Critical Tools

What was critical to inspection years ago is still critical to inspection today, say most of the persons interviewed for this article.

Brian Jeans, plant manager for Blastal Coatings Services, Inc. (Brampton, ON), says the most important inspection tools are those that measure relative humidity, temperature, dew point, and dry film thickness.

Surface profile gauges, wet film thickness gauges, chloride contamination test kits, and visual standards are also very important to achieving a successful coatings job, says Gary Wolch, quality control manager for Clara Industrial Services Limited/Clara Inc. (Thunder Bay, ON) and a NACE-certified Level III inspector.

Bill Corbett, technical services administrator for KTA-Tator, Inc. (Pittsburgh, PA), agrees that soluble salt detec-
tion kits are important inspection tools.

Depending on the specific job, other tools may play a critical role in inspection, he says. For example, tank lining inspection requires the use of holiday detectors, and metallizing inspection may require adhesion testing equipment.

Proper Training Avoids Misuse

“Any tool in the hands of an untrained inspector can be misused,” says Gary Tinklenberg, but some problems occur more often than others. He is the president of Corrosion Control Consultants and Labs, Inc. (Kentwood, MI).

Equipment Reliability Depends on Calibration

In some instances, digital innovations don’t save inspection tools from the most basic of problems—improper calibration. As Tom Dunkin II, president of Dunkin & Bush, Inc. (Redmond, WA) admits, “We all fall a little short on [calibration].” Before achieving certification from SSPC’s Painting Contractor Certification Program (PCCP), his workers were calibrating their inspection equipment on a “job by job” basis. Because the PCCP requires the contractor to keep maintenance logs for the calibration of equipment, this procedure has become routine, he says.

“Ninety-nine percent of the calls we get are about calibrating [equipment] to SSPC standards,” says Joe Walker of Elcometer, Inc. (Rochester Hills, MI). “You don’t have to calibrate constantly. You need to check calibration constantly,” he says. For instance, when an inspection instrument is passed off from a worker on one shift to a worker on the next, its calibration should be verified. If calibration is not checked, the contractor runs the risk of hours, days, or weeks of production that could be compromised, he says.

Steve Pinney of Stephen G. Pinney, P.E., Inc. (Port St. Lucie, FL) also points out that some electronic inspection tools require mechanical calibration. Thus, he questions the value of such equipment (e.g., electronic psychrometers) over analog equipment.

Standards Affect Equipment Usage

Some problems with the use of inspection instruments spring from the standards written for their use, say several persons interviewed. Wolch says that the standard method of using pull-off adhesion testers needs to include clearer instruction on the time allowed for the test and the movements of the equipment in operation.

According to David Beamish of Defelsko Corporation (Ogdensburg, NY),
the currently available standards for adhesion testing (ASTM D4541-95, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers, and ISO 4624, Paints and Varnishes—Pull-off Test for Adhesion) tend to identify unique test methods for each individual adhesion tester. “Commonalities in the standards relate only to the most basic elements of the equipment and test methods. Critical elements such as the design of the dolly, its method of removal, and the method for increasing the pressure load required to initiate the removal are left to vary greatly between manufacturers. As a result, pull-off measurements between devices can vary significantly,” Beamish says.

Beamish is an advocate for the development of NIST-traceable standards for pull-off adhesion measurement. “In the meantime, the development of common platforms (using instruments such as strain gauges and load cells) for calibrating adhesion testers under real life conditions would go a long way towards identifying the amount of variation between adhesion testers,” he adds.

A person specifying adhesion testing should indicate the specific method that is to be used, says Walker. Different adhesion testers, created for measuring coating adhesion on different types of substrates (curved versus flat, for example), can give different readings, potentially skewing inspection results. Likewise, specific dry film thickness gauges should be named in the specification because different gauges have different levels of accuracy, he says.

Dunkin says that several tools are misused due to a lack of understanding the standards for their use. An example is when inspectors use dry film thickness gauges without adhering to SSPC-PA 2, Measurement of Dry Paint Thickness with Magnetic Gages. These inspectors, he says, take an in-
correct number of measurements. “The use of PA 2 yields a general feel for the [entire] coating system, not for a single spot on the structure,” he says.

Corbett has seen a lot of errors in the use of dry film thickness gauges, due to improper calibration verification, improper assessment of the base metal readings, and improper frequency of readings (i.e., under- or over-inspection).

Has Digital Technology Revolutionized Inspection?

“In the last decade or so, we have experienced a strong trend toward the use of microprocessors in coating thickness gauges,” says Corbett. Microprocessors make thickness gauges compatible with computer software. Today, he says, there is more of a need for complete documentation of data, and electronic inspection equipment makes documentation more convenient.

However, the level of sophistication displayed by some of the available inspection equipment is not absolutely necessary for the typical painting contractor, he says. Gauges offering digital readouts are good tools for contractors, because they are accurate and fast. But digital dry film thickness gauges with computer compatibility are probably not for everyone. “Most industrial painting contractors just want to know how thick the paint is,” says Corbett. These tools may be more appropriate for a paint line operation that must have sophisticated equipment to meet ISO quality assurance standards.

Tinklenberg’s view is similar. Digital technology, he says, can be either necessary or unnecessary, depending on what is being done. For quality control, simpler is often better, because quality control relies solely on consistent inspection throughout a project. Digital inspection instruments are a benefit to quality assurance, however, because it depends on the statistical
analysis of a representative sample. Jeans is an advocate of digitalization. He says that the digital dry film thickness gauges offer greater efficiency because readings can be taken and stored on the gauge, downloaded to a computer, then e-mailed to clients. These digital gauges help his shop keep up with quality assurance, he says.

Some electronic tools are definitely better than their older counterparts, says Wolch. These tools, such as electronic thickness and temperature gauges, offer ease of calibration or, at least, obvious evidence of improper calibration during use to alert the user to problems, he says.

“Technology is positive,” says Dunkin. Great strides have been made with laser temperature gauges, which enable the user to measure the surface temperature of steel without accessing the surface. This works well for measuring the surface temperature of stacks, etc. Improvements in technology are epitomized by the evolution of inspection equipment from the banana gauge to digital gauges, providing “a quantum leap” in accuracy and ease of use. Digital dry film thickness gauges and electronic psychrometers take the guesswork out of measurements, he says.

Other recently developed inspection tools such as non-destructive coatings thickness gauges for non-metallic substrates and ultrasonic gauges that can measure individual coats of paint are helpful to inspection, says Pinney.

Innovations in surface temperature, relative humidity, and dew point instruments have improved the ease and accuracy of measurement, says Walker, if at a certain cost. For example, traditional sling psychrometers require enough space in an area such as a ballast tank to allow two thermometers to be swung by the inspector. The inspector may have to stand anywhere from 10 to 20 ft (3 to 6 m) away from the steel, says Walker. On a hot day, the air temperature at this location may be much different than that near the surface of the steel, due to reflective heat. Conversely, a digital gauge, equipped with two probes, measures the temperature directly at the surface and between 1/4 and 1/2 in. (6 and 12.5 mm) away from the substrate. These gauges calculate the temperature automatically, whereas the operator of a sling psychrometer must use psychrometric tables to calculate the temperature, says Walker. The cost of the digital equipment, however, can be off-putting. A sling psychrometer and associated equipment cost less than $200, as compared to digital gauges, which can range from $700 to $850, Walker says.
Although not developed specifically for coatings inspection, digital cameras are a valuable addition to the contractor’s and inspector’s toolboxes. “Digital cameras have been a real blessing,” says Tinklenberg. He likes the instant documentation and storage that digital cameras offer, and he notes that his firm now uses digital cameras exclusively.

What the Industry Wants; What It May Get

When asked what inspection instruments the contractors and consultants interviewed would like to see developed for the coatings industry, they had several suggestions. An equipment manufacturer also predicted what the industry is likely to be using in the future.

Dunkin says that one great innovation would be a dry film thickness gauge that could scan a coated surface using infrared technology and give readings. The ability to download the readings and calculate total dry film thickness for, say, an entire tank would be an additional benefit. Of course, this tool must be affordable, too, he adds.

Pinney would like to see a chloride detection device capable of accurately measuring 100% of soluble salts on a substrate. Current soluble salt test kits are able to detect 40 to 90% of surface contaminants, he says.

Non-contact coating thickness gauges for measuring wet coatings or coatings on extremely hot or cold surfaces could yield time savings and a means of measuring areas of limited access, says Corbett. This technology was originally developed for paint lines using huge, fixed machines, which cost hundreds of thousands of dollars. An affordable, portable gauge would be an asset for inspectors, he says.

According to Walker, instruments will also continue to be developed and refined not only to take readings but also to perform the calculations that make the data useful. In addition, the
ability to maintain digital job files will continue to be simplified by electronic inspection equipment. He points to the shipyard segment of the coatings industry, where digitalization has saved ship owners a great deal of money. Walker says that a ship in dry dock can cost the owner anywhere from $10,000 to $100,000 per day. The use of digital inspection equipment can cut one and one-half to two days off a 30-day dry dock, yielding a substantial savings, he says.

Now, a user can store coating thickness, surface profile, dew point, surface temperature, and relative humidity on inspection instruments and download the data into a computer at a later time. Walker believes that not enough people take advantage of this technology today, but within 10 years, digital job files will be the rule rather than the exception.

Another trend Walker sees is that inspection instruments will be developed that will test a coating as it is applied. He cites a U.S. Navy project in which a coating thickness gauge was developed to measure thickness during application. This technology will allow users to get the measurements they need immediately, rather than waiting a day or two, says Walker. Production will go faster, and mistakes will be corrected more rapidly, he says. In the next 10 years, Walker predicts that non-contact wet film thickness gauges will be in use.

Conclusion
From this small survey of contractors, consultants, and equipment manufacturers, it appears that many of the inspection tools used years ago are still critical to the success of a coatings job. Today, however, these tools come in high-tech packages, using digital technology to make use easier, more accurate, and more reliable.

What’s the future for inspection instruments? Expect more of the same: more digitalization, more capability for downloading data to computers, and increased emphasis on ease of use.

But as technology improves, people using inspection equipment must educate themselves on the proper operation of the instruments. “I’m a strong proponent of training,” says Corbett. “Anyone who uses coating inspection instruments and makes decisions based on what the gauges say should receive proper training. Sometimes instruction manuals assume you know what you’re doing already. Training teaches you how to use gauges and what the measurements mean in terms of coating performance.”