November 12, 2014 Meeting

The November 12, 2014 Waterloo Technical Society (WTS) meeting was called to order by President Gary Dorhout at 7:20 pm.

A total of 31 were in attendance. Treasurer Ken Friend reported a previous balance of $986.43. Receipts included $0.00 interest and $60 in membership dues. Expenses were $30 for the October guest speaker's and spouse's meals. The ending balance was $1016.43. Ken reported 11 honorary and 32 paid members for a total of 42 members.

No old business was discussed.

New Business. President Dorhout asked that members consider using some of the treasury to support technology in the Cedar Valley. Two ideas to ponder are 1) Lego robotics and 2) museum traveling exhibits. No action was taken on these ideas.

Our guest speaker was Mr. Lyle Krueger, Manager, Water Reclamation/Sewer Division for Cedar Fall. Lyle has worked for the city of Cedar Falls since 1974, first as a maintenance worker in the Sanitation Division (1974-1978), then Lab Technician (1978-1984) and since 1995 he has been the Manager, Water Reclamation/Sewer Division. Lyle graduated from the University of Northern Iowa with a Bachelor of Arts Degree in Biology in 1974. He is a member of the Water Environment Federation and Iowa Water Environment Association.

History. Sewage treatment affects every citizen. Showers and toilets must work and everyone uses these facilities daily. In 1939 raw sewage was dumped into the Cedar River. Cedar Falls grew and environmental concerns led to cities treating sewage before passing water to the river. In 1993 the 4th and State Street facility was an island due to a flood that spring. In 2001 a $1.9 million flood wall was constructed by the Army Corps of Engineers to protect Cedar Falls and the facility at 4th and State. The flood of 2008 did not cause any harm to the sewage treatment facilities although citizens did increase the flood wall height along the Cedar River to prevent breaching the retaining wall.

Process. Lyle showed a short video of the operation of the Sewage Treatment facilities in Cedar Falls. The handout at the end of these minutes describes the process. The basic ideas for sewage treatment are 1) settling of solids through flow control and 2) enabling bacteria to eat the organic solids.

Upgrades. In the 1990s the first stage trickle filter was added to get rid of low oxygen odor. A dome was later added to contain any offensive odors. Slime on rocks digests the organics. The system is a self-contained ecosystem that is a delicate balance of waste, organisms, water and temperature. There are no chemicals used in the sewage treatment.

In 2011 an $18 million update was made to bring the facilities up to EPA standards. This included a belt filter press, digester for solids, a polymer filter medium, and equipment to enhance solids coagulation. The anionic polymer draws water from the slurry raising the solids level from 10% to 25%.

In 2013 another major upgrade occurred. An ultraviolet (UV) disinfection system was added. Exposure to the low voltage (36 μV) lamps in each of 10 modules disinfects the liquid. Water zig-zags around the UV lamps. This is the last treatment before the fluid enters the Cedar River. These UV-C, 254 nanometer wavelength, rays (UV-A tans the skin, UV-B burns the skin) kill virus and bacteria. Chlorine was previously added to the fluid but has been discontinued. Chlorine sterilizes but does not kill bacteria. These UV lamps have a three year life and cost $300 apiece.

Metrics: The lowest 7 day average in a 10 year period is set as the standard condition. Treatment capacity is based on this level. Drugs can pass through the system and subsequently affect the environment. Approximately 4 million gallons of sewage flow through the system daily. This is 0.2% of the Cedar River volume. To ensure environmental protection, system redundancies are utilized. There are 2 microprocessors, one is redundant, to monitor and control the system. Pumps and tanks are also duplicated and one is redundant.

User assistance. Fats, oils and grease (FOG) are trapped by commercial customers. These can block flow of the fluid, but they can be treated if they enter the system. Since the pipe from the customer is smaller than the sewer's, the customer will experience clogging and system backup. For this reason, customers have grease traps in their pipes to prevent clogging.

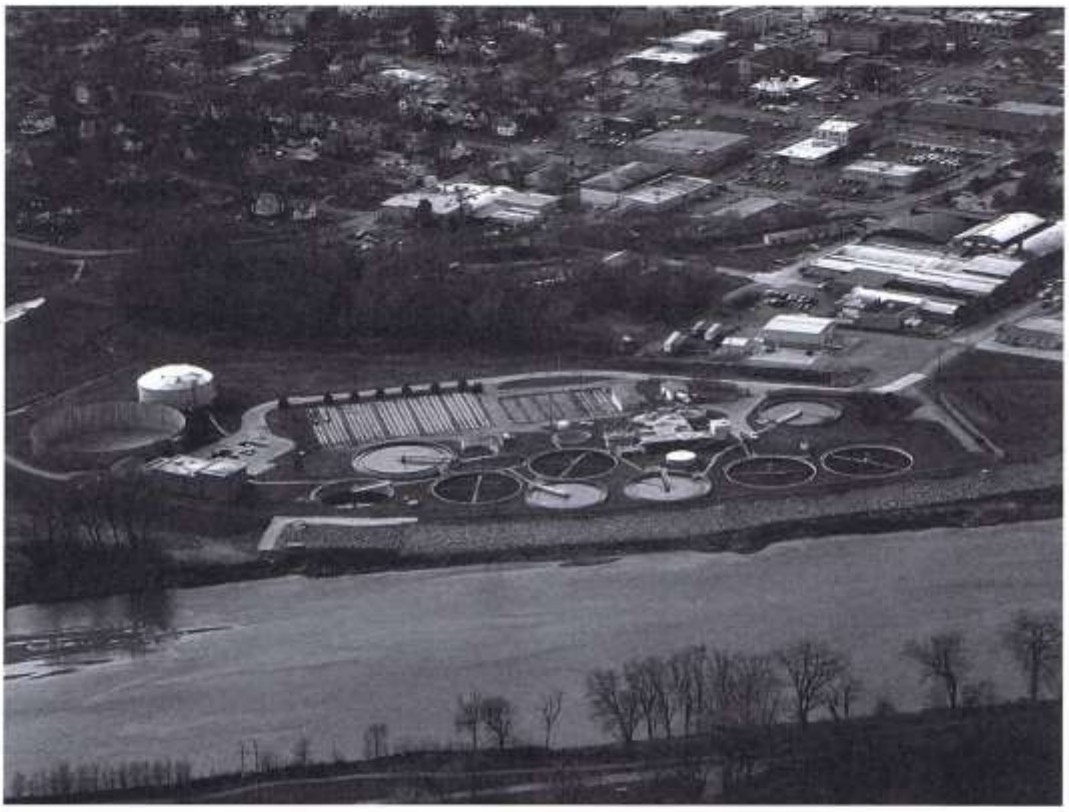
Closing. Many attendees were interested in keeping the environment safe from harmful chemicals and sewage. All were glad that Lyle showed a deep concern for the proper operation and treatment of Cedar Falls sewage.

Respectfully submitted,

James R. Stevenson

CITY OF CEDAR FALLS

WATER RECLAMATION FACILITY



Welcome to the City of Cedar Falls Water Reclamation Facility. The city's first wastewater treatment plant was constructed on this site in 1939. After expansions in 1952, 1962, 1984, 1999 and an $18 million upgrade in 2013 we now have a modern three-stage trickling filter plant complete with disinfection capabilities, capable of meeting the treatment needs of our growing community. The plant is staffed 8 hours a day (minimum) 7 days a week, however, the treatment of wastewater is a non-stop operation.

Treatment of wastewater, and the solids it carries, is accomplished using a 3-stage trickling filter process (followed by disinfection) with anaerobic digestion. Each individual unit and its purpose is described on the following pages.

WASTEWATER TREATMENT

1. DETENTION BASIN – The normal flow received at the plant averages around 4.5 million gallons per day (MGD). During wet weather these flows can increase significantly due to infiltration and inflow. When the flow rate exceeds 21 MGD wastewater is diverted to the 5 million gallon detention basin. This flow is released back through the plant at a controlled rate when the capacity is again available. Wastewater is not treated in this unit, it is simply held for later treatment.





(2) GRIT REMOVAL – Sand, cinders, and other settleable, inorganic materials (grit) are removed in this process.

(3) PRIMARY CLARIFIERS – The organic solids are separated at this point. Water flows very slowly through these tanks to allow the solids to settle to the bottom. The solids (sludge) are scraped to a hopper in the center of the tank and pumped to the digesters.

4. FIRST STAGE TRICKLING FILTERS These units are frequently referred to as biological contact beds. Wastewater is sprayed over the surface of the coarse rock. The dissolved and suspended organic material in the water is taken in as food and biologically consumed by microorganisms living on the rocks.



5. INTERMEDIATE CLARIFIER – Additional removal of solids takes place here including the removal of the dead organisms that have washed off the rock from the previous process. This thin sludge is returned to the start of the treatment plant.

(6) SECOND STAGE TRICKLING FILTERS – Additional removal of dissolved and suspended organics is accomplished by the microorganisms.

(7) THIRD STAGE TRICKLING FILTER – Also referred to as a bio-tower, this unit was put on-line in January 1999. The main purpose of the bio-tower is the removal of ammonia. Ammonia can be detrimental to some aquatic organisms.

8. FINAL CLARIFIER – Settleable solids which wash off the trickling filters and bio-tower are settled in these two units, collected and returned to the start of the treatment plant.

9. ULTRA-VIOLET DISINFECTION – Water from the final clarifiers pass through channels with rows of ultra-violet lamps. The UV rays sterilize the disease causing bacteria and viruses in the water before being released to the Cedar River.

SLUDGE / BIOSOLIDS HANDLING

A. PRIMARY DIGESTER – The sludge from the primary clarifiers is mixed and heated to 95 to 100 degrees Fahrenheit. Bacteria in the absence of oxygen, digest and reduce the sludge to a stable and usable product called biosolids. This digestion process produces methane gas. anerobic bacteria

B. WASTE GAS BURNER – The methane gas produced by the bacteria in the digester is used to heat the control building and the digesters. The excess gas is burned before release to the atmosphere.

C. BIOSOLIDS HANDLING BUILDING – Liquid biosolids at a concentration of about 4.5% solids are pumped out of the digesters into this building. The material can be directed into a tank truck and hauled as a liquid or can be dewatered in a belt filter press. The dewatering yields a product that's about 25% solids. Wet or dry, all biosolids are applied to agricultural fields as a fertilizer and soil conditioner.

D. BIOSOLIDS DRYING BEDS – If needed (an optional method of disposal) biosolids from the digesters can be spread on the sand drying beds and allowed to dry for 6 to 8 weeks. The biosolids can then be hauled to farm fields as a solid material.

E. SECONDARY DIGESTER STORAGE – This unit receives only supernatant from the primary digesters. It provides additional capacity for storage and also allows for some thickening to occur.

F. GRAVITY THICKENER – This tank settles and thickens sludges collected from the bottom of the intermediate and final clarifiers. The sludges end up in the primary digester.



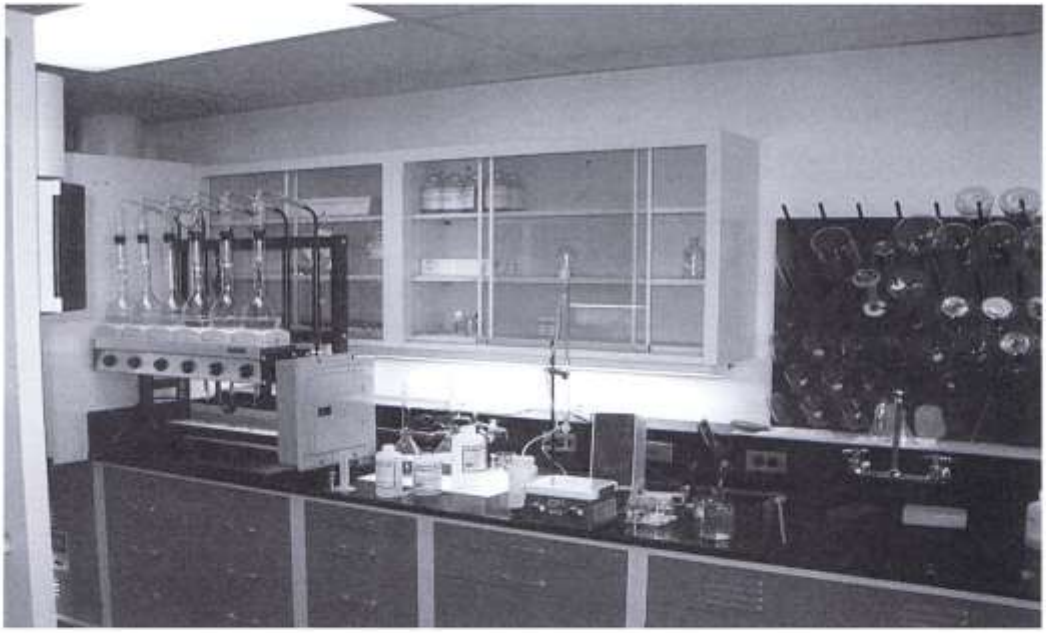
This modern wastewater treatment plant is capable of reducing the natural process of water treatment from several days in the river to several hours in the treatment plant. This treatment results in a clear, clean effluent which discharges to the Cedar River.

During the treatment process greater than 90% of the settleable solids and 85% of the oxygen consuming materials are removed. The dissolved oxygen available to aquatic life in the treated wastewater is increased to approximately 7 mg/l.

In January 2001 a new flood levee was completed (note the left edge of the picture on the right). It was constructed to protect the treatment plant and other low areas in Cedar Falls from the unpredictable waters of the Cedar River.



Laboratory analysis of the wastewater at various stages in the treatment process is required by the state to verify that the plant is operating efficiently and meeting the required standards.



DESIGN PARAMETERS

Design Flow – 7.68 million gallons per day
Peak Flow – 21.6 million gallons per day
Detention Basin – 5.0 million gallons
Influent Design BOD (Biochemical Oxygen Demand) – 8435 lbs/day
Influent Design SS (Suspended solids) – 9920 lbs/day
Effluent Design BOD – 1920 lbs/day
Effluent Design SS – 1920 lbs/day