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BOA
Building Operators Association of Canada

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BOA TRADESHOW POSTPONED UNTIL MAY 2021

What's Inside?

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President's Message

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I hope this message finds you and yours well and in good health

As we enter the 2020/2021 BOA season we are still living with the Covid 19 virus in our community, still unsure how it affects our communities, The Building Operators association is still not able to hold our monthly meetings as we would normally do. We have delayed the meetings from March through to June hoping the virus problem will have come under control, it has not. The mandate of the association is to educate and to inform the members, through monthly meetings and our published magazine. I believe now in this time of uncertainty even more so, Operators who need useful information, helping them to operate their facilities in reasonable and practical ways. BOA will continue to put out the monthly magazine in an electronic format,(there will be a mail out paper issue in October) The executives have been meeting monthly in a virtual capacity and the meetings have been successful using **Zoom** as the platform.

The monthly meetings are also going to take a change while we are under the rules set by Canadian law, our meetings over the rest of the year will be virtual too. This presents to our members a unique opportunity to attend our meetings in a way not previously done.

The Building Operators Association will be holding a virtual meeting using **Zoom** as the carrier and anyone can attend the meeting if you have a smartphone or a computer to view. Mark Arton our Chairman will host the meeting and it is open to anyone who cares to join. The meeting will be about a half an hour in duration; beginning **5PM, Mountain Time, Tuesday September 8, 2020**.The link to dial in is *(copy and paste in the browser):* https://us02web.zoom.us/j/81040652066?pwd=dlNQdEUyLzd0amRKMkhEQnA1a0xuZz09

Our inaugural guest speakers will be from two companies presenting together: **Honeywell Building Technologies** and **West Excel Automation.** The topic will be **Healthy Buildings.** It is an uncertain time and I hope the presenters will help to shed some light on safe practices in a multitude of facilities. It will be a PowerPoint presentation and we will keep a link to it on our website for future reference. Next month we will have a presentation using **Zoom** on filtration by BGE, Indoor Air Quality Solutions.

We will as well be delaying our trade show to May 11, 2021. I hope we can honour that date.

Warm regards,
Les Anderson PE, RPA

JOIN US!

For our first Virtual BOA Monthly Meeting

on Tuesday September 8th, 2020 at 5pm

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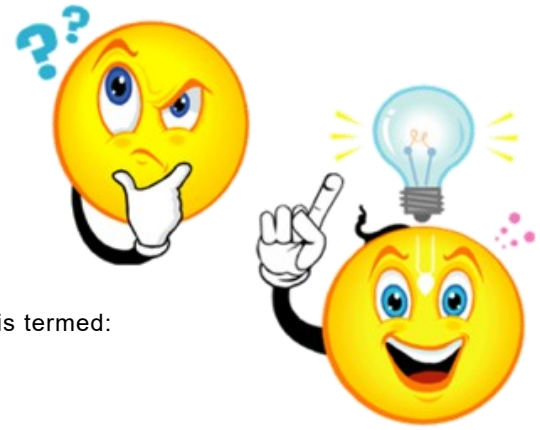
Test Your Operator IQ!

Are you equally adept at troubleshooting problems in the boardroom and the boiler room? As the resident facility guru, there's a lot riding on whether or not you know the difference between sounds control and a sound investment.

If you're ready for 21st century challenges, then you are ready for our monthly Operator IQ challenge…answers on page 17.



1. A very common packaged boiler gas burner is the:
   a. non-articulated burner
   b. post mix atmospheric burner
   c. mechanical atomizing burner
   d. cluster nozzle burner
   e. ring burner

2. An atmospheric burner has air entering around the burner which is termed:
   a. primary air
   b. secondary air
   c. atomizing air
   d. combustion air
   e. tertiary air

3. An atmospheric burner head which is very popular on heating boilers is the:
   a. refractory type
   b. star type
   c. ring type
   d. rectangular type
   e. ribbon ring type

4. An intermittent pilot:
   a. lights the main flame then extinguishes
   b. must be manually ignited
   c. lights the main flame and remains on with it
   d. remains on when the main flame extinguishes
   e. lights a pilot flame then extinguishes

5. Atmospheric burners are used for:
   a. gas stoves, hot water heaters, heating furnaces, and many heating boilers
   b. ring type burners
   c. coal firing
   d. lowering the relative humidity in the combustion air
   e. warming the incoming combustion air

Retrocommissioning Going Back To Get Ahead

Stephen R. Wiggins

Improving energy management in existing facilities

Retrocommissioning institutional and commercial facilities properly can deliver a host of benefits to organizations. But starting the process can be intimidating for engineering and maintenance managers, in part because so much misinformation has been circulated about the process of commissioning existing facilities.

Managers cannot expect accurate and maximum results from the process without properly identifying the project's scope, carefully selecting a retrocommissioning professional at an appropriate time, and defining the success of the process.

Preparing a project's scope

A suitably written scope of work should clearly define the goals of the project, their due date, their format, and a manager's definition of a successful project.

Before selecting an outside retrocommissioning professional, managers must define the scope of the project. A few examples of reasons to retrocommission include improving poor building or system performance — especially critical-use facilities — reallocation of space, political considerations, and high energy costs.

Another element to consider in developing the project's scope is whether an organization plans to pursue LEED-EB certification through the U.S. Green Building Council. If so, a manager must evaluate the facility against LEED-based criteria.

Next, managers should identify, prioritize and rank their criteria for the project. For example, having a healthy indoor environment is one of the most critical criteria that managers use to assess a facility. Whether the facility is an office building, a learning center or a data center, facilities have to provide an environment in which clients can achieve their goals.

Each facility is critical in its own way. A data center that does not operate properly can result in significant loss of worker productivity and elevated energy use. But an unhealthy learning environment in a classroom can be just as costly for students, teachers and the school's staff.

Next, managers must identify the systems to include in the project. In general, any facility system that experiences chronic problems should be part of the process. Most projects involve the HVAC system, and many include at least one of these systems: electrical, plumbing, fire alarm, vertical transportation, information technology, nurse call, pure water, and medical or laboratory gases.

After identifying facility systems, managers should determine the specific work limitations that might affect the project. These limitations might include: when technicians can perform the work, such as after normal hours, or only on weekends; security, such as clearance requirements for workers; and building-component issues, such as hard ceilings with limited access.

Finally, the scope of work should identify the process a manager expects to use. Each project has unique features and requirements that managers must assess separately, but a project matrix defining responsibilities serves as a good starting point. An experienced retrocommissioning professional can assist managers in this process.

Once managers have clearly identified these items, they can begin to write a proper scope of work. Visit the NEBB web site — www.nebb.org — for more information and examples of scopes of work.

Developing an RFQ

If a manager does not have a relationship with an experienced retrocommissioning professional, the next step is to develop a request for qualifications (RFQ). This document outlines the qualifications a manager is seeking in a retrocommissioning professional, such as experience on similar projects, experience, and references from other projects.

This document also should include the scope of work, as well as a request that the retrocommissioning professional provide a proposed implementation plan. Managers should evaluate all responses to the RFQ for their thoroughness and practicality.

When issuing an RFQ to multiple potential partners, managers should consider including a scoring matrix in the RFQ. Again, examples of retrocommissioning RFQs are available from a number of organizations, including NEBB.

Managers can identify a successful retrocommissioning professional through technical questions in the RFQ and a proper experience evaluation. They should contact each reference to ask detailed questions as a way of ensuring that facilities used as project examples by the applicant have continued to operate properly.

Selecting the right retrocommissioning professional can determine the success or failure of a project, so managers must be thorough and careful. The industry is rife with individuals claiming to be retrocommissioning professionals. Unfortunately, in evaluating their competency on technical issues, their credentials do not hold up.

True retrocommissioning professionals must have field experience in the proper startup, setup, and calibration of equipment. They also must have significant knowledge of system, subsystem, and system-to-system operations.

Without this experience, the retrocommissioning professional cannot properly test systems, identify deficiencies, make proper recommendations for corrections, and evaluate the appropriateness of the repairs. Theoretical training alone is not enough to provide an individual with the tools required to be a successful retrocommissioning professional.

Defining success

Many organizations use savings generated by one retrocommissioning project to fund future projects. For example, one manager established a retrocommissioning program by funding initial projects directly out of an existing maintenance budget. For the first three years, as operating costs declined in these facilities, one-half of the savings went to retrocommissioning, and the other one-half went back to the general maintenance budget.

For the next two years, one-fourth of the savings went to the retrocommissioning project and three-fourths went to the maintenance budget. As a result, the manager created a self-funding program that returned much larger benefits than just financial rewards. So when implementing such a program, managers must be certain that top management agrees in principal to the funding process.

If funds from energy savings are going to play a large part in the retrocommissioning program, managers need to measure and verify the levels of past and current energy use. Without historical data, no baseline exists from which to measure improvement. Historical data includes factors such as weather and occupancy levels, which then can be used to evaluate energy use.

Most retrocommissioned facilities see annual energy savings of at least 10 percent, and energy savings of 20-30 percent are not uncommon. But saving money is not the only goal of the process.

For example, to achieve a healthy, comfortable indoor environment, ventilation air quantities often need to increase. Perhaps the outside airflow has been completely shut off, the air volume has been reduced, or building operators have used improper control sequences. But re-establishing required ventilation rates can drive up energy use.

So, instead of focusing solely on cost, the overall goal should be facilities that provide healthy indoor environments while using the least energy possible.

Retrocommissioning can be an incredibly powerful tool for managers. It can provide large financial benefits from energy savings and occupant productivity. By clearly identifying a project's scope, turning results of the process into actual savings, and finding a means of sustaining a healthy and comfortable indoor environment over the life of the facility, retrocommissioning can yield an array of long-term benefits.

Finished Project as Training Tool

A central element in maintaining quality results from retrocommissioning over the long term is to use each project as a training class for an organization's maintenance technicians.

If this maintenance team is not involved in the process from the early stages through completion, a retrocommissioned facility will not function properly for very long.

So rather than having retrocommissioning teams constantly returning to a facility to fix problems, it is much more cost effective to implement training classes for the technicians who work daily in keeping these facilities operating efficiently.

These classes then will enable the retrocommissioning process to have longer-lasting effects on both a specific facility and other facilities in the organization.

Stephen R. Wiggins is a senior associate with the Commissioning and Operations Group of Newcomb & Boyd — www.newcomb-boyd.com. His work with the firm involves commissioning, retrocommissioning, operations and training activities for institutional, commercial, government and industrial projects. Article reprinted with permission.

KENKEN PUZZLE

How to solve the Kenken puzzle: (answer on pg. 21)

- Fill in the numbers from 1 -6 (in this case 6, because the kid is 6x6).
- Do not repeat number in any row or column.
- The numbers in each heavily outlined set of squares, called cages, must combine (in any order) to produce the target number in the top corner using the mathematical operation indicated.
- Cages with just one square should be filled in with the target number in the top corner.
- A number can be repeated within a cage as long as it is not in the same row or column.

2÷		4	3−	1−	
8+		5−		20×	
3+			3	3−	10×
	600×				
1−		6+	5−		3
	2			10+	

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Guest Speaker Series- Managing The Risks

JAMES A MACLEOD, FIIC, CRM

Litigious Society:
There are several reasons for the societal trend towards more litigation and increasing involvement of the courts in related injuries. Whatever the reasons, the results are real and increasing.

Increased Participation:
More disposable income leading to more time being spent on leisure activities.

- A general increase in the numbers participating in leisure activities.
- Younger and older patrons using recreational facilities.

Increasing Awareness of the benefits of healthy life style.

The Aging of Baby Boomers:

- Same urge to participate
- Decreasing vision
- Decreasing flexibility
- High expectations
- High earning years.

Changing Attitudes:

- "Someone else is responsible for my injury" has replaced a previous willingness to accept the risk of injury
- Society has higher expectations for the designers, installers and maintainers of facilities

The monetary setback is not a matter that needs to be solved by the individual but is a responsibility of a third party

Increased Number & of Activities:

- New facilities being built with new and varied equipment and apparatus.
- An increase in the number of high risk activities (skateboarding, climbing walls, trails).

Influence of Media:

- Extreme games, mountain biking, skateboarding, ice climbing
- Reporting of legal liability settlements (Walkerton)

TV shows discussing legal issues and the rights of the public (Marketplace, W5)

Influence of American Experience:

- Canada is 5 -10 years behind the USA
- Common Law can draw from the USA for precedence
- Tourism from the USA is increasing.

Increased Awareness of Liability & Legal Rights:

- The Canadian Charter Of Rights
- Occupiers Liability Act
- Building & Fire Codes
- People participating in activities at recreational & gym facilities have built in expectations of safe conduct and equipment. Accidents are viewed as breaches of these expectations.

More Lawyers /Increased Access to Legal Aid:

- Innovative methods of accepting liability suits are being explored by lawyers (Smoking gun documents on the internet, lawsuit kits,easy financing)

Legal Aid has meant that legal advice is available to those who in the past could not afford it.

Increased Number & Amounts of Settlements:

- More participation has led to more accidents and injuries which has led to more legal action.

Individuals are increasingly looking to the courts to solve the issue - greed is a motivating force.

Deep Pockets & Presence of Insurance:

- Governments, Municipalities, buildings owners and insurance companies are viewed as having deep pockets.

The plaintiff may receive some compensation even if they are in the wrong.

Impact of Increased Litigation:
Negative:

- Increased liability insurance costs
- Program cancellation
- Increased cost of protective equipment
- Increased legal activity

Positive:

- Improved standard of care
- Increased awareness

- Increased importance of Risk Management

Types of Liability:
Legal Liability:
"Legal liability infers a responsibility or obligation between parties which the courts recognize and enforce."

Contractual Liability:
- Employment contracts (labor law)
- Construction, installation contracts
- Rental contracts
- Service and product contracts

Criminal Liability:
- Crimes of violence that might take place on facility property (robbery, rape)
- Misdemeanors such as theft, disorderly conduct

Human Rights Liability:
Gender, Age, Race, Provisions of opportunity for persons with disabilities.

Tort Liability:
- Duty owed
- Injury to person, property or reputation
- All who had anything to do with the situation likely to be sued.

Negligence:
"An unintentional harm or act caused by a failure to meet the standard of care"

Elements of Negligence:
- The defendant owed a duty of care to the plaintiff,
- The defendant breached that duty of care,
- Injury or damage did occur
- The breach was the proximate cause of the injury.

Breach of Duty or Standard of Care:
- Reasonable person test (a special standard of care exists for children and seniors)
- Professional Standards: pool safety equipment, maintenance of recreational/gym equipment
- Supervision and Instruction: dependent on the age, degree of danger
- Equipment and facilities: age, maintenance, safety inspections

Damage or Actual Harm:
- Medical Expenses
- Loss of income
- Cost of extended care
- Pain & suffering
- Physical Impairment

Damage or loss to property

Proximate Cause:
- Direct linkage between the injury and a negligent act.
- Usually the linkage of the act to injury is straight forward.

Who Is Liable?
- The plaintiff will attempt to sue everyone in the organization and if equipment is responsible the manufacturer of the equipment.
- Vicarious Liability
- Personal Liability
- Product Liability
- Occupiers Liability

Risk Management Process:
- Identify the exposures
- Examine feasible alternative risk management techniques
- Select the best combination of alternative risk management techniques
- Implement the chosen techniques

Monitor the results to ensure the program is effective.

Alternative Techniques:
Risk Control:
- Avoidance
- Loss Prevention
- Loss Reduction
- Segregation of Exposures
- Contractual Transfer

Risk Financing:
- Retention
- Transfer

Risk Control:
- Risk Control may be defined as any conscious action (or decision not to act) intended to reduce the frequency, severity or unpredictably of accidental losses.

Three Major Requirements:
- Risk control focuses on actual harm, not on amounts of monies paid
- The impact of any given risk control technique can only be measured from the perspective of a given entity
- A given risk control measure is risk control with respect to one or more specific exposures.

The topic was presented by:
James A MacLeod, FIIC,CRM
Branch Manager, Insurers' Advisory Organization Inc.
A subsidiary of Underwriters Adjustment Bureau Ltd.

Ripple Effect

by James Piper

Well-designed and maintained water treatment programs offer multiple benefits to facility executives

In their search for ways to improve the operating efficiency of their building's HVAC systems, facility executives are focusing attention on an important, unglamorous and often overlooked maintenance task: water treatment. To take full advantage of the many recent improvements in the design of energy-using systems, the heat transfer surfaces within the systems must be kept clean and free of scale. And the best method of accomplishing this is the comprehensive water treatment program. But helping to keep systems operating at peak efficiency is only one of the benefits of water treatment programs. Effective water treatment can enhance operating safety, protecting both personnel and equipment. Systems that have been operated with a well-designed water treatment program also have longer service lives than those where the quality of water being circulated has been ignored.

But when it comes to water treatment, one size does not fit all. Programs must be tailored to a specific application, including the type of system, the types of metals found in that system, the quality of the makeup water being introduced into the system and the rate at which makeup water is being added.

Water treatment programs also are not one-time efforts, which once initiated can be forgotten. Water treatment programs require continuous monitoring. Samples must be taken on a regular basis and analyzed to determine the specific contaminants that are present in the water system and their concentrations. For chemical-based systems, the application of chemicals to the system must be monitored to ensure that only the needed level of chemicals is added to the system. Too high a concentration level can be as hard on the system as one that is too low.

There are three separate building systems that can benefit from water treatment programs: boilers, HVAC closed loop water systems and cooling towers.

Boiler Water Treatment Programs

The benefits of water treatment in boiler systems extend beyond the boilers themselves to include both the steam distribution and condensate return systems. Throughout the entire steam system, water treatment works to maintain operating efficiency and extend the service life of practically all components.

There are four basic steps in boiler water treatment programs: clarification, demineralization and softening, deaeration, and the addition of amines.

All circulating steam systems contain suspended solids. The solids can be introduced into the system by boiler makeup water, or they can come from piping and other components within the system. If these solids are allowed to remain in the system, they can interfere with the operation of steam traps and valves, or they can accumulate sufficiently to block portions of the system. Clarification, the first step in boiler water treatment, is designed to remove the larger suspended solids in the system. In most cases, removal can be achieved through the use of properly placed filters. To assist in removal of smaller suspended solids, chemical coagulants are added to the system to help clump these particles together so they can be captured by the filters.
The second step is demineralization and softening. All water contains certain levels of dissolved minerals or salts, such as silica, iron, calcium and magnesium, which tend to form scale on heat transfer surfaces. Scale decreases the energy efficiency of the system. Scale on boiler tubes can also result in the formation of localized hot spots that can lead to tube failure.

The two most common processes for demineralization and softening are lime-soda softening and ion-exchange. The water treatment system based on the lime-soda process uses a form of hydrated lime to react with the calcium and magnesium bicarbonates in the boiler feedwater to form precipitates. These precipitates then can be removed by settlement or by filtration. The ionex-

change process removes a number of ionized impurities, including calcium, magnesium, iron and manganese. The third step in boiler water treatment, deaeration, involves removal of dissolved gases from the boiler feedwater, including oxygen, carbon dioxide and hydrogen. These dissolved gases are highly corrosive to most components, including boiler tubes, steam piping, steam traps and especially condensate return systems. The most common deaeration systems use steam to heat the boiler's feedwater, causing dissolved gases to be carried off with vented steam.

The addition of amines to the boiler water is a treatment method designed to reduce corrosion within the condensate return system. All steam systems, including those with good water treatment programs, have oxygen and carbon dioxide in the condensate return system. As a result, corrosion will continue to take place. To help protect condensate return system components from this corrosion, afilming amine is added to the boiler feedwater. Carried throughout the system by the steam from the boiler, these amines form athin, protective layer on metal surfaces primarily in the condensate system, helping to reduce contact between the corrosive condensate and condensate system components.

Closed Loop Water Systems

There are two major concerns with closed loop heating and cooling systems: scale and corrosion. Scale, like scale in boiler systems, is the result of precipitation of salts found in the water. These salts tend to adhere to heat transfer surfaces, are difficult to remove, and reduce the efficiency of the heat exchanger. Fouling factor is a measure of the resistance to heat transfer often used in evaluating chiller performance. In new chillers, the fouling factor is typically 0.0002 or lower. Even a thin layer of scale on the tubes can raise a chiller's fouling factor to 0.0025, resulting in an increase in chiller condensing temperatures by five degrees and an increase in overall compressor energy use by 20 to 25 percent. In most systems, scale is controlled by adding chemicals to reduce the calcium hardness of the water.

Corrosion is an electro chemical process that erodes metal surfaces in the closed loop system, including piping and chiller tubes. The rate at which corrosion takes place is primarily a result of the level of oxygen in the system, the degree of alkalinity or acidity of the circulating water, the temperature and velocity of the circulating water, and the concentration of dissolved and suspended solids in the water.

There are two types of corrosion: generalized and localized corrosion. The former attacks all metal surfaces in the system exposed to the water. Although generalized corrosion releases oxides that contribute to scaling, it is a relatively slow process and less of a concern than localized corrosion.
Localized corrosion attacks small areas on metal surfaces, resulting in rapid pitting and perforation. With the average chiller tube being less than 3/32 of an inch thick, localized corrosion can quickly eat through the material, resulting in the mixing of refrigerant and water. Controlling corrosion requires knowing what types of metals are used in the system, how susceptible they are to corrosion and what the operating conditions are in the system. Chemicals introduced to control corrosion must be carefully matched to the system requirements in order to avoid doing even more damage to the system. Once in place, the system must be continuously monitored through water sampling to ensure the proper mix is being used.

Cooling Towers

Cooling towers are natural dirt collectors. Leaves, dust, dirt and other contaminants easily enter condenser water systems through the cooling tower. Untreated, these contaminants accumulate, blocking piping and reducing the effectiveness of heat transfer surfaces. Equally important, the warm waters found in cooling towers and condensing water systems are perfect breeding grounds for micro-organisms such as legionellosis that, in addition to potentially blocking the chiller's heat exchangers, can pose a serious health risk to those who work close to or are exposed to wind-borne water droplets from the cooling tower. A comprehensive water treatment program is the most effective means of controlling both particulate and biological contaminants.

As with both boiler and closed loop systems, the water that is circulated in the system contains dissolved minerals that if left untreated will form scale on heat transfer surfaces, decreasing efficiency. What's more, cooling towers are open systems with a significant makeup water requirement. Evaporation, drift and the need to bleed off a portion of the circulating water result in an ongoing need for makeup water. For example, a typical cooling tower serving a 350-ton building chiller will lose three to five gallons of water per minute from evaporation and drift. This makeup water becomes an ongoing source for new dissolved minerals in the system.

Compounding the problems is the fact that few of the minerals present in the system are carried off by the evaporating water, resulting in a steady

increase in the concentration of dissolved minerals in the circulating water.

While bleeding off a portion of the circulating water will help to limit their concentration, a water treatment program is required to keep their levels within acceptable limits.

There are three primary goals to cooling tower water treatment programs: controlling scale formation, reducing corrosion and minimizing the growth of microscopic organisms. In areas having hard water, scale control is the driving concern, while corrosion protection is the major concern in areas with soft water. Water treatment programs must evaluate the conditions that exist at the site to determine the type and quantity of chemicals that are required to bring water quality within the acceptable range. Systems typically continuously monitor water conditions in the condenser water system, adding the proper quality of chemicals required to control both scale and corrosion.

The most common method of controlling the growth of microscopic organisms is to add a biocide to the circulating water. Biocides can be either oxidizing or nonoxidizing depending on the particular needs of the system. They are added to the system typically through a small pump on a timer that introduces a set amount of the biocide on a regular schedule. Monitoring of the levels of growth in the system is required to ensure that the proper dose and schedule are being used.

Non-chemical Treatment

Although most water treatment programs are chemical based, there are alternatives. For example, electronic technology can be used for scale control and can play a role in controlling corrosion.

There are also alternatives to traditional chemical biocides. One is the use of ultraviolet light to kill organisms.

The systems operate continuously, eliminating under dosing and over dosing problems found in biocide-based systems. With no moving parts, the systems are practically maintenance-free. With no chemical requirements, ultraviolet-based systems have very low operating costs. Ultraviolet-light-based systems, when combined with a filtration system at 40 to 50 microns, can provide performance that matches or exceeds that of biocide-based systems. However, UV systems leave no residual biocides in the water.

Another option is the use of copper-silver ionization. These systems use electrodes to generate parts per billion levels of copper and silver in the cooling tower water to kill micro biological life. They operate continuously and leave a residual in the water. At least one company says that it offers a non-chemical program for all aspects of cooling tower water treatment. That program combines copper-silver ionization, filtration and electronic scale control technology.

Implementation

Water treatment programs will require installation of specialized equipment, generally including chemical feeders, monitoring sensors and sampling ports. Once installed, equipment operation must be monitored. Water samples must be taken and analyzed, typically weekly. And adjustments will have to be made in the program to match changing water conditions.

Facilities have the option of implementing the program in-house or contracting all or part of the program out to firms that specialize in water treatment. If in-house personnel are used, they must be fully trained in all of the procedures involved in the water treatment program, including how to safely handle the chemicals involved. If the program is contracted out, it is important that a qualified contractor be selected, one that is experienced in working with systems similar to the ones in the facility. Regardless of the method of implementation, the result will be better performing and longer lasting systems.

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Kenken Puzzle Answer

2÷ 6	3	4 4	3− 5	1− 2	1
8+ 3	1	5− 6	2	20× 5	4
3+ 2	4	1	3 3	3− 6	10× 5
1	600× 6	5	4	3	2
1− 4	5	6+ 2	5− 6	1	3 3
5	2 2	3	1	10+ 4	6

TEST YOUR OPERATOR IQ ANSWERS:

Answers: 1) E 2) B 3) E 4) C 5) A

BOA GENERAL MEETING SEPTEMBER AGENDA

To Be Announced

BOA CALGARY OPERATOR MAGAZINE ADVERTISING RATES:

1/8 page	$200	**Premium Locations:**	
1/4 page	$400	1/2 page inside/outside cover	$850
1/2 page	$775	1/2 page outside cover	$900
Full page	$1000		

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Quality Combustion & Controls	403-936-0065
Cleaning / Janitorial Services	
Regency Cleaning	403-520-7788
Drain Services	
Revive Pipes	403-903-4445
Engineering Services	
Building Envelope Engineering	403-287-0888
Filtration	
BGE Air Quality Solutions Ltd.	403-243-5941
Alberta Diesel Dialysis	403-813-9999
Fire Protection Services	
Constant Fire Protection	403-279-7973
Sprouse First & Safety	403-265-3891
HVAC & Electrical Services	
Black & McDonald	403-235-0331
Boulder Mechanical Contractors Ltd.	403-230-5519
Indoor Air Quality Services	403-276-2201
Gasonic Instrument Inc,	
Black & McDonald	403-235-0331
Lighting Services	
Calgary Lighting Products	403-258-2988
Motor Services	
James Electric Motor Services	403-252-5477
Supply Services	
DC Sales Corporation	403-253-6808

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