Cost-Effective Commissioning for Buildings

Developments in ECBCS Annex 47

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Many buildings fail to meet performance expectations due to problems that occur at various stages of their life cycle, from building design to operation. These problems, which often originate from building systems and their interactions (including the building envelope, heating, ventilating, and air-conditioning (HVAC) systems, and lighting systems), can trigger increased CO_2 emissions, energy costs, occupant discomfort and health problems, reduced productivity, and higher maintenance costs. Building commissioning is a quality assurance process that if applied more widely and at earlier stages in the building life cycle has the potential to dramatically reduce building energy consumption and improve performance. Methodologies and tools to realize these goals are being studied by the ECBCS research project on "Cost Effective Commissioning in Existing and Low-Energy Buildings", Annex 47.

The project, underway since June 2006, includes 12 participating countries represented by over 50 organizations. The shared objectives are to:

- develop tools that utilize design data and the buildings' own systems in commissioning,
- automate the commissioning process to the extent practicable,
- develop methodologies and tools to improve the operation of buildings in use, and
- quantify and improve the costs and benefits of commissioning.

The scope includes initial commissioning for advanced and low-energy systems, re-commissioning and optimizing existing buildings (the focus of this update), and quantifying the costs and benefits of commissioning.

One of the challenges in developing commissioning tools is to address the different needs of existing buildings and new low energy buildings. Low-energy buildings emphasize an integrated systems approach throughout their life cycle; some buildings may comprise novel and/or advanced technologies and system operation strategies, while others take full advantage of existing technologies.

Existing Buildings

For conventional buildings, the interest to improve methodologies and develop automated and semi-automated tools for commissioning and optimization is based on the sheer number of buildings, their high energy consumption, and the fact that very few have been commissioned. Therefore significant energy savings will be attained at the national level by applying cost effective processes for commissioning and optimization of building envelopes, HVAC systems, and the building energy management systems (BEMS) in conventional buildings.

Conventional buildings often lack design data, have limited monitored data and the addition of new sensors and minor refinement of present systems must be shown to be cost-effective. Furthermore, the goal for re-commissioning is usually to get the best performance with existing systems (e.g, run fault detection and diagnostic (FDD) algorithms and if problems are identified then run specific functional performance tests (FPTs).
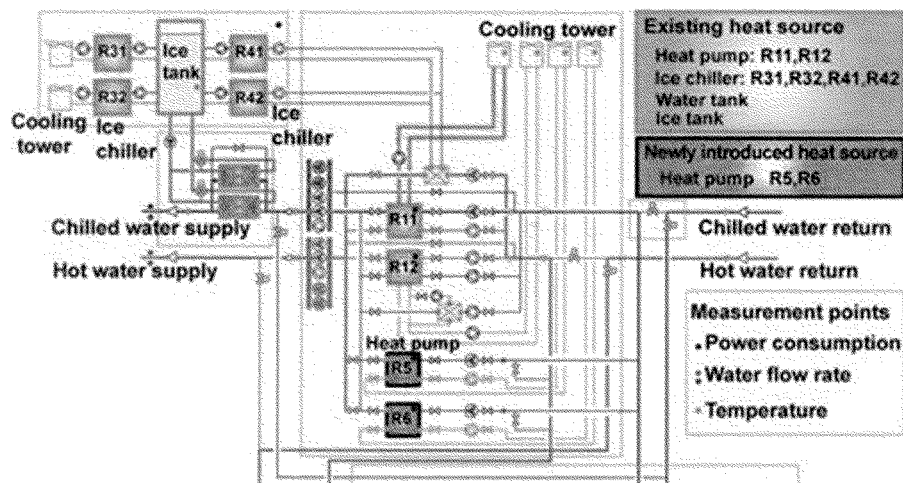
A generic commissioning tool is under development for the energy plant which supplies chilled/hot water to three commercial buildings.