



# OXYGEN

Simply smarter

Intelligent ventilation for an optimal learning environment

Numerous experiments have shown a clear correlation between poor indoor air quality and impaired pupil performance.

When rooms get stuffy and concentration levels drop, so do overall levels of achievement. It's a problem experienced by schools of all sizes – and OXYGEN is the answer.

simply smarter



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# OXYGEN

## Introducing

A solution that's simply smarter for everyone

**Jaga OXYGEN is an intelligent and fully controllable heating and ventilation solution that optimise's indoor air quality in an energy efficient way.**

Ideal for schools of all sizes, this smart integrated solution helps create learning environments that are conducive to higher levels of achievement – at the same time as boosting your building's green credentials.

Studies have shown that poor indoor air quality adversely affects pupils' attention levels and impairs their performance. Jaga **OXYGEN** automatically monitors the air quality in a classroom, actively controlling CO<sub>2</sub> levels to ensure adequate fresh air and create an optimal learning environment that helps improve concentration and alertness to enable an enhanced learning experience that's better for everyone.

### Another innovation from Jaga

Jaga is a respected market leader, well-known for its wide range of commercial and domestic heating solutions. With a reputation for delivering different solutions to traditional problems, the Company is now applying its expertise to the issue of indoor air quality and introducing it's pioneering **OXYGEN** solution to schools and specifiers across the UK.

## A pioneering approach

The next generation OXYGEN Dynamic solution combines unique displacement ventilation with an integrated heating system plus complete controllability for optimal performance and energy efficiency.

Fully scalable, future proof and specified in a way that suits your specific situation and budgetary requirements, Jaga **OXYGEN** is an intelligent and innovative solution that's simply smarter for everyone.





# The need for smarter ventilation in schools

Good indoor air quality is essential



Trials by the International Centre for Indoor Environment and Energy found that when temperature remains in the range 20-25°C, indoor air quality – and CO<sub>2</sub> concentrations in particular – have a more profound effect on cognitive performance than elevated temperature.

*It has been proven time and time again that improved indoor air quality (IAQ) is essential for optimal concentration and alertness – and it is especially important in the educational arena.*

The challenge facing UK schools and those involved in designing new-build projects is how to meet the increasing requirements for a healthy environment for optimal learning. At the same time satisfying both building regulations and the need for sustainable design that delivers ongoing energy efficiency in the years ahead.

**Healthy fresh air, on demand**  
Too much CO<sub>2</sub> in the classroom can lead to many complaints, including headaches, aggression, impaired concentration and fatigue. In addition, high humidity is also likely to lead to increased condensation – creating an ideal breeding ground for black mould and the dreaded dust mite. All of these unhealthy effects can be improved through the controlled delivery of clean, fresh air, on demand.

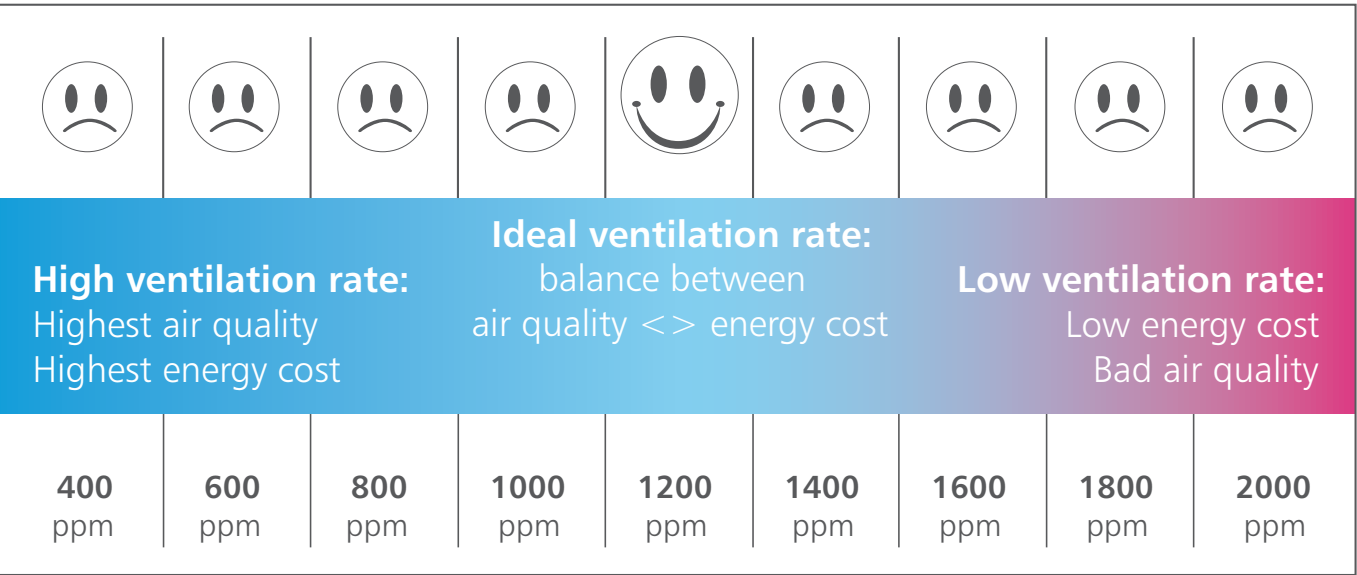
**Ill effects of inadequate indoor air quality (IAQ)**  
Sick Building Syndrome is a concept that the world has been aware of since the early 1980s. Numerous studies have been undertaken, with findings consistently stating that symptoms – such as headaches, poor concentration, drowsiness and lethargy – are triggered by poor IAQ and have a negative effect on both performance and personal health. Studies suggest that every day across northern Europe, some 2,000 teachers and 20,000 pupils could experience notable ill effects brought on by inadequate IAQ in the classroom.

**Impaired performance and attentiveness**  
Many studies have shown that poor IAQ impairs the performance of pupils, and that elevated levels of CO<sub>2</sub> are likely to cause drowsiness and a significant fall in attentiveness. In practical subjects, such as science and design technology, inadequate IAQ may have even more serious effects by increasing risk of accidents.

**Clear benefits of controlled ventilation**  
Tests conducted in the Netherlands – and carried out in the middle of the school day, when concentrations of CO<sub>2</sub> tend to be elevated – demonstrated that schoolchildren performed language and maths tasks better in controlled ventilation conditions than when only basic ventilation was provided.

**UK schools should be thinking smarter too...**  
In recent years, schools of all sizes across Europe have made significant efforts to improve indoor air quality – to enhance

not only students' health but achievement levels too. Meanwhile, in the USA, an increasing number of lawsuits are being filed as a result of poor IAQ. There is a risk that schools with recognised IAQ problems may be subject to litigation by parents who feel the academic potential of their children is threatened. So it's time for the UK to catch up with the wider international trend and to switch on to the ongoing benefits of smarter ventilation in its schools.



According to EN 13779: IDA3 \* Depending on local legislation





# Specifying an optimal solution

Jaga understands the challenges you face every day. Compliance and regulation dictate the way we work, and all of our innovations are underpinned by real school experiences.

**That's why we're convinced that when it comes to seeking a smarter ventilation solution, OXYGEN is the answer...**

## Compliance is a critical factor

When it comes to specifying a suitable ventilation solution, it's essential to ensure compliance with all relevant legislation. Any option you consider must fully comply with all current Building Regulations – as well as ideally delivering ongoing operational benefits and energy efficiencies too.

## Indoor air quality is also important

Achieving and maintaining acceptable IAQ is just as important a consideration. Effective ventilation in schools leads to improved attentiveness and performance, and creates a healthier environment for pupils and teachers alike.

As well as eliminating 'sleepiness and stuffiness' from your classrooms caused by pollutants such as carbon dioxide, the introduction of healthy, fresh air through effective ventilation will remove substances that produce unpleasant odours. It will also dilute the concentration of allergens and any build-up of infectious airborne agents, such as bacteria and viruses that are easily passed between individuals.

Of course, effective ventilation will also remove warm air and replace it with cooler air, helping you maintain comfortable indoor temperatures for an optimal learning environment.

## CO<sub>2</sub> is a good indicator of IAQ

CO<sub>2</sub> levels are widely accepted as being a good indicator of IAQ and the effectiveness of any ventilation solution, as well as being

a useful measure of occupancy levels in any given room.

In a school environment, CO<sub>2</sub> is constantly exhaled by the occupants of a classroom or an assembly hall perhaps, resulting in lower oxygen levels in the air around them and in the bloodstream of the teachers and pupils in those spaces. We know that elevated concentrations of CO<sub>2</sub> can have a detrimental effect on attentiveness and performance. If CO<sub>2</sub> levels rise, it is an indication that stale air in any given space is not being replaced quickly enough in relation to actual occupancy levels – even though classroom occupants won't have noticed that the quality of the air they are breathing is slowly deteriorating. This means that IAQ is easy to monitor and measure. Reliable, accurate CO<sub>2</sub> sensors can be used to deliver controlled ventilation on demand to meet specific requirements for optimal learning.

## Other key considerations

As well as specifying a ventilation solution that is capable of achieving and maintaining acceptable IAQ in an energy efficient way, it is also important to take account of the need to react to variable classroom occupancy rates and the impact of variation in ambient temperatures throughout the school year. Some ventilation systems may also be influenced by wind speed and direction, making their performance unpredictable and difficult to control.

The solution you specify should be designed to ensure that both heating and ventilation requirements are met.

In colder weather, the heating system should be able to compensate for the introduction of fresh air at lower temperatures, so that acceptable room temperatures are maintained.

In warmer weather the ventilation system should be able to respond efficiently and effectively to temperature as well as CO<sub>2</sub> levels so that it is able to help control optimal space temperatures. The ventilation system should therefore be capable of delivering in excess of 8 l/s/p of fresh air at any given time. In warm weather, it will also be desirable to be able to use the ventilation system for night-time cooling of the building fabric to help create an optimal learning environment for the next morning.

## The logical conclusion

To ensure optimal IAQ without adversely affecting energy efficiency, you clearly need to be able to specify a solution that is highly responsive – purely because of

all the different factors that can impact on ventilation demand and performance. Demand-controlled ventilation is widely accepted as the most practical and efficient way to do this.

## Meeting regulatory requirements for schools

There are a number of specific regulatory requirements for schools relating to classroom IAQ and temperature. The challenge for any building services engineer or specifier is to design or recommend a solution from the requirements that apply below:

### Fresh air rates

- No less than 3 l/s person (l/s/p)
- Minimum daily average of 5 l/s/p
- Capability to achieve 8 l/s/p

### CO<sub>2</sub> levels

- Average CO<sub>2</sub> levels during normal school hours not to exceed 1,500 ppm
- Ability to lower CO<sub>2</sub> levels to 1,000 ppm

- Not to exceed 5,000 parts per million (ppm) during the teaching day

### Temperature

- Temperature not to exceed 28°C for more than 120 hours during the school year
- Temperature difference between indoor and outdoor not to be more than 5°C in summer conditions

- Temperatures in normal classrooms not to be lower than 18°C – in areas of greater activity (eg, drama workshop), 15°C is considered acceptable

- Internal air temperatures not to exceed 32°C when rooms are occupied

### Energy

- Mechanical ventilation has weighted average fan power not exceeding 0.8W/l/s

- Demand-controlled ventilation aligns energy consumption to ventilation requirements

### Noise

- Indoor ambient noise level for classrooms and general teaching areas not to exceed 35 LAeq,30min (dB).

## Relevant regulations

Building Regulations can cover work to existing buildings, not just new, including the Building Regulations that cover all building projects and the Building Bulletin design guides produced specifically for schools – which may, at times, appear contradictory.

In addition, different local authorities may also have their own requirements over and above these national regulations:

### General

- Building Regulations Part F (Ventilation)
- Building Regulations Part L (Conservation of fuel and power)
- Other local planning requirements

### Educational buildings

- Building Bulletin 87 (BB87) – Guide for environmental design in schools
- Building Bulletin 93 (BB93) – Acoustic design of schools
- Building Bulletin 101 (BB101) – Ventilation of school buildings







## Destined to be top of the class

*OXYGEN outperforms regulations for recommended classroom ventilation every time – while also achieving significant energy and cost savings.*

### Perfect for positive learning

Specifically designed to optimise indoor air quality in an energy efficient way, this pioneering solution can help to boost concentration, enhance learning outcomes and increase overall levels of achievement in classes of all sizes, school-wide. By directly admitting healthy filtered air into each classroom, OXYGEN creates the perfect atmosphere for a positive learning environment.

### In-built efficiencies

With Jaga OXYGEN, you get a fully integrated, intelligent heating and ventilation solution with complete controllability that's always built-in. In effect, it can deliver three solutions in one; heating, ventilation and night time cooling. You can use it to save on energy, save energy costs and to save on the initial installation cost too – because with this



smarter integrated solution, you won't have to pay three times over to get the same benefit from three separate systems.

### Optimal ventilation on demand

OXYGEN Dynamic is based on unique displacement airflow, operates in a very energy efficient way and can be

programmed to automatically control the differing heating and ventilation needs of individual rooms according to actual demand – with locally installed teacher override options for each room providing additional boost if required. It is also a fully scalable, future proof solution that can adapt to meet your changing needs in the years ahead.



## Simply smarter on three levels

Jaga's next generation OXYGEN Dynamic solution combines unique displacement ventilation with an integrated heating system plus complete controllability for optimal performance and energy efficiency. All of which makes it **simply smarter** than other options – available on three levels:

1



### Optimal ventilation

*Unique displacement ventilation ensures optimal indoor air quality*

2



### Integrated heating (& night time cooling)

*In-built heating and cooling solution ensures optimal temperature*

3



### Complete controllability

*Smart system ensures optimal performance and energy efficiency*





# Optimal IAQ and energy efficiency

Studies in Denmark have shown that an increase in fresh air rate from 5 l/s to 10 l/s results in a 29% improvement in cognitive performance.

## Promoting best practice in sustainable building design

*Specifying an appropriate and adaptable ventilation solution is essential for school buildings, where indoor air quality plays such a significant role in effective learning and overall achievement. Ongoing energy efficiency and sustainable design are also of utmost importance. OXYGEN delivers on all of these counts and more...*

### More than just compliance

Poor indoor air quality is caused by a build-up of CO<sub>2</sub> because of a lack of freely circulating fresh air in the classroom. UK regulatory requirements for schools only specify a maximum permitted concentration of CO<sub>2</sub> (5,000 ppm) and a minimum airflow rate (3 l/s/p). And we don't think this is enough. So we do more than just complying...

At Jaga, we recognise the importance of adequate IAQ at all times. So we have designed a pioneering solution that delivers the exact amount and speed of air brought into the classroom to optimise IAQ for the specific number of people in that room. Also suited to the activity they're engaged in, as well as the time of year.



### Ventilation when and where it's needed

OXYGEN delivers a controlled supply of clean, filtered, fresh air by ventilating only when and where needed – and in the exact quantity required – for optimum energy efficiency at all times. This controlled approach avoids over-ventilation and guarantees a healthy indoor climate for every type of current classroom activity without excess energy loss.

### Comfortable, economic, almost silent operation

Fully integrated into your choice of sleek, economical and environmentally friendly Jaga Low-H<sub>2</sub>O radiator units, our innovative OXYGEN heating and ventilation solution is designed for comfortable and almost silent operation in the classroom.

There are no air currents to distract or chill pupils, and the sound output is barely distinguishable at less than that of a typical laptop fan. Total power consumption at full power, meanwhile, is only 7W – similar to that of a single low energy light bulb.

### Free cooling during the summer

During hot summer months, when classroom conditions can become particularly uncomfortable for both pupils and staff, schools can take advantage of OXYGEN's free and fully integrated night-time cooling feature.

Switching to the boost function in the evening will draw plenty of cooler outside air into the fabric of building, which then acts as a cool store, helping to reduce temperature levels in the classroom the following day. This feature is an effective alternative to expensive and energy intensive air conditioning systems.



### Helping to set the standards

At Jaga, we are committed to supplying the best possible solution for your specific requirements – a smarter, integrated solution that meets all your needs and your project budget, too.

We're keen to work closely with schools and specifiers at the conceptual stage, acting as expert advisors and consultants to help set the standards for enhanced learning environments throughout the UK.



### What is BREEAM?

BREEAM is the Building Research Establishment Environmental Assessment Method for buildings. It benchmarks best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognised measures of a building's environmental performance.

In the UK, it is a condition of capital funding that new build and refurbishment projects on schools and academies, achieve specified rating under BREEAM 2011. Smaller schemes may also require formal BREEAM assessment.

### How could different ventilation solutions affect BREEAM assessment?

There are many factors that the BREEAM 2011 assessment takes into account in order to achieve an overall rating including transport, pollution, waste, land use, water and materials. Those factors that can be affected by different ventilation solutions are:-

#### HEALTH AND WELLBEING

HEA 02 Indoor air quality – minimising air pollution and effective strategies with occupant control can be of benefit. HEA 03 Thermal comfort – assisting in keeping internal summer temperatures better than recommendations by use of night time free cooling can be of benefit. HEA 05 Acoustic Performance-maintaining operating sound levels below recommendations and minimising building envelope openings where external noise can be a source of problem can be of benefit.

#### ENERGY

ENE 01 Reduction of CO<sub>2</sub> Emissions – maintaining effective control of building CO<sub>2</sub> emission rates whilst improving the indoor environment can be of benefit. ENE 03 Energy Monitoring – providing comprehensive logging of equipment usage and consumption can be of benefit.

In comparative Energy Performance Certificate calculations, the OXYGEN Dynamic system indicated only 0.67% increase in KgCO<sub>2</sub>/m<sup>2</sup> per annum when compared with a manual system relying on occupant control of opening windows. This would have virtually no effect on the rating of the building, whilst providing accurate control of the CO<sub>2</sub> within the classrooms and all the additional benefits of local occupant control, night time cooling in summer, reduction of wastage of energy by over venting in high wind situations and under venting in low wind conditions, monitoring and logging of internal environment conditions.



## Intelligent control

Advanced, yet so easy to use



## Several control options available to you

*A sophisticated heating and ventilation solution like this, which presents so many different possibilities, could potentially be very complex. But Jaga OXYGEN is particularly easy to use.*

Fully automatic monitoring and control of the indoor climate saves time and distraction, allowing teachers to concentrate on their classes, and pupils to concentrate on the task at hand. And because the air quality in each room is regulated independently, you know that each class will be benefiting from appropriate IAQ for its size and activity at any given time.

### Future proof programmable controller

OXYGEN is an intelligent, scalable solution, which is monitored and managed by a central controller that is both fully programmable and future proof to meet all your needs in the years ahead.

This smart controller is so powerful that its capabilities actually far exceed what we use it for within the OXYGEN solution. This means that it can also be used to simultaneously control other school management systems, helping you to achieve significant cost savings.

### Simple monitoring via user-friendly interface

The considered design of a user-friendly interface allows you to monitor the

performance of your OXYGEN solution with ease. It's even possible to set up a special website to enable remote monitoring of different room conditions and the response of your OXYGEN solution.

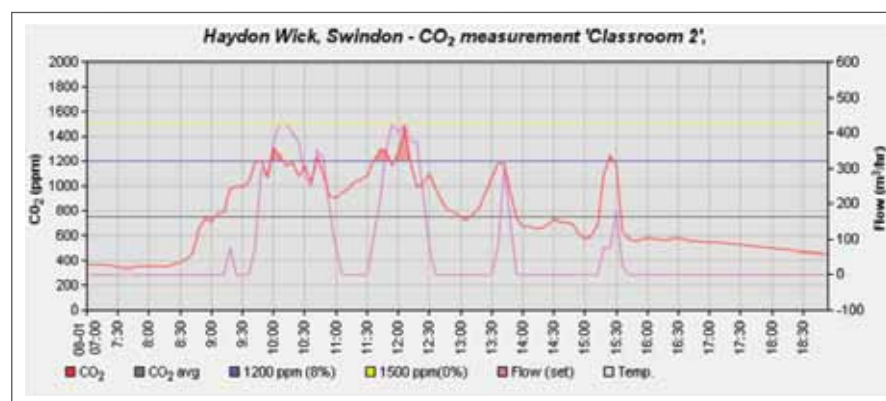
This is exactly what Haydon Wick Primary School in Swindon has done. The operation of its OXYGEN solution can be viewed in real-time via the internet from anywhere in the world. Setting up a special remote monitoring website like this will enable Jaga to adapt system programming and tackle any troubleshooting requirements, potentially avoiding unnecessary and costly site visits. However, you will not be able to change any controller settings yourself.



To view a live demonstration of this functionality, just log on to the special website at:

[http://accnet.picasse.com/station/sw\\_haydon/](http://accnet.picasse.com/station/sw_haydon/)

Username: Viewer  
Password: Watch!



Swindon School Example Graph

### Proactive performance

You can see from the adjacent chart of the OXYGEN Dynamic solution installed in Haydon Wick Primary School that the central controller is constantly monitoring the rate of change in the CO<sub>2</sub> levels in each classroom to optimise energy efficiency at all times.

It will increase the operational speed of the OXYGEN refresh units and exhaust units to ensure that stale air is extracted before excessively high levels are reached, therefore avoiding the need for the units to be activated at full speed during normal school hours.



The Jaga OXYGEN control system is designed to provide fully scalable intelligent control capabilities to suit your specific needs. These give you several options:

- Optimal ventilation based on CO<sub>2</sub> levels, with a manual boost override**  
 The single beam optical CO<sub>2</sub> sensor continually monitors the air quality within a room, passing data to the controller via the BUS cable. Upon receipt of this data, the controller calculates the precise amount of air required to ensure that the CO<sub>2</sub> levels within the space remain at optimum levels. A boost override facility is available if required.
- Integrated temperature control, with internal space temperature sensors**  
 Your integrated OXYGEN solution will not only control ventilation within a space, but also the heating requirements. An internal space temperature sensor will monitor fluctuating temperatures and relay this data back to the central controller. After analysing this data, the controller will send a 0-10v signal to a 2- or 3-port diverting valve to increase or decrease the amount of hot water within the fast-reacting Jaga Low-H<sub>2</sub>O radiator.
- Flexible control strategy to suit individual customer requirements**  
 Jaga OXYGEN can be programmed to provide protection against low air on temperatures in severe weather conditions. If the incoming air measured either within the Oxygen refresh unit or externally mounted temperature drops below the design minimum temperature the damper will close and the refresh unit will cease to operate. Frost protection during unoccupied times will be provided by others.
- Free night-time cooling for energy efficient summer-time ventilation**  
 Your OXYGEN solution will include free, fully integrated night-time cooling functionality, which you can use during hot summer weather to avoid expensive air conditioning costs.  
  
 Simply programme the desired hours of operation and the temperature requirements into the central controller and the refresh units – 8pm to 5am, for example – and the refresh units will operate at maximum capacity during these set periods to insert as much cool external air into the internal space as possible, thus cooling down the fabric of the building for the following day.



## How it works

*Achieving and maintaining acceptable indoor air quality is easy with OXYGEN*



### Four key system components

Four key components work in unison to provide an enhanced learning environment that is conducive to higher levels of achievement:

#### 1. OXYGEN Refresh Units

Silently suck in outside air, filter it and supply it into the classroom.

#### 2. CO<sub>2</sub> Sensors

Constantly monitor IAQ by measuring ambient CO<sub>2</sub> levels in each room.

#### 3. Controller

Continually regulates the balanced intake and exhaust of air in each individual classroom.

#### 4. Smart Switch

Gives teachers the ability to briefly boost the flow of fresh air if they feel it is required.

#### The OXYGEN solution explained

Jaga OXYGEN Dynamic is an intelligent and fully controllable heating and ventilation solution that optimises indoor air quality by delivering healthy, fresh air on demand in an energy efficient way.

Easy to install and to operate, it combines unique displacement ventilation with an integrated heating system plus complete controllability that's *always* built-in for optimal performance and energy efficiency.

#### Constant clever control

Jaga OXYGEN Dynamic uses CO<sub>2</sub> sensors to constantly monitor IAQ and manage ventilation needs on a room-by-room basis. Depending on real-time needs, a central controller directs refresh units integrated

into Jaga Low-H<sub>2</sub>O radiators to work in unison with exhaust units to increase or decrease the amount of fresh air being delivered into individual rooms. Teachers are also able to use a smart switch to briefly boost airflow if they feel it is required.

The direct admission of filtered air into each room via external air inlets, rather than through central supply ducts, ensures a clean, healthy, pollutant-free indoor environment at all times – all with improved energy efficiency of up to 28%.

#### Unique displacement ventilation

Special smoke tests have been carried out to demonstrate the effectiveness of our unique displacement ventilation method.

The controlled supply of fresh air at low level and extraction of exhaled stale air at high level on opposite sides of the classroom ensures optimal IAQ for the room's occupants – and an increase in ventilation efficiency of 20% [source: NPR-CRI 752].

#### Innovative Low-H<sub>2</sub>O technology

Jaga's Low-H<sub>2</sub>O technology is the result of more than 40 years of continuous research into heating technology by Jaga and our partner universities. This resulted in the design of a super-efficient modern fin tube element, which complies with present and future building codes and energy efficient technologies.

Our Low-H<sub>2</sub>O radiators are low-mass, low-water content products, which require only a tenth of the water and weight of standard steel panel radiators. A scientific study at the Building Research Establishment in Watford showed that Low-H<sub>2</sub>O radiators consume around 10% less energy than standard radiators. How are they so much more economical? Because they react much faster when warmth is needed – or when it is no longer required.

Faster response means better comfort and lower fuel bills, plus lower CO<sub>2</sub> emissions and greater all-round energy efficiency to help building designers and constructors meet carbon reduction targets. All Jaga Low-H<sub>2</sub>O heat exchangers also come with a 30-year guarantee.



OXYGEN works seamlessly with your choice of Jaga radiators



Knockonwood



Tempo



Strada



# The core components

## 1 OXYGEN Refresh Units

Built into Jaga's patented Low-H<sub>2</sub>O radiators, our OXYGEN Dynamic Refresh Units silently suck in outside air, filter it and supply it into the classroom at a low level to optimise the effect of displacement ventilation.

Depending on different needs, one or more refresh units can be installed in each room or space.

These units are fully integrated into and housed within your choice of elegant and unobtrusive Jaga Low-H<sub>2</sub>O radiator designs – or our Low Surface Temperature radiators, if you prefer. Depending on the type of casing being used, up to four OXYGEN refresh units can be fitted into one radiator, therefore saving valuable wall space. As ventilation demand changes, our super-efficient Low-H<sub>2</sub>O radiators are able to respond instantly offering excellent, fast response to heating and ventilation control.

### Specifications

- Dimensions: L500mm x H360mm x D150mm
- Power: 230 volts/50Hz
- Control: 0-10 volts from Jaga 2 wire network
- Output: Nominally 22.2 l/s @ 30dBa
- Air inlet: 150mm or 125mm dia dependant on model, with integrated damper
- Power consumption: Approx 7W at 80m3/hr

## 2 Controller

The central controller supplies power and data to all connected components of the OXYGEN solution using the Jaga OXYGEN BUS system – a 2-wire BUS for power and control.

Sitting at the heart of the solution, the controller continually analyses and reacts to data supplied by each CO<sub>2</sub> sensor around the school to regulate the balanced intake and exhaust of air in each classroom according to individual needs to ensure adequate IAQ in an energy efficient way.

This controller can provide real-time monitoring of, and intelligent reaction to, individual room conditions from a single central point within your school.

### Specifications

#### Functionality:

- 1/2/3-BUS functionality (500 mA per BUS)
- USB connectivity for configuration via computer
- SD card for data logging and system backup
- Optional Ethernet connectivity and internal web server functionality
- Flexible software design (open source)
- Communication using serial numbers
- Modular and scalable design
- More powerful yet more energy efficient
- Internal clock/calendar
- Future proof
- BUS system:
  - Power BUS (current BUS): insensitive to outside influences
  - 2-wire BUS for power and control
  - No polarity
  - Automated periodic checks of all components
  - Multiple BUS layout options
  - i/o output to BMS

## 3 CO<sub>2</sub> Sensors

A CO<sub>2</sub> sensor in each room constantly monitors IAQ by measuring CO<sub>2</sub> concentration in the surrounding air and communicates with the central control system via the Jaga OXYGEN BUS system.

### Specifications

- GE manufacture ensures accuracy and reliability
- Single beam range detects 400-4000ppm in 1 byte precision (256 steps of 16ppm)
- Optional integration of:
  - Humidity RH%
  - Dew point calculation
  - Temperature to 0.5°C precision
- Power consumption: ca 30 mA during 1 second in a 15-second cycle
- No external power required – only BUS wire needed
- Operational guarantee: 10 years

## 4 Air Inlets

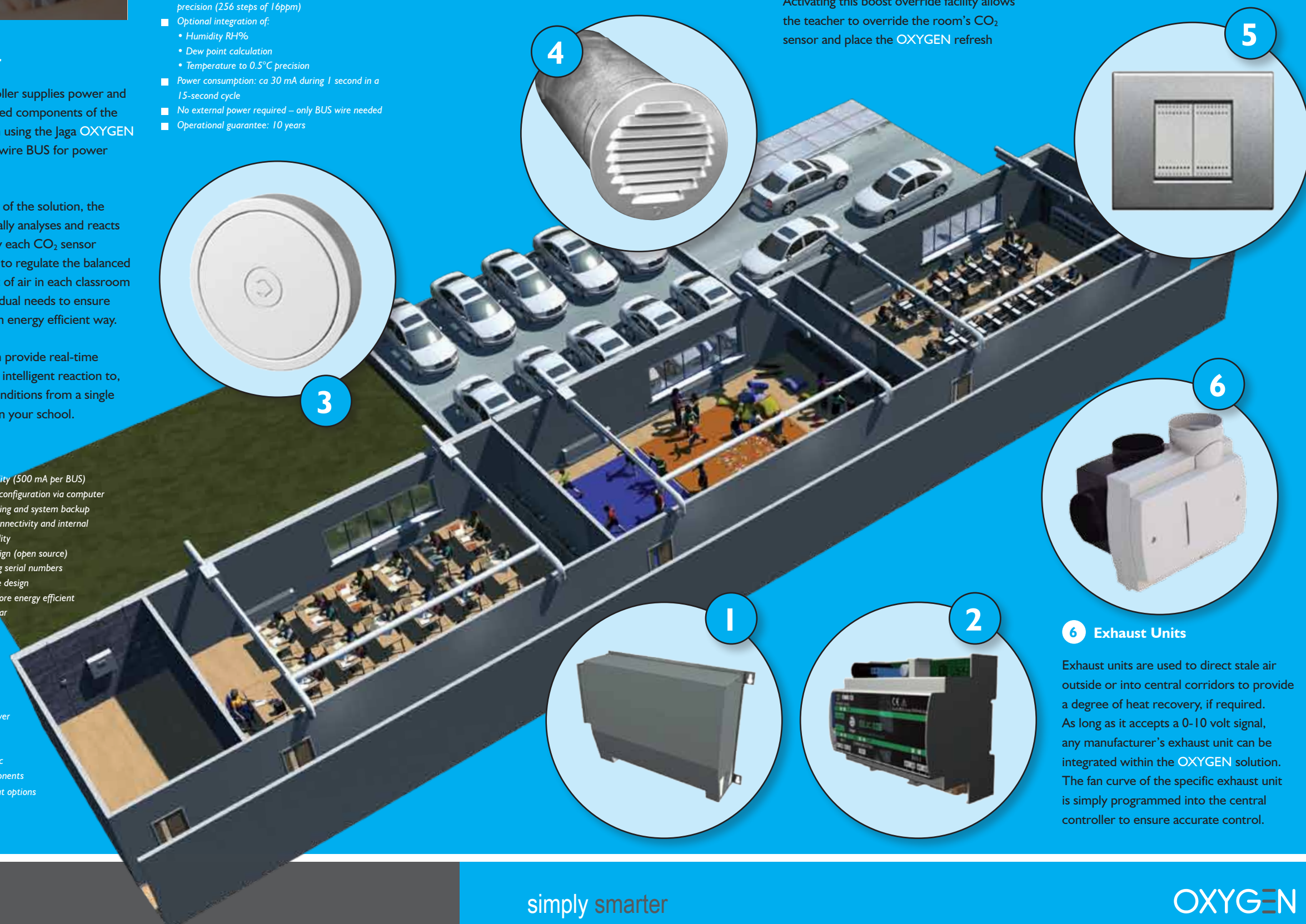
Each OXYGEN refresh unit requires a 125mm diameter feed to the outside air. This air inlet features an integrated powered open/close damper. External grilles are available in a range of styles and up to 32 colours for optimum aesthetic effect. These grilles also feature an integral insect screen.

## 5 Smart Switch

A smart switch in each classroom enables teachers to select an override option to briefly boost the flow of fresh air above that delivered by automatic operation. They can use this if they feel it is required to help further refresh a class that appears to be flagging quickly, for example.

Activating this boost override facility allows the teacher to override the room's CO<sub>2</sub> sensor and place the OXYGEN refresh

units on full speed for a period of 15 minutes to deliver an increased flow of fresh air. At the end of this override period, the central controller will automatically switch the system back to automatic monitoring using the CO<sub>2</sub> sensor. This also allows for the possibility of temperature and occupancy control.





## Disadvantages of the 'do nothing' approach

- No control
- Least benefit

Simply opening a window is not a good ventilation solution.

By the time the teacher notices that extra fresh air is needed, indoor air quality will already be poor.

The outside air that flows in is not always clean – it is more likely to be polluted and/or allergy-laden.

There is no control over the speed or direction of the incoming airflow. An unnecessary amount of heat escapes through the window. Pupils are distracted by cars driving past, air movement and flying insects. Open windows present noise distractions and a security risk too.

## OXYGEN is the answer...

Choose between two sophisticated solutions:

Oxygen Dynamic  
ventilation  
P20

Oxygen Natural  
ventilation  
P22



# OXYGEN Dynamic ventilation solution

- Complete control
- Greatest benefit



## In a nutshell

*OXYGEN Dynamic ventilation is an intelligent and fully programmable heating and ventilation solution that offers complete controllability and operates almost silently to optimise indoor air quality on demand and in an energy efficient way.*

## Purposefully designed to meet differing needs

It could be a 'listen to the teacher at the front of the class' lesson, more group-based learning and discussion, an active drama audition or a session in the science lab... Whatever the size or specific requirements of your school, **OXYGEN** Dynamic demand-controlled ventilation is designed

**Displacement ventilation systems with a balanced supply and extract, linked to CO<sub>2</sub> sensors, would appear to offer the highest levels of responsiveness and efficiency in most situations.**



Optimal IAQ and complete controllability thanks to unique displacement ventilation and a Smart Switch

to meet differing needs for optimal indoor air quality on a room-by-room basis in an energy efficient way every time. It also gives teachers the ability to select an override option to briefly boost the flow of fresh air in their classroom above that delivered by automatic operation if they feel it is required at any moment.

What's more, because it's a fully integrated heating and ventilation solution, your school can benefit from a fresh, healthy and comfortable indoor climate that's conducive to effective learning all year round.





# OXYGEN Natural ventilation solution

- Substantial control
- Significant benefit

## In a nutshell

*OXYGEN Natural ventilation operates using our unique displacement ventilation method and offers almost all the same benefits as OXYGEN Dynamic ventilation – with the exception of complete controllability.*



## Effective ventilation that's naturally energy efficient

Like our **OXYGEN** Dynamic demand-controlled ventilation option, this solution automatically monitors CO<sub>2</sub> levels to optimise indoor air quality in every classroom in an energy efficient way. But it achieves optimal IAQ through the use of air inlet dampers rather than **OXYGEN** refresh units.

**Numerous studies demonstrate that demand-controlled ventilation, based on actual occupancy levels and requirements, is the best possible way to achieve and maintain adequate indoor air quality.**



Achieve optimal IAQ with a significant degree of control thanks to a smart system and efficient air inlet dampers

In this system, when the central controller receives data from a CO<sub>2</sub> sensor suggesting that the flow of fresh air in a classroom needs to be adjusted to optimise indoor air quality, it will act to open or close the inlet damper to suit the ventilation demand.

A motorised damper on the natural extract can then be opened or closed, or an extract fan operated, to facilitate the removal of stale air from the room.





# A solution that's specified to suit you

## A truly tailored approach

Every enquiry that we receive about our pioneering OXYGEN solution is treated in an individual way, because we know that no two schools are the same and specific requirements invariably differ.

So although OXYGEN is a one-stop solution that will always meet all of your integrated heating and ventilation needs, it is not an off-the-shelf solution. That's because we always adopt a truly tailored approach to make sure that the solution we supply is carefully considered and specified to suit you.

### Tell us your challenges...

Whether it's a small renovation project or a big new-build, we can provide your school with a simply smarter solution for an optimally controlled indoor climate.

At Jaga, we are committed to supplying the best possible solution for your specific requirements – an intelligent, integrated solution that meets all your needs and your project budget too.

So just tell us your challenges and particular requirements and we'll advise you about and recommend the best solution and configuration for your specific situation – the solution that will deliver the best system performance, the best energy efficiency and the best learning outcomes for you and your school.

### Whatever works best for you

Jaga OXYGEN is a flexible and fully scalable solution that can be tailored and built from the ground up to meet your specific needs – we'll implement whatever works best for you.

Only the four key components of the OXYGEN Dynamic ventilation system are standardised. The number of refresh units and CO<sub>2</sub> sensors that are required, the design and positioning of your Jaga Low-H<sub>2</sub>O radiators, the type of exhaust

units that are installed, the colour of your air inlet grilles, even the layout of the BUS system that controls the whole solution... Everything else is pretty much down to you. Although we're always on hand to offer plenty of guidance, of course.

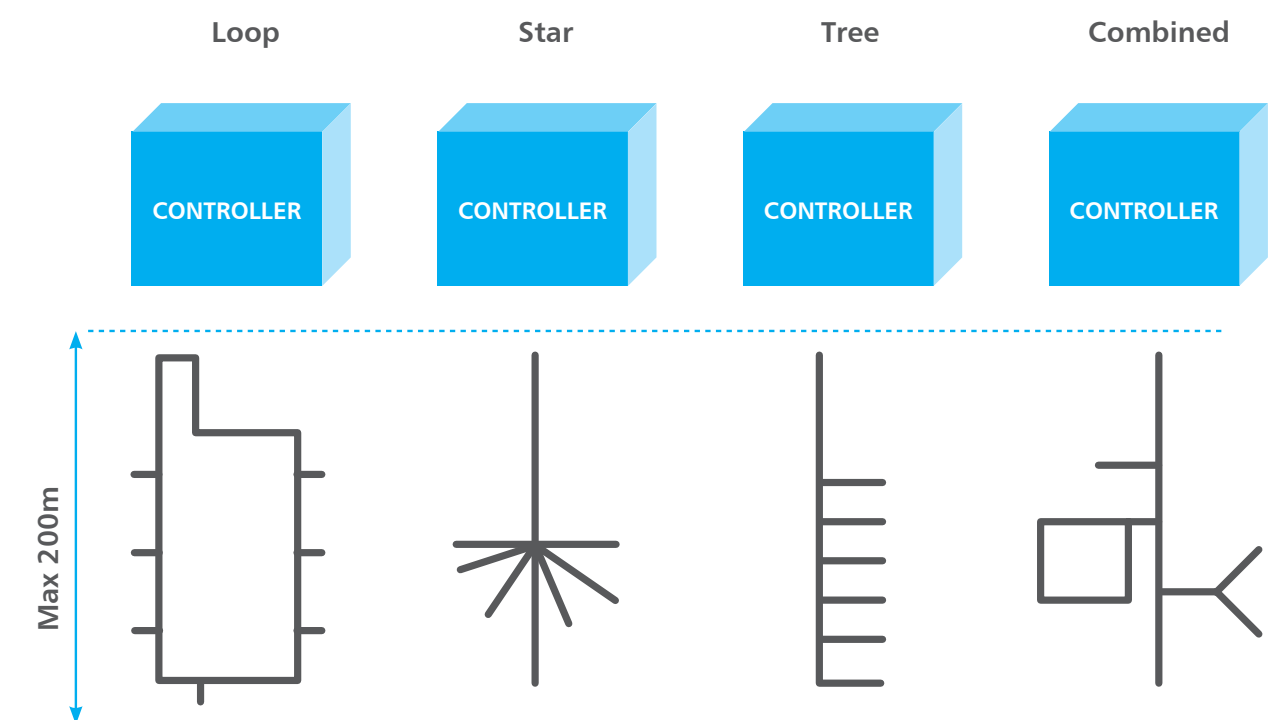
We'll work closely with you to determine the most practical configuration for your school – one that will deliver the best possible benefits in the months and years ahead.



We're keen to work closely with schools and specifiers at the conceptual stage, acting as expert advisors and consultants to help set the standards for enhanced learning environments throughout the UK.

Almost every aspect of our intelligent, fully integrated OXYGEN solution can be tailored to meet your specific needs. This even includes the design and layout of the 2-wire BUS system that controls all the other system components.

Depending on what will work best for your particular school, you can choose a loop, star or tree data network configuration – or a combination of all three!





# OXYGEN in action around the UK

Suitable for every type of organisation

*OXYGEN is a flexible and fully scalable solution, which can be easily installed into any type, size or age of building, delivering numerous benefits for many different types of organisation – in addition to the entire educational market.*

*You can see OXYGEN in action in schools across the UK, as well as at venues such as the Victoria & Albert Museum in London and Academy House in Ballymena.*

## See who opted for OXYGEN...

Some of our recent projects are briefly outlined here as a guide only. Each installed OXYGEN solution is tailored to meet the particular needs of an individual school or organisation, so please do speak to us about *your* specific requirements.

### Haydon Wick Primary School, Swindon

Haydon Wick Primary School was experiencing a number of problems associated with poor heating and inadequate air quality in the classrooms. As a result, the school's 290 pupils tended to fall asleep in lessons, feel sluggish and suffer from headaches.

New School Building Bulletins required innovative solutions to this problem and

Swindon Borough Council specified the Jaga OXYGEN Dynamic solution to provide good indoor air quality and safe, energy efficient heating.

We installed Jaga Low-H<sub>2</sub>O LST radiators containing OXYGEN refresh units, CO<sub>2</sub> sensors and exhaust units in the three-classroom extension to the school. The whole OXYGEN solution is controlled by a PC, making it very easy for Haydon Wick

to adjust programme settings as needed. The system can also be operated remotely, through a secure internet connection.



Haydon Wick Primary School, Swindon



You can see the intelligent monitoring element of Jaga OXYGEN in action by taking a look at the live demonstration of real-time operation at Haydon Wick on page 12.



### Torquay Girls' Grammar School, Devon

Torquay Girls' Grammar School in Devon required a cost-effective ventilation system that fully satisfied recent Government legislation on heating and ventilation within school buildings. In most cases, the capital and lifetime costs of air conditioning systems make them an unlikely specification for educational establishments, so specifier Paul Walters, of Scott Wilson Consulting, chose a Jaga OXYGEN Dynamic solution for the school.

"Firstly, we needed a system that was fit for purpose and one that would comply with both Building Bulletins 101 and 93," he explains. "The OXYGEN solution met this challenge with ease, but there were also

other far-reaching benefits to be had for the school in the form of a healthier indoor climate for all and significant energy and cost savings."

A total of 25 Linea Plus Jaga Low-H<sub>2</sub>O radiators incorporating OXYGEN refresh units were installed around the new sixth-form building, along with CO<sub>2</sub> sensors and exhaust units in each room. The school's central controller only activates the system when there is actually a need for fresh air, so over-ventilating is avoided and money is not wasted.

During the hot summer period, the OXYGEN refresh units efficiently insert cooler night time air from outside to

lower the internal temperature. This provides an alternative to costly air conditioning systems, whilst using a fraction of the energy.



Jaga Linea

Further examples overleaf



Torquay Girls' Grammar, Devon





# OXYGEN in action around the UK

## Leeds Grand Theatre and Opera House, West Yorkshire

Built in the 1800s, the Leeds Grand Theatre and Opera House is one of the oldest buildings in West Yorkshire. The theatre recently underwent a £31.5 million transformation designed to bring current building standards into the historic building and improve the audience experience. Phase two of the project involved the installation of a new heating system in the rehearsal rooms.



Leeds Grand Theatre & Opera House, West Yorkshire

As the rooms are relatively small, when groups of people had previously been rehearsing, CO<sub>2</sub> levels tended to build up quickly creating stale air and an uncomfortable humid feeling. Architects BDP therefore specified Jaga OXYGEN to simultaneously ventilate, heat and monitor air quality in the three rooms.

One solution could have been simply to open the windows. However, this would not only create security and safety risks,

but the draft from outside could prove to be too cold for occupants' comfort – especially in winter, when temperatures in Yorkshire have been known to drop as low as -17°C. In addition, intrusive and distracting noise from traffic and passing pedestrians could not be tolerated at peak times by performing artists focused on their rehearsals.

As well as almost silent operation, the design of the OXYGEN solution was an important factor too. The Strada Type 21 radiators specified for the project are not only attractive and compact, with greater visual appeal than traditional steel-panel radiators, but also feature Jaga's innovative low-H<sub>2</sub>O technology, which typically reduces energy consumption by 10-15%.

## Stevenage Borough Council, Hertfordshire

As part of a £400,000 refurbishment, Stevenage Borough Council recently



Strada



Stevenage Borough Council, Hertfordshire

installed Jaga's OXYGEN solution to provide its offices with both energy efficient heat and ventilation. With up to 50 members of staff and without an adequate ventilation system, the Council previously found that poor indoor air quality was creating a humid and uncomfortable atmosphere, as well as causing drowsiness and inattentiveness among staff. The building, which was built more than 50 years ago, previously used under-floor

heating as its main source of heating. However, this proved to be a costly system to service in terms of fixing or replacing faulty parts because this work had to be out-sourced, meaning the Council was unable to control maintenance costs.

An OXYGEN solution was specified using refresh units integrated within Jaga's Strada radiators to deliver optimum levels of heat during the winter months, whilst

“The whole OXYGEN solution is very impressive”

Brian Ginn, Building Services Manager at Stevenage Borough Council

also providing good ventilation to provide staff with maximum comfort levels year round. The fact that the Strada radiators incorporate Jaga's Low-H<sub>2</sub>O technology means they use 90% less water than traditional steel-panel radiators, helping to reduce overall costs and carbon emissions.

Brian Ginn, Building Services Manager at Stevenage Borough Council, is extremely pleased with the results: “The whole OXYGEN solution is very impressive – I now have complete control over the heating and ventilation system by monitoring the CO<sub>2</sub> levels in the room, and the output is adapted as and when it's required. The office is now much more comfortable.”

He adds: “The Strada radiators met the brief perfectly, both in terms of style – we needed a discreet and compact unit – and our energy efficient requirements which, in turn, help to keep overall costs down too.”



## 5 good reasons why you, too, should opt for OXYGEN

### Because Jaga OXYGEN:

- 1 Improves indoor air quality to create an optimal learning environment every time
- 2 Delivers clean, healthy, fresh air on demand – and in a highly energy efficient way
- 3 Is an intelligent, integrated solution that meets all your heating and ventilation needs
- 4 Is completely controllable and fully scalable to meet any changing and future needs
- 5 Can help you to reduce the carbon footprint of your school and benefit from significant energy and cost savings for years to come

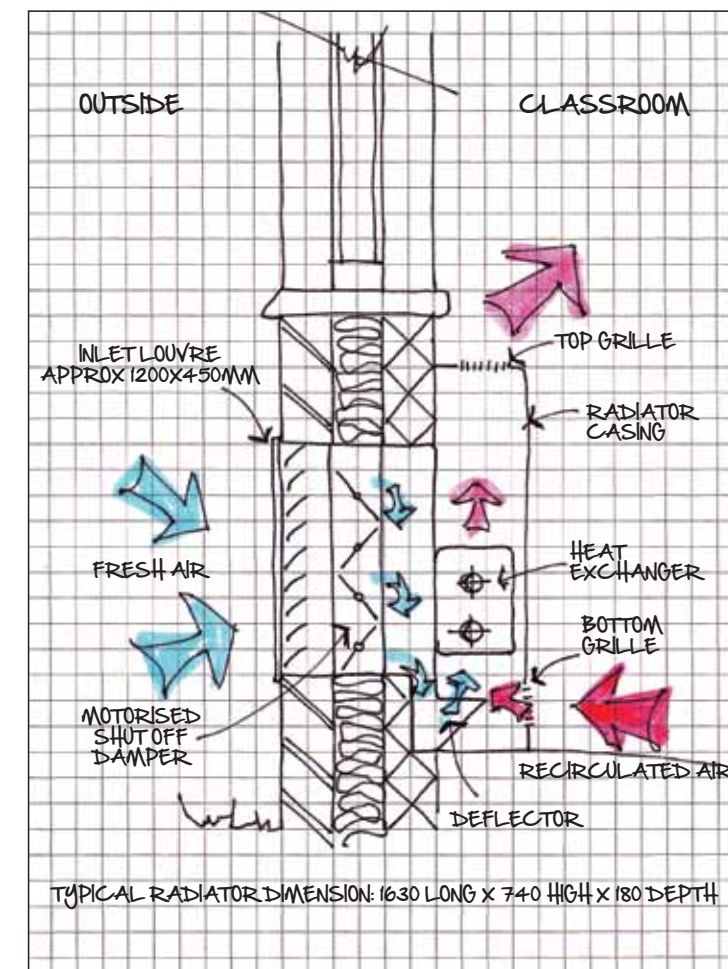


## Simply smarter

Intelligent ventilation for an optimal learning environment

### OXYGEN Natural

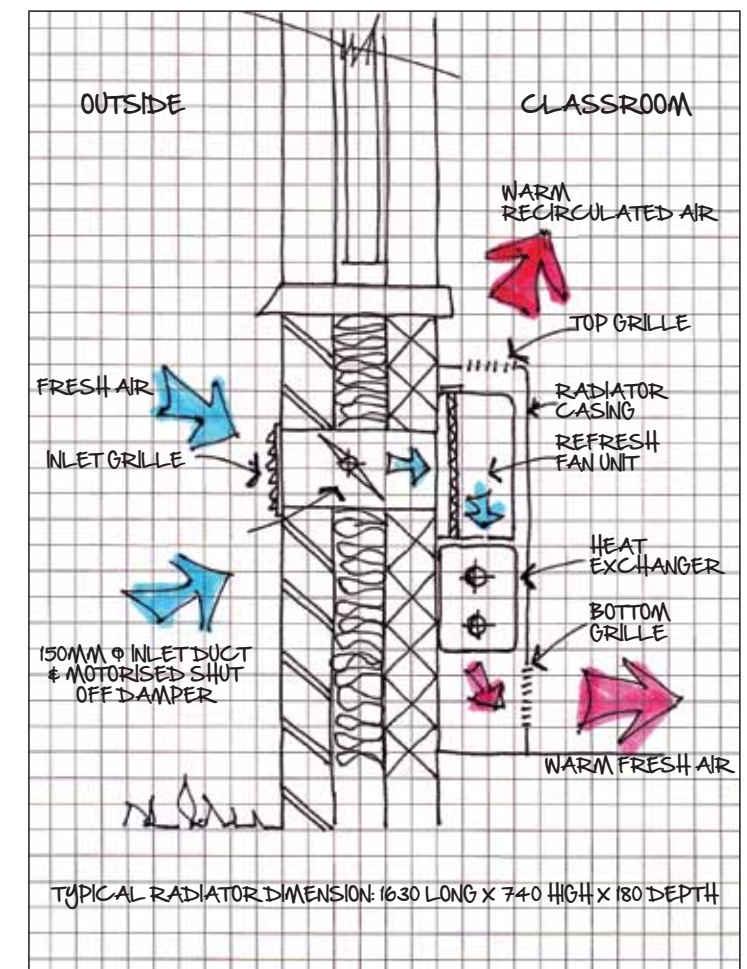
The process



As the CO<sub>2</sub> level increases above the minimum set point, the motorised damper modulates to allow fresh air to enter the inlet plenum and be directed upwards via the deflector plate, thereby preventing cold air dumping into the space at low level. It mixes with the re-circulated air coming from the occupied space and passes over the heat exchanger gaining temperature then being discharged from the top grille. The extract system removes the warm stale air at high level.

### OXYGEN Dynamic

The process



As the CO<sub>2</sub> level increases above the minimum set point, the low voltage modulating fan draws in precise amounts of fresh air and discharges it downwards over the heat exchanger to be heated prior to being discharged at low velocity into the occupied space. The low velocity warmed fresh air is then distributed into the space utilising displacement ventilation process. The extract system removes the warm stale air at high level.





### Speak to us about consultancy and CPD training

We are happy to act in a consultancy role for any project and offer a wide range of expertise and experience in dealing with heating and ventilation options for schools.

We also offer a series of CIBSE approved CPD training sessions for designers, specifiers and building services engineers.

Please ask for further information and let us know if you would like to arrange for us to visit your team.

### Find out more

For more information about any aspect of our next generation **OXYGEN** solution, please get in touch:

- Call us: **+44 (0)1531-631 533**
- Email: **[info@jagaoxygen.co.uk](mailto:info@jagaoxygen.co.uk)**
- Or go online: **[www.jagaoxygen.co.uk](http://www.jagaoxygen.co.uk)**

Founded in 1962, Jaga is an award-winning manufacturer of innovative, energy saving heating and ventilation solutions

## OXYGEN

Simply smarter

The intelligent and fully controllable heating and ventilation solution that's **simply smarter**