

What is Clean?

By Tom Morrison — posted 07/19/2010 ISSA.com

Imagine this scenario. A slightly overweight middle-aged man has been experiencing some minor chest pains during the past year. In addition, he loses his breath quickly, tires easily, and he hasn't seen a doctor in years. Heart disease runs in his family, and he regrets that he didn't stop smoking a couple of decades ago.

Pressured by his family and a little concerned himself, he finally decides to go to a doctor for a physical. After describing his symptoms, the doctor begins the examination, which consists of looking into the eyes and ears, feeling around the abdomen, and listening to his breathing. After asking a few simple questions, the doctor declares with certainty that the patient is just fine, although maybe a little overweight and in need of some rest.

Perplexed, the man asks, "Doctor, aren't you going to run some tests? Maybe check my blood pressure, how about an EKG, run some blood tests, order me a stress test?" And the doctor responds, "Trust me; I've been doing this for a long time."

If this man were a relative of yours, you might think the doctor is either unprofessional, or a quack, or possibly both. And you'd probably advise him to see another doctor who's going to run some real medical tests with scientific measurements of the vitals before reaching a conclusion. In other words, you'd recommend a professional scientific analysis of the patient's health.

Well this is not much different than what occurs every day in the cleaning industry. If the main goal of the cleaning industry is to remove soils and other unwanted matter from buildings, that should be our main measurement, or "vital sign." Considering, however, that much of the unwanted matter that we are charged with removing is invisible and odor-free, including potentially dangerous microorganisms, mere visual inspections aren't nearly sufficient. Yet, very few of us have ever measured how we are doing scientifically. We don't order the tests; we don't know which tests to run or how to run them. Just like the doctor, we look at our work and judge it by our eyes and nose. We say, "It looks clean and smells clean, so it must be clean."

Given what we know today about the importance of effective cleaning in removing harmful biological hazards to reduce the risk of disease, it isn't good enough to simply clean for appearance. Cleaning for health must be the ultimate goal.

Stuck in 'Janitor World'

A lot of people don't like the term "janitor world." They think that it's a put-down of the janitorial profession. But it is not intended to be. Janitors, custodians, cleaning professionals, or whatever title they are given are some of the hardest working people on the planet. Most environmental scientists and public health officials agree that cleaning is the first line of defense against infectious disease. It is clearly noble work.

But, as an industry, we've done little to connect the dots between cleaning and health through science. As a result, the general public today does not really

understand and appreciate the important role that janitors play in maintaining a healthy living space and quality of life. In truth, neither do many of those who are actually responsible for cleaning. We're clearly losing the PR war. We're stuck in janitor world.

Unfortunately, the cleaning industry itself is largely to blame for this state. In general, the industry has been guided by the marketing of products, not the science of cleaning. For the most part, manufacturers have invested little in science to discover what is actually required to produce a sanitary outcome and have not used scientific method to validate their claims. What often passes for science is really theory or opinion, and not really supported by data or evidence.

This is evident in the obsolete or ineffective tools that most cleaning workers are forced to use. There are no agreed upon standards or guidelines. There is not even a universal agreement about what clean really is. The fact is, there are solutions available for many of these problems but the general public isn't aware of them, nor do they really understand their importance. In the meantime, cleaning budgets are often the first to get cut, a number of very good people end up suffering, and no one wants to send their children to school to become a janitor. Again, we're losing the PR war.

Moving to 'Cleaning for Health World'

To change this path, it's important that we move from "janitor world" to the "cleaning for health world."

We know that effective cleaning can actually save lives. In fact, it's probably true that sanitation and hygiene have saved more lives than medicines and drugs combined. We are all reminded of this when there is a disease outbreak, like the recent MRSA and H1N1 outbreaks when the natural first response was to close the buildings for a thorough, if not often misguided, cleaning. We need to do a better job of communicating this to the public.

For us to win the PR war, we must change how we operate and think.

- We must measure our cleaning results and connect the dots to the outcomes that the public cares about and understands, like lowering absenteeism, reducing nosocomials in hospitals, and minimizing the spread of disease.
- We must provide high quality products and services substantiated by real science. Just as important, we must distance ourselves from the ineffective tools and practices of the past.
- We must be accountable to our customers by validating scientifically that we are using best practices designed to deliver the expected results.

To bridge the gap, to get ourselves out of janitor world, will require our industry to understand cleaning science and begin to measure our performance objectively. In many ways, "cleaning for health world" is our promised land, where our industry can finally get the recognition and due respect for the valuable service we provide and be compensated accordingly.

The good news is that with the development of new measurement devices, cleaning science is becoming more accessible and easier to understand, making this a very achievable goal.

Defining Clean

In 2007, the Cleaning Industry Research Institute (CIRI) held its first Symposium in Las Vegas. It was an international event, where scientists, doctors, contractors, distributors, manufacturers, and other constituents gathered to hash out and define some of the foundational concepts of what cleaning science is about.

Until then, there was much unresolved debate about the definitions of clean and cleaning. The purpose of the first Symposium was to lay out a science-based foundation of what clean and cleaning really are. Here are some of the basic definitions that were established.

Clean – A condition free of unwanted matter (soils, germs, chemical residue, etc.).

Cleaning – The process of *removing* pollutants from the indoor environment and putting them in their proper place.

Notice the emphasis on removal. That is our ultimate goal, and therefore, our vital measurement. Considering this, it's worthwhile to get back to the basics and review what the cleaning process really involves.

Properly cleaning a building entails five basic steps:

1. Know the building (school, office building, etc.), including soil loads and types, characteristics of the occupants, building function, construction, and so on.
2. Locate the soils and understand them with a focus on human health. For example, H1N1 brought awareness of the need to remove unwanted microscopic contaminants from desktops, touch points, and other disease transfer points in order to reduce the risk of outbreak.
3. Separate the soil from the surface and contain it, using appropriate tools and chemicals. This is critical because many times, outdated tools simply redistribute the soils around the room. Also, we must be careful to remove not just the soils, but chemical residue as well.
4. Transport the soil out of the building. This is an important measurement to make sure that we're not just re-depositing it back into the building with dirty mops, towels, poor vacuum filtration, etc.
5. Properly dispose of the soil in a way that does not cause harm to the indoor or outdoor environment.

Defining "Effective" Cleaning

Effective Cleaning is the process of removing unwanted matter to the optimum extent that reduces the adverse risk to humans, valuable materials, and the environment.

There are a number of factors that go into determining the "optimum extent" and

they can vary from facility to facility, from space to space and even from season to season. These factors can include the purpose of the facility or space, the number and type of occupants that inhabit the facility, what are commonly touched surfaces, and more.

For example, shiny floors may be a priority to a retail establishment that is trying to attract customers. However, to a K-12 school that is trying to create a healthy learning environment, commonly touched surfaces, desktops, and restrooms should take priority over shiny floors. And during a flu outbreak, the requirements should increase further. Or, an office building inhabited by healthy office workers may not require the level or frequency of cleaning that a nursing home occupied by an immune-compromised elderly population does.

Obviously, determining the appropriate optimum extent for various buildings is a very important undertaking that requires input from assorted professions, such as:

- Public health officials
- Physicians
- Cleaning experts (practical and achievable perspective)
- Scientists (how to measure objectively and quantitatively)
- Measurement tool manufacturers

There are already a number of efforts underway to determine these levels of optimum extent, or clean standards, including [a joint project](#) involving ISSA and CIRI to develop a set of measurable clean standards for areas and surfaces within K-12 schools.

You Can't Manage What You Don't Measure

In order to accurately gauge whether or not we are achieving our cleaning objectives, it is obvious that we must be able to measure our results. Fortunately, hygiene measurement technologies are now available that can quantify the amount of biological matter that resides on just about any surface in less than a minute.

For example, easy-to-use handheld ATP meters rapidly measure the amount of organic bio-pollutants on virtually any surface, including floors, sink handles, toilets, dispensers, desk tops, and more. Specifically, these devices detect and quantify the presence of adenosine triphosphate (ATP), the universal energy molecule found in all animal, plant, bacteria, yeast, and mold cells. This makes them perfect for showing before and after cleaning results.

These innovative instruments are new to the cleaning industry but are commonly used in a number of other industries, including health care and food processing, to ensure health through proper sanitation. They enable non-scientific people to immediately and easily see the amount of invisible organic soils on a surface, even when it appears to be clean. After all, it is these invisible contaminants that pose the greatest health risk to human health. And, while ATP is not the same as bacteria, multiple independent scientific studies have demonstrated a strong correlation between bacteria and ATP levels.

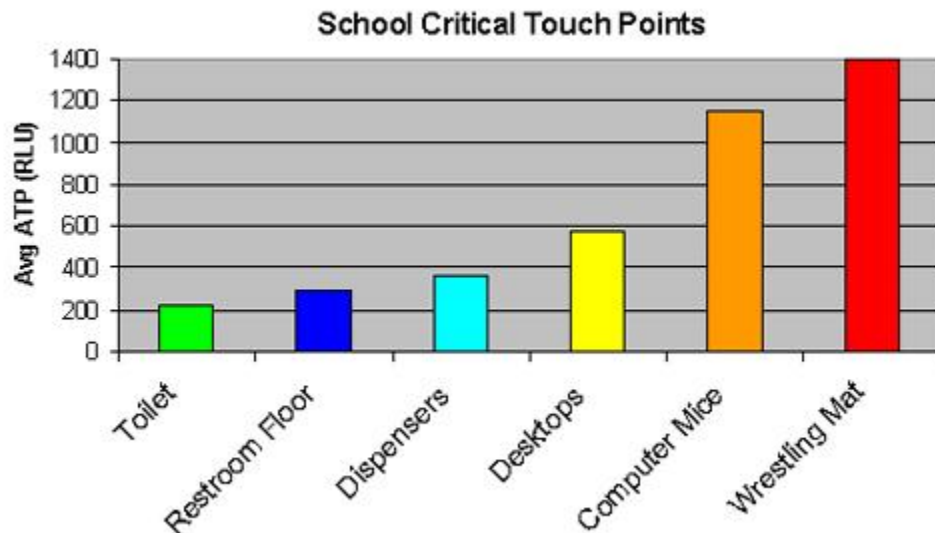
With ATP monitoring, it's now possible to establish a quantifiable standard of hygiene that defines when a surface is really clean for different areas throughout your building.

Some have said the ATP meter is to the cleaning industry what the microscope was

to microbiology. The ATP meter makes cleaning science easy and practical for a wide audience. The rapid scientific results not only raise professionalism by providing proof of service they also improve credibility.

Applying Science: One Manufacturer's Experience

When my company discovered ATP measurement, we started utilizing it extensively in the lab and in the field, trying to understand how and where soils accumulate as well as what are the best tools and practices for removing them.



Note: In the graph above, ATP is measured in RLUs (Relative Light Units).

One of our primary markets is schools, and so we were curious about what surfaces in a school building were the dirtiest, trying to determine where we should focus our cleaning efforts. We began our investigation by measuring surfaces throughout a local elementary school. It was initially shocking to discover that the classrooms were typically more contaminated than the restrooms (although the wrestling mat was even worse).

This chart shows our average findings from over 2000 ATP data points across the United States:

- The desktops and computer mice were three-four times dirtier than toilets. This was surprising until we discovered that they are rarely cleaned except when gross, visible soils are present.
- Wrestling mats are extremely soiled, mostly because they are cleaned with dirty mops that just spread the sweat and filth around.
- In general, touch points are neglected in most school cleaning programs. Ironically, these are also the surfaces where disease is commonly transferred from person to person.
- There was little if any difference in appearance between the most and least contaminated surface. They all would probably have passed a visual inspection.

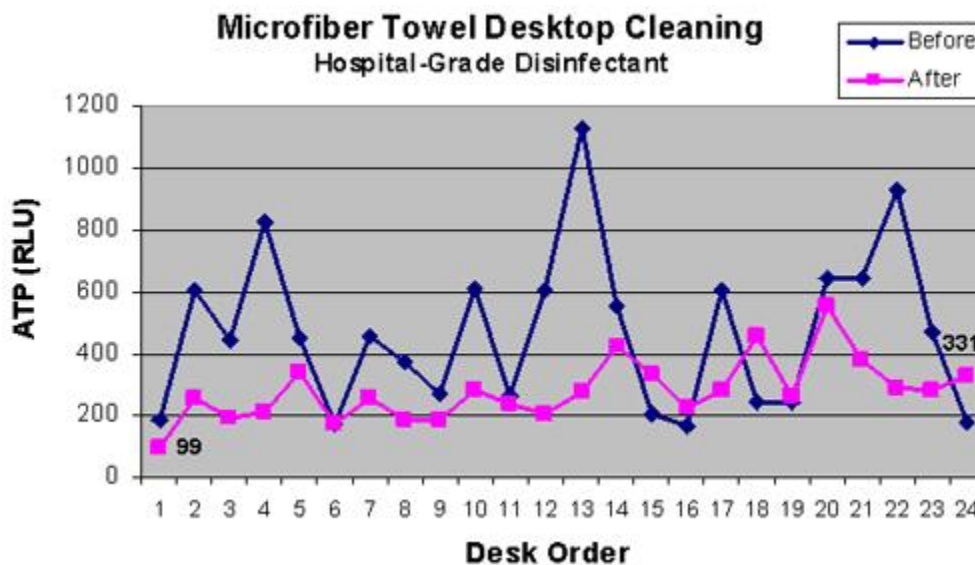
The ATP meter “shined the light” on the invisible dirt. It also revealed that we spend too much time cleaning the floors and not enough time on frequently touched surfaces, or touch points. Few schools, for example, regularly clean desktops or shared classroom computers, even though these are the common touch points where students are more likely to be exposed to infectious disease.

If [effective cleaning](#) is about removing the soils that can cause an adverse risk to humans, we need to change how we clean schools. More time must be spent cleaning touch points because we know “hand to eye, nose, and mouth” is how most diseases spread.

One Thing Leads to Another

These findings motivated us to discover better ways to clean touch points in schools.

Dr. Charles Gerba from Arizona State University, also known as Dr. Germ, discussed a recent research study at the CIRI Symposium showing that when classroom surfaces, including desktops, were cleaned regularly and properly, illness-related absenteeism was reduced by approximately 50 percent.



As a result, we began to investigate better ways to clean student desktops. The first test was to clean the desks in a classroom with microfiber in conjunction with a hospital grade disinfectant cleaner. Each desktop was sprayed with the cleaning solution and then wiped clean in a circular motion with the microfiber towel. A new microfiber towel was used. The chart above shows the before and after ATP measurements (before in blue, after in pink):

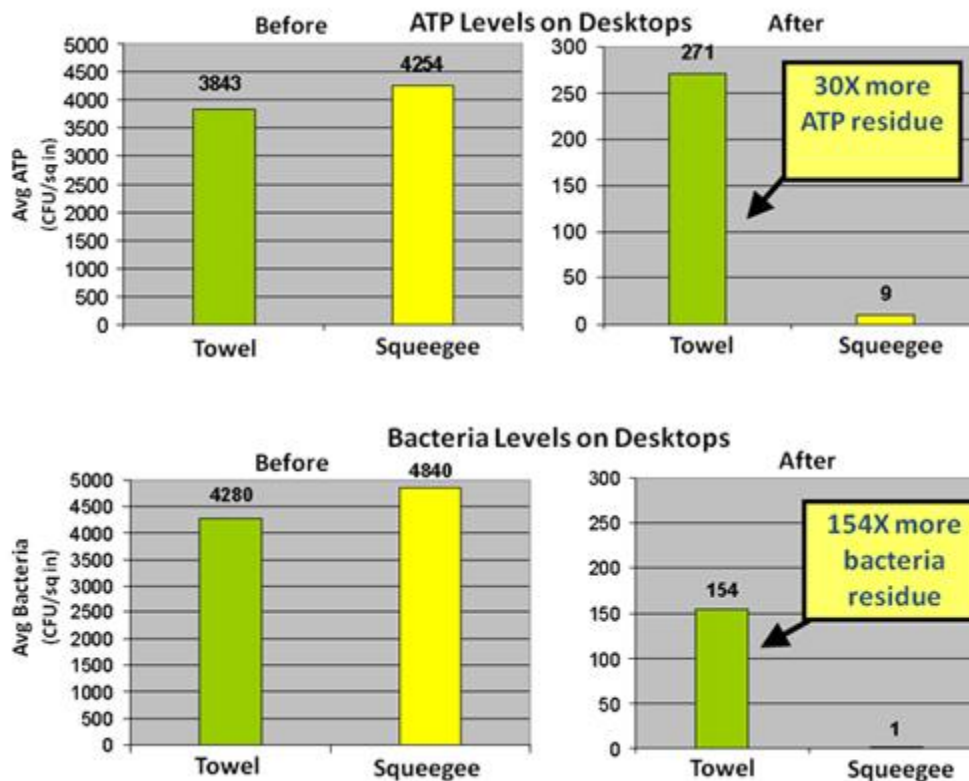
These results surprised us because:

1. The desktops did not get much cleaner than the initial readings of restroom toilets and floors (see previous chart).

- We started off with a new clean microfiber towel, however, it quickly loaded up with soil. In fact, by the end of the classroom, some desktops were actually dirtier after cleaning (desks 15,16,18,19, and 24).

From studies we'd conducted with our no-touch cleaning machine, we knew that we achieved better, consistent readings on heavily soiled restroom floors with a squeegee-based wet vacuum system. So we designed a desktop cleaning process that combined a microfiber applicator pad with a hand-held squeegee. Then, we conducted a study that compared the results of this new squeegee-based method with the original microfiber towel method. After cleaning, it was difficult to visually discern a difference between the two methods. However, ATP and bacteria (CFU – colony forming units) measurements revealed following results:

Comparison of Desktop Cleaning Methods



The charts on the top show average ATP readings before and after cleaning. The charts on the bottom are average bacteria counts before and after (as determined by 3M Quick Swab – Aerobic Bacteria Petrifilm Plates).

The desktops were soiled consistently with a test solution that was both high in ATP and bacteria. The charts on the left show the 'before cleaning' measurements.

Why were the results so different when the visual appearance was similar? The key is highly efficient soil removal capabilities that are effective even at a microscopic level. Clearly, adding the squeegee to the process improved the cleaning effectiveness dramatically. The microfiber rag alone left 30 times more ATP and 154 times more

bacteria behind. This represents a quantum leap of improvement.

The squeegee was the key to soil removal on these flat surfaces. That's why squeegees work well for cleaning windows, where soil shows up so clearly. Interestingly, adding the squeegee to the process did not add any time to the process. In fact, it was actually faster, and it also reduced shoulder fatigue.

This was a breakthrough in cleaning effectiveness for flat surfaces like desktops and cafeteria tables and dining tables. Without scientific measurement, we would have never been able to discover this. We would have erroneously assumed that the processes were achieving similar results and inadvertently left invisible disease-causing organisms behind.

Summary

Once measurement standards are set, the marketplace will drive innovation that will transform our industry from "Janitor World" to "Cleaning for Health World." Manufacturers will race to provide solutions that are more effective, faster, more ergonomic, more cost effective, greener and will also result in more funding and respect.