Air Balancing and Energy Savings

By Rob "Doc" Falke, President, National Comfort Institute

For five decades air balancing has been specified by mechanical engineers on nearly every commercial project. In recent years, air balancing has moved into the energy efficiency market as a method of verifying the operating performance of both residential and commercial HVAC systems.

Let's take a look at how new air balancing reports are placing manufacturer specifications and measured field data side-by-side to prove how efficient an installed system is operating.

What is Air Balancing?

A relatively small band of practitioners and HVAC professionals test and adjust the performance of operating HVAC systems, manipulate control devices and fan speeds, to bring the system into a state of compliance with design specifications.

Test results and readings are recorded and then compared to the manufacturer specifications. Line-by-line, a trained eye can then interpret the performance by seeing how the installation deteriorated the laboratory-rated performance of the system.

Typical measurements that air balancers take include a broad number of airflow tests, air velocities, static pressures, wet and dry bulb temperatures, fan speeds, electrical and fuel consumption. Other information they need to capture includes dimensional measurements and installation details, as well as all equipment nameplate and engineering data.

Way Beyond Airflow

For decades, most air balancing certifying bodies only captured airflow data. However, newer reports capture an average of 200 data points for each system and include performance diagnostics, system temperature profiles, as well as delivered equipment and system BTU calculations to establish installed system energy efficiency ratings.

If airflow-related adjustments fail to bring the system up to minimum operating capacity, a scope of work can be drawn to recommend upgrades to equipment, ducts systems, insulation, and controls.

A Shift in Perspective

Traditionally air balancing is a required step in the construction process. Even today, on most commercial HVAC projects, engineers specify an air balance report to be submitted at the end of each job. This report documents a series of tests and adjustments and its use still dominates the air balancing profession today.

Around 1990 a new application of air balancing emerged. A handful of air balancers began to use the same tests, but completed them in association with an engineer or system designer, prior to an HVAC system renovation. Air balancing went from being a service included at the completion of a project, to a service provided at the beginning of a project. The purpose was to identify system performance defects and provide essential information needed to redesign the system and correct comfort and efficiency defects.

This was the beginning of retro-commissioning HVAC systems. The term caught on quickly and expanded to include lighting, fire and safety systems, and even building envelope testing; although many use air balancing to focus on the HVAC system only.

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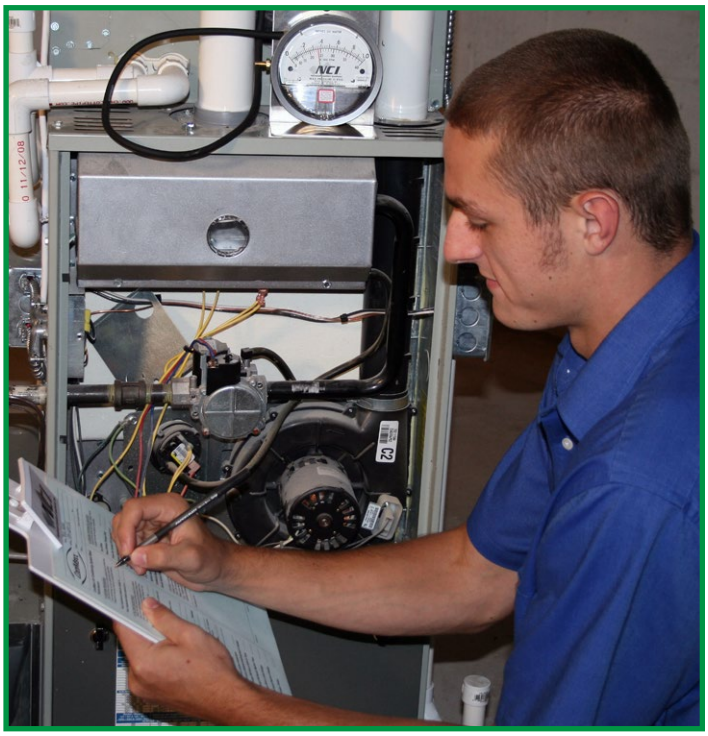

Diagnostics and Renovation

This practice has redefined air balancing into HVAC system performance testing and diagnostics. This testing and diagnostics, coupled with the resulting renovation of the HVAC system, offers far greater results in energy savings than air balancing alone, and is widely applied in residential as well as commercial and industrial applications.

Balancing combined with the needed repairs identified through advanced performance diagnostics produces an average energy savings of over 30% for both residential and commercial HVAC systems.

It's quite scary to realize the typical US HVAC system operates at less than 60% of the equipment rated efficiency isn't it? What if your customers knew that?

Where do the Savings Come From?

Let's focus on savings produced by testing, adjusting, and balancing alone. HVAC equipment is designed and built to perform at peak efficiency under a narrow set of operating parameters. When equipment is installed as part of a system, in a manner that forces operation outside of design specifications, performance and efficiency suffers.

Adjusting airflow, combustion, refrigerant charge, pressures, and energy consumption to comply with manufacturer's specifications obviously increases performance and increases system efficiency. Specific testing and diagnostics delivers far more energy savings than today's checklist quality or verified installation programs that have failed to move the market towards greater energy efficiency.

As the specified airflow over a system is obtained, heat transfer from the equipment peaks, compressors and heat exchangers function under the conditions they were designed to, fan power finds the level of performance it was meant to perform at, duct loss is minimized and system controls are satisfied, reducing run time. When a building has equal temperature and adequate ventilation, thermostat settings are naturally lower, not to mention the increase in total comfort, the primary reason the system was created for.

As the HVAC industry and the building science communities continue to unite in the study of building and system performance, I'm confident the energy efficiency of properly tested, adjusted, and balanced HVAC systems will be included in field studies and research.

Rob "Doc" Falke serves the industry as president of National Comfort Institute, an HVAC based training company and membership organization. Go to NCI's website at nationalcomfortinstitute.com for free information, articles and downloads.