Aerial view of the City of Eau Claire Regional Wastewater Treatment Facility

51st Annual W.W.O.A. Conference
October 17-20
Madison Marriott West, Middleton
The Clarifier is the publication of the Wisconsin Wastewater Operators’ Association and is intended to inform and educate the membership on issues related to the treatment and control of wastewater. The Clarifier is produced five (5) times each year: February, April, June, September, and December. All members are encouraged to contribute to the mission of the Clarifier.

The Wisconsin Wastewater Operators’ Association is a non-profit organization dedicated to educating, informing, and advancing the wastewater profession. WWOA has approximately 2,000 members divided throughout six regions: Southeast, Southern, Lake Michigan, North Central, Northwest, and West Central.
Presidents message: Looking forward to an exciting 51st year!

WATER! I am in awe as I sit in the sunshine typing this message and staring at our most critical and precious resource – water! We are so fortunate to live in a region where we have such a plentiful supply of fresh water. We tend to take it for granted when we go to open the faucet that clean, fresh water will be delivered and when we flush the toilet the wastewater will disappear. I am proud to be part of the Water Resource Recovery Community and to help lead an association that works every day to reclaim and recover our most vital resource so that we can all live in a healthy and rich society. I am truly honored to lead the Wisconsin Wastewater Operator’s Association (WWOA) as we look to the next 50 years.

The dedication and service of the WWOA founders and members was highlighted very eloquently by the keynote speakers who opened the 50th Annual WWOA Conference in LaCrosse, Wisconsin. Joe Gehin, Duane Schuettpelz, and Ken Sedmak gave an excellent historical presentation of the WWOA and Wisconsin Clean Water Regulations. Wisconsin and the WWOA were frontiers on treating water and recovering resources in the United States. In addition to the Keynote Presentation, the 50th Anniversary Committee led by Past President Wade Peterson, put together several special events and displays for the conference including 50 years of photographs depicting WWOA’s history, the 50th Anniversary Clarifier Edition, and the entertainment after the Awards Banquet. Jeff Bratz, who served as the Vice President and Technical Chair for the 50th Annual Conference, put together an informationally packed technical program which included two workshops, 38 technical sessions, and an Operator’s Competition between five teams, including two student teams. Troy Larson led the Operators Tricks and Tips session which was very well received. The WWOA Board of Directors hopes to make this a constant fixture of the WWOA Annual Conference and welcomes all members to submit their tricks and participate in the educational sharing discussion. I also encourage all members to submit their tricks and tips to the WWOA Webmaster throughout the year to post on the website.

The awards banquet on Thursday evening recognized the 2016 WWOA Award winners and honored the past recipients. Please make sure you check out the WWOA website and this issue of the Clarifier to see photographs of all the honorees. I also want to give a special welcome to our two new WWOA Directors, Ricky Mealy and Jeremy Cramer, who were elected to the Board during the Business Meeting on Thursday. They are a great addition to the WWOA Board of Directors.

The 50th WWOA Annual Conference came to a close Friday morning with Paul Kent’s engaging Jeopardy game of New Developments in Water and Wastewater Regulations. Thank you to all who organized, presented, and participated to help make the 50th WWOA Annual Conference a great success with a record number of 840 attendees, including 149 exhibitors. The Board of Directors and Committee Members are working hard to plan the 51st WWOA Annual Conference in Middleton on October 17 – 20, 2017.

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I want to thank the WWOA membership for putting their trust and faith in me to serve as your president. Serving on the Board of Directors and working closely with my fellow Directors and WWOA members is definitely a highlight of my career. A special thank you goes out to the Immediate Past President, Lyle Lutz, for showing me the ropes and helping give me direction. I look forward with excitement to the 51st year of the Wisconsin operators recovering resources!

### Clarifier Deadlines 2017

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## City of Eau Claire Regional Wastewater Treatment Facility

### Background and History

Located at confluence of the Eau Claire and Chippewa Rivers, the City of Eau Claire is a vibrant river town boasting tree-lined streets, bike trails galore, a vibrant music scene and a thriving revitalized downtown. Born from sawdust amidst its rich logging industry origins, the City was incorporated in 1872. The City boasts diverse and expanding business opportunities in manufacturing, information technologies, health care, and retail. The City’s Wastewater Treatment Facility (WWTF) is located on its west side at 1000 Ferry Street, serving an extended sewer service area within the Eau Claire metropolitan area and the City of Altoona, a population of 75,000.

Effluent from the WWTF is discharged to the Chippewa River in accordance with the Wisconsin Pollutant Discharge Elimination System. Class B biosolids from the WWTF are beneficially reused on agricultural land in compliance with permit requirements and state and federal regulations.

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*continued on page 6*
The original treatment facilities were constructed at the existing site beginning in 1937 and were completed in 1939. The system consisted of screening, primary settling, drying beds, river discharge pumping and laboratory facilities. Very few improvements were made to the original design until 1980.

Major Facility Improvements

1980 Major Secondary Treatment Upgrade

In 1980, the additions of a Headworks Building, Digesters and Digester Complex, Clarifiers and rotating biological contactor (RBC) secondary treatment process were installed. The City became proud owners of 56 air-driven RBC units which operated until 2015. The RBCs were configured in seven treatment trains with four stages in each train. The baffle between the first two stages was later removed to increase the surface area of the first stage and convert to a 3-stage process. RBC effluent was settled into three final clarifiers. The City had been practicing partial recirculation of settled secondary sludge to reduce RBC shaft weight and improve treatment efficiency. The RBCs were air-driven using three centrifugal blowers. Each RBC unit had a total fixed media surface area for growth of microorganisms of 100,000 ft². Ferric Chloride was added upstream of the Final Clarifiers for phosphorous removal. Secondary sludge was thickened prior to discharge to the anaerobic digesters. Primary sludge was pumped to a gravity thickener prior to discharge to the anaerobic digesters. The City operated two primary digesters followed by two secondary digesters. Digested biosolids were stored in the secondary digesters and a liquid sludge storage tank. The gravity belt thickener, used to thicken secondary sludge, was also operated to re-thicken a portion of the digested biosolids prior to storage.

In 1990, the Wisconsin Department of Natural Resources (DNR) enacted a phosphorous limit of 1.0 mg/l. The RBCs secondary treatment allowed for only chemical phosphorous removal. In 1995 a 30,000 gallon Ferric Chloride storage facility and pump metering system were installed to meet the new phosphorous regulatory limit.

In 1997 a gravity belt thickener and a 1-million gallon storage tank were added. With the additional phosphorous

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removal process using Ferric Chloride and increased solids production, the City was approaching their maximum 180 day sludge storage limit.

In the mid-1990s, the City began experiencing high equipment failures and poor replacement parts availability due to the age of the existing screw pumps and bar screens. In 2000, the City replaced three 150 HP high lift pumps and both bar screens. The chain and bucket style bar screens were replaced with climber screens.

Planning
Regulatory changes in ammonia limits, additional storage needs and aging equipment at the facility and key lift station upgrades predicated the need to develop a long-term plan. The Wisconsin Pollutant Discharge Elimination System Permit of 2005 contained an effluent ammonia limit with a compliance date of July 1, 2009 which the WWTF would not be able to meet with its current processes.

The RBC equipment had exceeded its 20-year estimated usable life by 15 years and failures of the Otter Creek lift station force main discharge manifold piping provided further urgency to consider an extensive WWTF upgrade.

These process concerns among others prompted the City to consider the next steps for the WWTF and key wastewater conveyance booster stations.

Facilities Plan Amendment
The City recognized that the WWTF would require major upgrades in the near future. In 2005 the City conducted a Consulting Engineer selection process. Through the selection process, the City chose engineering firm Donohue & Associates to conduct the facility evaluation and formulate project recommendations. The proposed plan would have to meet the City’s current and future wastewater treatment needs for reliable and effective facility performance for the next 30 years. The evaluation results and recommendations were itemized in a Facilities Plan Amendment (FPA). The FPA details the analyses process and results of the facility capacity and conditions, the evaluation of alternatives and resulting recommendations and the plan for implementation. In 2007, the FPA was completed and submitted to the DNR for review and approval.

The Scope of the FPA included the following tasks.
1. Evaluate existing facilities at the WWTF and the Otter Creek and Eau Claire River lift stations relative to...
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their effective and reliable conveyance and treatment of wastewater.
2. Determine the reliable-rated capacity of these facilities to convey and treat wastewater.
3. Identify and evaluate alternatives to allow these facilities to meet the City's current and future needs for a 20-year planning period through year 2030.
4. Recommend a plan for implementing improvements to these facilities to meet the City's needs through the planning period and through year 2030.

FPA Recommendations and Implementation Plan
The project recommendations were prioritized into two phases for implementation. Phase I included three projects addressing the most critical needs: ammonia compliance (regulatory), biosolids storage (regulatory) and upgrade of the Otter Creek lift station (conveyance reliability). This phase would be implemented immediately.
Phase II included the remaining recommendations forming the basis for a major facilities upgrade project. The major project elements during this phase would be the replacement of the RBC system with nitrifying activated sludge. Phase II would be implemented in the next 5 years.

Partners
The prospect of transitioning from the RBCs to a new activated sludge process was a challenging but necessary undertaking. The City's wastewater treatment system had to be upgraded to meet increased regulatory effluent standards and the anticipated needs for City growth through Year 2030. Staff members from the City of Eau Claire Utilities Division, Wisconsin DNR, Donohue and Associates, CD Smith, Total Electric, Energecns, Ahern and other partners would comprise the project management team that would follow the upgrade from conception through its completion. From planning to design to construction to substantial completion, the entire project would span more than 10 years.

Project management and system operations during the construction phase presented many challenges for these team members. Balancing existing facility operations with the construction of new buildings and piping while bringing new processes on line was interesting at times.

Phase II – Major WWTF Upgrades
Phase II focused on a major wastewater treatment facility upgrade with an estimated cost exceeding $40 million dollars to replace the RBC system with a nitrifying activated sludge system. The WWTF Phase II proposal included layered and complex system upgrade specifications such as electrical distribution upgrades, new control equipment,
The radar signals of the VEGAPULS WL 61 deliver reliable, accurate level measurement without contacting the liquid. Even through plastic and fiberglass, the VEGAPULS WL 61 outperforms the competition.
activated sludge processing equipment, communications systems and the construction of new buildings and new piping network. Phase II also featured upgrades to the facility laboratory, facility odor control, the facility electrical system and many other system upgrades.

Headworks Complex
A number of upgrades were required at the Headworks complex to comply with updated codes. All electrical devices had to be replaced with explosion-proof components, the motor control center (MCC) room had to be isolated and entrance made only by exterior doors. The air exchange rate in the building had to be increased to 12 air exchanges per hour. This would require an outside air handling unit with the capacity of 19,000 cfm.

Prior to design, it was identified that the Headwork site was the prime source of facility odors. To confine the odors, aluminum covers were placed at the screw pump inlets and air grit tank. A fiberglass piping collection system was installed that picked up odors at the screw pumps, bar screens, grit tanks and discharged the odorous gas into a biofilter for H2S and odor removal.

The original improvements to the bar screens were to install smaller bar screen spacing to improve rag and debris capture. The hydraulic profile and lack of sufficient head differential did not make this possible. Instead the City installed two inline sludge screens. Primary sludge settling pumps discharge to the screens prior to the gravity thickener.

Blower Building
A new Blower Building was constructed to house the standby generators, generator controls, MCC equipment and new aeration blowers. The two standby generators are 600 kW Kohler diesel units. The units can operate as standby generators to power the entire facility or are capable of operating in sync with the utility. The parallel capability allows for easy unit testing and load shedding with the utility.

BONUS INCENTIVES IN 2016
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Two 600 kW Kohler diesel generators provide standby power
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The new MCC provides power to the Headwork and Blower buildings. Three 350 hp blowers provide air for the aeration process. The blower units are high speed, operated with variable frequency drives (VFDs) and contain magnetic bearings, all features which make these units highly efficient.

Aeration/Lime Addition
Donohue utilized Biowin Modeling to evaluate alternative treatment strategies to optimize design and activated sludge performance. The evaluation showed the MUCT configuration to be the best option. The system provides nitrified mixed liquor recycle which maximizes denitrification and alkalinity production. Full nitrification would also consume alkalinity requiring the addition of a lime storage and metering system to supplement the alkalinity need.

The aeration system included high speed turbine blowers, membrane fine bubble diffusers, low energy vertical shaft selector zone mixers and DO controlled aeration system. The control system provided DO probes in each tank. The Multiple Supervisory Control & Data Acquisition (SCADA) system allows for DO set point control to minimize over aeration.

The activated sludge performance has been exceptionally impressive as illustrated in the following Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) charts. The activated sludge process has significantly improved TSS and BOD removal.

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Clarifiers

The clarifier modifications were one of the more challenging construction obstacles. The required larger pipe sizes and depth of the new piping required extensive dewatering and monitoring. The higher-than-normal river and ground water levels during the first spring and summer of construction compounded the problem.

For the project to move forward, only one clarifier could be modified at a time while the activated sludge tanks and support equipment were in operation. In October of 2014, Activated Sludge Train 1 and the modified clarifier were put in service. Seed sludge was brought in from nearby Chippewa Falls WWTF. Gradually the primary flow was increased in the aeration train to a 50/50 split between the aeration tanks and the RBCs. Once the second clarifier modification was completed, all flow was diverted to the aeration tank and the RBCs were decommissioned.

Twenty of the 56 RBCs were transported to other facilities and reused. The plastic media was removed from the shafts, ground up and recycled from the remainder of the RBCs.

Solids Building

The Solids Building was constructed to position three gravity belts thickeners; two were for activated sludge and one for digested sludge re-thickening. The RAS return pumps as well as GBT feed pumps are located in the basement.

Digester Complex

Due to the increased air exchange needs of the new activated sludge processes, the City installed four new boilers. High capacity boilers were required to meet the ventilation and heating needs for equipment in the Headworks Building, the Solids Building and the Digester Building to create a mesophilic system for heated sludge in the secondary digester. In addition, heating requirements for primary and secondary digester sludge to create indicated that high

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capacity boilers were warranted. Two three-million btu/hr boilers natural gas operation and two five-million btu/hr boilers methane or natural gas operation were installed.

Covers
Two new insulated fixed covers were installed in the primary digesters. The primary digester mixing systems were upgraded from gas mixing lances to linear motion mixers. The 100-foot diameter secondary fiberglass cover on secondary Digester 3 was removed and replaced by a floating steel cover. The Digester 4 Dystor cover was removed and replaced with an aluminum dome. Digester 4 was then converted to sludge storage. Each digester had to be emptied and cleaned before the new covers were installed. The secondary two-million gallon digesters had not been cleaned since 1980. The coordination of biosolids hauling and land application was critical.

Digester Gas Generators
Two 275 kWe combined heat and power (CHP) Kraft methane generators were installed for electrical peak shaving and hot water generation. The methane conditioning process included H2S carbon filter followed by Unison siloxane removal system.

Controls—SCADA system
The City selected control system integrator firm Energenecs, Inc. for the instrumentation and control system for the upgrade. The $2.3 million dollar control system consists of 5 Allen Bradley Redundant ControlLogix programmable logic controllers (PLCs) communicating on a fiber optic...
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data network. Four of the most critical PLCs are wired in redundant configuration. SCADA workstations are located in strategic process sites in the facility. These workstations run Wonderware InTouch graphical interface software to allow operators to view and control the plant processes from the Headworks, Solids and Digester Buildings as well as the Operators Room in the Administration Building.

Additional control system upgrades included four large MCCs with 39 VFDs connected by the Ethernet data network. An array of field instrumentation upgrades included 15 magnetic flow meters, six dissolved oxygen and ORP sensor/transmitters, 26 level transmitters using radar, ultrasonic, submersible and flanged methods, 12 thermal dispersion mass air and gas flow meters, 19 methane and 02 gas analyzers, an orthophosphate analyzer, an ammonium analyzer and approximately 200 switches and gauges.

New radio and PLC equipment was installed to monitor the City’s 24 lift stations and river level monitoring sites. Remote monitoring using the SCADA system allows the Water Treatment Facility operators to monitor the WWTF and lift station operations during WWTF unstaffed times. This automation has enabled the City to reduce staffing by 33% through attrition, saving over $300,000 annually in labor costs.

Laboratory upgrade
Gone is the circa 1981 orange wall motif with dilapidated wooden lab benches. The lab upgrade included a demolition and removal of all electrical, plumbing, fixtures, cabinets, hoods and windows. Only the original walls and floor remained. The lab upgrade was expedited due to its critical role in wastewater processing. The remodel took only six weeks from demolition to completion.

The upgrade included new plumbing, extra sinks, dedicated HVAC with new hoods, windows, cabinetry, electrical, lighting, new sampling station and an improved ergonomic efficient design. The new floor plan allows for independent workstations in the lab.

Green Design
The WWTF upgrade included many sustainable design aspects to meet the City’s goals for sustainable and environmentally conscience growth. Conserving energy, water and chemical additives for processing were top priorities. The State of Wisconsin's Clean Water and Drinking Water State...
Revolving Fund programs provided guidance that identified specific goals and eligibilities for green infrastructure, water and energy efficient improvements and environmentally innovative activities. These design specifications qualified the City for Focus on Energy rebates of $350,000 to offset equipment costs.

To honor the City of Eau Claire’s “Tree City USA” designation and to take advantage of site conditions, native trees were retained and storm water is diverted to ditches and swales to take advantage of the porous sandy soils. To conserve water, effluent reuse is estimated at 740 gpm for core facility systems on a continuous basis. Effluent reused as Gravity Belt Thickener wash, wash water for process tanks and facilities cleaning, digester foam suppression in biogas handling vessel, polymer carrier water, prep tank and pipe flushing, elutriation water for thickening primary solids in gravity thickener and the odor control in Headworks engineered media system all contribute to the City's green goals.

**Energy Efficiency**

Biogas used by two engine/generator sets with exhaust heat recovery provides 50% of the facility heat requirements. The City benefits from reduced energy costs because of this biogas utilization. Heat recovery from facility effluent provides 20% of the WWTF heat requirement and high efficiency motors were specified in processing equipment acquisitions. Natural gas usage dramatically decreased from 19,597 ccfs in December, 2015 to 4 ccfs by April, 2016 after methane boilers went online. VFDs on major equipment allow for operation at efficient variable demands based on need which also reduces operation costs.

**Environmentally Innovative**

Transitioning to the biochemical processes enabled the City to procure energy efficient processing equipment including low-energy mixers, high efficiency, aeration blowers and recycle mixed liquor for nitrate oxygen utilization. Utilizing biological phosphorus and ammonia removal with the implementation of activated sludge processes significantly reduced WWTF’s chemical costs in CO2 and ferric chloride from $250,000 in 2014 to $25,000 in 2015.

**A New Normal**

Throughout the renovation, dedicated WWTF staff worked diligently to keep wastewater operations online amidst ongoing extensive construction. Improvising critical temporary fixes during unexpected construction snags or process transition issues, operators, lab staff and managers worked in and around constantly changing environments.

Now that the contractors have left and the dust has settled, the crew is working through the initial optimization and maintenance on new systems and equipment. The staff at the WWTF is finding a familiar yet different rhythm of troubleshooting equipment and making process adjustments. The operations crew at the WWTF welcomes the numerous benefits the upgraded facility offers the residents of the City.

### Annual Cost Savings to the City

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<td>Natural Gas</td>
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Lighting technology offered many opportunities to decrease electrical consumption and ease facility lighting operation. Programmable zone controls for interior and exterior spaces and LED lighting with dimmable and motion-sensing features were installed in offices and equipment rooms.
Sporting Clays 2016 at Sparta

What a way to start the celebration of the 50th anniversary of the Wisconsin Wastewater Operators Association annual conference, 10am Tuesday Morning October 11th, forty four guns went off starting the 10th Annual Sporting clays event, held this year at the Sparta Rod & Gun Club. Knowing we had to have a special event to mark the 50 years of the organization, Bucky Walters and Tom Stebbins suggested we have a steak fry “cook your own steak, with all the fixings, plus a 10 round novelty shoot along with the 50 round sporting clays shoot. Tom Stebbins trailered the large group charcoal grill and everything we needed for a great lunch, from the Harrisville Sportsmen Club. Some grilling instructions from Bucky Walters and we were all master chefs.

While we waited for the charcoal to heat up, we all participated in a ten round novelty shoot. The object was to break as many targets as possible to gain extra tickets for the gun drawing. This event proved to be very challenging for only one person was able to break all 10 targets. Tom Kruzick kept everyone honest with the score keeping.

With the help of our sponsors we honored three winning teams and Top Gun. We were also able to give away three guns: a Remington 12 gauge, Benelli 12 gauge, and a 22 rifle. Thanks to Sabel Mechanical and JF Ahern for the gun donations. Four cases of shot gun shells were also drawn for. Thanks to Water Technologies and Bright Technologies. Everyone was able to go home with a door prize, thanks to our continual sponsorship from MSA Professional Services, LW Allen, Crane Engineering, Mulcahy/Shaw Water, William/Reid, Dorner Corporation, Visu-Sewer, and Strand Associates. Special thanks to Jeff Simpson who kept the committee on track this year and does shoot pretty fair with that old pump Winchester shot gun.

Respectfully submitted by Jim Thalke

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50th Anniversary Committee

Row 1 L – R: Karen Harter, Carol Strackbein, Leo Templeton, Dan Busch, Joe Gehin, Roy Lembcke
Row 2 L-R: Lyle Lutz, Pete Albers, Wade Peterson (Chairman), Ken Sedmak, Kelly Zimmer, Jeff Bratz

Meet ‘n Greet
Honorary Members

Pete Albers, Leo Templeton, Carol Strackbein, Dan Busch
2016 Operators of the Year Award

Lake Michigan Region

North Central Region

Northwest Region

West Central Region

Aaron Eichhorst, New Water (presentor),
Brent Mullholland, Johnsonville Sausage

Joe Gehin, Becher Hoppe (presentor),
Dan Felckowski, Village of Amherst

Dave Wierzba, MSA Professional Services (presentor),
Tim Pernsteiner, City of Medford

Dale Hexom, Director of Public Works, La Crosse
Jared Greeno, La Crosse
2016 Operators of the Year Award

Southeast Region

Kerry Gloss, Kenosha

Southern Region

Chris Liveris, City of Ripon (presentor),
Jack Wendler, City of Ripon

Newcommer of the Year

Dan Brady, Sheboygan WWTP
Tyler Hoffman, Sheboygan WWTP
Sharon Thieszen, Sheboygan WWTP

Region of the Year

West Central
Jeff Simpson, Crane Engineering
Joe Beaudry, City of Hudson
Lifetime Members 2016

Past Lifetime Members

Past Bernauer
2016 Bernauer Award

Jeff Bratz, Western Racine County Sewerage District
Gary Hanson, SEH

Kolby Crabtree 2016

Randy Wirtz, Strand Associates
Troy Larson, Strand Associates

Past Kolby Crabtree Recipients

2016-2017 Board of Directors

Jeff Simpson, Jeremy Cramer, Jeff Smudde, Jeff Bratz, Sharon Thieszen, Lyle Lutz, Rick Mealy, Don Lintner, Jim Johnson
Scholarship Recipients

NCL Scholarship Winner: Mike Raynovec, North Central Labs
Serena Kuczmarksi, University of Wisconsin - Stevens Point

WWOA Scholarship: Jim Johnson, Xylem Flygt
Evan Garski, University of Wisconsin – Stevens Point

WWOA Scholarship: Jim Johnson, Xylem Flygt
Simon Stevenoski, University of Wisconsin – Stevens Point

Crane Scholarship: Jeff Simpson, Crane Engineering
Brandi Saylor, NWTC
WWOA Service Award

Randy Herwig, MSA Professional Services
Wade Peterson, City of Baraboo Utilities

Membership Award

Karen Harter, WWOA
Jeff Simpson, Crane Engineering

Past Presidents of WWOA
Call for technical papers 2017

The WWOA Technical Program Committee is requesting your assistance in developing the Technical Program for our 51st Annual Conference to be held Oct. 17-20, 2017 at the Madison Marriott West, Middleton, WI.

Technical papers are being solicited at this time for the Technical Program. The Committee is especially encouraging members actively involved in the day-to-day operations of a wastewater facility to prepare and present technical papers at the Conference. The following are some of major subject areas that presentations may cover. Papers dealing with other topics will definitely receive consideration/use by the Committee.

Please consider responding to this request or forwarding it on to someone who may be interested in participating. The strength of the WWOA is in the sharing of ideas and information. The success of this organization is dependent
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Register Now for the Spring Clays Thurs., April 6, 2017
Wild Wings Sportman’s Club
N865 Hwy. W Campbellsport
Lunch at Noon – 1PM Shot Gun
Start
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Includes: 13 station/50 target shoot. Bring your own shells or purchase at Wild Wings. Cash bar after shoot!

Payment should be received no later than April 1, 2017. Committee will assign stations but if you must shoot with others please advise. WALK UPS WELCOME.

Prizes for 1st, 2nd & 3rd individual score. Special raffle for vendor supplied door prizes.

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51st Annual WWOA Conference Conference Submittal Form
Oct. 17-20, 2017 Madison Marriott West, Middleton

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(Word file for E-submission at wwoa.org)
And the winner of the 2016 Operators Competition is…. New Kids on the Pot!

Held at the La Crosse Center on October 7th, this year's Operators Competition was a huge success. With five teams competing, it was bound to be a very tight competition. The five teams worked through four tough events prepared for them.

The Operators Competition challenged the five teams in the Collection Event, Maintenance Event, Lab Event and Operations Event. The Collections Event had the teams fixing a section of 8'' PVC pipe with another piece of 8'' PVC pipe with a saddle. Each section of pipe had to be cut and made by the teams. At the same time they had to set up a flow meter in a flume to send a signal to the sampler to sample at a given rate.

The maintenance event was replacing a seal in a submersible pump. Teams had to lift the pump with a tripod, set it in the work area, disassemble the pump, replace the wear parts, reassemble it and reinstall the pump into its original location. This proved again, to be a great event, challenging the team's mechanical knowledge and skills. The plant operations event tested the team's knowledge of plant operations and problems that are encountered in treatment facilities. The lab event, teams were asked to set up BOD samples for testing using the proper techniques and seeding where required. This event included a written test and calculating BOD results.

New Turtles on the Block from the Lake Michigan Region took the victory in this very tight competition. Jake Kehring, Bobby Zepnik, and Cody Evers all from New Water combined skills for the victory. They were followed by the North Central Region Turtles; Alex Smudde – Merrill, Derek Budsberg and Adam Clark – Stevens Point. Third place was taken by the Southeast Region Dookie Butter Brothers; Bob Biedrzycki – Lyons, Jessie Medrow and Nate Steffen – Burlington. They were followed closely by two other prepared teams; The NWTC Tardigrade Terrors – Brandi Saylor – Junior, Justin Meyer and Jacob Price Seniors and the UW Stevens Point Pointers; Garrett Schaeetz, Jacob Tanner and Simon Stevenski all Seniors.

A special thanks to our volunteers who acted as Judges for all of the events. I would like to acknowledge and thank Matt Schmidt, Mark Duerr, Jacob Becken, Holly Blazer, Rick Mealy, Jeff Mayou, Aaron Eichhorst, Josh Voight, Justin Jerabek and Jim Miller for their hard work and time making this another excellent event.

Thank you to all the sponsors of the event with supplies and equipment; NCL of Wisconsin, Flygt a Xylem Brand, HD Waterworks, JF Ahern, Mulcahy Shaw Water, Ferguson Waterworks and Central States Water Environment Association.

Thank you to John Bond for helping to run the competition, it was a busy day!!

CONGRATULATIONS to all the participants, well done! ☺️

Jeff Bratz, Karen Harter
Operators Competition
La Crosse Bike Ride
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The WWOA would like to recognize the following individuals and organizations for their special contributions to the Conference:
Local Arrangements - Mark Johnson and Jared Greeno (La Crosse WWTP)

On-site Pre-Conference Registrations - Mona Jackson (ByTec Resources)

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Evaluation Tabulations – Shelly Callahan (Becher-Hoppe)

The WWOA Board offers special thanks to everyone that contributed to the Conference. Your hard work is appreciated by all. 😊
From RBCs to BNR Activated Sludge
From Passengers to Pilots!
Kathy White/City of Eau Claire, Tyler Fadness/City of Eau Claire, Mike Theiste/City of Eau Claire, and Bill Marten/Donohue & Associates

As discussed in the feature article, the City of Eau Claire’s wastewater treatment facility (WWTF) has recently undergone an extensive upgrade. The heart of this upgrade was the City’s decision to replace its almost 40-year-old rotating biological contactor (RBC) secondary treatment process with an advanced biological nutrient removal (BNR) activated sludge process.

The decision to make this significant change in the treatment heart of the facility was multifaceted:
• The workhorse RBC system was well beyond its expected reliable life, and was considered in need of replacement as well as capacity expansion.
• When compared to a state of the art BNR activated sludge system, replacing and expanding the RBC system with appurtenant systems to achieve equal treatment was found to be much more expensive – over 3 times from both a capital and total present worth basis.
• Process modeling combined with actual operating experience from other plants (e.g., Sun Prairie, WI, Marquette, MI) showed the selected BNR configuration of the Modified University of Cape Town (MUCT) process, coupled with upgrading the plant’s existing secondary clarifiers to state of the art units, capable of greatly exceeding current levels of secondary and nutrient removal treatment performance, advantageously positioning the City for future potentially more restrictive nutrient limits.

A Unique Challenge
One of the unique aspects of the Eau Claire wastewater, which significantly contributed to the above findings and decision to go with the MUCT process, was its very high nitrogen content. While plant influent BOD, TSS and phosphorus concentrations typically fell in the ranges expected for municipal wastewaters, the nitrogen content was about double what is considered typical. This high nitrogen content represented a number of challenges:
• Providing sufficient aeration tankage and oxygen supply to convert the influent nitrogen to nitrate via nitrification.
• Dealing with extremely high levels of alkalinity consumption from the resulting nitrification. An innovative approach to supply supplemental alkalinity was incorporated that maximized biological production through selector zone denitrification to minimize chemical alkalinity addition, provided via a lime feed system.
• Preventing the extremely high nitrate content of the return activated sludge (RAS) from inhibiting enhanced biological phosphorus removal (EBPR or Bio-P) performance.

As noted, use of modeling tools and process experience from other facilities, coupled with the secondary clarifier upgrades to optimize their performance, were critical to achieving the City’s goals with regard to the new system’s performance.

A Paradigm Shift
Getting the design of the new BNR activated sludge system right was only one challenge – it simply provided the City with another set of treatment tools to maintain and expand its environmental protection mission. A larger challenge came as the new facilities came on line – and that involved going from being passengers on a self-operating secondary treatment ocean liner – the RBC system, to the pilots of a hydrofoil advanced BNR activated sludge system capable of higher, or lower, levels of treatment. This could have really good or possibly really bad outcomes…

The good news, with the tools provided, the plant staff rose to the occasion – resulting in very positive outcomes – although not without intermittent challenges.

The first challenge – learning about the BNR activated sludge processes, and how and what to monitor and control. This involved training and learning – both related to the project and reaching out to fellow operations folks in our industry, coupled with effective tools and a positive “can do” and “let’s see what we can do better” attitude that continues to the present. And then OJT – gaining experience and expertise through doing – actually operating the process, controlling it, adjusting it, watching it respond, and on and on. This challenge is faced at every plant, by every operations staff, as they go through upgrades. In Eau Claire’s case, it was an extreme challenge – going from a process that required virtually no control and minimal monitoring to one involving very high levels of monitoring and control.

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The results speak for themselves – as can be seen in Figure 1, which compares effluent quality from the last 12 months of full RBC (no activated sludge) performance with the first 12 months of full BNR activated sludge performance (once plant construction activities related to secondary treatment were essentially complete). Also shown is the significant reduction in ferric chloride usage for phosphorus removal – higher levels of P removal are being attained with much less ferric (usually only added to sidestreams now), due to the robust Bio-P performance being achieved.

These results didn't come without a price, however. On top of the project costs, a greatly increased challenge was faced by plant staff – more equipment, and more complicated processes, to monitor, operate, maintain and most importantly – control! And while the entire wastewater utility staff has risen to this challenge, the plant lab staff had to take on a good portion of the brunt of it.

And in doing this, the staff has made great efforts in developing and implementing tools and methods to maximize efficiency and effectiveness, as discussed in the following sections.

Sailing an Aircraft Carrier

Early into the startup of the activated sludge system, problems occurred – specifically a bulking and foaming situation caused by widely fluctuating daily conditions, somewhat related to the phased, partial system startup being undertaken. While plant staff were controlling the activated sludge process in the preferred manner – based on a target solids retention time (SRT)/sludge age – the daily flow and loading variations were creating unstable conditions.

To remedy this, an alternative SRT-based process control strategy was adopted – involving use of an Excel-based spreadsheet calculator to estimate daily activated sludge wasting targets using a multiple day running average, rather than daily monitoring information. Even though a nitrifying activated sludge process seems like a hydrofoil compared to an ocean liner RBC system, controlling it (including Bio-P and denitrification aspects) in a stable manner is akin to steering an aircraft carrier, rather than a speedboat. Wasting decisions based on running averages similar to the system average SRT are all that are needed to steer the carrier, and avoid a lot of reactionary change that just jerks the system around and can lead to unnecessary upsets.

An Excel based spreadsheet (see Figure 2) was developed to help staff make the wasting decisions. This spreadsheet has evolved over the past 2 years, as plant staff have worked to enhance the process control, process performance and process monitoring information it can provide – such as trend charts on key activated sludge performance measures like SVI, SRT, etc. (see Figure 3). The spreadsheet wasting calculator has become an integral part of the plant’s daily activated sludge process control routine.

Another very important process control activity plant staff have embraced involves daily microscopic examination of the activated sludge system. Such daily examinations help serve as a monitoring tool – and as an early warning of changes happening in the system. Figures 4 shows the plant’s microscope, which includes a digital camera to allow developing a library of historical activated sludge images.

continued on page 42
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Figure 3: Wasting Calculator Example Trend Chart

Figure 4: Plant Microscope

Innovation to Improve Efficiency

As staff has gained experience with operating and controlling this complicated BNR activated sludge aircraft carrier, demands on time have grown due to the increased workload associated with data collection/analysis and process control. In addition, with the new facilities the plant staff adopted additional routine monitoring to help stay on top of all things treatment – a good example being a renewed commitment to sampling/monitoring all hauled in waste loads at the plant.

As demands on their time grew, lab personnel recognized the need to maximize efficiencies – and have worked...
diligently to look for opportunities to do so. The following figures show examples of a couple of these initiatives – all adopted in the interest of maximizing staff efficiency without compromising information gathering:

- Figure 6, showing a computer webcam setup to monitor the activated sludge settleometer tests. A digital record of the settled sludge interface over time is developed, saving the need for a person to monitor the test “live”. The video record can then be used to assess the 30-minute settling volume for use in calculating and recording system SVIs.

- Figure 7, showing the lab’s microwave TSS analysis instrument. This unit drastically reduces the time for TSS analysis – reducing sample drying time from hours to minutes. One key benefit is in activated sludge mixed liquor suspended solids and RAS analysis – same day results are obtained in less than a half hour, allowing the wasting calculator to represent “day of” conditions, not “day before” conditions.

There have been many other innovations adopted, including use of aquarium monitoring test strips for quick “non-reporting” spot checks on a number of parameters (e.g., alkalinity, nitrates, nitrites, ammonia, phosphorus) and standardized oxygen uptake and pH testing of all hauled in wastes.

The Rubber Has Hit the Road
The Eau Claire WWTF upgrade to an advanced BNR activated sludge system has provided the City with a reliable, robust system that has it well-positioned for the coming challenges of the 21st century.

Through the “can do” and “can make it better” attitude of the plant personnel – the system has drastically improved water quality discharged to the Chippewa River along with reduced chemical requirements and energy efficient biology. The ultimate winner – our environment!

The authors would like to acknowledge the following for their ongoing contributions to the success of these never-ending clean water efforts: Jeff Pippenger/Utility Manager; Steve Hayden/Utility Engineer; Craig Hendrickson/Plant Supervisor; plant operators Glenn Ambelang, Bjorn Olson, Pat Miller, Al DeSouza, Dennis Donnelly, Mike Caponigro, Mark Seidling, and Mark Weber; and all their fellow utility co-workers.

Without the dedicated efforts of everyone our success would be much more challenging. 🌟
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