FALL
2011

The Official Publication of the Water Environment Association of Utah

DIGESTED news

Celebrating 50 Years of Clean Water

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Contents

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FEATURES

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Message from the editor

Fall…what a wonderful time of year. Fall is my favorite time of the year. With fall, come the incredible colors as the leaves change from green to gold, red and orange. I like the cooler temperatures, a reprieve from the hot summer months. Fall is also a signal that winter is not too far off (I wouldn't mind if it got delayed a bit though). It is only fitting that as I write about changing seasons that I write about the changes at the *Digested News.* This will be my final editor's message. Chad Burrell will be taking over with the winter issue in December. Chad and I have worked together on the last two issues. Chad will work with CKA and continue to push the *Digested News* to new heights.

I have thoroughly enjoyed my time as editor and have enjoyed the relationship with CKA in putting together the *Digested News.* To all of those who have contributed to the *Digested News*, I thank you. It would not have become what it is without you. Thank you to Central Valley for allowing me to serve in this position. Without support this position would have been a lot tougher to fulfill.

Now, to change my name and to slip off into retirement…..

Sincerely,
Sharon Burton, *Digested News* Editor

You do what?

Dan Olson

Last month, an underground boring company drilled through a main gas line in the City of Tooele. We were fortunate that there was no explosion, fire or harm to anyone. The gas leakage entered the sewer and was detected in manholes for blocks around the site. It caused the evacuation of many homes, businesses, and closure of Main Street for most of the night. Every police officer available in the city and county responded as well as firemen, emergency management personnel, hazmat, city managers, streets and water departments, and other city and county workers. One group of responders was clearly missing, the wastewater and collections personnel. Of all the entities that were contacted and responded these two divisions were not called. The following day when I learned of the accident, I contacted the Fire Chief and we had a frank discussion. His response to our discussion was "I didn't think to call you guys."

Now, I am not being critical of the job he did. In telling this story it serves to illustrate how the work we do is lost in so many levels. Without exception a new employee within the first month of employment will utter the words, "I had no idea what it takes to run the plant." A good plant operator has knowledge of electrical, mechanical, hydraulics, pneumatics, biology, chemistry, physics, mathematics, and engineering. He/she may need some skills in budgeting, public speaking, personnel management, the ability to train other operators and public relations.

It never ceases to amaze me the amount of knowledge and skills needed to operate a wastewater treatment plant and collections system. Wastewater treatment plant operators and collections system operators are some of the most diversely trained group of professionals. We will never be recognized fully for this by our mayors, councils, board of directors, public works directors, or the public, etc, so let me recognize you here. Thanks for doing the single most important job in the world. At least I believe it is. dn

Dan Olson

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Fall 2011 class schedule

Date	Chapter	Tests
October 5	7	Ch. 7, B Math 5, A Math 6,
October 12	8	Ch. 8, B Math 6, A Math 7, Turn in test application to DEQ
October 19		Catch up (No class)
October 26	9	Ch. 9, B Math 7, A Math 8
November 2	10	Ch. 10, B Math 8, Mini Review
November 9	12	Ch. 12, Adv. Practice problems
November 16	13&14	Ch. 13 & 14,100 question review, UVU Review
November 23		Catch Up (No class)
November 30		Last minute review
December 2		Test, Good Luck

Read the Sacramento, Ken Kerri manuals titled *Operation and Maintenance of Wastewater Collection Systems*, 6th Edition, Volume 1 & 2. The manuals can be purchased at the following site, *http://www.owp.csus.edu/training/courses/waste_water/index.php.* Do the chapter tests as you read, for example by the September 14 class; you should have read chapters 1, 2 & 3 and finished the test, also do the tests in the books. Bring a calculator to every class.

Classes start at 12:30 PM and go until 3:30 PM. Along with the chapter test you will get two sets of math sheets each week the B (beginning) math series is for people just starting out and taking the grade 1 or 2 test. The A (advanced) math is for people who have taken the grade 1 or 2 test and need training for the grade 3 or 4 test.

Taking this class does not guarantee you will pass the test. The more you study especially outside of class the better your chances are of passing. You can call me (Lonn) at work 943-7671 or after hours at home before 10: PM, 253-1172 with questions. DN

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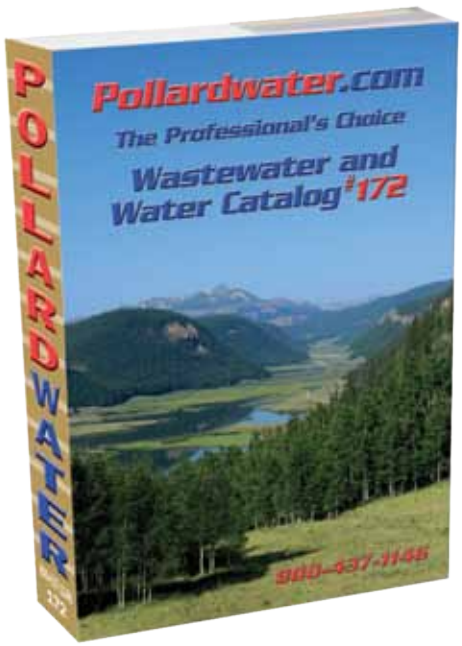

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Collections Quiz

from *Sewergeek.com*

1. Leakage of seal water around the packing on a centrifugal pump is required because it acts as a(n)?
a) Adhesive **b)** Coolant
c) Lubricant **d)** Vapor Barrier

2. The flushing water pressure in a water-lubricated wastewater pump should be at least _____ the pump discharge pressure.
a) 10 psi less than
b) 5 psi less than
c) 5 psi more than
d) 10 psi more than

3. A wet well is 10 feet deep by 17 feet in diameter. When the pump is not running, the water rises in 2 min. If the level rises in 16.0 min. while the pump is running, what is the pump rate in GPM?
a) 1,612 Gal./Min.
b) 1,520 Gal./Min.
c) 1,797 Gal./Min.
d) 9,209 Gal./Min.

4. Given the data below, what is the most likely cause of the lift station problem?
DATA:
- Wet well inlet is normal
- Well drops normally when pump #1 is running
- Well level rises slowly when pump #2 or pump #3 is running
- Run amperage is the same for all three pumps
- One of the pump motors turn backwards when off.
- Level system is reading correctly.
- Electrical controls are all in automatic.

a) Pump #1 & #2 are air-bound
b) Pump #1 check valve stuck open.
c) Either pump #1 or #2 is wired backwards
d) Check valve on pump #3 is clogged.

Answers:

1- c, 2 - c, 3 - b, 4 - b

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Screens (Step, Perforated, Wedge Wire, Bar Rake, Septage, and for MBRs), Wash Press and Grit Washer

JDV
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LAKESIDE
Screens (Perforated Plate, Bar, Septage, and for MBRs), Wash Press, Grit Removal and Grit Washers

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FRP Parshall Flumes, Weirs, Buildings, Slide Gates, Stop Logs

POLYCHEM
Grit Removal System (Chain & Flight)

WESTECH
Screens (Perforated Plate, Bar, Step, Sludge), Grit Removal, Grit Classifier

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Floating Aspirating Aerators and Coarse Bubble Diffusers

AQUA-AEROBIC
Floating Surface Aerators and Mixers

ENVIROPAX
Fixed Vertical Mixers for Selector and Anoxic

KOMAX
Static Mixers

LANDIA
Submersible Mixers and Recirculating Wall Pumps

MASTRRR
Chemical Blending Flash / Induction Mixers

NEUROS
Single Stage High-Efficiency Turbo Blower

SSI
"Airflex" Disc & Tube Diffuser

UNIVERSAL BLOWER
Positive Displacement Blower Package System

TREATMENT PROCESSES

AQUA-AEROBIC
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AZZURO-AIR
Biological Odor Control

BLUE WATER
MBR Pretreatment

ENVIROQUIP
"Kubota" Membrane Bioreactor "SymBio BNR" Aerobic Digestion

JAEGER
Plastic Media for Trickling Filters

LAKESIDE
BNR Oxidation Ditches (Brush Rotors)

WESTECH
Membrane Bioreactor (Flat Sheet)
Oxidation Ditch (Vertical Turbine Aeration),
Motorized Trickling Filter Rotary Distributor,
Hydraulic Trickling Filter Rotary Distributor,
Rotating Drum Aeration Process,
Slow Speed Mixing with Fine Bubble Aeration

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Sedimentation Removal

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Dealing with the aftermath: A guide to restorative drying equipment

By Michael Duke, MBA, CR, CMR from Utah Disaster Kleenup

The inevitable happened, a line was plugged or burst and a home or a business (or two, or three) were flooded. You called a clean-up company for help, they arrived and cleaned up the mess and now you are stuck with paying the bill and wondering if the charges, especially those for restorative drying equipment, are justified. How do you determine how much equipment is enough, too much, or not enough? Fortunately, although calculating equipment is not an exact science, there are established guidelines that will help define equipment requirements.

When using restorative drying equipment the goal should be to safely and sensibly return the property and salvable materials to their pre-flood dry condition. This goal is best accomplished with a mix of evaporation and dehumidification. Evaporation, the act of changing a liquid to a vapor, is usually accomplished with heat and rapid air movement. Dehumidification removes excess water vapor from the air, and is usually facilitated by air exchange or use of a mechanical dehumidifier. If a balance between evaporation and dehumidification is not maintained secondary damage may occur as moisture migrates into, or condenses onto previously unaffected materials. In most dry-out scenarios, fans are used to promote evaporation and mechanical dehumidifiers are used to remove moisture from the air.

The Institute of Inspection Cleaning and Restoration Certification (IICRC) published the S-500-2006, an ANSI recognized standard for professional water damage mitigation. The S-500 established a matrix for flood classification based on evaporation potential.

1. Class 1 = small area or semi or non-porous materials are wet such as in a basement with a concrete floor and concrete walls.
2. Class 2 = porous materials are flooded and/or where water has wicked-up less than 24" into porous wall cladding such as drywall or paneling or insulation.
3. Class 3 = porous materials are flooded and water has wicked-up into walls more than 24" and/or may have come from overhead and saturated ceilings as well as floors.
4. Class 4 = special situations where materials such as hardwood flooring, or substrates behind stone or ceramic tile are flooded.

The IICRC also tied factors to flood classification to assist with equipment sizing. These factors provide a starting point for both evaporation and dehumidification needs. For dehumidifiers, the total cubic footage (FT^3) of the flooded area is divided by the dehumidification class factor to determine initial equipment needs. For the examples in table 1, a theoretical space of 33'9"L X 25W X 8H was used.

For fans, the total linear feet (lf) of walls in the flooded area is calculated and fans are spaced every 12 to 16 lf along the wet walls, 12 lf for Class 3, 14 lf for Classes 2 and 4, and 16 lf for Class 1 floods. Usually a fan is added for every closet and another for every 200 sf of floor space with carpet. A simple way to approximate the total number of fans required is to divide the total square footage (ft^2) of the space by a class factor for fans.

Understanding that equipment needs will change as drying conditions change is important to maintaining an efficient drying environment and controlling associated costs. Once the initial 'easy' moisture load, or that moisture that is easily evaporated, is removed equipment resources can usually be scaled back. Drying goals should be established for materials and areas impacted by flooding. Daily moisture monitoring should reveal when impacted materials and areas meet pre-established drying goals and hence, when equipment should be removed. dn

TABLE 1

Flood Classification	Class Factor for Dehumidification	FT^3 of Affected Space	Initial Recommendation for Pints of Dehumidification
Class 1	100	6,750	67.5
Class 2	50	6,750	135
Class 3	40	6,750	168.75
Class 4	50	6,750	135

Flood Classification	Class Factor for Fans	FT^2 of Affected Space	Initial Recommendation for Number of Fans
Class 1	200	844	5
Class 2	60	844	15
Class 3	50	844	17
Class 4	60	844	15

OUR CONCERN FOR THE ENVIRONMENT IS MORE THAN JUST TALK

As we continue to deliver valuable information through the pages of this magazine, in a printed format that is appealing, reader-friendly and not lost in the proliferation of electronic messages that are bombarding our senses, we are also well aware of the need to be respectful of our environment. That is why we are committed to publishing the magazine in the most environmentally-friendly process possible. Here is what we mean:

- We use lighter publication stock that consists of recycled paper. This paper has been certified to meet the environmental and social standards of the Forest Stewardship Council™ (FSC®) and comes from responsibly managed forests, and verified recycled sources making this a RENEWABLE and SUSTAINABLE resource.
- Our computer-to-plate technology reduces the amount of chemistry required to create plates for the printing process. The resulting chemistry is neutralized to the extent that it can be safely discharged to the drain.
- We use vegetable oil-based inks to print the magazine. This means that we are not using resource-depleting petroleum-based ink products and that the subsequent recycling of the paper in this magazine is much more environment friendly.
- During the printing process, we use a solvent recycling system that separates the water from the recovered solvents and leaves only about 5% residue. This results in reduced solvent usage, handling and hazardous hauling.
- We ensure that an efficient recycling program is used for all printing plates and all waste paper.
- Within the pages of each issue, we actively encourage our readers to REUSE and RECYCLE.
- In order to reduce our carbon footprint on the planet, we utilize a carbon offset program in conjunction with any air travel we undertake related to our publishing responsibilities for the magazine.

So enjoy this magazine...and KEEP THINKING GREEN.

Craig Savage: Self-starter

By Dan Olson

When I was a kid my father told me a story about the trucks they had on the farm. All of the trucks were started by turning a crank except for one. It was a self-starter. In the winter it was the only truck that would start. They would then use the self-starter to pull the other trucks until they all started. The day's work could then be done. Craig Savage, or Craigo to his friends and family, is the self-starter in his field. Every morning you can count on him to say, "Let's Go." He keeps everybody going at work and at home. He never has to be reminded to complete tasks. Craigo is proactive; he finds and corrects problems without direction from others. He also is innovative and has found solutions to problems that others have missed. As a kid he found solutions to problems too. When his sisters were annoying him, he came up with a cannon that would shoot a rubber ball at them every time they walked through their bedroom door. Craigo is a workaholic. He works full time for the city and runs a small business on the side. The only time he slows down is when he is playing with his three-year-old son who idolizes his dad. His son follows him everywhere and does exactly what Craigo does, they are funny to watch. He is very entertaining, always quick with responses to everything. It was reported that his first words were, "Mmmmmmm….. Corn." Craigo has his own language; he has never called anything by its right name. His sense of humor is pretty dry though - we do not know if he is serious or not most of the time, in fact his coworkers think he is from an alternative dimension. Craigo loves to eat - his favorite is potato salad. His wife says she does not make it enough for him - so one year he called his mother-in-law to tell on her. The following Christmas guess what his wife got for Christmas from her mother - mixing bowls, an egg cooker and instructions that she was to make potato salad for him at least once a month. I wonder if that worked. He loves to hike and be outdoors. He enjoys golfing with his family as often as possible. His favorite place to visit is Yellowstone National Park; I think he would live there if it was not so cold in the winter.

Thanks for your hard work and dedication Craigo; you are an asset to our industry. Keep up the great work. DN

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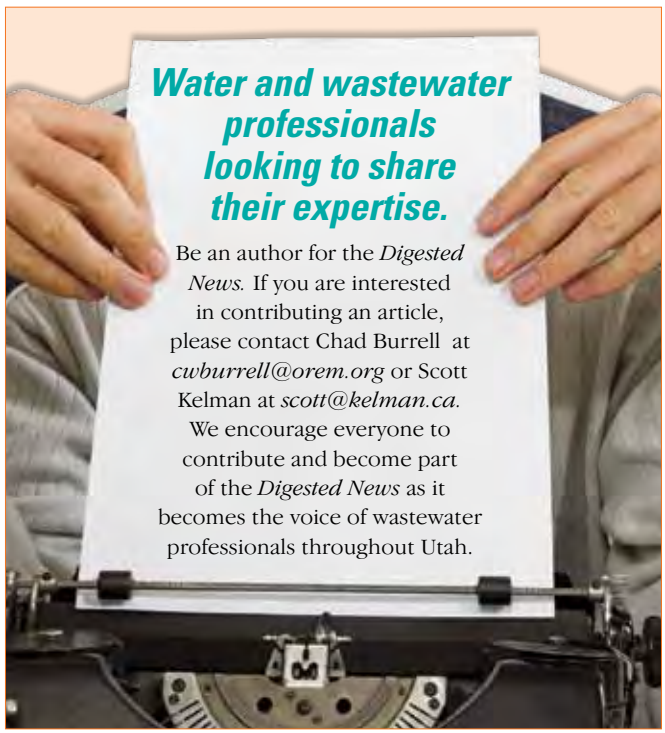

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In Remembrance: Lyle Ford

By Leland Myers

"An Institution: an organization, establishment, foundation, society, or the like, devoted to the promotion of a particular cause or program." Lyle Ford was a water quality institution in Utah. As one of the founding members of the Water Environment Association of Utah, Lyle promoted the water quality industry when it was still called the sewer and people thought you were crazy to work there. Lyle founded Ford Labs and provided quality laboratory services to many facilities across Utah. Lyle was always available for a chat if anyone had a question and would offer advice and help when technical supported was needed. Lyle served as a board member and chair of both, Salt Lake City Suburban Sanitary District #1 and Central Valley Water Reclamation Facility where he continued to build the profession. Lyle was always furthering his knowledge of the sciences associated with the water quality industry and could be seen at every training available. Lyle will be missed and always remembered. dn

> "Lyle was always available for a chat if anyone had a question and would offer advice and help when technical supported was needed."

In Remembrance: Oren Edward Hopkins Jr.

Oren Edward Hopkins Jr. died on May 8, 2011 at his home in Easton, Maryland in the presence of his family. Oren was born in Norfolk, Virginia on February 12, 1925 to Oren E. Hopkins Sr. and Norma Brock Hopkins. After graduation from Maury High School, he was drafted into the Army in July 1943 and served as a combat engineer in the 282nd Engineer Combat Battalion of Patton's Third Army in the European Theater.

After the war, Oren attended the Virginia Polytechnic Institute and State University, graduating with a Bachelor of Science degree in Industrial Engineering in 1950. During his years at Virginia Tech he played football on the 1946 Sun Bowl team (the first-ever Virginia Tech bowl game) and served as co-Captain of the 1949 team. He also served as President of the German Club of Virginia Tech (a service organization). Oren was recognized as a distinguished undergraduate student by his election to Alpha Pi Mu and Tau Beta Pi, the national honorary societies for undergraduate engineering majors, and to Omicron Delta Kappa (ODK), the national honorary society representing distinguished undergraduate leaders. After graduation he attended Columbia University, earning a Master of Science degree in Industrial Engineering in 1951.

Oren started his professional career in the engineering service division of the DuPont Company in Wilmington, Delaware and met his wife Marian Elizabeth Brown soon thereafter. They were married in Kennett Square, Pennsylvania in May 1953 and raised three children – Jane, Oren III (Tripp) and Christian. After DuPont, Oren spent 18 years with Sharples/Pennwalt Corporation as a sales engineer and general sales manager, followed by ten years with EIMCO, a division of Envirotech, as Vice President for Sales and Marketing, before founding the Coombs-Hopkins Company in 1985. His career took him from Wilmington to Red Bank, New Jersey, Houston, Texas, Bay Village, Ohio, Doylestown, Pennsylvania, Salt Lake City, Utah and Phoenix, Arizona. Oren and Marian developed many wonderful friendships along the way.

During the course of his career in the field of wastewater management, Oren actively participated in a variety of professional organizations (the Water and Wastewater Manufacturers Association, the Water Environment Federation, the American Water Works Association, the Arizona Water and Wastewater Pollution Control Association, and the Utah Water Association), holding a number of leadership positions over the years. He served on the Board of Directors of the Virginia Tech Alumni Association, was a member of the Ut Prosim Society and the committee of 100 of the College of Engineering at Virginia Tech, was elected to the Virginia Tech all Century Football Team, was an active volunteer for the American Field Service student exchange organization and a member of First Presbyterian Church and the Alta Club of Salt Lake City. Oren and Marian's involvement in AFS let to many relationships that have lasted a lifetime. Their AFS daughter, Barbi Lund (Sam and Rebecca), and Nii Ansah Mensah (Marlene and children, Nate and Teki), have long been a part of their extended family.

Always an avid sports fan and participant, Oren also had a passion for music, dance, art and travelling. He valued friendships and family, was openhearted, warm and fun-loving and a loving and supportive husband, father and grandfather. In his Bay Village, Ohio days, he regularly attended the Cleveland Browns and Indians games and, while living there, learned to ski. In Salt Lake City he became an avid Utah Jazz fan and the family enjoyed many great ski outings together with friends from around the world. He skied until his late 70s. He and his wife traveled the world, visiting friends and discovering new places (Antarctica, Egypt, China, Galapagos Islands, the mid-East and Sub-Saharan Africa).

After his retirement in 2001, Oren and Marian's journey took them back to their East coast roots where they settled in Easton, Maryland. Here Oren enjoyed boating, attending music and art events, watercolor painting and gardening.

He is preceded in death by his son, Christian Smith Hopkins, and survived by his wife, Marian Brown Hopkins, his daughter Jane C. Hopkins and husband Stephen Geiger of Arlington, Virginia, his son Oren (Tripp) E. Hopkins III and wife Laura Dupuy of Salt Lake City, Utah; and two grandchildren, Michael Christian Hopkins and Sarah Jane Hopkins.

A memorial service for family and friends was held at The Presbyterian Church of Easton, Maryland at 11:00 am on Saturday, May 21, 2011.

The family requests that donations, in lieu of flowers be made to the German Club Alumni Foundation, 711 Southgate Drive, Blacksburg, Virginia 24060 or the National Kidney Foundation of Maryland, 1107 Kenilworth Drive, Suite 202, Baltimore, Maryland 21204. DN

"During his career in the field of wastewater management, Oren actively participated in a variety of professional organizations."

Susan Holmes elected to NACWA

Susan Tanner Holmes, chair for the Central Davis Sewer District (CDSD) Board of Trustees, was elected to the National Board of Directors of the National Association of Clean Water Agencies (NACWA) representing Utah, Colorado, Montana, Wyoming, North Dakota and South Dakota. As a CDSD Board member, Ms. Holmes has represented Utah's interests at NACWA meetings for over ten years by serving on the national NACWA Legislative, Biosolids and Clean Water Committees.

"This is a great opportunity for Utah. We now have a seat at the national advocacy table," said Leland Myers, CDSD Manager. "This is the first time Utah has had a representative on this Board of Directors. NACWA is an advocacy group in national legislative initiatives and serves a great service to water and sewer districts. CDSD's focus aligns with NACWA, our goal is to ensure America's waters are protected while understanding and focusing our efforts on good science and demanding financial restraint from the Environmental Protection Agency (EPA) and other governmental groups."

"CDSD is noted for its proactive approach to environmental issues," said Ms. Holmes. "Joining with others to solve problems isn't new for us. Recently the District joined with seven other Utah sewer districts and cities located along the Jordan River and Great Salt Lake to ensure that careful and comprehensive science is performed. On many occasions, this coalition has found EPA's science is either faulty or non-existent."

"Ms. Holmes is an excellent choice to serve on this national board," said Myers. "She brings a wealth of political, local and business knowledge to the NACWA Board." Ms. Holmes has served on many state and local volunteer Boards, as a Farmington City Councilwoman, on legislative writing committees, and on various local and state committees. She has owned her own marketing firm for over 35 years.

"This is a great opportunity for Utah," said Ms. Holmes. "NACWA represents 350 member agencies throughout the U.S. and focuses efforts and advocacy to ensure local Districts are not financially or scientifically encumbered with EPA rules and requirements that are unreasonable and unattainable. In addition to participating in various legal actions to protect Districts from unrealistic EPA demands, NACWA has focused new efforts on promoting legislation in the US House of Representatives and the Senate to implement NACWA's Money Matters program of restrictions to local costs of broad EPA rule-making regulations."

"NACWA is well known nationally for its leadership on environmental policy and technical resources, and ecosystem protection issues. Presently NACWA is working to ensure changes to the Clean Water Act and the new Farm Bill will protect the environment, but also protect our public's pocketbook," said Ms. Holmes. DN

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Leading the baby-boomer WQ specialists into retirement

Reed Fisher's oldest son, Lance, once explained to his grade school classmates that his dad was a train engineer. While knowing that dad was an engineer, the prospect that his career centered around treating other's wastes was just too 'unmentionable'. Such attitudes have changed considerably, thanks to the contributions that Reed, and others like him, have made to the field of Environmental Engineering in the State of Utah. After nearly 40 years Reed has elected to retire at the end of this year from a stellar water quality career.

Reed's current hobbies include toy trains, yet his boyhood desire to be an engineer did, indeed, embrace the application of mathematics and physics to design projects to benefit society. Upon entering the University of Utah, however, his goal was to become a structural engineer. When course-work toward his structural degree fell 'out of sequence' he was encouraged by his advisor, Utah wastewater pioneer Grant Borg, to consider a new program at the University – Environmental Engineering. Piqued by the challenge, Reed entered the program with a small cadre of six other, mostly Master's Degree, students. Reed also married the love of his life, Cheryl, in 1967.

Reed graduated with a B.S. in Civil and Environmental Engineering in 1972– the same year that Congress passed the Clean Water Act 92-500. After a short stint as a structural engineer with Chicago Bridge and Iron, Reed was hired by Charlie King, partner of local consulting firm Coon, King and Knowlton (CKK). Frank Reuckert was Reed's first boss and together they served many communities throughout Utah.

Reed recalls the gratitude expressed by the residents of Tropic, Utah after he and CKK solved serious water quality health issues stemming from lack of sewer collection and treatment facilities. He served as design engineer and resident engineer for design and construction of the Moroni wastewater treatment plant–a municipal/industrial facility serving the adjacent turkey processing plant. The firm also served as City Engineer for Nephi City. Much of the work took Reed away from his growing family. Lance, born in 1970 was followed by sons Jason (1972), Brad (1975) and daughter Julyn (1979). It was during this period that Reed acquired a private pilot's license, as flying to remote client and contractor meetings was more efficient than driving.

In 1978, Reed was a key member of the newly-formed CKK/Brown and Caldwell joint venture and was instrumental in landing the planning and design of the Central Valley Water Reclamation Facility. He was designated as the CKK member's Project Manager, not knowing at the time that the remainder of his career would be inextricably linked to Central Valley. Reed became a mentor to many young engineers as he directed design of the Central Valley interceptors and treatment works, under a protracted EPA Construction Grants schedule, throughout the 1980's.

> "Reed became a mentor to many young engineers as he directed design of the Central Valley interceptors and treatment works, under a protracted EPA Construction Grants schedule, throughout the 1980's."

When CKK was acquired by Los Angeles-based DMJM in 1982, Reed's assignments expanded to include design review of the 800 MGD Hyperion Advanced Secondary Expansion in Los Angeles; proposal preparation for projects as far away as the Phillippines, performance evaluations of packaged plant systems in eastern state's Job Corps centers and on-going business development and project management functions. One of the design jobs he most enjoyed was design of the award-winning Coalville, Utah wastewater treatment plant. His promotion to Division President with DMJM/CKK Salt Lake was testament to his technical, managerial and interpersonal skills.

In 1992, Reed assumed the reins as the third General Manager for the Central Valley Water Reclamation Facility (CVWRF), the plant he knew so well from it's inception a decade before. Under his leadership the plant has consistently met permit limits, exhibited an outstanding safety record, appears as a well-maintained industrial show-piece and is considered a great place to work. To this day, Reed's demand for accountability and performance is accompanied by his loyal advocacy on behalf of the employees under his charge. And his willingness to consider new technologies and strategies has moved CVWRF from a wastewater treatment plant to an ever- more sustainable resource recovery facility.

The CVWRF General Manager's position provided a platform for Reed to enhance the public's view of water quality professionals and the work they do. He served for 9 years on the Operators Certification Council and for three years on the State's Operator Certification Board. In the mid-90's Reed volunteered to sit on the Eagle Mountain, Utah Utility Board, assisting the fledgling community to responsibly meet its citizen's utility needs. He currently sits on the Economic Development Committee for South Salt Lake City and is an Honorary Colonel for the City's Police Department as well.

Reed has served WEAU as Board Member, Vice President and President in 2000. He is a member of WEF's Quarter Century Operator's Club and is currently serving as WEAU's Member Delegate to WEF. As Reed and Cheryl motor into the future in their little red Porsche, we at WEAU offer our thanks and wish them all good things for a well-earned retirement. DN

WEAU General Association Awards NOMINATION FORM

Instructions: Place a 'X' mark in the box next to the award for the nomination. Next, fill out the information for the nominee and yourself (nominator) as fully as you can, this information will be used by the selection committee to process the nomination. Please send a separate application for each nomination, ***OK to copy form if needed for this purpose.*** Next, FAX application to: (***801) 536-4301, no cover necessary,*** e-mail to: ***jenrobinson@utah.gov***, or mail to: **Division of Water Quality (attention Jennifer Robinson) PO Box 144870, Salt Lake City, Utah 84114-4870.** Applications are due by **December 15, 2011.**

WEAU is a member organization where members can nominate those individuals or organizations within our industry that deserve recognition by the association for their efforts. When you send in your nomination, you will be contacted to arrange a time for a visit by the awards committee. Individual awards must be nominated by someone other than nominee. Please notify their supervisor and have them sign the form. Members with significant managerial responsibilities, (i.e., general managers, etc.) are ineligible. Those with significant supervisory responsibilities, (i.e., coordinators, directors, etc.) should be considered for the supervisor award, or program award. If you have any questions, please feel free to contact Jen Robinson at (801)536-4383. Good Luck.

- ☐ Plant under 5 MGD
- ☐ Discharging Lagoon
- ☐ Operator under 5 MGD
- ☐ Collection System under 5 MGD
- ☐ Collection Operator under 5 MGD
- ☐ Pretreatment Program
- ☐ Young Professional
- ☐ Plant over 5 MGD
- ☐ Non-Discharging Lagoon
- ☐ Operator over 5 MGD
- ☐ Collection System over 5 MGD
- ☐ Collection Operator over 5 MGD
- ☐ Pretreatment Specialist
- ☐ Laboratory
- ☐ Laboratory Technician
- ☐ Safety
- ☐ Maintenance Specialist
- ☐ Supervisor
- ☐ Biosolids Program

Nominee Information:

Name (as if will appear on plaque):_____

Facility Manager: _____

Facility Manager: _____

Address:_____

City/State/Zip: _____

Phone:_____ Fax: _____

E-mail: _____

Supervisor's signature:_____

Nominator Information:

Name: _____

Address:_____

City/State/Zip: _____

Phone:_____ Fax: _____

Briefly describe why you think the nominee should be considered for an award: _____

_____

_____

FAX FORM TO: (801) 538-4301 or E-mail FORM TO: *Jenrobinson@utah.gov* or
Mail FORM TO: Division of Water Quality, Attn: Jennifer Robinson, PO Box 144870, Salt Lake City, UT 84114-4870
By Dec. 15, 2011

Experienced individuals needed

Awards Committee Needs

We are in need of experienced individuals to chair various evaluation committees:

- Pretreatment
- Collections
- Safety
- Operators
- Others

The kickoff meeting for the awards committees will be January 4, 2012 at 195 North 1950 West in Salt Lake City. Individuals will have the opportunity to visit nominated facilities and individuals throughout the State. Groups will be formed with 3 to 5 people with a lead. The lead in the group is required to have 3 years experience and be willing to coordinate the other members in the group to visit with the nominees, previous winners are a plus.

Forms will be provided at the kickoff meeting for CEU's to be submitted to Judy Etherington, once the committees have completed the visits with the nominees.

The WEAU awards program publicly recognizes excellence in individuals and entities in many areas of our industry throughout the year

Some of the rewards & benefits to you:

- State Wide Recognition
- Community Recognition & Exposure
- P/R and Marketing Opportunities
- Prestige and Enhanced Reputation
- Capacity and Leadership
- Award for Prominent Display
- Boost to Employee Morale
- Training/CEU'S
- Networking

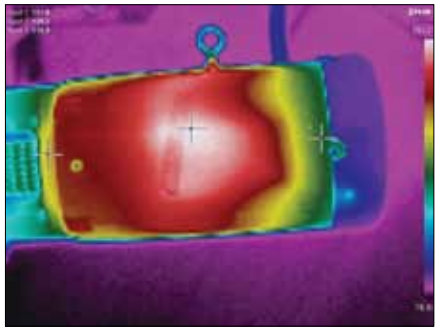
Thanks for your support!!

Investing in your predictive maintenance program with infrared thermography

By Jordan Boone

Infrared thermography is the production of non-contact infrared or heat pictures from which temperature measurements can be made. By detecting anomalies often invisible to the naked eye, thermography allows corrective action to be taken before costly system failures occur. Portable infrared imaging systems scan equipment and structures, then instantly convert the thermal images to visible pictures for quantitative temperature analysis. Infrared thermography is being used by wastewater treatment plants for the predictive maintenance of a wide range of applications, including mechanical systems, electrical systems, and building diagnostics – making it a smart investment for its versatility. Typical mechanical systems monitored in a predictive maintenance infrared program include bearings, motors, pumps, and compressors. For electrical applications, infrared thermography can detect loose connections, corrosion, and load imbalances.

Abnormal heating due to high resistance or excessive current flow causes most problems in electrical systems. Infrared thermography is used to quickly locate 'hot spots' so repairs can be made before catastrophic failures. Motors can have hundreds of electrical connections that can become loose or faulty. Poor connections, current overload, and phase imbalance problems can be identified safely using non-contact thermal imaging. When connections become loose, they



generate excessive heat. When this condition occurs, the wire will burn in two, causing the motor that is being controlled to single-phase. This condition will cause the electric motor to fail prematurely. Electrical switchgear, motor control centers (MCC), data centers, transformers, fuses, circuit breakers, and panel boards can all be inspected using infrared thermography.

Electric motors are essential to the operations of a wastewater treatment facility. There are primarily two potential failure modes that affect electric motors, bearing failure or electric winding failure. Each type of failure mode can be detected and predicted, enabling maintenance to plan and schedule removal of the motor to avoid unwanted downtime. Motors are rated by class for their maximum operating temperature. Temperatures in excess of these maximum ratings will cause damage to insulation on the windings, greatly shortening the life of the motor. Electric winding insulation breakdown can be detected by motor current analysis enabling predictive maintenance personnel to predict the premature failure of a potential problem. Thermal imaging can detect problems before costly failures, thereby reducing down time.

For example, in this picture is a 10 hp motor that is used on a sludge conveyor for a centrifuge. The motor is brand new and in the second day of operation. After running for about four hours under normal operating load, this picture was taken so that we would have a baseline to refer to. Spot 1, where the copper windings are located, is reading 151.8 degrees Fahrenheit which is normal. Spots 2 and 3 are looking at the bearing temperature. Spot 3 is at the opposite drive end bearing where the fan is located, therefore it is reading about 12 degrees cooler than the drive end bearing. Six months from now when the motor is inspected again, we can start trending results. After compiling information over a few years on each and every motor, we will see which ones are in need of either rebuild or replacement without having been burdened with unexpected costs and down time. Costs will have been cut significantly by instituting these proactive measures versus going on blind faith in mechanical and electrical hardware alone.

Plants are seeing favorable ROI with infrared thermography programs as the technology enables them to take corrective action before problems occur – thereby saving money and other resources. Types of savings include:

reduced PM inventory because problems are detected early, savings in labor by taking immediate corrective action, energy savings – both from making sure that equipment is running optimally and sealing building leaks, decreased downtime, increased production, reduction in waste and scrap parts, quality assurance during the process via real-time process control, and much more. The sluggish economy is taking its toll on many areas of industry. Plants are looking for smart, cost-effective ways to help their facilities operate more efficiently and save money without sacrificing quality and performance.

Infrared thermography has proven itself to be a valuable tool for predictive maintenance and process monitoring system applications for many industries – even in sub-par economic times. The fact of the matter is, when the economy 'takes a dump' most facilities want to cut their maintenance budgets to make it through the hard times. Instead of making cuts, why not invest in a good preventive/predictive maintenance program to reduce the risk of catastrophic failure. This insurance policy for your equipment will save in costs over time, reduce unnecessary labor, and give you a better return on investment than any budget cut could accomplish. DN

In my book, they are heroes

By Gary Hill

In my garage there is an old recliner that has seen better days. It resides by the window and on a clear day you can see across the street. It is tattered and worn but it does the job. Beside it is an old cooler that holds a variety of liquids to wash the dust down. My son calls it the chillin' chair. So, I'm parked out here, looking at the old Pontiac and thinking…. Dangerous.

I read in the paper today about a guy who jumped in a river to save a teenager from drowning. In the process, she was rescued, but he died. Sad, and they said he was a hero. Now you hear about heroes all the time, our military personnel currently deployed and the older Vets from wars past, firefighters (especially after 9/11), policemen (not so much if you are the recipient of a speeding ticket), nurses, and pilots who safely land planes in rivers. We also honor those who save others in disasters and let us not forget any good to great sports figure. I could go on and on.

So what about us who work in the service of society's infrastructure? The unsung, un-applauded, un-recognized people who work behind the scenes to keep the water flowing out the tap, the toilets flushing, and the lights on? It is a 24 hour/365 day job. There are those who work the weekends, the holidays, the swing and graveyard shifts, and some, bless 'em, in the small towns who ARE the Public Works Department. Not much recognition for the on-calls in the middle of the night, in a snowstorm, or trying to maintain the plant when the flood waters are pouring over the sandbags and you are up to your neck in alligators. But just let the water stop flowing, the toilets back up and sewage go where it is not supposed to, or the lights go out and I will bet you could not count past two before the phone is ringing off the hook. Yet we do it day in and day out, year after year, many times sacrificing family and personal time, and we stick around to make a career of wastewater. We certainly are not getting rich or celebrated by society, but we do more than a herd of doctors could to ensure that waterborne disease and the sickness and epidemics that could occur do not. Preventive medicine I call it, and that is something to be proud of. So whatever the world may view us as, I raise my glass and salute you. The men and women of the water/wastewater industry are heroes in my book. DN

Nationals in LA

Well it is that time again. The national operator's challenge is coming up this October and we are pleased to have two very talented teams representing Utah this year. Our first team representing Utah for 2011 is the Wasted Gas from Central Valley. They were the team that took first place in the 2011 WEAU operators challenge. !@#$%. Just kidding. They are an awesome team that is quick under pressure and always meets or exceeds their expectations. Central Valley has always been a huge driving force in the success of the WEAU and is an amazing group of people, with the exception of Chris Reilly. Just kidding Chris. The Wasted Gas team members are Jared O'Brien, Kevin Gallagher, Darin Morris, Tiffini Adams, and Jeff Weiss as their coach, but we know who is really in charge, huh Tiffini. She will keep them in line. On a special note, Reed Fisher, Central Valley's general manager will be retiring at the end of this year and we were going to organize a blanket party on his last day. Space is limited due to Central Valley's avid participation. Ha ha ha. On a serious note we would like to recognize Reed for all he has done for our profession and our association and wish him all the best in his retirement.

Our second team this year is the Wasatch All Stars. This team is made up of one member of five other teams that participate in the WEAU operators challenge for the current year. This year we have Nick Brown from Snyderville Basin, Shawn Wilson from Central Weber, Weston Gardner from South Valley, John Lewis from Cotton Wood, and Lane Reynolds from North Davis as the coach. This team is stacked with talent as well and has a very good chance of putting the hurt on everyone in their path. We would like to give a special thanks to these entities for allowing this team to represent Utah. I am glad it is not me going up against them. They do not have a Tiffini so we are going to give Lane a bat with nails sticking out of it. We like to call it the talking stick. It is mostly for Weston. Anybody who knows Weston completely understands what I am talking about. We wish both teams the best of luck so train hard and kick butt. dn

Wasatch All Stars

Central Valley Water "Wasted Gas" operations challenge team. Team members: Tiffini Adams, Jared O'Brien, Darin Morris, Kevin Gallagher, Coach Jeff Weiss (not pictured).

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Shand & Jurs Biogas Product Spotlight

Shand & Jurs Biogas continues to pave the way with new product enhancements specifically designed with plant operators and plant maintenance personnel in mind.

Our latest product enhancements include a control panel for both our High & Low Pressure Electrically Actuated Drip Traps, along with the addition of a Proximity Switch that can be mounted onto Flame Trap Assemblies.

Control Panels for the High & Low Pressure Electrically Actuated Drip Traps can monitor up to 5 Low Pressure or 3 High Pressure units. Typical enclosures available are Nema 4X Fiberglass, Nema 4X 316SS or Nema 7 Aluminum. Indicators include Auto/Off/Manual, Manual Fill/Drain, and Fill & Drain.

The Flame Trap Assembly has visual indication to monitor the open or closed position of the pallet. Wiring the proximity switch to the local control room will notify personnel when the thermal valve pallet closes. The addition of the proximity switch now enables plant personnel to have real-time status to ensure gas flow is not restricted.

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The fall 2011 Utah Wastewater Operator Certification exams

OFFERED BY THE UTAH DIVISION OF WATER QUALITY

Any particular exam may be taken on only ***one*** of the two dates – ***either*** September 1, 2011 at the Rural Water Association of Utah (RWAU) Northern Conference in Layton, ***OR*** on December 2, 2011 at one of the other four locations (Ogden, Richfield, St. George, or Utah Valley University in Orem). Remember—You may NOT take the **same** exam twice during the 'Fall exam cycle.'

September 1, 2011

Thursday – 9:00 a.m. to noon, Davis Conference Center, Layton, Utah. **Applications must be received at the Division of Water Quality office by 6:00 p.m. on Thursday, August 4, 2011.** (State offices are closed on Fridays.) This is a separate application & fee from the RWAU conference registration.

December 2, 2011

Friday – 1:00 to 4:00 p.m., at one of the four other locations in the state: Ogden, Richfield, St. George, or Utah Valley University in Orem. **Applications must be received at the Division of Water Quality office by 5:00 p.m. on November 4, 2011.** This is a separate application & fee from any training seminar registration.

Exams offered

Wastewater Treatment (Grades I – IV)
Collection (Grades I – IV)
Small Lagoon System I

Applications

Applications are available through the Division of Water Quality:

- Visit our website at *www.waterquality.utah.gov/OpCert/*
- Email *wwopcert@utah.gov* with 'Application Request' in subject line
- Call (801) 536-4344 to have an application form mailed to you

Note

No exam application forms or confirmation letters are being mailed unless specifically requested. The exam rosters for each location are posted on our website under 'Am I registered?' as soon as the applications are processed. Check to be certain that you are scheduled for the specific type of exam and location you requested. **Time allotted for the exam is three (3) hours, in compliance with ABC's testing recommendations. No additional time is allowed if you choose to take more than one exam during a session.**

Cost

$50.00 per exam - make checks payable to the 'Division of Water Quality' (Full refund up to the deadline—after the deadline, no refunds can be given)

To apply

Submit a fully completed exam application, notarized Citizenship/Alien ID Certification form with copy of photo ID, and the $50.00/exam fee (payable by check or money order, but no credit cards accepted. Do NOT MAIL cash)

Mail to

Wastewater Operator Certification
C/O Division of Water Quality
PO Box 144870
Salt Lake City, UT 84114-4870

Deliver to

Division of Water Quality
Multi Agency State Office Bldg,
DEQ 3rd Floor
195 North 1950 West
Salt Lake City, Utah 84116

In compliance with the *Americans with Disabilities Act*, individuals with special needs (including auxiliary communicative aids and services) should contact Brooke Baker, Office of Human Resources, at (801) 536-4412, TDD (801) 536-4414, at least five working days prior to the scheduled testing date. DN

Biosolids Committee training

By Tom Pendley

So, I am asked to write an article about the recent Sample Seminar that the Biosolids Committee put together and any upcoming training we may be talking about arranging for the near future.

Well, my first thought was "Does a sentence constitute an article?" Of course, everyone I asked looked at me like I was nuts. Usually being a person of few words, let us see what kind of an 'article' I can create.

On August 31, the Sampling Seminar was held at the MASOB (Multi State Agency Office Building). We had a full day planned with six speakers lined up. Jeff Macfarlane of North Davis led us off with Pretreatment Sampling. Ken Burgener also from North Davis took us on a side trip into why we need to do the jobs we do. I think Ken needs to somehow get his presentation out to the general public. That would help with Public Relations for all Plants. Pete Deligt from Central Valley covered Compost Sampling. After lunch, to help keep us on our toes, Sherrie Sheffield from South Valley entertained us with how to prepare for the certification tests. Good shot, uh I mean good job Sherrie. Dwaine Funk filled in for Anthony Daw both from Central Valley and covered analyzing Lab Samples. To finish our day, Leland Meyers from South Davis covered Agronomic Rates and Land Application.

A very tasty lunch was catered by Joe Morleys and I believe was enjoyed by all.

Thanks to all that attended and those that helped make it happen.

The Biosolids Committee is now working with PWO's Gary Hill and Ron Clements (a.k.a. Curly Howard) to sponsor two consecutive math classes on November 2 at North Davis. PWO is going to cover Grades 3 & 4 math and the Biosolids Committee will cover grades 1 & 2 for those getting ready to take the next Operations test. We have volunteered Myron Bachman to cook us his famous Brisket and beans for lunch that day.

On February 15, we have the Honorable Professor/Doctor Michael McFarland from Utah State University conducting Biosolids 101. This will be held at the MASOB.

Watch for more details on these two seminars in the upcoming flyers. Hope to see you at both events.

Well how did I do? Does this qualify as an 'Article?' DN

Maintenance Quiz

Provided by Weston Youd

1. What could cause a demand for more oxygen in an aeration tank?

A. Increase in inorganic waste.
B. Increase in BOD.
C. Decrease in Ph.
D. Increase in toxic substances.

2. An increase in plant effluent coliform levels could be contributed by?

A. Solids built up in contact basin.
B. Short circuiting in contact basin.
C. Increase in effluent BOD
D. Low chlorine residual.
E. All of the above.

3. What can influence the settleability of solids in a clarifier?

A. Short circuiting.
B. Flow velocity.
C. Temperature.
D. Detention time.
E. All of the above.

4. Toxins entering a treatment plant can be detected by?

A. Smell of odors.
B. Bulking of sludge in clarifier.
C. Changes in color of incoming waste.
D. A,B and C.
E. Flow of waste water.

5. It's okay to write a signed note in-place of a lock-out tag-out lock.

A. True.
B. False

Answers:

1.B 2.E 3.E 4.D 5.False

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- **Host Pipe Integrity** Single slot installation means minimal loss of pipe integrity, so our valve gasket forms a seal directly in the pipe. Other methods weaken pipe by cutting out an entire section.
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- **The EZ2 Guarantee** EZ2 doesn't need to seal on an "epoxy valve body." Our patented expandable Resilient Wedge Gate will seal better and deliver a guaranteed drip tight seal every time - which no others can claim.
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2011 MIDYEAR CONFERENCE

ANOTHER NOT-TO-BE-MISSED EVENT!

By Jim Schwing

The 2011 WEAU Midyear Conference is shaping up to be another in an annual string of not-to-be-missed events. Mark your calendars now and watch for registration information in your email and snail mail.

Date

Tuesday, November 15, 2011

Location

Utah Cultural Celebration Center
1355 West 3100 South
West Valley City, UT

Sample presentations and events

- Odor Control
- Collection System Rehab
- Design Build Project Delivery
- Nutrient Recovery
- Jordan River Water Quality Issues
- Great Salt Lake Water Quality Issues
- Heat Recovery from Wastewater
- Doing More with Less Financially
- TMDLs
- Operator Training
- TMDL Panel Discussion – Representatives from Regulators, Regulated Community and Consultants
- Young Professional Lounge with Student Poster Display and Competition

Keynote speaker

Leah Ann Lamb, Utah Division of Water Quality; TMDLs, Nutrients and Water Quality Issues DN

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Multiple Barrier
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Optimize nutrient removal with the flexibility of the AquaMB Process® with integrated process control for the ultimate in biological nutrient removal.

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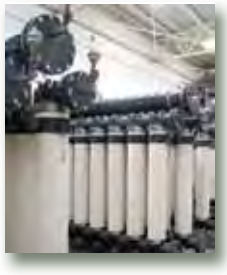

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My experiences at the Stockholm Junior Water Prize

By Shwan Javdan

I just started my first semester at the University of Utah as a member of the Honors College a couple weeks ago, and were it not for the research I did in high school, I would not have earned my full-tuition and housing Eccles Scholarship. I will try to spend most of this brief article describing my experience in Chicago, and less about my own project. The details about that can be found in my paper and abstract (which you guys have).

I arrived to the Hotel pretty late and missed the icebreaker, but that did not stop us all from getting to know each other. The field trips and group activities that followed it helped us all get acquainted. I learned the first day that I was there that my project was average or, at best, slightly above average when compared to some of the others. Since only one person would go to Stockholm and only three or four others would go to LA, I quickly decided I should just accept the fact that I would be leaving empty handed, and that what I should take away from Chicago was my experiences. I knew my project like the back of my hand, and studying was not something I prioritized; instead, I focused on making connections. How often does a student my age get to know like-minded scholars from all across the nation? My experience in Chicago can easily be described as a social one. I made dozens of new friends (who I still keep in contact with), established some long-lasting relationships, and learned quite a bit of science outside of my niche of knowledge along the way. I found the competition to be most exciting when I was learning about *other* people's projects, rather than when I described my own to judges. The students there were brilliant – some, genius – and it was an honor and a privilege hearing them discuss their research.

Ultimately, my experience in Chicago was one of the best in all the science fairs I have attended, rivaled only by ISEF (the international science and engineering fair). The city was magnificent, the various sites that we toured (i.e. the Aquarium or Millennium Park) were awe-inspiring, and the social experience was unparalleled. In the present day, months after the competition, I still find myself asking people I met from Pennsylvania or Massachusetts how to do a certain Chemistry problem at school, or how they would approach some scientific dilemma I am having (all of this done through Facebook, of course). DN

WEAU members attend Salt Lake Bees game

WEAU celebrated a Family Fun Night at the Salt Lake Bees baseball game on August 26. 77 WEAU members and their families attended, including 37 people from South Davis Sewer District. A great time was had by all. Dinner was provided and all attendees received WEAU t-shirts. The highlight was a raffle for $500 in prizes during the 7th inning stretch. Kaylee, whose Grandfather Steve Rix works at South Davis Sewer District, was the grand prize winner of a $100 Cabelas gift card. Thank you to the Young Professionals Committee for organizing this wonderful event. dn

SALT LAKE BEES

Engineering technologies for pipeline asset management

By Bryon L. Livingston, Ahmad Habibian, and Kent Lackey - Black & Veatch

There are many technologies available for managing the condition of underground infrastructure, or buried pipe. In this article, we will focus on a few of the non-destructive technologies commonly used in conducting condition assessments in water systems. The condition assessment step is a key component of the asset management process, and knowing what technology to use is important. Asset management principles are not a new concept for most utilities, except that using a formalized approach provides a more efficient use of the data collected. The formalized process provides for converting data from condition assessment to implementation of projects based on priorities.

This article will identify why utilities should be proactive in determining the condition of the pipe in their system – especially those located in critical areas. The condition-based assessment will show why it is beneficial to have information on the actual condition of the pipe based on field evaluations, versus information based on statistical methods.

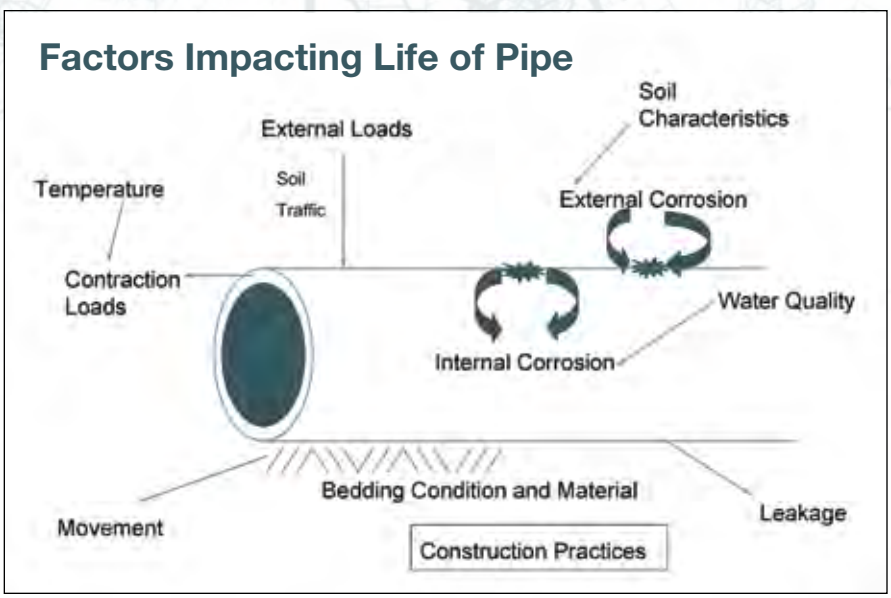
Managing buried infrastructure requires balancing the performance of the system; the associated risks; and costs required with operational efficiency, planning requirements, affordable rate structures, security, and regulatory requirements. The decisions made to replace or repair/rehabilitate pipe should be made based on the actual condition of the pipe in the system. The service life of pipe is variable and is affected by many factors. The 'wave' of reinvestment is just beginning, and utilities that take steps now to prepare for reinvestment needs will reap the benefits of early planning.

News reports are full of many incidents describing catastrophic events and disruption to traffic and lifestyle resulting from breaks in water lines. It is impossible and impractical to try to prevent all the line breaks, but it is practical and also sound management to prevent failures on critical pipelines that can result in catastrophic events. Effective planning and condition-based assessment are required to minimize the number of such events. With aging infrastructure, they are becoming more common. Now is the time to take action. Developing an inventory of the type(s) of pipe in a system and the year(s) the pipe was installed will help determine the future investment needs. However, not all pipes installed in the same year will fail during the same year in the future. Evaluating these factors will provide data that is useful in the condition assessment. There are several factors that impact the length of the service life of pipe, including:

"This article will identify why utilities should be proactive in determining the condition of the pipe in their system – especially those located in critical areas."

- third-party damage;
- temperature, which creates contraction loads;
- external loads from overburden and traffic;
- external corrosion from oil characteristics;
- internal corrosion from water quality characteristics;
- transient pressures that affect the structural integrity of the pipe;
- design and construction practices;
- bedding condition and material;
- ground movement; and
- groundwater and leakage.

Understanding that these factors exist and knowing how they affect the service life of pipe is important to manage the risk



associated with buried infrastructure. Such factors cannot be eliminated, but they can be managed. Several models have been used in the past to predict the condition of pipe, including:

- Prioritization Model,
- KANEW Model,
- Economic Analysis, and
- Risk-Based Model (Monte Carlo Simulation).

These models are useful in developing a plan to identify areas to focus repairs in a replacement program. These tools will not be discussed here, but are presented for information. Rather, the engineering technologies listed below will be discussed:

- Visual Inspection and Closed Circuit TV;
- Electromagnetic (Remote Field Eddy Current and Broad Band);
- Ultrasonic, including G-Wave;
- Remote Field Eddy Current/ Transformer Coupling;
- Acoustic Monitoring;
- Leak Detection; and
- Magnetic Flux Leakage (Currently used in oil and gas).

This is only a partial list and there are a number of technologies or variations of these that are available. The following sections are summaries of the technologies listed.

Visual and Closed-Circuit TV (CCTV)

Visual inspection by entry into pipe has been used in the past as a standard method to inspect pipe interior. This method is not as cost-effective as in the past because of OSHA requirements. Additionally, increased awareness of safety related issues associated with manned confined space entry make this option less desirable and in some cases unacceptable.

The technology for CCTV is making dramatic improvements. It has been used primarily in the gravity sewer lines, but improvements are making it applicable for water lines. Unless the system's pipes are full of tuberculation, there are some potential benefits from using CCTV inside a water line. The pipe can be cleaned and CCTV would be a valuable tool to identify internal corrosion. The CCTV technology is similar to that used in sewer lines; the camera can pan and tilt to identify lost valves, build-up in the pipe, zebra mussel, and various repair needs. The value of this technology could be used to enhance a repair program to investigate the condition of a pipe following a line cleaning.

Broadband (BEM) Electromagnetic Technology

This technology is used for inspecting metallic pipe; it measures wall thickness and pits using near-field electromagnetic. The inspection is completed using an internal survey by droid and an external scan by 'blanket.' The pipe must be exposed and out of service in order for the inspection to be conducted. Also for this inspection, the pipe must be very close to round and the survey must be performed in a straight line. The inspection provides the **average** thickness based on spot measurements at nodes. Based on the results, an ultrasonic inspection can be used to confirm findings.

Remote field eddy current

This technology inspects the pipe wall from the interior of the pipe and is used to assess the wall thickness of metallic pipe. This pipe includes:

- ductile iron,
- cast iron, and
- steel.

The inspection process detects internal and external defects equally well and can identify pits (20mm) with metal loss or cracks. The application of this technology is limited because of the use of linings in water piping systems. This technique is used in conjunction with ultrasonic inspection to confirm findings. It was developed for oil and gas pipelines and has limited applications in the water industry. As the need for assessing metallic water pipe increases, this technology has the potential to provide the information required.

Ultrasonic inspection technology

This technology is used for metallic pipes and requires an external inspection to determine wall thickness by measuring the transit time of sound waves through pipe wall. One of the limitations of the technology is that it can be used only for spot measurements. This requires a detailed evaluation of the pipeline to determine the area most likely to contain wall loss or pitting. The pipe wall must be very clean to provide a good contact between the sensor and the pipe wall. A couplant, an inexpensive handheld instrument, is normally used to improve contact. Some cities have purchased this equipment and conduct tests, known as B-scans, whenever there is a leak or access to the pipe. Advantages of the B-scan are that:

- it is accurate to three thousandths of an inch,
- it uses water as a couplant,
- it displays the cross-sectional thickness of the material,
- it is very portable, and
- it is five to 10 times faster than a conventional point-to-point ultrasonic.

The limitations of the B-scan technique are that:

- it can scan only surfaces that can be reached by the technician, and
- it cannot scan pipes with heavily corroded exterior surfaces.

Impact echo

Impact echo is a simple test that is used on concrete. The test measures the sound waves that result from striking the concrete with a measured force. This principle is the same as using a hammer to strike the concrete and listening to the sound. A hollow sound indicates the possibility of separation in the concrete.

Remote field eddy current/transformer coupling

This technology was developed to identify broken wires in prestressed concrete cylinder or non-cylinder pipe (AWWA C-301 and C-303). The electromagnetic waves are used to evaluate the condition of the pre-stressing wires. The tool uses the pre-stressing wires as an antenna, and the exciter in the tool transmits a signal that is recovered by the receiver. The technology measures the signal to identify wire breaks. Normally, this process is used prior to acoustic monitoring to establish a baseline, but it can be used following acoustic monitoring, if the situation requires it. There are several factors that affect the electromagnetic signal, including:

- wire anchoring methods,
- variation in wire spacing,
- variation in wire diameter,
- variation in cylinder thickness,
- wire splices,
- shorting straps,
- joint configuration, and
- insulation in joints.

Knowledge of the pipe is required to

improve the accuracy of the evaluation. Calibration of the pipe prior to the investigation greatly improves the results. Evaluation of the signal is an art as well as a science, and interpretation of the data requires experience.

Acoustic Emission Technology (AET)

AET detects areas of active deterioration by measuring the frequency and number of distress-related acoustic events that occur along the monitored PCCP pipe section over a defined period of time. This technology is used for PCCP to monitor for wire breaks. Once they have been detected, monitoring can indicate if the wire breaks are active.

Acoustic monitoring evolved in the mid 1990s. The technology is used to detect wire breaks while the pipe remains in operation. The pre-stressing wire breaks or releases tension (slips), generating acoustic energy. This energy propagates into the water and moves down the pipeline. The energy from a break or slip generates a unique acoustic signal that is detected as it passes the hydrophone or accelerometer installed along the pipeline. The location of the 'event' is determined based on the arrival time of the sound at the site of the accelerometer or hydrophone.

Leak detection technologies

There are several methods used to detect leaks in distribution systems. The older acoustic methods cannot identify the location of leaks smaller than 125 gallons per hour or 3000 gallons per day – 1.1 million gallons per year. These technologies perform better in smaller diameters no larger than 12 inches, as the signal attenuates and weakens in large-diameter pipe. The accuracy of these tools limits locating the leak to usually within 10 feet or more. Another complication is that multiple leaks tend to distort signals.

The question "Why find leaks?" has an obvious answer. First, but not always foremost, leakage from the system is classified as 'non-revenue' water, and systems should recognize this will become a significant issue, if not addressed. With emphasis on sustainability and water scarcity, the amount of water from leaks can be a significant concern.

Leaks contribute to accelerating pipe corrosion, weaken the bedding support material, and can lead to a 'catastrophic failure.' The number of leaks is also an indicator of pipe condition. It is important to recognize that not all leaks surface – at least, not right away. Leaks can go on for years, depending on the soil condition in the surrounding area, which can lead to very dangerous situations – such as sink holes – when water lines are under roadways or other structures. The process of water moving through soil porosity provides the erosion of the soil and for potential failures by the formation of sinkholes. A sinkhole is developed when a small leak goes unattended. The water pressure from the leak washes away the soil and bedding around the pipe. The water and soil move through existing cracks and voids in the ground around the pipe. The erosion of the soil through the cracks eventually forms a cavity. In time, or as the result of a large leak, the size of the cavity increases until the weight of the soil and roadway cause a collapse.

Also, the primary goal of condition assessment is to avoid the major failure of a critical pipeline. If a utility has experienced a catastrophic failure on a critical pipeline, there is a good chance that the utility will probably have or will be receptive to an ongoing aggressive asset management plan.

Sahara® leak detection technology

This technology uses an acoustic monitor. It was developed in the United Kingdom and complements the other technologies: Noise Correlation, Acoustic Leak Detection, and Metering.

Sahara® Leak Detection Technology can be used on any pipe of any material; the data results are identified in real time. The significant difference in this technology is that it can detect and precisely locate leaks as small as 0.5 gallons per hour. The inspection is limited to 5,000 feet and 12-inch or larger pipe.

A recent project found a medium leak that, when excavated, revealed that a large area had been washed away. Finding the leak prevented a potential catastrophic incident and allowed a scheduled repair rather than an emergency repair.

Complete the condition assessment

With the data from a condition assessment, it is possible to identify the right pipe to be replaced or repaired. The use of a risk analysis will determine the right time required and engineering principles will determine the right material. Using asset management principles, it is possible to incorporate knowledge of pipe condition into a program for managing pipeline assets.

With knowledge from the technologies to properly manage infrastructure, a process must be developed. The condition assessment is the first step and results in documented results that are used to identify projects whose cost can be estimated for incorporation into a capital improvement. The projects are then prioritized based on the risk evaluation and are ranked using risk criteria.

The amount invested in pipeline infrastructure constitutes a large portion of a utility's assets and can be the major driver for altering investment needs. In contrast to treatment works, pipe replacement and rehabilitation require a sustained flow of expenditures, not a periodic capital expense followed by years of service. As stated previously, all pipes 'born' in a given year will not 'die' during the same future year.

The focus on buried infrastructure is ***balancing performance, risk, and cost***. The basic steps to managing pipeline infrastructure are:

- conducting a condition assessment,
- developing a program,
- prioritizing based on risk analysis, and
- implementing the plan.

The approach is summarized by the following equation:

R3 = Replace the Right Pipe at the Right Time with the Right Material.

About the authors

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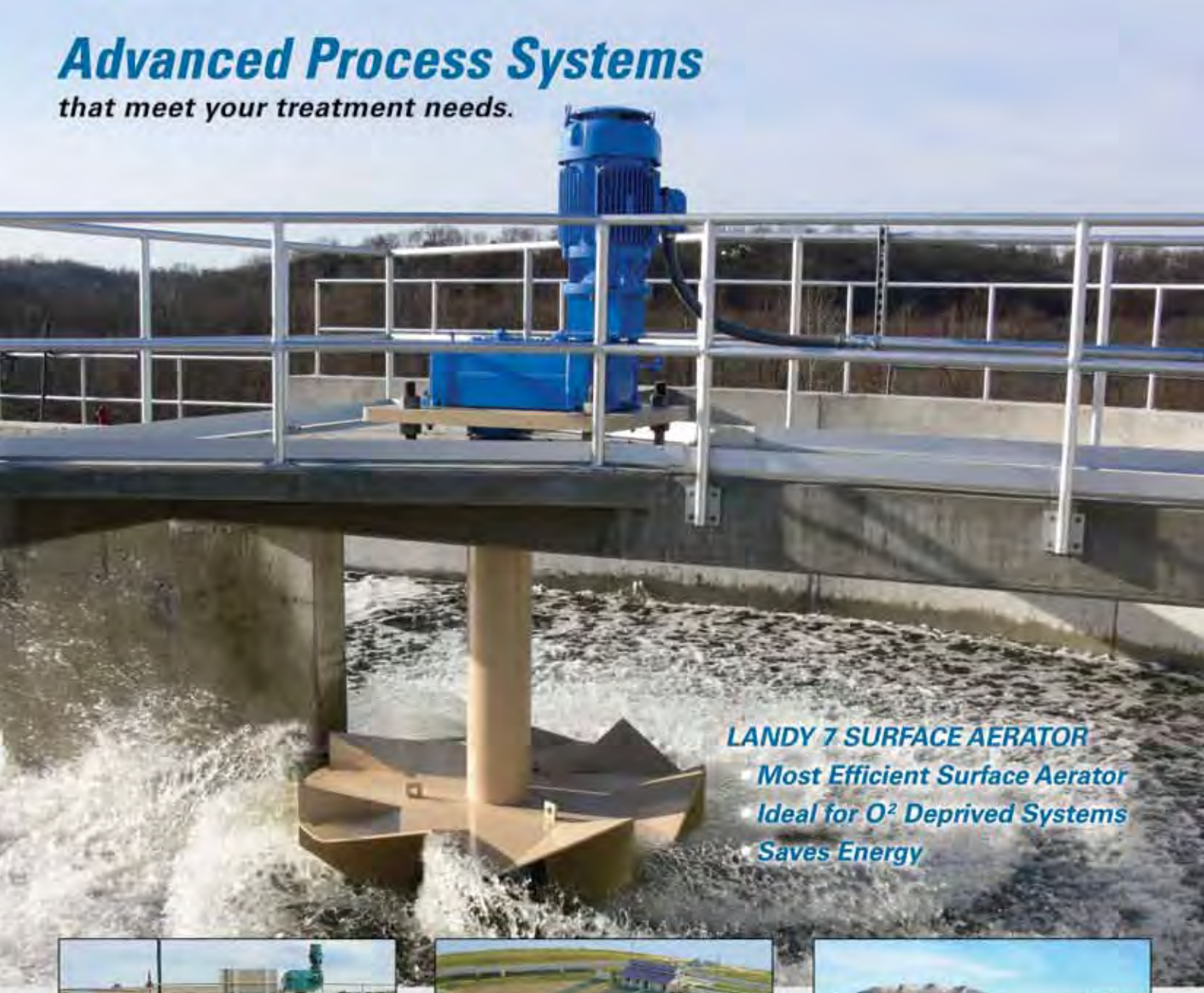

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