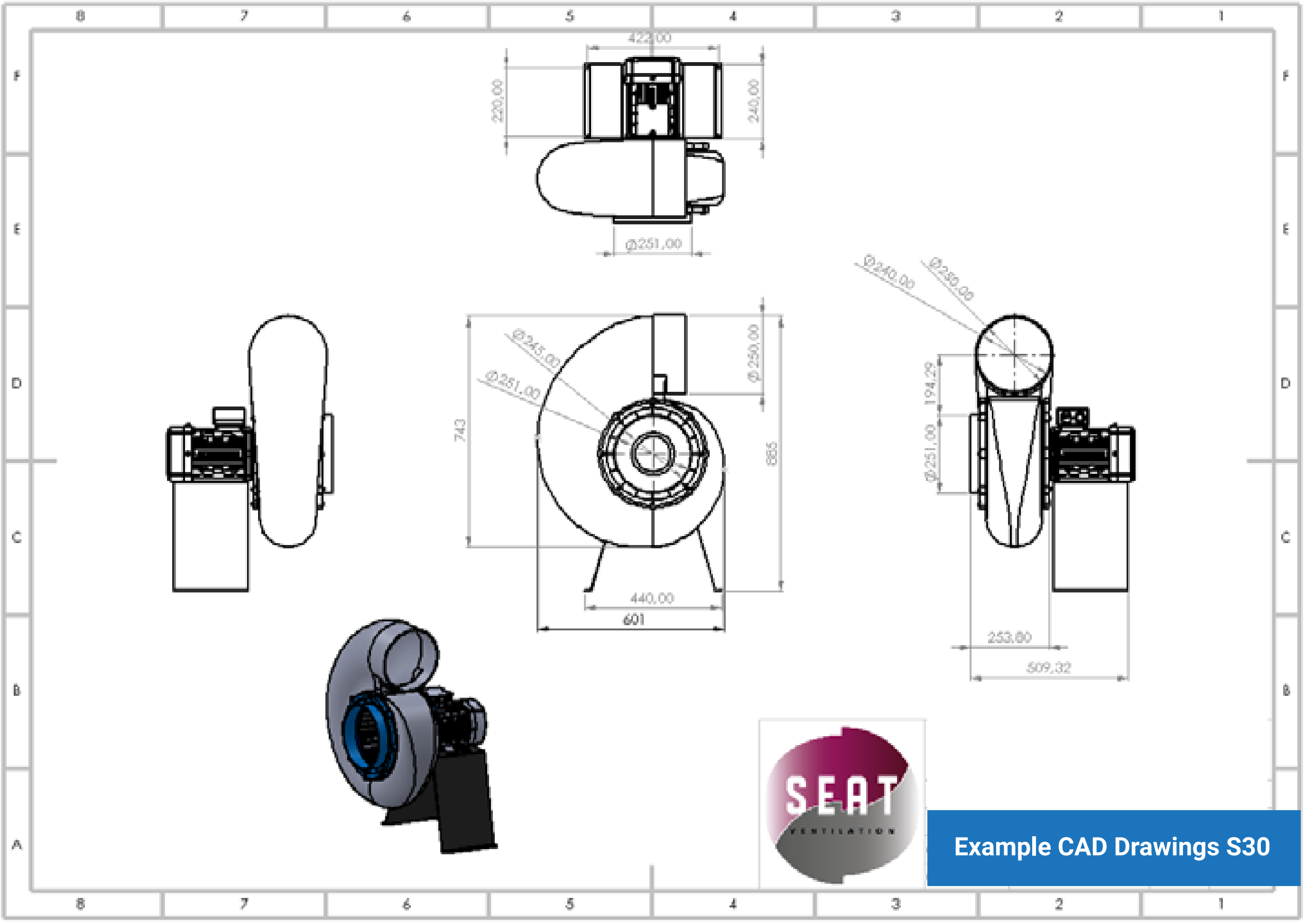
Example 3D BIM Models

CAD: Computer Aided Design & STEP: Standard for Exchange of Product Data

CAD (Computer-Aided Design) and STEP (Standard for the Exchange of Product Data) files are both digital file formats used in the engineering and manufacturing industries to represent 3D models.

Specifiers can use CAD files to delve into the detailed design of individual fume extraction fans.

Specifiers can use STEP files to exchange fume fan models between different CAD software platforms, ensuring seamless collaboration with various stakeholders. Specifiers can obtain STEP files from different fan manufacturers, allowing for direct comparisons of fan specifications, sizes, and performance characteristics. STEP files can be imported into BIM and CAD software for integration into the overall fume extraction system design.



Example CAD Drawings S30

By leveraging BIM, CAD, and STEP files, specifiers can achieve a comprehensive and data-rich overview of fume extraction fans. These file formats facilitate collaboration, streamline the design process, aid in system analysis, and ensure a seamless flow of information among stakeholders, ultimately leading to a well-optimised and effective fume fan selection.

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Sustainability

Sustainable Laboratory Fume Extraction

Laboratory areas are defined as highly serviced spaces where physical, biological, or chemical processing or testing is carried out. Such areas will have inherently high energy demands including ventilation, air handling, and containment or fume extraction. To achieve a good or outstanding BREEAM status a laboratory should incorporate highly sustainable features, low energy design strategies and contribute to a building's overall sustainability objectives.

Understanding BREEAM

BREEAM, which stands for **"Building Research Establishment Environmental Assessment Method"** is a voluntary building certification scheme that many UK local authorities, new buildings, and universities have incorporated into their planning process as a mandatory requirement for sustainable building management. It is used to measure the environmental performance of new and existing buildings, and is now considered best practice in acheiving sustainability. BREEAM awards credits for different environmental features which are combined to achieve an overall score. BREEAM compliant buildings are certified on a five-point scale of pass, good, very good, excellent and outstanding.

BREEAM®

Scope 2 Carbon Emissions

Scope 2 carbon emissions relate predominantly to the building and its infrastructure, the daily business activities, and the operational processes of the building.

The energy efficiency of these activities, processes and equipment has a large impact on the potential to reduce scope 2 carbon emissions. Scope 2 refers to activities where energy is purchased, and consumed, for example in running fans and motors in HVAC, fume extraction systems, or laboratory activities.

> **"Energy efficient measures implemented must result in a reduction in the total energy consumption of the laboratory, by at least 2%."**
>
> Noted in BREEAM Ene.07 assessment criteria

High BREEAM ratings for refurbishments in research or laboratory settings are complicated but are required to achieve sustainability goals. Educational laboratories are one of the largest energy consuming sectors in the UK, consuming between four to six times more energy per square metre than standard offices or commercial buildings.

Energy

Credit Contributions*
Ene.07. Energy Efficient Laboratories

Reducing energy consumption in laboratories is a significant method of reducing overall energy use that is addressed in the BREEAM energy category **Ene.07.**

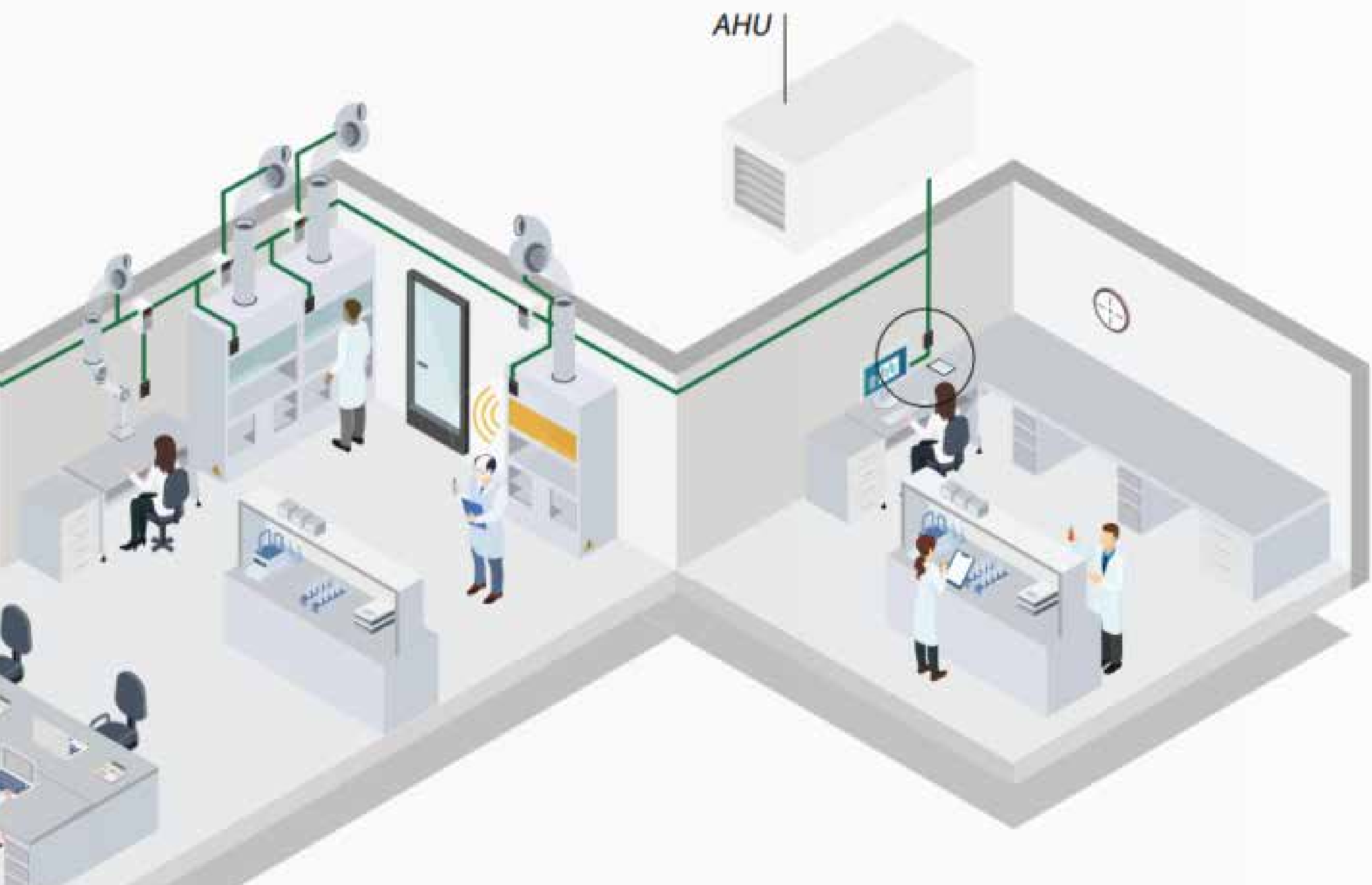
Lower Operational Energy Costs

Much of the operational energy use within laboratories is associated with the high rates of ventilation required to maintain air quality in air handling units, or to maintain face velocity in individual, manifold or local exhaust fume extraction systems.

Lower Environmental Impact

Many UK companies are working in accordance with the greenhouse gas protocol (GHG) and recording their scope 2 carbon emissions. A 20% reduction in energy consumption has a significant impact on a helping a business to acheive its future net zero goals by reducing carbon emissions.

Under the BREEAM assessed category energy, Ene.07 focuses specifically on energy efficient laboratories. For suitable laboratories, up to 4 credits are available for best practice energy efficient measures. The energy efficiency measures implemented must result in a reduction in the total energy consumption of the laboratory of at least 2% to be considered effective.



Through the BREEAM assessment process, manufacturers performance data showing energy consumption or motor efficiency are classed as significant contributions towards the design and implementation of energy efficient laboratories that contribute to reducing the overall energy consumption by at least 2%.

Lower Carbon Emissions

Electric motors account for approximately 45% of all global electricity usage and 75% of all industrial electricity usage. Efficiency is especially important in today's climate, for reducing CO2 emissions but also for reducing the cost of the motor over its lifecycle.

Simple Retrofits

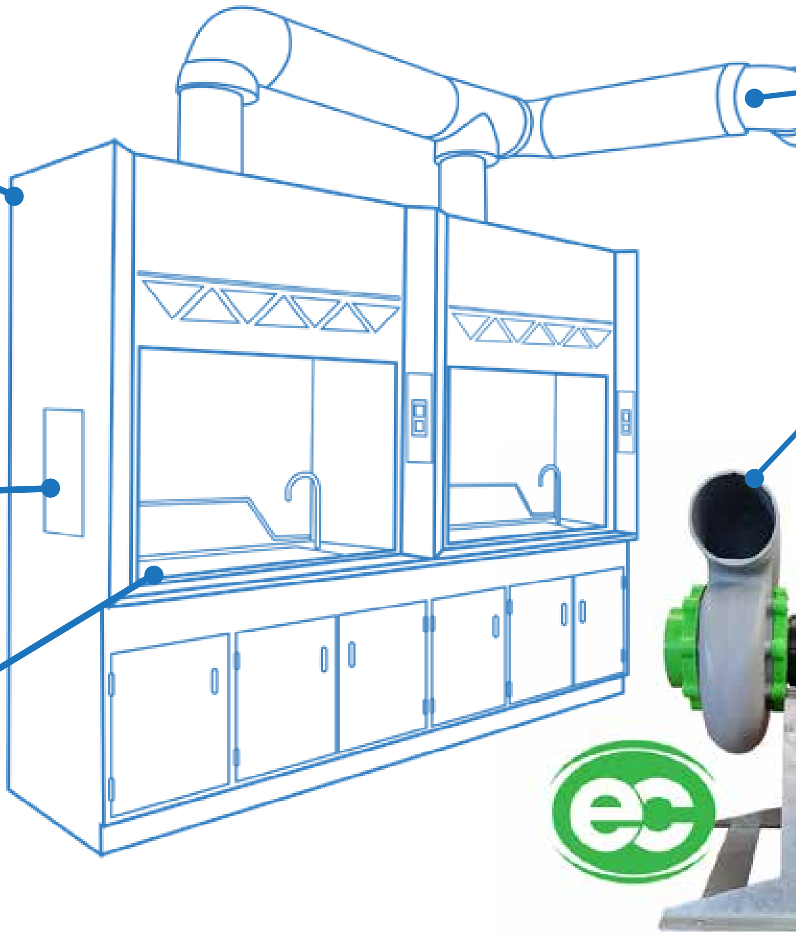
Retrofitting an existing fume extraction system with more energy efficient fans is made simple. EC fans are manufactured in the exact same size as their AC counterparts with a full range of datasheets to accurately match the required operating duty of the system.

Energy Efficient Laboratory Fume Cupboards

An efficient exhaust fan is key to providing an effective fume cupboard that protects laboratory workers and technicians from exposure to toxic chemicals. The IP55 polypropylene range of EC fans and motors are available in a variety of sizes in both single and three phase variants covering airflows from 20-9000m3/hr and pressures to 1500Pa.

Where laboratories use an individual or manifold fume extraction system, whether recirculating with a fan installed in the cupboard, or exhausted into atmosphere, efficiency should be a part of the selection process for the manufacturer of these units. This means balancing energy consumption with overall fan performance to ensure that the fume cupboard performs as expected in all conditions. Our team can ensure a fan is selected that can perform as required.

Fume cupboards are an important laboratory ventilation system and play a crucial role in protecting occupants from harmful chemicals and substances.



In BREEAM assessments, fume cupboards are evaluated based on their performance in controlling airflows and preventing the escape of hazardous substances.

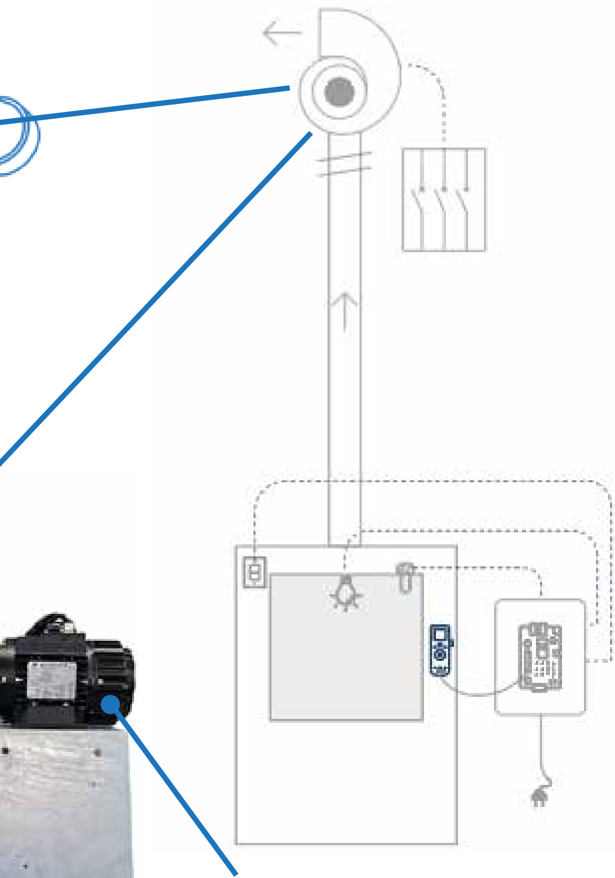
Delivering a consistent and optimal airflow means better fume cupboard performance. Save up to 20% of energy consumption without affecting performance with EC fans.

Reducing operational energy consumption can be an important part of a laboratories carbon reduction strategy and will make a significant contribution to a sites overall net zero and sustainability goals.

Under BREEAM assessments in this category, laboratories, teaching and other laboratory workshops with a limited amount of fume cupboards or other containment devices, or those with no energy intensive process equipment specified, are excluded unless the design team can provide evidence that their consumption is at least 50% higher than a typical office due to the laboratory process related activities.

Extract & Resist Corrosive Fumes In Laboratory Extraction

- ✓ Lower operational energy costs
- ✓ Lower environmental impact
- ✓ Lower carbon emissions
- ✓ Simple fume fan retrofits
- ✓ IE5 ultra premium efficiency motors
- ✓ Short lead times from stock
- ✓ Customised builds available
- ✓ 1 & 3~ versions
- ✓ Industry size spiggots
- ✓ Trusted by industry professionals
- ✓ Fan integration experts
- ✓ Lightweight & transportable
- ✓ Full range of datasheets
- ✓ EC range (SEC)
- ✓ Medium pressure range (S)
- ✓ High airflow range (S)
- ✓ High pressure range (ST)
- ✓ Low airflow range (ST)
- ✓ ATEX zone 2 versions
- ✓ Various handings & orientations
- ✓ Metal or outdoor pedestals
- ✓ Specified by consultants



By using IE5 electronically commutated (EC) motors, energy consumption can be significantly reduced when compared to standard AC motors*.

*Electric motors account for approximately 45% of all global electricity usage and 75% of all industrial electricity usage.

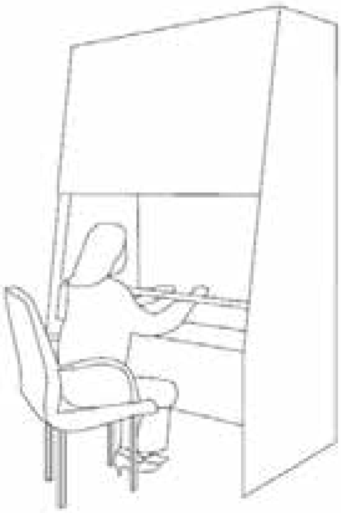
5

Applications

Fume Extraction Applications

A properly designed fume extraction system will collect the air that contains contaminants, make sure they are contained and taken way, and if necessary, clean the air and discharge safely into atmosphere. In this section we'll look at the main extraction systems that you'll come across. These can occur in many industries including laboratory, water treatment and environmental sectors.

Laboratory Extraction



Environmental Chambers

Fume Extract Arms

Process Fume Extraction

Fume Cupboards & Fume Hoods

The size of the fan required in fume cupboards depends on factors related to the specific application and the design of the fume cupboard system. As their primary function is containment within the fume cupboard, or hood, then to effectively extract and remove chemical fumes and contaminants, the fan size is determined by the required airflow rate. The containment requirement determines the need to extract and remove. This should be specified by the fume cupboard manufacturer or governed by safety guidelines.

Important Formula: Sash Size x Capture Velocity = Airflow Volume

Key Considerations

Face Velocity

Face velocity refers to the speed at which air is drawn into the fume cupboard opening or sash. It is an important parameter to consider when selecting a fan. The fan size must be capable of providing the necessary airflow to maintain the desired face velocity, ensuring that the fumes are accurately contained within the fume cupboard.

Static Pressure

The fan must generate enough static pressure to overcome the resistance offered by the fume cupboard and the associated ductwork.

Ductwork Design

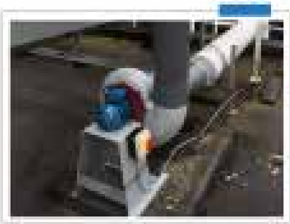
Fans must have sufficient capacity to overcome the resistance from the length, diameter, air velocity, and configuration of the ductwork, while maintaining the airflow rate throughout the system.

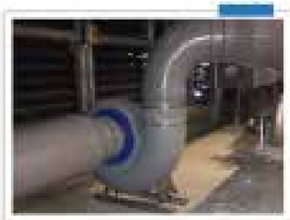
Capture Velocity

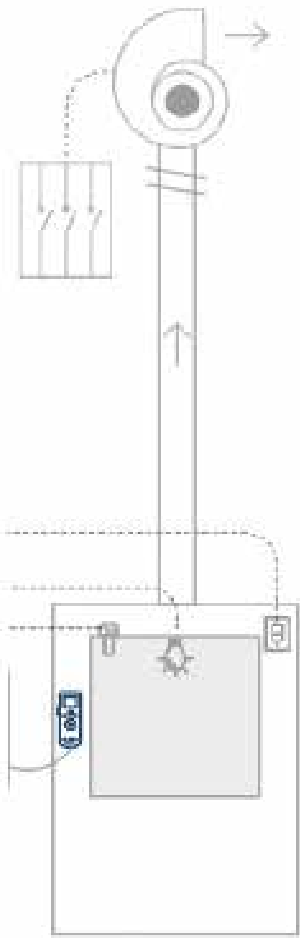
This is the minimum air velocity required at the face of the fume cupboard or containment device to effectively capture and contain hazardous fumes, gases or particles.

Noise

Fume cupboards are often located within laboratory or workspace environments where noise levels must be kept at an acceptable level. Consideration should be given to selecting fans with low noise levels especially if they will be in close proximity to workstations or occupied areas. This is particularly important for ductwork. High velocity will cause high noises.







Manifold Fume Extraction Systems

Fans for manifold systems must have enough capacity to overcome any resistance and maintain the required airflow rate throughout the multi source system.

Manifold extraction systems are designed to extract fumes from multiple sources and channel them through a centralised ductwork system. These systems are commonly used in industrial and lab settings where there are multiple workstations or processes generating chemical fumes or hazardous substances.

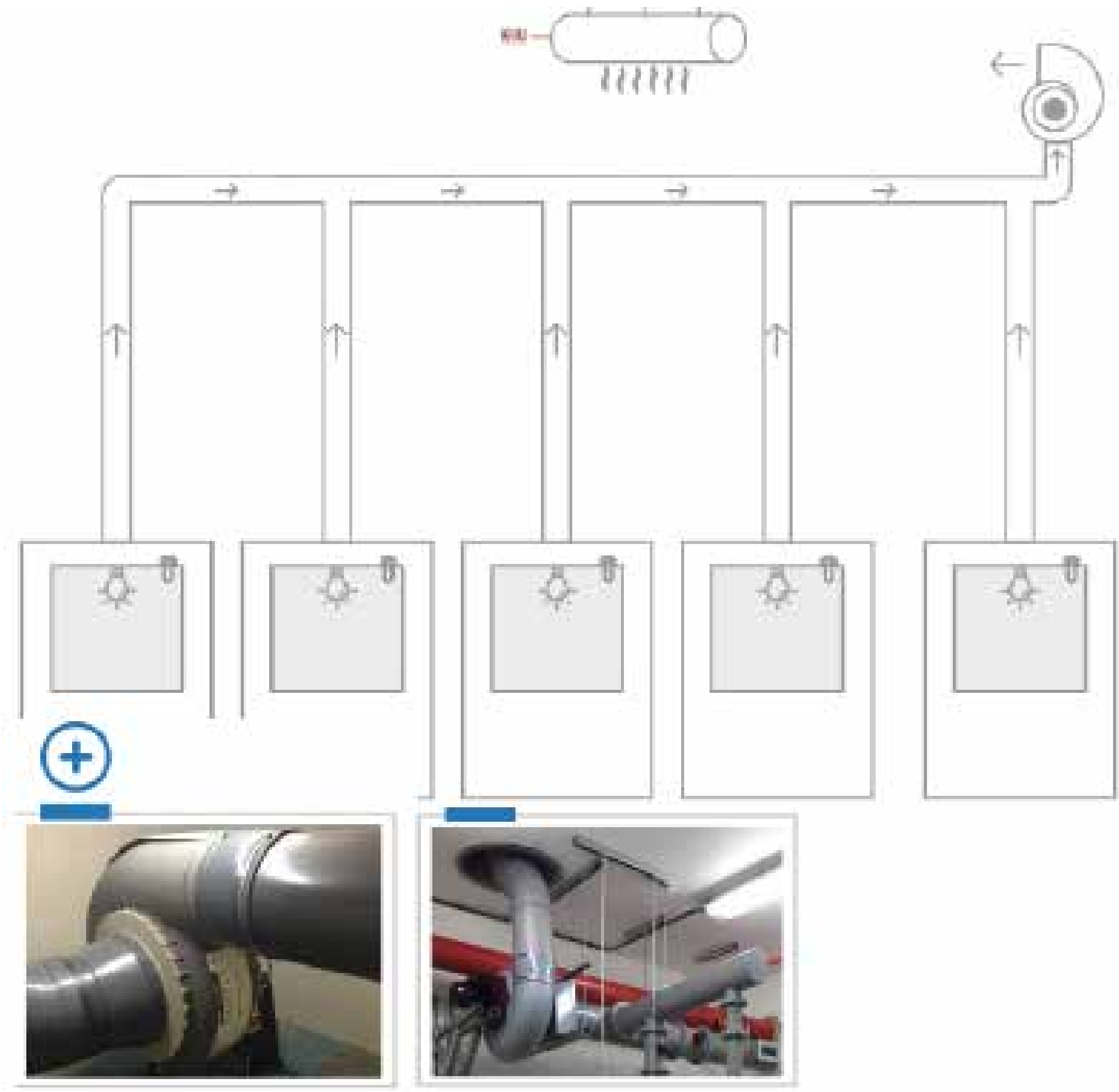
The layout and design of the ductwork system play a significant role in determining the fan size used in manifold systems. The length, diameter, and complexity of the ductwork, as well as the number of bends, elbows, and transitions can create resistance to airflow. The fan must have enough capacity to overcome the resistance and maintain the required airflow rate throughout the system.

The total airflow required to extract fumes from all sources needs to be calculated. System configurations such as whether a single central fan system, or multiple fans serving different sections, can affect the size and the capacity of the required fan. We recommend you work with suppliers who have experience in fume extraction systems to accurately select the appropriate fan for the manifold system.

Fan volume is determined by the volume that comes through the ductwork served and connected to the fan.

Learn More Online

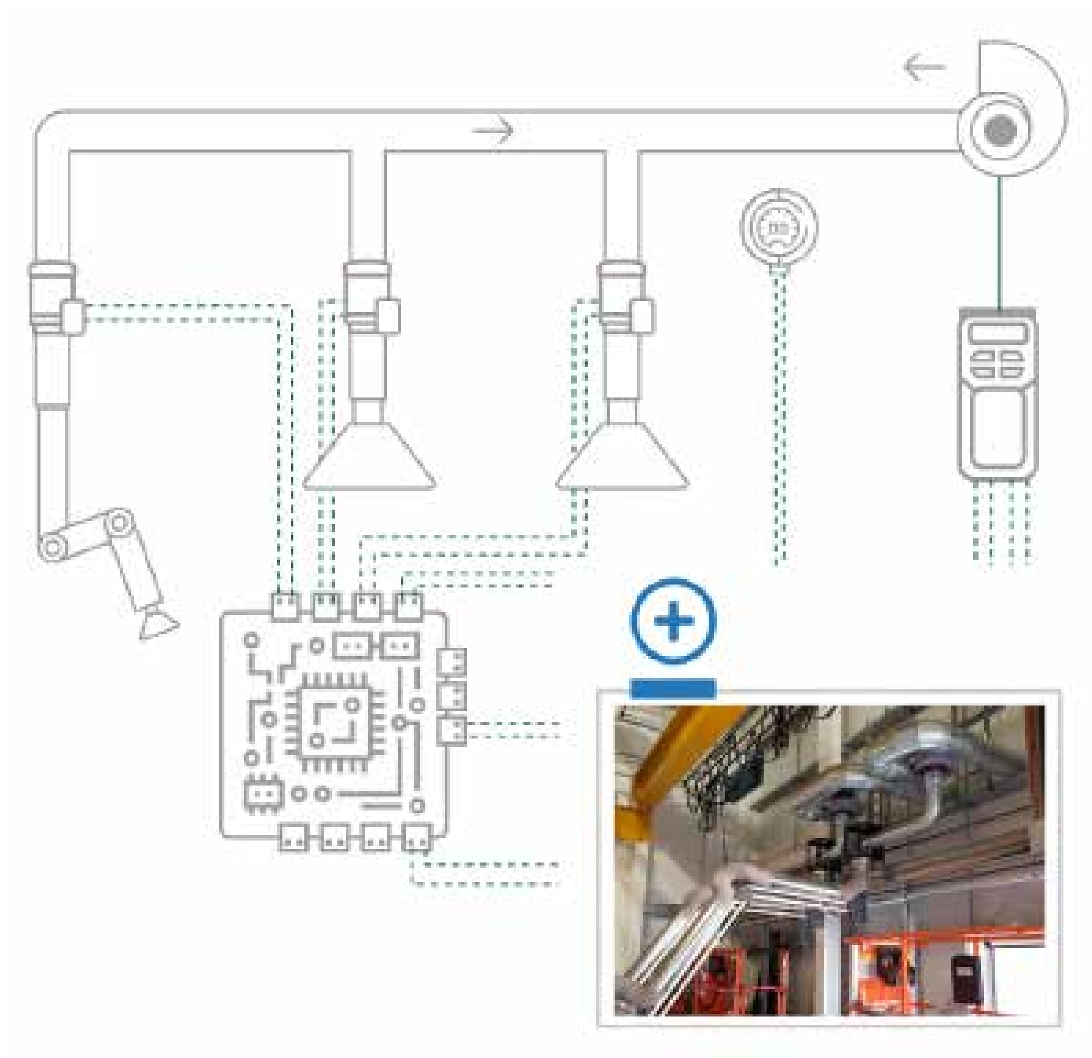
Visit our website at www.axair-fans.co.uk to download performance charts and fan data, or talk to one of our technical advisors on chat.



Local Exhaust Ventilation & Extract Arms

When selecting corrosion resistant fans for local exhaust ventilation systems that require chemical resistance, it is important to consider the specific corrosive agents present in the environment. Corrosion resistant fan selection ensures the longevity and performance of the fan in the presence of corrosive substances. Therefore, you should identify the specific gases that the LEV system will be exposed to. These include acidic fume, alkalis corrosive gases and other chemicals. Understanding the nature and concentration of these chemicals is crucial for selecting a fan with the appropriate corrosion resistance.

Choose fans constructed from materials that offer high resistance to corrosion. Polypropylene Is the preferred choice as it aligns with the protection required for most corrosive substances.



Additional Resources

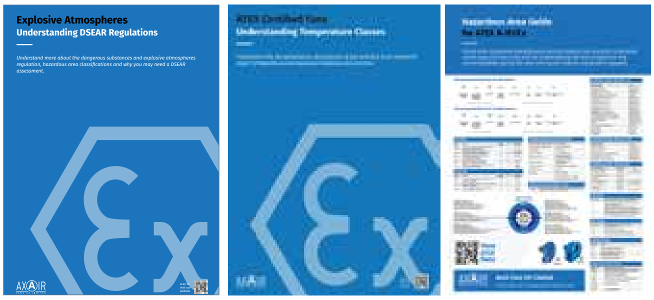
Visit www.axair-fans.co.uk to download a wide range of resources and to view more technical information. We update our website regularly with industry leading technical content, case studies, product information and key industry legislation.

If you have any additional requirements or questions about specifying our corrosion resistant polypropylene fans in your laboratory or construction specification, contact us on sales@axair-fans.co.uk or call 01782 349 430.

www.axair-fans.co.uk

Technical References

Learn more about key concepts to help with fan selection in specific market sectors including ATEX & corrosive fume extraction.



Product Brochures

View performance data, product dimensions, electrical and mechanical data for a wide range of fume extraction fans.

Your Fume Fan Specification

To ensure you have an accurate and comprehensive fan specification in your project document we advise that you include the following data to allow additional stakeholders to source and find the right product for the project:

Product Name & Model

Clearly identify the manufacturer, specific model and product name of the fan you are suggesting.

Technical Fan Performance Data

Provide performance data such as airflow capacity, static pressure capabilities, voltages, motor power rating and any other performance parameters. This will help stakeholders to understand the fans capabilities and suitability for the intended application. Importantly, add noise levels in decibels to allow for acoustic considerations.

CAD Files & Physical Dimensions

Make technical documents, CAD drawings or performance curves available. This will allow stakeholders to accurately understand the fan specifications and requirements. Specify the dimensions of the fan, including height, width, and depth. This allows you, and others, to determine the space requirements to ensure proper installation within the designated area.

Material & Construction Information

Clearly state the materials used in the construction of the fan, especially if ATEX rated or corrosion resistant.

Certifications

Note the relevant certification including ATEX, UL, CE, AMCA as well as compliance with specific industry regulations

Warranty & After Sales Information

Advise any warranty period offered for the fan, or any after sales service. This provides confidence to all stakeholders regarding the chosen products quality and long-term reliability.

Mounting & Installation Requirements

Describe the specific handings, orientations, mounting and installation requirements of the fan e.g. roof, LG90

1st Phase

Concept Brief

Outline your objectives so that we can understand the overall goal. We'll use this to select from a particular range of fans.

2nd Phase

Research

You know what you need to do, so now you need options. You intensively research potential suppliers, looking for technical documentation to ensure it's the right product from a viable source that won't put your reputation in jeopardy. Talk to suppliers, explain your objectives, and ensure you're ticking all the boxes required to choose the right fume fan.

3rd Phase

Consideration

On gathering information and speaking to your shortlisted suppliers, you decide on the product type and configuration. You want to ensure that the product will be seen suitable by all stakeholders such as contractors and installers, including the price, installation and after service.

4th Phase

Design & Specification

You've done it, you've chosen, so you add the product model, supplier and key details to the specification to ensure that sourcing parties know exactly where to go and can close the transaction quickly and easily.

5th Phase

Construction

The project has been handed over to the next party in line, usually the awarding building services contractor. It's now with them to read through the specification and reach out. They may well try and undercut the pricing or look at cheaper options but if you've given enough evidence and technical data to support your decision, they'll follow your lead for ease of project management.

6th Phase

Delivery

We know that lead times matter when it comes to keeping a project on schedule. With in stock popular components, and a clear delivery date on none stocked items, you can be sure everything will run smoothly. Ensure everyone is on the same page by communicating deadlines, proposed start dates, and any delays in the process will mean you receive components at the right time, reduce unnecessary component holding time for your suppliers and improve business reputation and compliance.

6

Case Studies

National Oceanography Centre

Following a tireless process working on a fume extract retrofit specification, Axair are proud to have been awarded the entire polypropylene fans schedule for the prestigious National Oceanography Centre in Southampton (NCOS). The retrofit would be tackled in two phases, with phase one in early Spring of 2023 and phase two starting in the September. Axair's industrial and technical team worked collaboratively with the contractor, specifier and building management consultant to ensure accurate fan selections that would deliver the required operating duties required to provide supply and extract to 8 classified area categories across the building.

The Fan Specification

The agreed specification stated that all fans should be chemically resistant polypropylene centrifugal fans with drain point, incorporating forward or backward curved multi-vane moulded impellers, manufactured from polypropylene. Fans should be mounted on a mild steel or outdoor box pedestal with inlet support ring and four rubber anti vibration mounts. All motors should be

About the Site

National Oceanography Centre

The NOCS is a centre for research, teaching and technology development in Ocean and Earth science, and has a range of laboratories, workshops, and testing facilities available to the marine science community and external organisations. The NOCS also provides undergraduate, post graduate and community study routes for those who wish to gain experience and work in the environmental sector.

NOC Laboratory Schedule

SDDS worked to support the cutting-edge facility at Royal Bournemouth Hospital. This new schedule of works is an exciting and significant project for Axair to be involved in and showcases the quality and value of the polypropylene fume extraction fans that the company supply. Due to be completed in the Spring of 2023 and fully commissioned by Summer of the same year, the project which started over five years ago will include a specialist diagnostic hub which will be used to study and diagnose disease and illnesses using the latest in medical technology to analyse anything from simple blood tests to more advanced genetic testing.

During the lifetime of the project, the five-page fan schedules changed according to building updates, consultant amendments and legislation. Axair worked closely with the awarded contractor J&B Hopkins to deliver a suitable specification in line with the required airflow and pressure duties of each plantroom application. Applications included ventilated specimen stores, down draught tables, ventilated cut up rooms, microbiological safety cabinets and autoclave in addition to multiple laboratories and processing rooms. Duty and standby fans were chosen with inverters for additional control and to reduce overall fume extraction system energy consumption by slowing down fans when required and allowing a more efficient start up on larger fans such as the S35.

The most impressive outcome of this project was that although Axair were awarded with the industrial fan order, they were not originally named on the specification. Due to the tenacious, technical ability of our Industrial team, who are trained to fine tooth comb through specifications, they quickly identified any errors or discrepancies in the fan selections given on the schedule based on the given duties and made the necessary comments back to the consultants for checking. They showed a higher degree of precision, technical ability, and overall customer care to ensure the fume extraction systems would perform as efficiently and at their optimal performance. Ultimately securing the order with the confidence of both the consultant and M&E contractors.

Why EC Fans with IE5 Motors?

Energy efficient polypropylene fans featuring IE5, are designed to reduce fan energy consumption by up to 20% without affecting performance.

EC Fan Inverters

EC polypropylene fans come with inverters prewired with a 1m cable while the motor can be situated up to 25m away from the inverter. 1m cable was supplied as standard by Axair, therefore additional cable was provided by the contractor.

Works Overview:

The works comprise the new build ground flow of laboratories, first floor of laboratories and offices and second floor of plant rooms with a roof over the plan room and lobbies. The works will also comprise an outbuilding containing services and storage as well as external works such as new access road, parking area, soft landscaping, and some hard landscaping. The M&E works will be extensive including the installation of a pneumatic valve, ventilation ducts, electrical cabling and drainage within floor trenches.

“The Axair team showed a higher degree of precision, technical ability, and overall customer care than our competitors. Ultimately securing the order with the confidence of both the consultant and the M&E contractor.”

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Contact Us

Whatever your issue, concern or question, contact our OEM team using the below contact details. Alternatively, visit our website and open a live chat to start discussions.

01782 349 430

sales@axair-fans.co.uk