S*AIR

AIR QUALITY OF LABORATORIES

Quality control of the interior environment

APLICATIONS

Ventilation under demand

The OptiNet system

Laboratories/Vivariums

Certification LEED

CAI Monitoring

DYNAMIC CONTROL OF VENTILATION

* INTRODUCTION

The energy related to heating, cooling, and moving air through the lab is by far the most significant contributor to energy consumption in a lab (60%-80% of the total), and the ventilation is the most important factor.

The incorporation of OptiNet system provides control of the HVAC system, the necessary information to regulate the amount of primary air to be introduced into each of the local analyzed depending on the indoor climate, or in other words, in function of Indoor Environment Quality (IEQ) measured in levels of CO2, TVOCs (total volatile organic compounds) and particles (and optionally CO and humidity) in environments of scientific facilities and in terms of CO2 (and optionally CO, VOC , particles and humidity) for general use environments, in coordination with the ventilation demand generated by devices capable of extraction (fume cupboards, exhaust arms, etc.).

This application provides a dynamic approach to air change rate compared to the traditional approach of constant ventilation rate.

When we talk about adjusting air flow it is important to clarify exactly “what air” we are talking about. Airflow is needed in a lab for 3 specific reasons:

1. To meet hood flow requirements: Aircuity does not interfere with the air supply required for this.
2. To meet the thermal load requirements: again, Aircuity does not interfere with this air requirement.
3. Dilution or “Makeup” air, used for occupant health, comfort and safety.

To combat thermal loads, strategies as dissociation heat loads and ventilation, chilled beams or fan coil units can be used.
To minimize the exhaust air from specific elements, there are variable volume techniques to optimize consumption.
In any case, these factors are determined by the internal process that occurs in the laboratory.
OptiNet system is focused on this third element, “makeup air”.

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MARKETS

Teaching buildings

Healthcare buildings

Research laboratories and vivariums

In this way, DIN1946 sets ventilation parameters (primary air) of 25 $m^3/h.m^2$ and a lot of world references talks about 8-10 ACH. However, studies have found that over 95% of the time, the air in the laboratory is clean, although sometimes incidents may happen in the labs as spillage or emission of fumes due to improper storage, work performed outside the safety devices or absence of local extractions for equipment. These facts show that there is no fixed ventilation range that is suitable for all time in the laboratories.

* TECHNICAL DESCRIPTION

OptiNet is a comprehensive suite of technologies which enables to establish energy efficient and healthy strategies for the occupants through the ventilation control in buildings. OptiNet's multipoint sampling system senses a multitude of indoor environmental parameters throughout a facility to deliver cost effective, accurate, and reliable knowledge on ventilation performance.

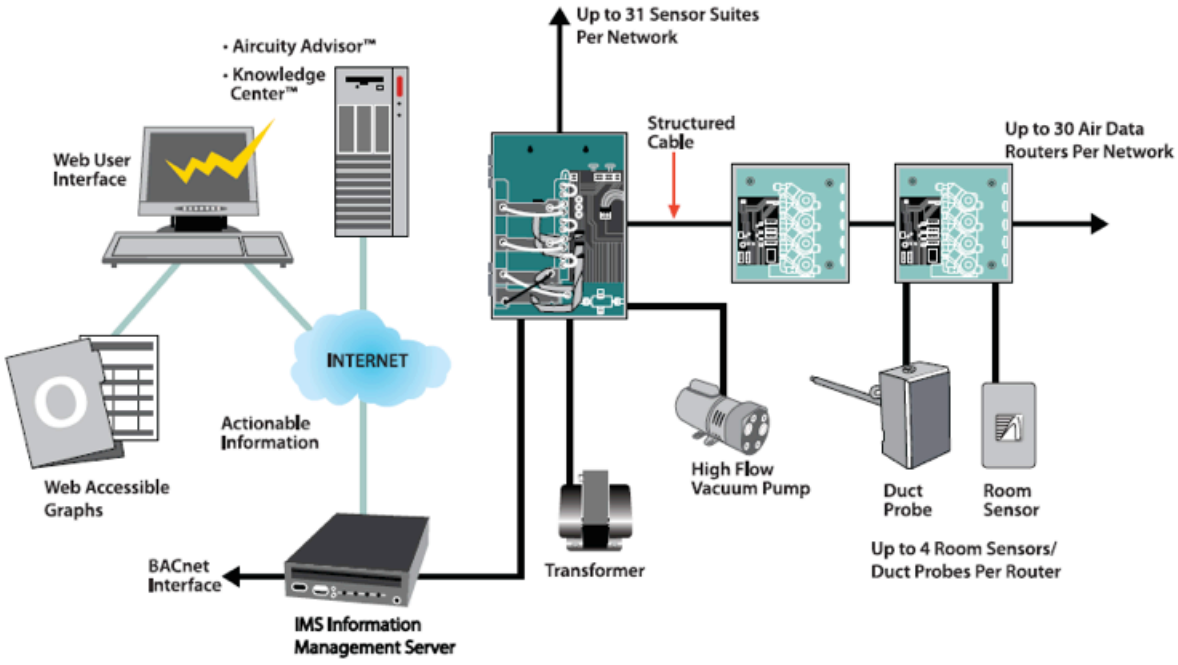
This information is integrated with a building control system to enact energy savings with an approach that includes: ventilation control under demand, free cooling based on enthalpy differential, and the dynamic control of ventilation of dilution in laboratories and animal facilities.

These strategies significantly reduce building energy consumption and also they enhance the facility's indoor environmental quality, and in many cases can reduce the building first costs.

Quality control of the interior environment

The OptiNet system continuously collects an array of building indoor environmental data. Air samples are gathered from individual spaces and are transported through the OptiNet network to the Sensor Suite for its analysis.

The sampled data is then transmitted to the web based on the Aircuity Knowledge Center for archiving, review, and graph generation. Additionally, the data is communicated to the facility's Building Management System for control of the facility's ventilation systems to reduce energy costs while improving indoor environmental quality.



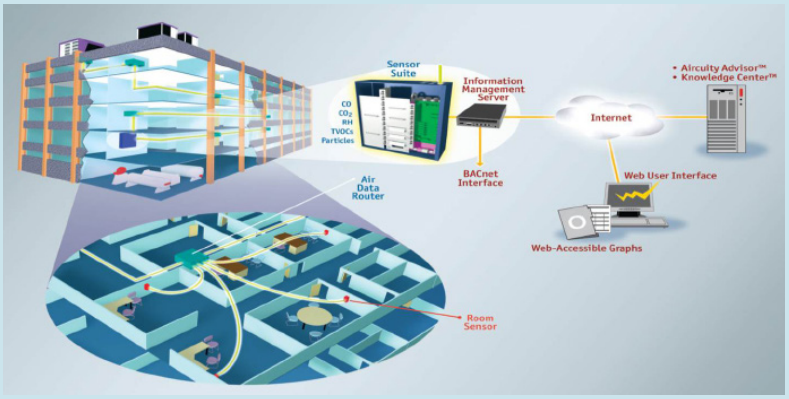
Quality control of the interior environment

"Sensors centralization of great quality for a total reliability of the system"

ARCHITECTURE AND OPERATION

The OptiNet system proposes to vary the ventilation rate of the building, monitoring the Indoor Environment Quality (IEQ), so that if the air is clean, low dilution is maintained and when contaminants are detected, the ventilation air flow is increased. These internal conditions are measured and analyzed by the system using remote air sampling at each location and through a common microducts are sent to a centralized set of sensors.

These samples are collected continuously, sequentially and in real time for specific rooms and individual spaces included in the system as well as the sample of the fresh air. This point is especially important, because the system covers situations of contamination caused by the internal use of the premises and therefore a differential is required regarding outdoor air, otherwise, it might be that a high level of CO2 produced by the entry of contaminated air (traffic, unwanted returns) with an absolute measurement system would demand more outside air, increasing input of the contamination's source.



The air samples are transported to the central set of sensors for the analysis through a common air and data bus, which is manufactured with nanotechnological materials that provide inert properties which minimize the chemical absorption and maximize the transport of particles.

Quality control of the interior environment

This transport of air samples is done using a vacuum pump and the scheduling of the OptiNet system server that determines the opening and closing sequences of the electro-valves (in the Air Data Router) which regulate the order in which the samples are being received from each sounding point. On the one hand, this ensures a maximum flexibility for the future and on the other hand, the integrity of the taken track in the mentioned bus because the sequences can be reprogrammed if later zones of division of the existing ones wanted to be added or also for the extension of the building.

Using a set of centralized sensors of high quality the accuracy of the measurement is increased and the costs of maintenance and calibration of the system is significantly reduced by reducing the total number of sensors and future maintenance resources compared to measurement and individualized detection systems per local.

In addition, the installation of centralized sensors with a program of recalibration of the sensors allows to avoid errors from measurements arising from the comparison of measurements with different sensors and inadequate management of sensor calibration, which means a sum of errors.

The central of sensors can contain the correspondent CO2, CO, particulates, VOCs and dew point. The samplings of each local may incorporate a sensor to measure local T[a].

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"The air conditioning costs can be reduced in 50-60%"

SYSTEM: COMPONENTS

* ROOM SENSOR (RS)

The Room Sensor (RS) interfaces to the Air Data Router for room level sensing of temperature; and for drawing air samples from the test areas through the patented MicroDuct® communications path. The assembly is flush mounted and can be custom painted to match architectural interiors.

* DUCT PROBE (DPB)

The Duct Probe (DPB) interfaces to the Air Data Router for duct and outside air level sensing of temperature; and for drawing air samples from the test areas through the patented MicroDuct® communications path. Enclosures are selected based on interior and exterior (weather tight) applications.

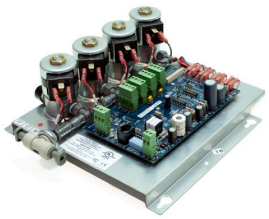
* SENSOR SUITE (SST)

The Sensor Suite (SST) is built on a scalable architecture to accept a variety of sensors for multipoint sampling of a host of indoor environmental parameters. The sensor suite affords distributed, multiplexed based sensing of the monitored areas by automating the collection of real time, area specific data received from Air Data Routers. A shared sensor platform minimizes calibration and maintenance costs while it maximizes the potential energy savings.

* SENSORS (SEN)

Located within a Sensor Suite, Sensor Suite Sensors (SEN) evaluate an array of environmental conditions using a shared sensor architecture. Each sensor is designed for optimal performance based upon a specific control or monitoring application. A range of sensors are available to measure carbon dioxide (CO2), carbon monoxide (CO), dewpoint temperature, total volatile organic compounds (TVOCs), and airborne particulates.

Quality control of the interior environment



"Greater sustainability and less environmental impact reducing the CO2 emissions."

* AIR DATA ROUTERS (ADR)

Air Data Routers (ADR) convey air samples to the Sensor Suite from up to four distinct test areas (sample points) via dedicated Room Sensors and/or Duct Probes and the associated OptiNet Structured Cable. The router multiplexes air samples from the room sensors and probes via onboard solenoid valves that are commanded to open/close through the router. The temperature readings will be direct from the same probes when those are equipped. Multiple areas can be monitored from one Air Data Router, and the routers can be networked as part of a larger distributed system.

* OPTINET® STRUCTURED CABLE (OSC)

The OptiNet® Structured Cable (OSC) is the communications backbone for the OptiNet Facility Monitoring System. The cable is a composite of both traditional LAN based technologies; and a patent pending sampling media named MicroDuct®. An exact blend of carbon nanotubes and a fluoropolymer resin maintain superior particle transport and chemical purity of the air sample.

* INFORMATION MANAGEMENT SERVER (IMS)

The Information Management Server (IMS) provides network management of the Sensor Suites; communications to the Aircuity Knowledge Center for a web based user interface and reporting; and for integration to a facility's Building Management System.

* HIGH FLOW VACUUM PUMP (HFP)

The High Flow Vacuum Pump (HFP) draws a continuous flow (vacuum) of air through the OptiNet communications backbone for evaluation. The pump interfaces to a Sensor Suite for sequencing of air samples from the Air Data Routers in the space.

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"Great energetic saving for a quick amortization of the inversion"

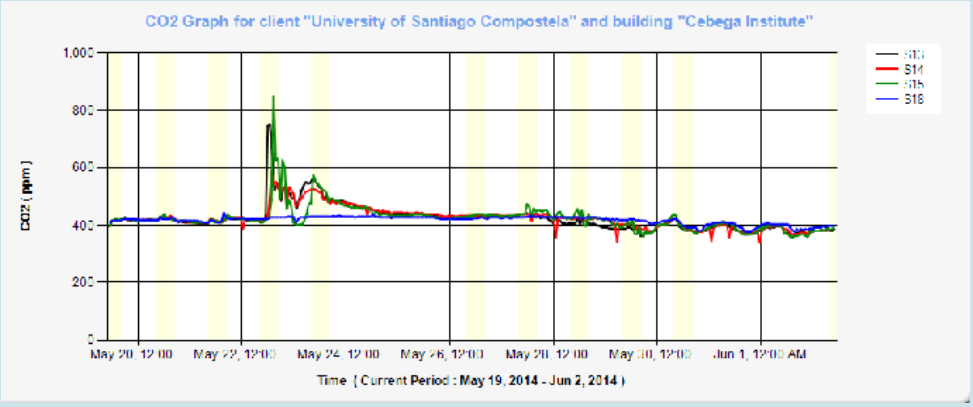
SYSTEM: ADVISOR TM SERVICES

Aircuity Advisor Services is a suite of tools used to alert, inform and analyze energy entitlement and Indoor Environmental Quality (IEQ) issues for users of the Aircuity OptiNet® system. Advisor provides ventilation and IEQ information to identify and diagnose issues as part of a continuous commissioning program. The Aircuity OptiNet system provides an unparalleled multipoint sampling scheme for IEQ parameters while Advisor transforms this raw data into clear and timely information through a collection of sophisticated Web pages and intelligent email alert notifications.
Includes:

* SERVICE ADVISOR TM

It offers:

- Graphical representation of desired parameter and system performance
- Sophisticated graphic tools for the representation of each parameter.
- Notifications through email of IEQ or air conditioning based on configurable conditions and alerts based on situations where gravity, duration, frecuency and unusual things in an intelligent way are taken into account.
- Periodical informs about the performance of the air conditioning system and IEQ, with data analysis and its possible causes.
- Possibility of exporting data of any parameter in a determined period.
- Historical data always available online.



Quality control of the interior environment

"Security Surveillance ventilating due to the real needs of each laboratory"

SYSTEM: DATA MANAGEMENT

The collected data is transmitted to the data center for archiving, reviewing and generation of reports. This information is able to communicate with the building management system (BMS), which allows to optimize the renewal rates of primary air on the basis of what is really happening in the local, reducing energy costs and achieving greater energy efficiency and better indoor environmental quality.

As additional support, the monitoring of contaminant levels in laboratories allows to technicians of prevention be aware of the conditions that are involved and analyze the incidents that might happen, so that they can take the appropriate measures for the prevention of users.

Advisor Services is a real game changing approach to how facility managers, building owners, and others can easily understand their building's airside performance and proactively address issues that negatively impact their energy savings or indoor environmental quality.

Advisor Services are comprised of 4 major components that work independently and interdependently to provide insight and intelligence about your building.

First, the gathered information is a collection of more than 30 different analytics delivered via secure Web page to provide information about energy reduction, ventilation performance and indoor environmental quality. These dashblocks go way beyond traditional BMS data streaming by translating data into usable information that can be trended over user defined time periods.

Different users can create custom views based on their areas of interest.

For example:

For sustainability you can quickly see your energy savings, whether or not targets are being met, and identify offending areas.

A facilities manager could view equipment and ventilation equipment performance.

Environmental health and safety personnel can immediately view the IEQ of every lab space, giving them insight into lab usage and whether or not lab protocols are being followed

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The second component of Advisor services, Summary reports, provide at a glance summaries of ventilation and IEQ performance delivered via e-mail to a user defined list of recipients. These reports are generated weekly and monthly, with summary information color-coded to help you identify and prioritize any potential issue.

Smart Notifications are e-mail call-to-action alerts for IEQ or ventilation events triggered based on statistical modeling and optimal ventilation of each space. Intensity thresholds are defined by the user. Test Areas can be grouped to minimize the issue of multiple alerts from a single event that affects contiguous spaces, and embedded hyperlinks to the Information Dashboard allow you to gather more intelligence about issue easily and quickly.

The final component of Aircuity Advisor is an on demand historical graphing and analysis tool with export capabilities. You can filter by any measured, monitored or calculated parameter; one or more test areas; over any time period. Zoom in and zoom out; save, copy or print charts; edit chart properties and style and export data to Excel.