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The importance of benchmarking

Application Note

Whenever the seasons change and your work changes from cooling to heating or vice versa, take a minute to review which of your measurement practices result in the greatest payback. On the technical side, surely one of the very best practices is benchmarking: Gathering specific technical data in order to compare it to an accepted standard, or to future conditions.

Everyone benchmarks to a certain extent. But is it an investment in the future, or time lost forever?

- **Every installation is different.** Equipment manufacturers cannot certify *their* equipment in *your* system installation. It is up to you to certify what is now your equipment in your system installation.
- **Benchmarking verifies that processes are not operating at the *limits* of acceptability.** Processes operating at the limits are more likely to create a premature or unexpected failure. Processes operating well within the limits of acceptability have a safety cushion that allows that process to swing one way or another with less chance of failure or endangerment.
- **Benchmarking helps you understand cause and effect and the relationship between processes.** Techs that formerly changed parts until "it worked" will begin to use the data to diagnose first, without time-wasting guesses. As more and more systems are benchmarked, the tech will more quickly recognize values that deviate from the norm.
- **For trending analysis.** As you compare the annual performance data, maybe you see a degradation of draft in a re-lined masonry chimney that prompts a thorough vent inspection. Or your conscientious insulation resistance testing of the compressor every year shows it's time to replace the drier and dehydrate the system before a catastrophic compressor failure.
- **As a competitive tool.** Whoops. Some of your competitors may already be way ahead of you on this one. Many contractors are going beyond the basic equipment performance and evaluating system performance using hot-wire anemometers for duct traverses and capture hoods for air balancing. These were traditionally thought of as commercial application tools. But contractors are beginning to work smarter by proving system performance and generating income with duct system improvements.

- **Use it to convince your customers that you are equipped with the best test equipment.** Let the before and after data speak. It's better to hear, "Wow, you improved the cooling air temperature by 4 degrees" than it is to hear, "Why was there a gap behind my coil pan?"

Tools for the job

Having the right tools will, of course, facilitate your benchmarking program. Here are the essentials:

- True-rms DMMs and amp-clamps. Modern HVAC components require true-rms.
- Combustion analyzer for O_2, CO, vent temperature.
- Smoke tester, pump and vacuum gauges for oil burners.
- Draft gauge or electronic manometer/micro-manometer.
- Temperature meter with at least two inputs and a selection of probes.
  - Bead thermocouples are not acceptable for all types of measurements. Air probes, pipe clamp probes, immersion probes and contact probes will pay for themselves in accuracy and speed.
- Infrared thermometer with a versatile distance-to-spot ratio for both small close work and distance, such as 40:1 or 60:1.
- Sling psychrometer or humidity meter with dew point and wet bulb displays.
- Manometers for gas pressures. Real manometers. Beware the Bourdon-Tube type gas pressure gauges.
- Incline manometers or electronic manometer/micromanometer
- Refrigeration gauges. Consider migrating to one of the highly accurate electronic gauges.

One or two advanced techs could be equipped with:

- Advanced environmental testers for airborne particulates, environmental CO_2, CO, humidity functions.
- Hot-wire anemometers, pitot-static tubes, capture hoods.
- Maybe even a thermal imager to go heads and shoulders above the competition.

Then you need concise, useful forms

Your form should be single page, or at most double sided. Include columns for initial and final readings, as well as 1st stage and 2nd stage readings. And print these in multiples for annual readings. Space shouldn't be wasted on form field descriptions. Space is needed for data. These will be documents tailored to your own market or specialty, and for your own interpretation. Your techs will know that RSP is for the manufacturer's reference suction pressure at the given outdoor temperature and ALP is the actual liquid line pressure. You may even want to throw in TCF for technician's confidence factor: 1 = confident, 2 = questions regarding data need review, 3 = not right, incomplete, need help. Or to confuse the outsiders or behind the curve competition, include something like NRS (Nothing Really Significant) and throw a number in it.

Finally, explain the purpose and goals to your techs

Let them participate in the form's development and evolution. Stress that accuracy is imperative. Without accuracy and truthfulness it is all lost. There is no shame in not being able to diagnose a problem, everyone's been there. There is shame in fudging the data or claiming that a job is complete or problem is solved when one knows it is not.

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