CHASTAIN-SKILLMAN, INC.

CONSULTANT'S UPDATE

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WHAT'S THE BIG DEAL ABOUT THE FLU...AND WHY DOES AN ENGINEER CARE?

By James R. Chastain, Jr., PhD, PE, MPH

Doesn't it seem like the flu is similar to earthquakes? Every year we're told to get ready for the "Big One". This year one can hardly pick up a newspaper or magazine without seeing some discussion about the pending Avian Flu pandemic. Is all this just part of a grand strategy by the pharmaceutical companies to promote their products, or are public health agencies just trying to increase their funding, or is it a legitimate concern? This article will provide some background on the illness and help you read the news reports intelligently.

And while we're asking questions…why would an engineer be writing about the flu? Most people know that Chastain-Skillman, Inc. has over 55 years of history as a Civil and Environmental engineering firm, but not everyone is aware that we have a very strong commitment to public health management. In fact, we have 12 professionals on staff that have master's or doctoral degrees in public health. Our Environmental and Occupational Health department monitors all manner of diseases and health effects that can affect people's ability to function or work. Certainly the flu falls into that category.

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EFFECTIVE COMMUNICATION IS KEY FACTOR IN A SUCCESSFUL PRETREATMENT PROGRAM

By Emigdio R. Isern, EI

A pretreatment workshop was held by the Florida Industrial Pretreatment Association (FIPA), based in St. Petersburg, Florida, on February 28, 2005 at the JEA Building in Jacksonville, FL. The topics of this workshop included the new Local Limit Information and Development System (LLIDS 2) software being developed by the Florida Department of Environmental Protection (FDEP) and compliance with categorical Industrial users. Among the groups that attended the workshop were local and state agencies, municipal wastewater facility operators, and city and industry representatives.

WHAT IS INDUSTRIAL PRETREATMENT (BACKGROUND)

The industrial pretreatment program aims to prevent the introduction of pollutants into publicly owned treatment works (POTWs) that will interfere with the operation of a POTW, including interference with its use or disposal of municipal sludge from disruptions of the

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EOH NEWS

- ***U.S. Surgeon General: IAQ Warrants Federal Action***
- ***Recent ASHRAE IAQ Related Publications***
  - *170P, Ventilation of Health Care Facilities Moves Forward*
  - *62.1-2004, Ventilation for Acceptable Indoor Air Quality Offers Revised Ventilation Rate Procedure (17 subsequently approved addenda)*
  - *62.2-2004, Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings*
- ***CSI Seminar Presentations:***

Florida AIHA 2005 Spring Conference

→ *Tampa, April 1, 2005*

National Conference for Environmental Health & Technologies

→ *New Orleans, LA – April 2-7, 2005*

The Mold Challenge in Florida

→ *Miami – April 14, 2005*

→ *West Palm Beach – April 15, 2005*

→ *Tampa – April 20, 2005*

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UNDERSTANDING THE INFLUENZA VIRUS

Anyone who has suffered through a bout with the flu knows they want to avoid it again at all costs. The flu is a respiratory illness usually caused by airborne transmission of an influenza virus. As you've probably picked up from the news reports, there is more than one strain of flu virus. There are, in fact, three primary types of influenza viruses which have been given the creative names: A, B, and C.

Type A can affect the entire population (all age groups) and result in epidemic and pandemic disease patterns. The Type B virus generally affects only children and, although they can cause epidemics, the epidemics tend to be milder. Influenza Type C causes only mild disease and has not been associated with widespread outbreaks, so it tends not to be a factor in epidemic surveillance.

This wouldn't be so bad if we could define each virus accurately. A vaccine could be developed and we would expect the impact to be significantly muted. However, what makes the flu treacherous is that it doesn't stay the same from year to year. (See the sidebar on page 3 for a description of how flu viruses mutate.)

WHAT'S THE DIFFERENCE BETWEEN A FLU EPIDEMIC AND A FLU PANDEMIC?

An epidemic is the occurrence of a disease in a particular area which is in excess of its background (endemic) prevalence. A pandemic is a disease that affects the majority of a population over a large region (continent or global). In other words, a pandemic is like a super-epidemic.

Fortunately, the mere appearance of a new virus doesn't guarantee a pandemic. For a pandemic to occur, three components must be in place. First, a novel (scientific lingo for new) influenza A virus must exist for which people don't have an effective immunity. Second, the virus must also spread easily from person to person and, third, it must cause a serious disease. As mentioned, Influenza B viruses do not readily undergo shift and are not associated with influenza pandemics.

SO WHAT DO BIRDS HAVE TO DO WITH THE FLU?

Type A influenza viruses don't just infect humans. They are found in birds, pigs and horses, as well as people. These animals serve as reservoirs for the virus through the year. What public health officials fear most is that strains of these animal viruses could mutate (shift) and "jump the species barrier" to infect humans. Southeast Asia has all the factors which are conducive to such an event which is why it is so carefully watched. If the jump occurs, the virus would be completely new and humans would not have immunity to it. Under the proper conditions then, flu could sweep almost unimpeded through the population. And given the extent of global travel that exists today, the epidemic could spin into a pandemic.

THE FLU IS BAD BUT IS IT WORTH ALL THIS FUSS?

For perspective, the flu and related illnesses typically rank as the 7th leading cause of death in the United States. The Spanish Flu pandemic of 1918-19 is estimated to have caused over 20 million deaths worldwide making it arguably the most lethal disease event in history. Global travel has increased significantly since the early 1900's so the geographic barriers that formerly existed have been essentially demolished. As an indication of its lethality, consider that since 2004, of the 69 people who have contracted Avian flu, 46 have died. That's a 67% death rate. The death rate for the Spanish flu was estimated to be 2%.

Also, consider the fact that the annual worldwide production of flu vaccine is reported to be 250-300 million doses to protect 6 billion people. Can you imagine the political and diplomatic chaos resulting from trying to distribute those doses? And what happens if there is a production glitch like there was this year? Also consider the fact that from a public health standpoint, those doses should be distributed first to the source (Southeast Asia) in an effort to contain the spread…and not to the United States. What are the political implications (and likelihood) of that?

So while the United States has many safeguards against these eventualities, it is necessary to be diligent. As with human bioterrorism, to prepare for this natural "bioterrorist" event, the public should be informed…hopefully in a manner that creates prudent action and not hysteria. The more you know about this threat, the better decisions you'll be able to make to protect yourself, your family and your community.

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ADA CHANGES ON THE HORIZON

By Suzanne S. Hunnicutt, AIA

In July 2004, an updated version of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) was published. This was the culmination of a decade-long review and revision of the Guidelines which were first published in 1991. So, if the new guidelines were published last July, when do they go into effect? The only correct answer to that is, "Not yet".

Although the Architectural and Transportation Barriers Compliance Board (also known as the Access Board) has completed the

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HOW DO FLU VIRUSES MUTATE?

The primary concern is the influenza A virus. Our immune system in a sense is blind and identifies invading organisms by 'feeling' its surface. Two key surface proteins mutate in a couple of important ways to form different subtypes of the A virus. These changes foil the ability of our immune system to recognize and successfully attack the virus before it damages the cell. These proteins are called hemagglutinin (H) and neuraminidase (N). These names are mentioned only because the initials H and N are part of a naming convention used to distinguish the different subtypes of the A virus. Tracking these proteins and predicting what combinations exist are at the crux of the flu surveillance effort. Currently, we are aware of 16 H proteins and 9 N proteins.

Fortunately influenza B viruses are more stable and don't have the same mutation rate. Thus, they are not divided into subtypes. During typical flu season then, usually one or more influenza A subtype and the B viruses circulate at the same time. This forms the target that the public health planners and vaccine developers are trying to hit.

Influenza virus A mutates primarily in two ways. The first type of mutation results in a relatively minor, but continuous, change in the genetic makeup which modifies the surface H and N. These small modifications are sufficient to disguise the virus and evade the body's immune system, but keep the virus subtype essentially the same. This is called "antigenic drift". Antigenic drift, more or less, ensures an annual flu season (flu epidemic.)

The other mutation mechanism is much more serious. It is called an "antigenic shift" and results when an influenza A virus makes a dramatic change (i.e., "shift") and acquires a new H or H+N characteristic. This can occur by incorporating pieces of genetic material from other sources into its genome. This shift results in a new virus to which the general population has no immunity. Thus, when you read an article that says health officials are detecting H5N1 (current Avian Flu strain), it means that both the H and N have made a significant shift from the current vaccine forms (H1N1, H3N2, and B). Thus, the vaccine probably is not going to be effective.

MOLD INVESTIGATION CAPABILITIES EXPAND

By Bruce D. Kelly, CIH, CSP, CBSP, CHS-III

The problem of mold growth in homes and other buildings is certainly not a new one. Humans have been sharing their shelter with the ubiquitous microorganisms probably since they first started seeking refuge from the elements. While early man may not have understood the mechanism that allowed mold to cause ill health effects, at some point along the way he realized that living in a home infested with mold was at best unpleasant and at worst a serious health threat. One of the earliest recorded mold assessment and remediation documents is the Bible. Leviticus Chapter 14 verses 33 through 53 details the process that a priest is to follow when someone is experiencing a mold problem in their home. Florida in 2005 is over two millennia away from the days of the Old Testament, but we're still experiencing problems with mold in our homes and buildings. While the basic common sense approach to correcting the problem (removing the mold and contaminated materials) hasn't changed much, we do now have the benefit of greater knowledge and understanding of the organisms involved as well as new technology to aid us in the assessment and clean-up.

Chastain-Skillman's Environmental and Occupational Health (EOH) Department has recently added some of that new technology to their arsenal of tools and, in doing so, has increased their ability to solve clients' mold problems. Industrial Hygienists at Chastain-Skillman have begun using the MycoMeter-Test™ in their assessment for mold contamination and as a method for verification of post remediation cleanliness. The MycoMeter-Test™ was developed and patented by microbiologists at the Copenhagen University in Denmark and was designed to be used to detect and quantify fungal contamination on building surfaces. The test is biochemical in nature and is based on the measurement of a mold enzyme, the amount of which correlates to the amount of mold present on a building material. Samples are collected from surfaces using a sterile cotton swab and are then run through a chemical process and analyzed using a fluorometer which produces a numerical value for that sample. The numerical value is then compared to guideline limits established through extensive research conducted by the method's creators. Collection of a sample takes approximately one to two minutes and a trained hygienist can easily analyze up to twenty samples in an hour. Traditional sampling methods that require laboratory analysis can take anywhere from a day to two weeks, depending on the type of sample.

Both the Orlando and Tampa offices now have MycoMeter analysis equipment and experienced Industrial Hygienists trained in their use. Florida's warm and humid climate is no stranger to mold growth and, after the hurricane season of 2004, the incidence of moisture related building problems increased dramatically. At the same time, we also witnessed an increase of companies claiming to be experts in mold assessment and remediation. Chastain-Skillman has been serving our clients for 55 years. Our EOH professionals are trained, experienced and properly credentialed. And they're well equipped, with the latest technology and old fashioned common sense.

Bruce Kelly served as a biosafety officer in the Airborne Disease Division at the US Army Medical Research Institute of Infectious Disease at Ft. Detrick and in an Environmental Microbiological Research Laboratory at Johns Hopkins University. Bruce is board certified in both the practice of industrial hygiene and safety by the American Board of Industrial Hygiene and the Board of Certified Safety Professionals. Along with these certifications, he holds a Level III certification in Homeland Security from the American College of Forensic Examiners International. He received his Bachelors Degree in Biology from Mount Saint Mary's College. He can be reached at (407) 851-7177 or bkelly@chastainskillman.com.

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revisions and the new Guidelines have been "published", they will not take effect until they are "adopted" by the Department of Justice (DOJ). Since the DOJ is only in the first stage of a three stage adoption process, it is likely that the effective date is still a couple of years away.

If it will be a couple of years until the revisions take effect, why worry about it now? Actually, instead of worrying about it, we should be looking forward to the changes which promise to incorporate an unusual level of coordination with other codes and standards. In fact, the new Guidelines actually reference the International Building Code for means of egress requirements and the National Fire Alarm Code for fire alarm standards.

The revisions do include some changes to technical criteria, such as reducing the maximum side reach range from 54" to 48". However, many of the changes are clarifications or enhancements to the original requirements. For instance, the section on parking spaces has a new provision specific to angled parking spaces which were not addressed in the original Guidelines.

Some provisions have been revised to actually help improve compliance. For example, the absolute dimension for the centerline placement of toilets (18") has been replaced with a range of acceptable dimensions (16"-18"). Also, a revamped section on handrails permits a greater range of designs and shapes.

Overall, the updated Accessibility Guidelines should be a big improvement over the present version which often conflicts with other codes and standards and is difficult to interpret. To that end, we should all be looking forward to their effective date, sometime in the next couple of years.

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DECISION MAKING WITH INSUFFICIENT DATA

By Cindy L. Duhm, MBA

It is not uncommon for engineers (or the clients they serve) to be required to make decisions in the face of insufficient data. In such situations, it is not possible to compute typical statistical parameters (i.e., means, standard deviations, confidence intervals, etc.) because the data doesn't exist or is so sparse as to be unreliable. However, a "flip of a coin" doesn't seem to be the responsible means of making an informed decision either. Fortunately, techniques do exist which can help quantify risks and focus attention on areas that improve the probability of correct, or at least improved, decision making.

Probability theory is used to develop an organized approach to solve problems with both quantitative and qualitative features. Decision theory describes two approaches to probability assessment in decision making: objective and subjective. Classical statistics is based upon computing objective probabilities using the long-run, historically observed, relative frequency of a particular event. This "frequentist" approach underlies the statistics that most everyone was required to take in school.

However, if a new situation arises without adequate background data, the "frequentist" approach is insufficient. In that case subjective, or Bayesian probabilities, are used which are based on a personal assessment of the likely occurrence of a particular event. The Bayes' approach recognizes at the outset that the decision maker does not know what state of nature will occur. However, using her judgment and any information available, she develops her best guess as to the likelihood (i.e., prior probability) of the various alternatives occurring. Then she sets about gathering data to update the prior probability to form an improved "posterior" estimate, thus improving the quality of the final decision.

A decision tree is commonly used to provide a graphical representation of both objective and subjective functions. Many times decision trees use Expected Monetary Value (EMV) as the basis for comparison. EMV is equal to the value of a particular action times the probability of the occurrence of the action. Because the probability of each branch must sum to 1.0, it forces the decision maker to deal with the likelihood effects of the different alternatives. Then, by summing the EMV of each alternative, one can determine the "best" alternative by finding the maximum (or minimum) EMV, as the case may be.

In mathematical notation Bayes' theorem, which is used to develop individual alternative outcomes, states that the probability of each alternative is:

$$\Pr(B_r|A)=\frac{\Pr(B_r)\cdot\Pr(A|B_r)}{\sum\Pr(B_i)\cdot\Pr(A|B_i)}$$

where r = individual alternatives

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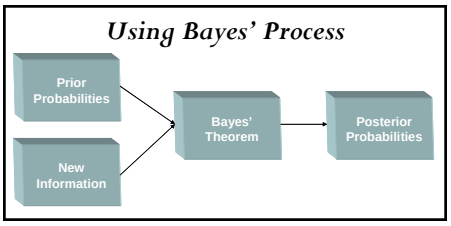
While the equation looks worse than it actually is, computer software exists to handle the computations and allow the decision maker to focus on the data and implications.

So, where do we obtain information to update the prior probabilities? Field testing, expert opinion, detailed studies or any other source that provides additional information can be applied to supplement the data used to define the initial probability estimates. One significant function of the prior probability estimation is to focus the development of the additional data gathering into fruitful areas.



Using this additional data, the conditional probabilities are updated and the posterior probabilities are computed. The revised probabilities can be used to update the EMV function or expected opportunity loss functions to determine the best decision given the new information. Through this exercise, one is also able to compute the "value of information" to discern whether additional study is warranted.

The EMV function is the weighted sum of possible payoffs for each alternative. It provides the long-run average value that would result if the decision were repeated a large number of times. The expected opportunity loss function is the cost of not picking the best solution. Sometimes referred to as the "regret" function, it reflects the difference between the optimal profit or the payoff for a given state of nature and the actual payoff received.

It is important to note that risk, uncertainty and variability exist due to the dynamic nature of decision setting as well as the wide range of assumptions that have to be made when dealing with subjective information. Regardless of the outcome of the analysis, considerable value also comes from identifying the significant factors and drivers involved in the decision making process, allowing engineers and other decision makers to focus their efforts on monitoring those factors in the future. Universally, we all would like to make better decisions. The ability to make smart decisions is an acquired skill, and decision analysis provides the methodology and tools to help us improve our decision making abilities.

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treatment processes, pass through discharges of pollutants that are incompatible with such works, and improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.

LLIDS SOFTWARE

It provides a database from actual sampling data at different points along the collection and treatment systems for the development of the local limits criteria for POTWs. The program creates reports given system input parameters from wastewater sampling and determines the pollution loading that the treatment system can process to meet the facility's NPDES permit criteria.

KEY FACTORS IN IMPLEMENTING A SUCCESSFUL PROGRAM

Representatives from three industries, 1) electric power generation, 2) organic chemicals, plastics and synthetic fibers, and 3) centralized waste treatment presented different perspectives on some challenges dealing with their pretreatment programs and the impact on the industry's day to day operations. Although the processes were very different, they agreed on several points that facilitated the implementation of the pretreatment program for each particular industry. Some concerns are presented below.

- A successful pretreatment program can be achieved with cooperation between the regulators, industries, and interested parties.
- Maintaining good channels of communication can mean the difference between delays in obtaining information and getting the job done. When good channels of communication were established, problems that were encountered were better handled and solutions were developed in a timely manner.

The key to the success in the implementation of the pretreatment programs, as the industry sector representatives pointed out, was the ability for the regulators and industry to maintain good working relationships which fosters an open attitude and trust between all of the interested parties. As the industries, governmental agencies, and environmental groups come together and set aside their agendas for the common good, society is better equipped to handle the problem at hand.

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