NSF International SUMMER 2004

WaterWorks

NSF and WHO Host Conference on Risk Management Strategies for Drinking Water Utilities

ON MAY 4–5, 2004, NSF International and the World Health Organization hosted the conference, *Risk Management Strategies for Drinking Water Utilities: The Role of HACCP, Management Systems and Water Safety Plans.* More than 80 attendees from 10 countries met in Ann Arbor, MI, to hear 27 speakers address the benefits and challenges of applying the principles of HACCP (Hazard Analysis and Critical Control Points), and other quality and environmental management systems in drinking water utilities.

Rick Karlin of the American Water Works Association Research Foundation set the stage with his presentation, "Is there a better way?" He expressed the frustration shared by utilities and state regulators with the current system of prescriptive monitoring to an ever-growing list of mandated parameters that may not be applicable to a given utility.

Next at the podium was David Cunliffe from the Department of Human Services in Australia. He described the Australian Framework for Management of Drinking Water, which is based on the same HACCP principles used worldwide to ensure safety in the food processing industry.

The Australian framework is proactive, designed to replace a reactive system that relied solely on endpoint testing for contaminants – an approach that in the case of pathogenic organisms, is typically too little, too late.

Several other Australian speakers discussed how they have implemented HACCP and modified HACCP systems to manage watershed protection, drinking water treatment and drinking water distribution systems. Speakers from water utilities in France, Iceland, Canada and the United States discussed the implementation and benefits of HACCP, ISO 9000 and ISO 14000 systems.

Among their many advantages, these systems:

- Use a proactive approach of problem prevention rather than a reactive system based on end-point testing.
- Help identify new risks.
- Help reduce customer complaints.
- Result in a faster response to water quality issues.
- Establish a due diligence defense if something goes wrong.

The U.S. EPA's Ken Rotert said the agency is considering HACCP management systems in its proposed regulations for distribution systems. A discussion paper is expected this fall, with a series of stakeholder meetings to follow.

Ephraim King, Director of the Standards and Risk Management Division of the U.S. EPA's OGWDW, encouraged utilities to develop risk-based management systems and said he planned to discuss with state regulators how these systems could be used in watershed protection.

Conference sponsors included:

- American Water Works Association (AWWA)
- American Water Works Association Research Foundation (AWWARF)
- American Water Works Service Company
- Association of State Drinking Water Administrators (ASDWA)
- Canadian Water and Wastewater Association (CWWA)
- Cooperative Research Centre for Water Quality and Treatment (CRC) (Australia)
- Health Canada
- National Association of Water Companies (NAWC)
- U.S. Environmental Protection Agency (EPA)
- The World Health Organization (WHO)

For more information on the conference, see http://www.nsf.org/cphe or contact purkiss@nsf.org.

HACCP Applications for Water Utility Operations

IN FEBRUARY 2004, Christine Bedillion and Dave Purkiss of NSF traveled to Australia to meet with water utility managers who had implemented or were in the process of implementing Hazard Analysis and Critical Control Point (HACCP) plans. These included Melbourne Water, South East Water, City West Water, Yarra Valley Water, Brisbane Water, Gold Coast Water and Sydney Water.

HACCP was developed by Pillsbury for NASA in the 1960s to ensure the safety of the food and water carried into space.

HACCP is a system that identifies, evaluates and controls significant health hazards. It was developed by Pillsbury for NASA in the 1960s to ensure that the food and water the astronauts carried into space would not adversely affect their health. The principles of HACCP are defined in the *Codex Alimentarius.*

HACCP and Water Supply

Water utilities in Europe and Australia have used HACCP, ISO 9000 and ISO 14001-based systems. In Australia, a major reason for the widespread implementation of HACCP systems was the report of a cryptosporidium incident at Sydney Water in 1998. Although no documented illnesses were linked to this report, it resulted in several boil water notices, and the incident was very costly to the water utility.

HACCP principles have been used to develop the Australian Framework for Management of Drinking Water, and also form the basis for the draft Chapter 4 of the *3rd Edition of the WHO Drinking Water Guidelines.* Although these documents are based in part on HACCP principles, their terminology differs somewhat from the *Codex Alimentarius.*

Preliminary Steps

The *Codex* describes five preliminary steps in developing a HACCP plan.

- Assemble a multidisciplinary team with representatives from all areas that are responsible and will be affected by the plan.
- Describe the product you are producing.
- Identify the product's intended use, including any unique customer needs.
- Construct a flow diagram that covers all steps in the production of the product.
- Verify the flow diagram.

A HACCP plan may address the entire process from source water protection to the tap, but many utilities divide the process into separate plans addressing source water protection, treatment, distribution, and building plumbing.

Seven Principles of HACCP

The *Codex* outlines seven HACCP principles:

1. Conduct a hazard analysis.
2. Determine the critical control points in your system for controlling hazards.
3. Set critical limits for each critical control point.
4. Establish a monitoring system for those limits.
5. Develop corrective actions that will be implemented immediately if a critical limit is exceeded.
6. Verify daily that the system is working.
7. Document and record.

1. Hazard Analysis

The first principle of hazard analysis involves listing all potential hazard events–including physical, chemical and biological sources. It helps to distinguish between hazards and hazard events. For example, bird droppings are a hazard, but every water storage tank has bird droppings on it. It is only a *hazard event* if the droppings get inside because a hatch was left open or has a faulty seal.

A risk assessment is conducted to rank and identify significant hazards. This can involve sophisticated numerical calculations on the likelihood of occurrence, the severity of the risk and the duration of the event or the assessment can also be a simple yes or no decision that certain hazards are significant and others are not. Control measures are then described for each significant hazard to be addressed in the plan.

2. Critical Control Points

Critical control points (CCPs) are a stage or process at which control is applied. Action taken at the CCP will eliminate or reduce the hazard to an acceptable level. Many companies differentiate between a CCP that controls a health hazard from a Quality Control Point (QCP) that controls other water quality issues such as aesthetic or environmental effects.

3. Critical Limits

Establish a limit for each critical control point parameter. Typically, this is a minimum-maximum range. Critical limits must be validated, that is, supported by scientific data. In the case of residual chlorine levels in water storage, for example, the minimum level will control the growth of microbial organisms, while the maximum level does not result in unacceptable levels of disinfection by-products.

4. Monitoring

A monitoring system ensures that critical limits are not exceeded. On-line chlorine analyzers at storage tanks, for example, should be checked and calibrated regularly.

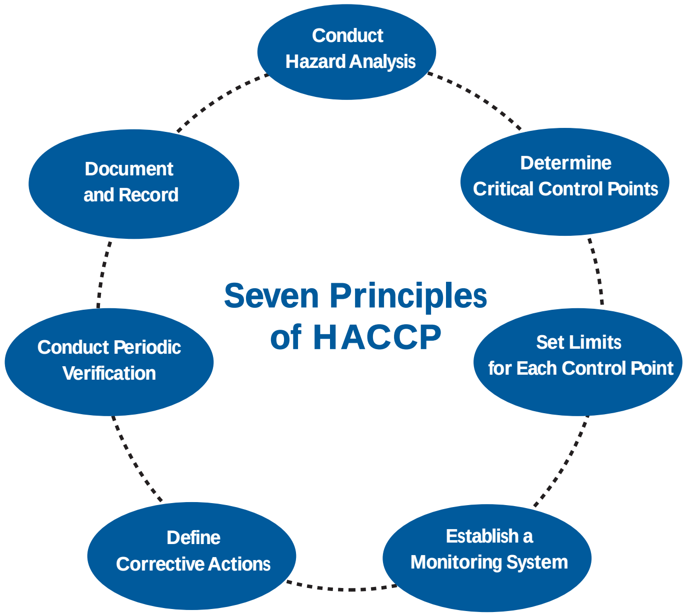
5. Corrective Actions

Corrective actions must be outlined for immediate implementation if critical limits are exceeded. Actions should define who is responsible and the disposition of the product. It is also essential to determine the cause of the problem so it can be prevented in the future.

6. Verification

Periodically verify that the HACCP system conforms to your plan and that the plan is controlling hazards by:

- Reviewing records daily.
- Ensuring SOPs are being followed.
- Ensuring critical limits are being met.
- Checking that corrective actions are being implemented.
- Reviewing of the HACCP plan annually.



7. Documentation

The seventh principle is documentation and record-keeping. This is essential to provide proof that the system complies with the HACCP plan. It gives evidence of due diligence and also affords opportunities to trace the sequence of events to determine the cause of problems.

Third-Party Registration

One of the best forms of independent verification of a HACCP plan and system is third party registration.

Elements of registration include:

- Desk audit of the HACCP plan.
- Verification of conformance of the plan to HACCP principles.
- Review of the hazard analysis.
- Review of the CCP determination.
- Review of the critical limit validation.
- On-site registration audit.

The on-site audit verifies that procedures and policies are being followed, ensures that the plan and system comply with the *Codex Alimentarius*, and verifies that all processes necessary to ensure water safety are defined and implemented.

Surveillance

Once a company is registered, periodic audits are performed to ensure that the HACCP plan is being updated and continues to be followed. Such audits serve to identify opportunities for improvement and document continuous improvement efforts. All elements of the plan are audited within three years of the registration date.

Significant Benefits

Some of the benefits of third-party HACCP registration as reported by water utilities in Australia include:

- The incidence of exceeding critical limits was reduced ten-fold over a three-year period.
- Cleaning of water mains is more targeted and less costly.
- Operations staff has a voice to correct problems. Staff complaints, which were sometimes ignored before HACCP, are now taken seriously.
- Customer complaints have been reduced significantly.
- HACCP has greatly increased their knowledge of the system and has also helped them to identify new risks.

For more information, contact Dave Purkiss, General Manager, Water Distribution Systems, at purkiss@nsf.org.

NSF 61 Certification of Activated Carbon Filtration Media

FILTRATION MEDIA are widely used to remove contaminants from drinking water. NSF testing of filtration media helps municipalities ensure the media will not contribute contaminants to the filtered water.

NSF has developed special criteria and certification policies at the request of manufacturers of activated carbon products. Certification of activated carbon filtration media (powdered or granular) to NSF/ANSI Standard 61 focuses on the point of carbon activation. If applicants do not activate the carbon, they must source it from an NSF Listed producer and acid wash or water wash and dry the media.

Otherwise, per NSF/ANSI Standard 61 Certification Program Policy, the applicant is classified as a repackager, and:

- Each supplier to the repackager must be audited in addition to the repackager, *OR*
- The applicant must test every production lot to verify its conformance to Standard 61.

Below are answers to some questions we're frequently asked:

How does NSF expose the filtration media to water?

Granular Activated Carbon (GAC) is exposed at 25,000 mg/L. GAC is first wetted with tap water for 16 hours, then conditioned for 30 minutes before it is exposed in pH 5 water for three 60-minute intervals. The final exposure filtrate is then analyzed for contaminants.

Powdered Activated Carbon (PAC) also is exposed at 25,000 mg/L. It is wetted for 60 minutes, but does not receive any conditioning. PAC is exposed for 60 minutes and filtered, and the filtrate is then analyzed.

What type of analysis does NSF perform?

NSF/ANSI Standard 61 requires that all activated carbon products be tested for:

- Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium, and thallium)
- GC/MS (Gas Chromatography/Mass Spectroscopy) base neutral acid scans
- Radionuclides.

Additional analyses or samples for testing may be required, based on production details or other information. After testing, both PAC and GAC results are normalized to a use level of 250 mg/L.

How does the product appear in the NSF Listings?

When activated carbon is listed, NSF includes a reference to the source (coal, coconut shell, etc.). PAC has an additional footnote about the maximum use level of 250 mg/L because it is a dosed media. PAC is usually added to the water and filtered out later, while GAC is generally used in a filter bed.

All process media have this footnote to indicate that the product was not evaluated for residential use, such as a drinking water filtration unit: *"Certified for water treatment plant applications. This product has not been evaluated for point-of-use applications."*

Where can I find NSF Listed products?

Currently, 26 manufacturers of GAC and PAC filtration media are certified to Standard 61. You can review the listings online at www.nsf.org/Certified/PwsComponents.

How does the transport of NSF-Certified media affect its Certification?

NSF Certification of filter media is valid until the product is removed from the original shipping container supplied by the NSF Listed production facility. If the product is transferred to another shipping container by a facility that is not NSF Listed, the NSF Certification is no longer valid. NSF Certification of repackaging facilities is required to prevent contamination and substitution of non-certified material.

What should a water utility do when it receives NSF-Certified media that it suspects may be contaminated?

Contact NSF immediately at 1-800-NSF-MARK. NSF will launch an investigation to confirm the contamination and trace the product through the distribution and production process to locate the cause of the problem.

For more information, contact Richard Martin at 1-800-NSF-MARK, ext. 5346 or martin@nsf.org.

Chlorine/Chloramine Resistance Testing of Elastomers

BASED ON A STUDY by the American Water Works Association Research Foundation (AWWARF), the American Society of Testing and Materials (ASTM) developed a standard test method to evaluate the Effect of Aqueous Solutions with Available Chlorine and Chloramine (ASTM D 6284).

The method monitors changes in mass, volume, and hardness with a visual turbidity rating of elastomers exposed to aqueous solutions with chlorine and chloramine.

NSF responded to ASTM's request for volunteers to validate the repeatability of the test results by participating in round-robin testing to ASTM D 6284.

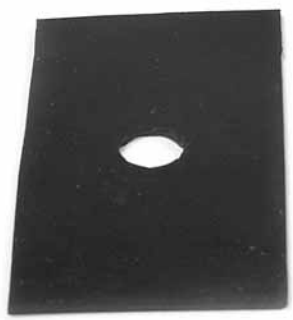
Although the material type (NBR, EPDM, etc.) was not disclosed, the results draw a clear picture that all material types do not perform identically when subjected to chloraminated water.

One sample outperformed all other samples when comparing changes in mass, volume, and hardness–the parameters evaluated under ASTM D 6284. Specifically, the sample had a 3.5 percent change in mass, a 6 percent change in volume, and a 3 percent change in hardness. In comparison, a sample from a different manufacturer had a 398 percent change in mass, a 446 percent change in volume, and a 73 percent change in hardness.

This data reinforces the potential for wide variability in elastomer performance, which may affect product performance in the field.

The test method does not provide a quantitative pass/fail criteria. However, it offers a useful way for a water company to compare elastomer performance before selecting materials and installing products in the distribution system.

For more information on third-party performance assessment of elastomers, contact Richard Martin at 1-800-NSF-MARK, ext. 5346 or martin@nsf.org.



The test results (before, left, and after, above) draw a clear picture that all material types do not perform identically when subjected to chloraminated water.

ASDWA Survey Shows Widespread Support for Standards 60 and 61

The Association of State Drinking Water Administrators (ASDWA) recently completed its annual survey on state adoption of NSF/ANSI Standards 60 and 61, and the results confirm increasing and widespread support for the standards and for third-party certification.

Most of the 50 states have adopted legislation or regulations referencing the standards, or have adopted their use as state policy. Two other states, Louisiana and Nebraska, are expected to adopt regulations this year.

Among the highlights from the survey:

- All 50 states report that they intend to use NSF/ANSI Standards 60 and 61.
- 47 states have adopted or plan to adopt legislation, regulations or policies that require drinking water treatment chemicals to conform to NSF/ANSI Standard 60.
- 45 states have adopted or plan to adopt legislation, regulations or policies that require drinking water system components to conform to NSF/ANSI Standard 61.
- 40 states require ANSI-accredited certification to these standards for all applicable products.

For a copy of the survey, go to www.nsf.org/business/water_distribution/more_information.asp?program=WaterDistributionSys.

Should Cement Materials Be Certified to NSF/ANSI Standard 61?

How are Cement and Concrete Made?

The manufacture of cement begins at a quarry, where shale and limestone are mined, crushed and mixed with ingredients such as clay, sand and slag. The crushed mixture is placed in a kiln and heated to 2700ºF to form large glassy cinders known as clinker.

After the clinker cools, it is combined with gypsum (hydrated calcium sulfate). The clinker and gypsum are crushed and mixed together to form a fine powder known as Portland Cement.

The cement is then mixed with other ingredients (such as water, aggregate, additive mixtures, accelerators, and colorants) to form various products and structures that have contact with potable water.

NSF certifies cement because it is a critical water contact material in concrete water storage tanks and pipes. Currently, NSF certifies 13 Portland Cement manufacturers and 26 production locations to the drinking water health effects criteria of NSF/ANSI Standard 61.

CEMENT AND CONCRETE ingredient and material suppliers as well as makers of mortar or concrete-lined pipe often ask if their ingredients, material and products should be NSF Certified to NSF/ANSI Standard 61.

The answer is "yes," if your goals are to:

✓ Meet client demand

✓ Meet state drinking water requirements for products *(For a list of state requirements, see www.nsf.org/business/water_distribution/pdf/ASDWA_Survey_2003.pdf.)*

✓ Increase your market share

✓ Increase your production flexibility and vendor options.

NSF's interchangeability policy affords NSF Certified cement pipe manufacturers a wider choice of ingredients and materials that have already been evaluated to NSF/ANSI Standard 61 health effects requirements.

NSF Certification–Work and Value

NSF International operates its certification program based on NSF/ANSI Standard 61 and the NSF Certification Policies (General and Program) for Drinking Water System Components–Health Effects.

Continued certification is based on:

- Annual unannounced production facility inspections
- Annual review of authorized materials (specific suppliers, use levels, etc.)
- Annual sampling of NSF Certified products at the production facility (cements, pipes, etc.)
- Annual inspection report, with copies to the client and NSF
- Annual chemical extraction testing (exposure of the product to water, followed by water analysis)
- Annual toxicological evaluation of test results (review data for pass/fail determination)
- Annual mailing of final testing data report with normalized results

NSF Certification involves substantial effort–work that municipalities, regulatory officials and end users rely on and is the reason they place NSF Certification in such high regard.

NSF Program Policy 18

An NSF policy particularly relevant to the cement industry is NSF Program Policy 18, or PP-18, *Interchangeability of NSF Certified Ingredients or Materials.*

NSF's Standard 61 Certified makers of products and materials using NSF Standard 61 Certified ingredients or materials may use any generically equivalent NSF Certified ingredient or material source as long as the substituted material or ingredient is from an NSF Certified production facility for an identical end-use application.

The use level of the ingredient must be in accordance with the manufacturer's existing authorized use level for that ingredient, but may

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not exceed the maximum use level indicated in the NSF Standard 61 Official Listing for the designated ingredient or material.

PP-18 affords NSF Certified cement pipe manufacturers a wider choice of ingredients and materials that have already been evaluated in accordance with NSF/ANSI Standard 61 health effects requirements. This policy also gives a market advantage to NSF Certified suppliers of cement and concrete ingredients. NSF Standard 61 Certified cement and concrete ingredients may be more readily purchased and used to produce NSF Certified pipe and other potable water structures.

To determine which cement products or materials are certified by NSF, please visit www.nsf.org/certified/pwscomponents

For more information, contact Richard Martin at martin@nsf.org or 1-734-769-5346.

NSF Certifies Concrete Water Storage Structures

Concrete, one of the world's most widely used building materials, is also used in structures that come into contact with drinking water, such as wells, cement-lined pipes, and storage tanks. While most of these uses lend themselves easily to cost-effective certification, large, one-time construction projects often do not.

The typical components of concrete are cement, aggregate, sand, gravel, water, and an admixture to give the concrete specific characteristics. NSF has been certifying cement and admixtures since 1995. But because of the common local sourcing of the aggregate components, certification of concrete historically, has not been very cost-effective.

NSF launched its Concrete Site Mix Design Evaluation program in December 2000 when its first successful evaluation was completed. The program was designed for large, custom projects such as concrete water storage structures. The program can also be used for non-certified cement and admixtures, but the process requires cement and admixture manufacturers to provide additional information to NSF.

To have a site mix evaluated, the vendor submits an application to NSF that details the product composition as well as the site application (such as tank location, dimensions, and volume).

If certified cements and admixtures are used, the evaluation could be completed within 30 days from receipt of information and samples.

Once NSF receives the mix design application and all required component information, test cylinders fabricated by a third-party laboratory are submitted for testing against NSF/ANSI Standard 61.

Extraction testing is performed and the results are evaluated to assure compliance with the health effects requirements of NSF/ANSI Standard 61.

A letter detailing the findings is sent to the applicant.

Because concrete is used extensively in the water industry and there is a possibility of contaminants entering a drinking water supply, it is important that utilities specify compliance to NSF/ANSI Standard 61 to help protect the quality of drinking water.

For more information, contact Richard Martin at 1-800-NSF-MARK, ext. 5346 or martin@nsf.org.

Certification of On-site Chemical Generators

MORE MUNICIPALITIES are using on-site chemical generators to supplement their water treatment solutions. Under *NSF/ANSI Standard 61, Section 8: Mechanical Devices*, NSF certifies chemical generators to ensure that they do not contaminate the output solution or drinking water.

The NSF certification process for chemical generators consists of:

- Client submittal of a wetted parts list for review by NSF toxicologists.
- Development of an exposure protocol for collection of the output chemical sample.
- Inspection of the production facility.
- Running the system and collecting samples.
- Testing and analysis of the solution at NSF labs.
- Toxicological result evaluation based on unit construction, chemicals, and materials.

Chemical generators tend to have many different parts or materials and can have a high level of complexity. Normally, a great deal of work is involved in gathering all the required formulation details for a toxicology review.

Such systems may also require special documentation for testing and exposure set-up. As a result, NSF certification may require significantly more work and time than simpler products.

On-site sodium/calcium hypochlorite generators are most readily tested "in-product" under actual operating conditions.

The Testing Procedure

On-site sodium/calcium hypochlorite generators are most readily tested "in-product" under actual operating conditions. The product is exposed only to the raw materials or finished chemicals consistent with NSF/ANSI Standard 61.

The units are set up and tested in accordance with the manufacturer's written instructions for bringing the products into service in the field. Testing can also be performed on a component basis through "in-vessel" exposures. If this is the preferred option, the correct extraction medium must be determined and communicated to the lab.

The total chlorine concentration is measured once the unit achieves its target concentration of hypochlorite solution. The units are then shut down and allowed to remain static for a minimum of four hours (or longer as recommended by the manufacturer) at 23°C +/-2°C.

For devices that usually operate at lower or higher temperatures, the exposure will be at the normal operating temperature. After the appropriate exposure period, a sample of the ensuing chemical is taken immediately.

Samples of the raw chemicals, including the source water, are also taken for use as controls but are analyzed only if the hypochlorite solution fails. Before analysis, the extractant is diluted to achieve a chlorine concentration of 100 mg/L, if possible.

NSF testing of chemical generators typically includes:

- Regulated metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium, and thallium)
- PNAs (Polynuclear aromatic compounds)
- GC/MS base/neutral/acid scan Gas Chromatography/ Mass Spectrometry
- VOCs (Volatile Organic Compounds)

Other analyses may be performed, based on the generator's material composition, process, chemical precursors, or chemical output.

From the time the test sample arrives at NSF's laboratories in Ann Arbor, Michigan, testing and toxicological evaluation will take about eight weeks. After a product's successful toxicological evaluation to NSF/ANSI

Certification of Ozonation Products

On-site generation of ozone by water utilities has become increasingly prevalent in the drinking water industry. This process involves the generation of ozone gas, a diffusion system, and contact chambers. Ozone then becomes aqueous after being diffused into water.

NSF has certified the following categories of products used in the ozone generation system:

Oxygen, for use in ozone generators, is certified under *NSF/ANSI Standard 60: Drinking Water Treatment Chemicals-Health Effects.* To check these listings, go to **www.nsf.org** and select "Drinking Water Treatment Chemicals Listings." Click "Oxygen" under "Chemical Name." Currently, one manufacturer, Matheson Tri-Gas, Inc, is certified for Oxygen gas.

Ozone injection tanks are certified under *NSF/ANSI Standard 61: Drinking Water System Components–Health Effects.* To check these listings online, go to Drinking Water System Components Listings and select "Ozone Injection Tanks" under "Product Type." Currently, one manufacturer, Hess Machine International, has been certified for ozone injection tanks.

For more information, contact Blake Stark at 734-769-5480 or stark@nsf.org.

Standard 61, NSF issues a detailed test report and NSF staff review the supporting data for compliance with all relevant certification requirements.

Upon completion of the certification process, a chemical generator is granted use of the NSF Mark and will appear in the Official NSF Listings with these footnotes:

"Certification is based on a dose rate that yields a maximum chlorine concentration of 10 mg/L into potable water."

"Certification of this product has been performed to the health effects requirements of NSF/ANSI 61, which assesses the acceptability of potential extractants from the chemical generator. No evaluation has been performed on the strength or efficacy of the chemical(s) generated. As unit operation, maintenance and the consistency of source ingredients may affect the performance of the unit, the ensuing chemical(s) is not certified by NSF to NSF/ANSI 60."

Currently six different companies are NSF 61 certified for chemical generators. Visit www.nsf.org/certified/pws-components to view NSF 61 listings.

For more information on certification of chemical generators, contact Richard Martin at 1-800-NSF-MARK, ext 5346 or martin@nsf.org.

NSF Certifies First Low Bromate Hypochlorite Disinfectant

Earlier this year, NSF International announced the first certification of a low bromate hypochlorite treatment chemical. Odyssey Manufacturing Company, a company that specializes in making bleach (hypochlorite) products, received NSF Certification for its Ultrachlor sodium hypochlorite product to *NSF/ANSI Standard 60: Drinking Water Treatment Chemicals– Health Effects* as a low bromate sodium hypochlorite product.

NSF/ANSI Standard 60 establishes criteria to ensure that chemicals used to treat drinking water do not contribute harmful levels of contaminants. Currently, most U.S. states require water utilities to specify NSF/ANSI Standard 60 for all drinking water treatment chemicals.

All hypochlorite products that receive NSF Certification are tested for bromate, in addition to regulated metals and VOCs, both initially and annually.

Although the standard requires all hypochlorite treatment chemicals to contribute less than 5 ppb bromate to drinking water when the chemicals are used at their maximum

All hypochlorite products awarded NSF Certification are tested for bromate, in addition to regulated metals and VOCs, both initially and annually.

use levels, some water treatment facilities need to use chemicals with bromate levels below 1 ppb in order to meet U.S. EPA requirements.

Bromate is especially a concern for water treatment plants that use ozonation as a primary disinfection process and add hypochlorite to reach a residual disinfection level as the water moves through the distribution system.

Water treatment systems that use ozonation as a treatment process need to be careful in selecting hypochlorite products, because many hypochlorite products can contribute between 3 and 5 ppb bromate when used at typical treatment concentrations.

According to Dave Purkiss, general manager of NSF's Water Distribution Systems program, NSF certification "demonstrates that Odyssey's Ultrachlor has been tested to stringent requirements and that the production process has been independently audited. This gives water treatment utilities added assurance that if they use an NSF Certified low bromate product, it should not contribute to compliance problems in meeting the U.S. EPA's bromate regulations."

The demand for low bromate hypochlorite products will likely increase as water utilities strive to meet the U.S. EPA's maximum contaminant level of 10 ppb bromate in finished drinking water.

For more information on NSF certification of low-bromate hypochlorite products, contact Blake Stark at 734-769-5480 or stark@nsf.org.

Certification of Copper Tubing to NSF/ANSI and ASTM Standards

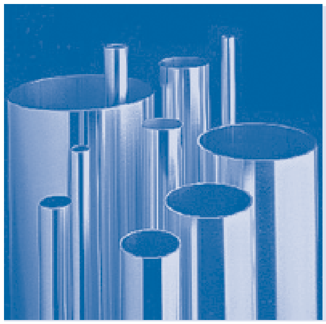
TO DATE, NSF HAS certified 28 manufacturers from 11 different countries of seamless copper water tube under *NSF/ANSI Standard 61: Drinking Water System Components–Health Effects.* In addition to this testing and certification, NSF also can test and certify to *ASTM B 306: Standard Specification for Copper Drainage Tube (DWV), and ASTM B 88: Standard Specification for Seamless Copper Water Tube.*

Health Effects

Under NSF Standard 61, copper tubing is exposed to pH 6.5 and pH 10 waters for metals analysis. This differs from the test conditions of pH 5 and pH 10 used for the metals analysis of all other products tested under NSF/ANSI Standard 61.

All copper and copper alloy pipes, tubing and fittings tested using pH 6.5 exposure water must place the following limitation statement on the manufacturer's use instructions and product literature:

"Copper Tube (Alloy C 12200) has been evaluated by NSF International to NSF/ANSI Standard 61 for use in drinking water supplies of pH 6.5 and above. Drinking water supplies that are less than pH 6.5 may require corrosion control to limit leaching of copper into the drinking water."



NSF certifies copper pipe to NSF/ANSI Standard 61 and to ASTM standards B 306 and ASTM B 88.

Copper or copper alloy fittings intended for use with copper pipe and tubing will be exposed to either pH 5 or pH 6.5 exposure waters, at the discretion of the manufacturer, and to pH 10 exposure water. Upon successful completion of all test parameters and compliance with all certification policies, the copper tube, pipe or fittings are eligible for Listing under NSF/ANSI Standard 61.

Performance: ASTM B 306

ASTM B 306 sets the requirements for seamless copper tube made from Copper UNS No. C 12200 intended for sanitary drainage, waste and vent piping (DWV). The standard sets requirements for chemical and mechanical properties of the Copper UNS NO. C1220, including the amount of phosphorous at 0.015-0.040 percent and the amount of copper, including silver, at 99.39 percent.

Chemical composition can be verified by ASTM Standards E 53 for copper and E 62 for phosphorous. Other requirements are a minimum tensile strength of 40 ksi as measured by ASTM Standard E 8 and a minimum Rockwell Hardness value of 30 as specified by ASTM Standard E 18.

The standard requires copper tubes to meet the electromagnetic examination/eddy current test specified by ASTM Practice E 243 and the pneumatic test of ASME section 16.2.3.

ASTM B 306 also requires that dimensions such as weight, wall thickness, diameter tolerance, roundness tolerance, standard length and tolerance, temper and squareness of cut meet specified parameters.

Performance: ASTM B 88

NSF also tests and certifies copper tube to *ASTM B 88: Standard Specification for Seamless Copper Water Tube.*

Currently, manufacturers from four countries are certified by NSF to ASTM B 88. This specification covers Copper UNS No. C12200 seamless copper water tubes suitable for general plumbing and other similar fluid-carrying applications commonly used with flared, solder or compression-type fittings.

The type of copper water tube most suitable for a given application is determined by the installation and service conditions, by the internal or external fluid pressure, and by local requirements. The method of joining or bending also affects the type of copper tube selected.

Among the requirements of ASTM B 88 are chemical composition, temper, mechanical properties, dimensions, mass, roundness, standard lengths and tolerances, and squareness of cut.

Upon successful completion of all requirements for the applicable standard and NSF policies, the copper tube is added to NSF Product Listings and is allowed to bear the NSF Mark.

For more information on testing and certification to NSF/ANSI Standard 61, ASTM B 306-02 or ASTM B 88-02, contact Richard Martin at 1-800-NSF-MARK, ext 5346 or martin@nsf.org.

Arsenic Treatment Technologies and POU Systems for Homeland Security

THE ENVIRONMENTAL Technology Verification (ETV) Drinking Water Systems (DWS) Center is managing verification testing of arsenic treatment products in Pennsylvania and Alaska to help small communities nationwide meet the new arsenic maximum contaminant level (MCL) of 10 micrograms per liter (µg/L) set in 2001 by the U.S. EPA. Other verification tests for arsenic reduction products are scheduled to begin this year in California and Michigan.

The ETV DWS Center, jointly administered by NSF and the U.S. EPA, manages voluntary performance verifications of commercially ready drinking water treatment systems–including package plants, treatment modules, and components.

The Center focuses on water treatment technologies that benefit small communities by accelerating the introduction of new environmental technologies and by supplying equipment buyers and regulatory agencies with performance data. The program also helps smaller communities comply with the 1996 Safe Drinking Water Act, which requires the U.S. EPA to set numerical contaminant standards and treatment and monitoring requirements to ensure the safety of public water supplies.

Concern about drinking water safety has increased in recent years due to highly publicized outbreaks of waterborne diseases, information linking ingestion of high levels of contaminants to cancer, and water security issues.

The need to provide higher levels of water security protection for individual homes has made testing of residential POU water treatment systems a top priority for the DWS Center.

Recent focus on providing a higher level of water security protection for individual homes has also led the DWS Center to make testing of residential point-of-use (POU) water treatment systems a top priority.

NSF is testing two POU reverse osmosis (RO) systems and one POU RO/microbiological water purifier to two new Homeland Security testing protocols for microbiological agents and chemical agents. All three products have been tested to the microbiological agents protocol; testing to the chemical agents protocol began in April.

POU Systems for Homeland Security

Three POU systems are being tested to microbiological agents and chemical agents protocols:

- Watts Premier Ultra 5 RO system
- Sears/Kenmore Ultrafilter 500 RO system
- Kinetico Purefecta™ drinking water purifier

The microbiological agents protocol uses surrogate bacteria and viruses to simulate drinking water that has been contaminated with bacterial or viral bioterrorism agents.

The chemical agents protocol uses the actual chemicals of concern, such as pesticides and arsenic. Both test protocols are designed to evaluate performance of the systems under a short-term water contamination. Verifications to these protocols will give information about the possible level of protection afforded by these systems.

Arsenic Projects

In 2002, the ETV DWS Center and the Pennsylvania Department of Enviromental Protection's Innovative Technology Program partnered in a cooperative arsenic treatment technology study involving adsorptive media.

Vendors participating in this project included Kinetico Incorporated with Alcan Chemicals (a joint venture) and ADI International, Inc.

Gannett Fleming, Inc. of Harrisburg, Penn., is part of the ETV project team and is the Field Testing Organization for both studies. The tests are being performed at two Pennsylvania community water systems with arsenic in their source water that appear to be representative of other small communities in the area.

Alaska Arsenic Treatment Study

The ETV DWS Center has also partnered with the University of Alaska Anchorage's Small Public Water System Training and Technical Assistance Center in a cooperative arsenic treatment technology study involving an ozonation and filtration arsenic reduction product manufactured by Delta Industrial Services, Inc. This test was performed in March at a community water system in Anchorage where the arsenic level in the source water exceeds the new MCL. The final report is expected this summer.

To learn more about the ETV Program and the Drinking Water Systems Center, visit www.nsf.org/business/ETV_EPA_NSF/ or www.epa. gov/etv/centers/ or contact Bruce Bartley at bartley@nsf.org or 1-800-NSF-MARK.

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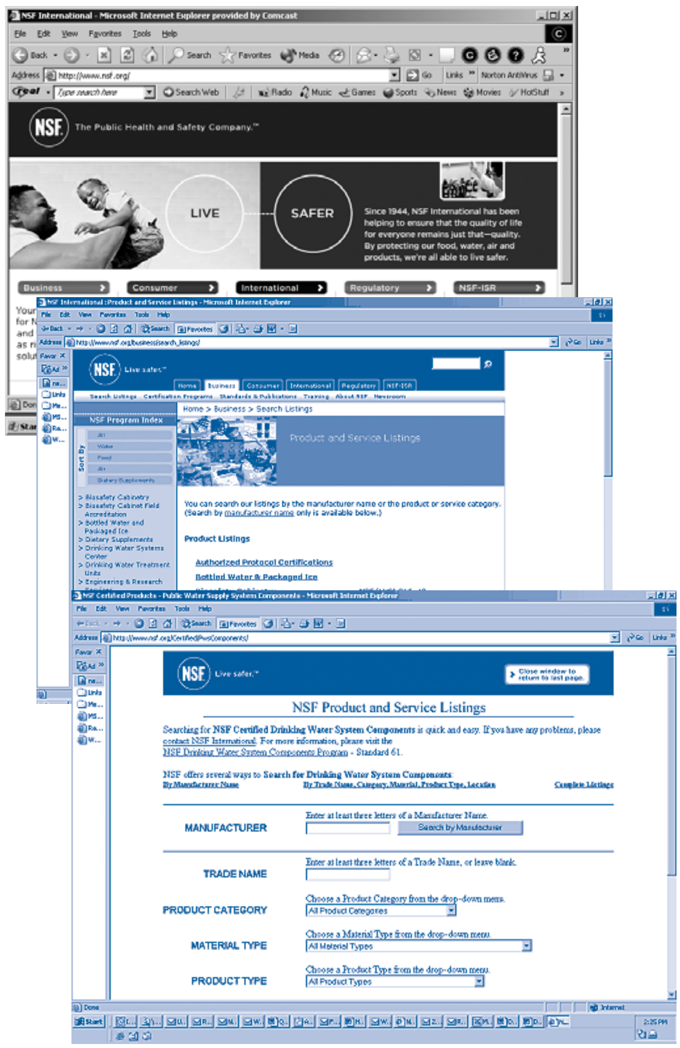

Another click takes you to the Drinking Water System Components/Std. 61 listings. One more click on "Search by Manufacturer" enables you to search all products and manufacturers certified to NSF/ ANSI 61 (left). You may also search on material type, product type, or production location.

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