Informa-TECH

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More powerful, quieter, integrated and essential controls

Outdated or innovative? A host of control solutions are available today; they are varied, very sophisticated and essential in any organization. The time has come to reassess the nerve centre in any building and their control—an art that is increasingly integrated into a building's operations.

At the heart of a building

Control systems are found throughout buildings today, and they go beyond the simple mechanics of running a building: heating ventilation and air conditioning (HVAC), fire protection, security and even audiovisual systems.

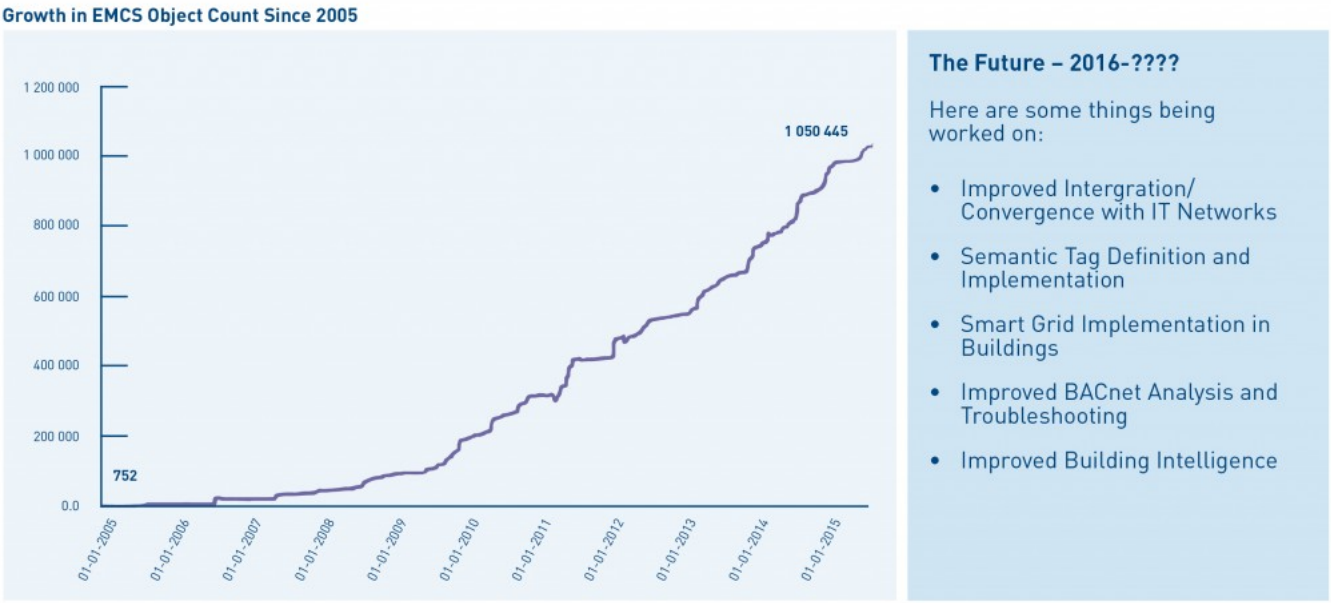
A fine example of a project that is at the forefront of building controls with integrated BACNet, a protocol developed by ASHRAE, is the Glen Site at the McGill University Health Centre (MUHC). The Site is equipped with a control platform developed by Johnson Controls Inc., which consolidates several solutions, from the thermal power plant to the heat recovery system integrated by Siemens, to control solutions for security, elevator, and fire protection systems. The Glen Site is equipped with more than 200,000 physical and virtual control points that monitor among others more than 50 air handling units and 2,500 variable volume distribution boxes. This represents an intelligent system that is easy to operate. This fully-integrated system provides many advantages:

- The use of air-handling systems and components, combined with innovative logic controls, helped create shelter spaces in case of fire without having to add dedicated systems for this purpose. Results: Significant space saving.
- For the chemistry/biology and research centre, Siemens BT controls offered a global system specially developed and tested as a whole for the type of critical environment identified. The integration process was simplified because the boiler room already featured boilers with efficient micro modulation and combustion quality control systems from the same manufacturer.
- The integration of energy data from submeters and operating equipment data helps track consumption and allows operating features to be adjusted quickly, functions that are very useful in managing the first building of its kind in Québec to obtain LEED Gold[1] and « Visez vert Plus » certification.

MUHC NETWORK ARCHITECTURE

2015–2016: Mature market, emerging technologies and integrated concept

Looking back, we could say that 2015 was a landmark year for building control. If the ASHRAE BACNet protocol set the baseline and confirmed its maturity 20 years later, it provided a clear path for the next generation of communications and protocols, which will be increasingly integrated in IT networks (big data) and SmartGrid energy networks[2].



ASHRAE Conference highlights, Montréal chapter, April 2016: BACnet: Its Origins and Evolution. Michael Newman, Chairman of the ASHRAE BACnet Committee (SPC 135P and then SSPC 135) from 1987 to 2000, still serving on the committee today

Something new in 2016: an ASHRAE committee is currently working on developing a protocol that will once again confirm the importance of control strategies. Guideline 36 – High Performance Sequences of Operation for HVAC Systems, was released for public review in April 2015 to establish best practices or control strategies inherent to the major mechanical systems in buildings.

From the equipment found in complex buildings to residential buildings.

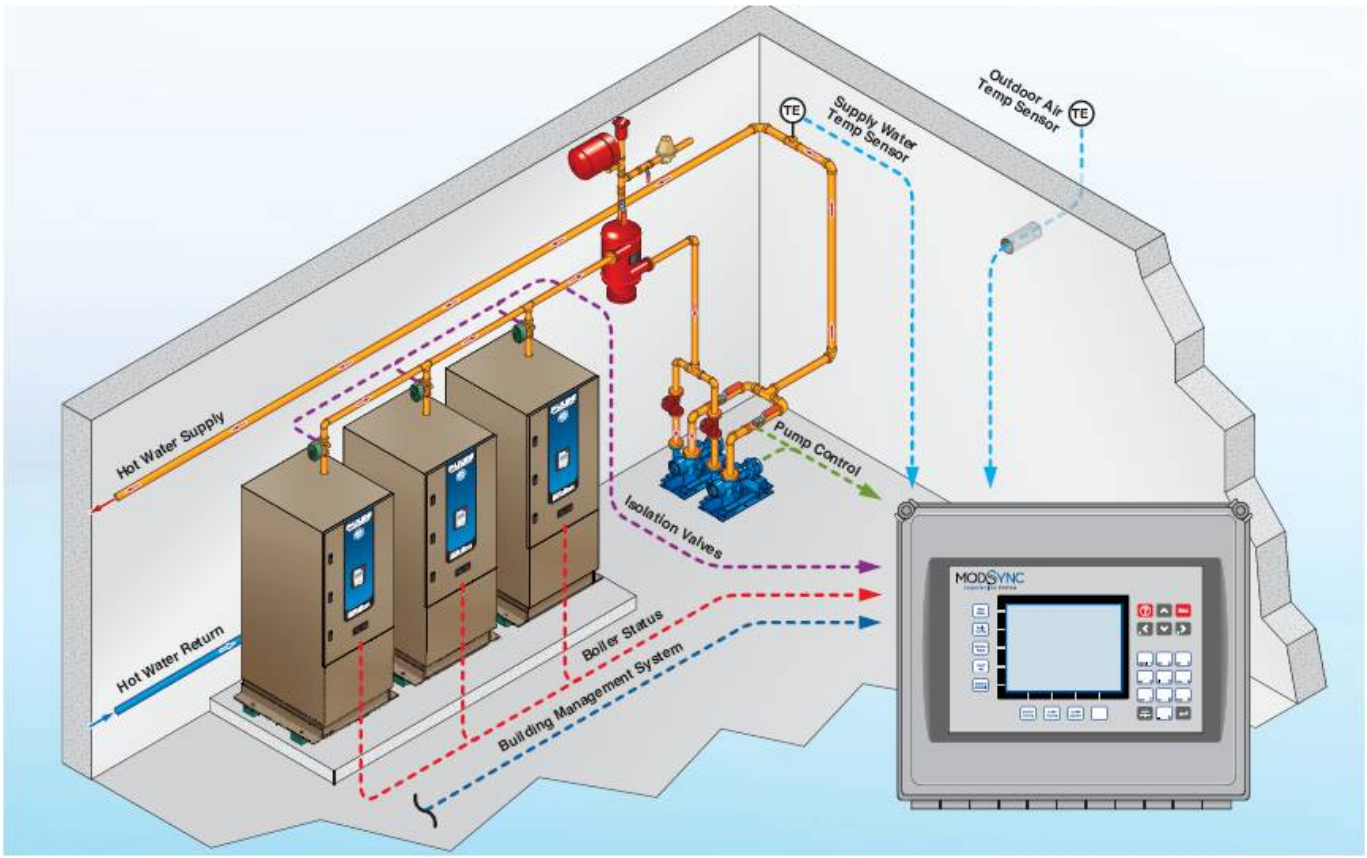
Today, control systems are found at almost every level in a building's mechanics:

More stand-alone equipments

Manufacturers are striving to outdo one another to integrate control platforms into equipment and boilers. Not only does this facilitate remote access to adjust temperature settings or for diagnostic purposes, these control platforms help create smarter equipment. For example, several boiler makers provide system controls that enable condensing boilers to achieve high-performance levels by running them simultaneously instead of in cascade.

More efficient hydronic networks

Several specialized solutions are designed to control and optimize hydronic heating systems. This type of solution manages the boiler room, i.e. the boilers, pumps and valves, based on demand and the building analysis. By analyzing and maintaining a temperature differential between supply and return, we can prevent energy wastes. But then again, this concept goes beyond controlling interior and exterior temperatures: it takes inertia and the building's reaction to factors other than temperature into account. For example, at -5°C, a building with curtain walls will not necessarily have the same reaction on a bright winter day as on a cloudy and windy day in the fall. This type of system will adjust the heat injection accordingly to respond more or less quickly and generate savings ranging from 10% to 15% on average, and even up to 35% in some cases[3]!

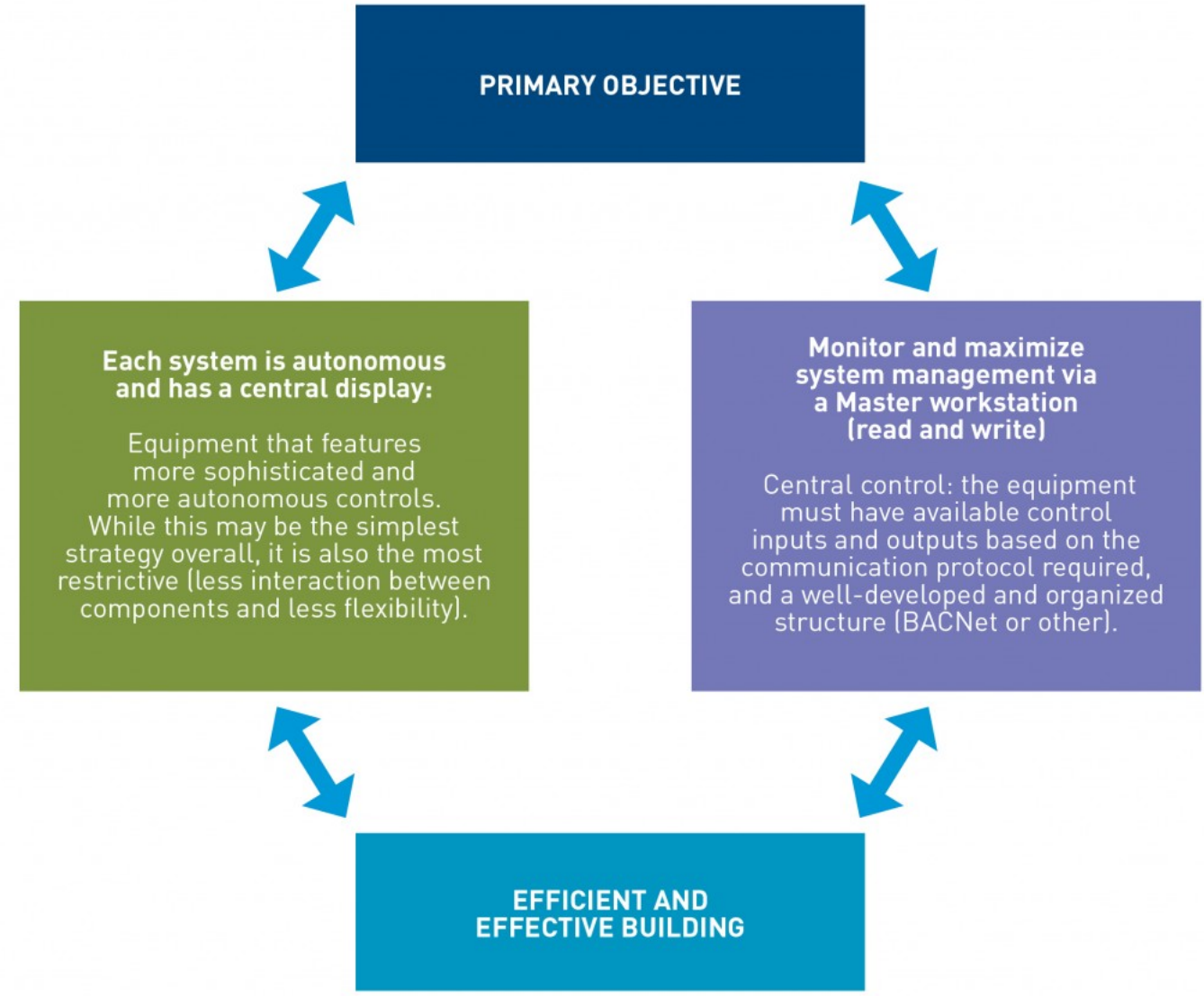


Source: [Enviroair, Synex solution]

Anticipating needs:

Much like in the first example, for the management of a commercial or institutional building, the manager wants to control the building's overall components. Different control strategies are available:

- Configurable control platforms: these components and controllers have predefined functions and sequences that are designed to meet the needs of most commercial systems: rooftop units, variable delivery systems and boiler rooms.
- Programmable controls: these controls provide greater flexibility, but require specific installation and programming expertise.



Some firms (distributors/installers) offer customized touch-screen interfaces that allow clients to view their intercom system, integrate their heating and ventilation systems and display energy-tracking data.

Digital tablet, picture from Regulvar

Digital tablet, picture from Regulvar

This type of flexibility highlights an important fact: today's technology is fluid and efficient, and its application potential is almost unlimited, especially in terms of logic and control sequences. The available technology also provides access to a large amount of data, making it possible to better understand building operations. The effective use of such technology facilitates the customer experience and the identification of productive solutions. This concept is at the heart of Honeywell's proposed strategy—"Connected buildings. Connecting people"—for keeping up with technological trends using mobile and cloud technologies[4].

Intelligent diagnostics and continuous fault detection

Much like control systems, different platform levels were developed to simplify system operations in larger buildings, whether this involves a simple Web-based data-tracking platform, like Vigilia[5], for instance, or an advanced diagnostic system such as DABO (developed by NRCan) that can carry out perform corrective actions in real time. These interfaces are usually displayed on top of the control tools in place to facilitate diagnostics and system management.

Selecting the right strategy

Given the scope of the solutions available, the type of system required based on future system changes must be defined at the outset. Ask the following question: What is the primary objective of this project?

Today, different control systems are available for different types of buildings. A multi-residential space will not need the same level of intelligence or reliability as a pharmaceutical laboratory that requires strict controls (ex.: CFR11[6]) or a small commercial building that has a few rooftop ventilation units.

Of course, these systems come at a significant cost. However, since the mechanical systems in buildings are becoming increasingly complex and efficient, using effective control systems to optimize system management is key.

Several financial assistance programs are available to support this type of initiative:

- Gaz Métro has an incentive and support program to implement improvements that target control measures.
- For major renovation and new construction projects, grants of up to $1.50/m^3 saved are available, making for interesting savings.
- The Recommissioning Program supports structured diagnostic and investigation initiatives that will determine which corrective measures will be the most beneficial to owners.

Some programs are simple, based on the equipment being installed, such as smart range hoods or programmable or smart thermostats.

In closing, if it has become almost impossible to overlook controls in any project that involves a building's mechanical systems, selecting the optimal strategy to ensure the full potential of these solutions is now more important than ever.

These solutions are easily integrated into complex building operations, or they can be part of actions to save energy. One thing is certain: today, any efficient building requires a good control strategy.

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[1] McGill University Health Centre, Sustainable Development. https://muhc.ca/homepage/page/sustainable-development-1

[2] ASHRAE Conference, Montréal chapter, April 2016: BACnet: Its Origins and Evolution http://ashraemontreal.org/storage/presentations/20160411_presentation_principale_Newman.pdf

[3] Results obtained by measuring the solutions presented as part of Gaz Métro's Technology Innovation Program. A few similar solutions are already in place at Demtroys, Synex, etc. Second reference: CFP1 Boilers and CT Energy Better System Design and Innovative Retrofits, ASHRAE 2014 Winter Conference, Paul Glanville, PE Gas Technology Institute

[4] BOMEX 2015, « CONNECTED BUILDINGS. CONNECTING PEOPLE », by Himanshu Khurana, courtesy of Luc Nadeau, Honeywell »

[5] Vigilia from HVAC.IO

[6] CFR – Code of Federal Regulations Title 21: TITLE 21–FOOD AND DRUGS CHAPTER I–FOOD AND DRUG ADMINISTRATION DEPARTMENT OF HEALTH AND HUMAN SERVICES SUBCHAPTER A–GENERAL PART 11 ELECTRONIC RECORDS; ELECTRONIC SIGNATURES (Loose translation: Strict FDA-required data-traceability standards, especially in the food processing and pharmaceutical industries.)

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Informa-TECH is a publication of DATECH Group of Gaz Métro offered free of charge. For further information on these topics, contact Marie-Joëlle Lainé, Eng., at 514 598-3444 #3507.