AIChE

Rocky Mountain AIChE News

May 2014 Volume 23 Number 8

May Section Meeting: Tour of DCP Midstream's O'Connor Gas Plant

Recent developments in oil and gas production technology have led to extensive development of reserves previously determined to be uneconomic. Current market conditions favor "wet" gas plays in which light liquid hydrocarbon molecules (C2 to C6+ components) are recovered along with the methane. To maintain product specifications and maximize value of the recovered hydrocarbons pipeline quality gas (called "residue gas") are separated from heavier constituents in gas processing plants. Typically there are 3 product streams from a gas processing plant: residue gas, natural gas liquids or NGLs (a mixture of C2 through C6 molecules) and condensate (typically C5/C6 and heavier). The composition of products from gas processing plants will vary depending on the inlet gas composition, process design and operating conditions.

This month we will tour DCP Midstream's O'Connor gas plant, located in Kersey. O'Connor is a 150MMSCFD deep cryo plant designed to operate in both ethane recovery and rejection modes. The plant uses the gas subcooled process design to achieve temperatures of -100F and lower during ethane recovery. Construction on the "base" plant which was designed for 100 MMSCFD began in 2012, and it was placed in service October 2013. An expansion to the base plant was placed in service in March of this year.

Brian Petko, project lead engineer with DCP Midstream, was involved in the design, commissioning and start up of the O'Connor facility and will be giving a short presentation on the plant.

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May Section Meeting

Topic: Tour of DCP Midstream's O'Connor Gas Plant

Speaker: Brian Petko

Date: Tuesday, May 20th

Time: 6:00 Gather/Sign-in
6:15 Tour Begins
7:15 Dinner and Presentation

Location: 24189 Weld County Road 51
Kersey, CO 80644 [map link]
See parking instructions pg 6

Cost: (w/RSVP)* Members: $20
Non-Members: $25
Students & Unemployed: $10

Bring: **Personal Protection Equipment** Required to wear cotton pants (e.g. jeans, Dockers, etc.) and closed toe leather shoes. Please bring a fire retardant shirt or smock (FR or Nomex) if you have one, hard hat and safety glasses. They will be provided if you do not bring them.

Please RSVP by Friday, May 16th, indicating your name, phone number, number of attendees. Please RSVP at rockyaiche@yahoo.com and pay at the meeting. You may also RSVP and pay online using PayPal: http://www.aiche.org/community/sites/local-sections/rocky-mountain/paypal

*Add $5 for attending meeting without RSVP

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Brian graduated from the Colorado School of Mines with a Masters in Chemical Engineering in May of 2010. After graduation, Brian joined DCP as an asset engineer. During his four years with DCP, Brian has been the plant engineer for the Roggen and O'Connor plants. He has also executed many small projects around optimization and reliability of the facilities in his assigned area.

Due to the limited space, attendance at this month's meeting will be limited to the first 30 people. Attendees will be required to wear cotton pants (e.g. jeans, Dockers, etc.) and closed toe leather shoes. Additional PPE for the tour includes fire retardant shirt or smock (FR or Nomex), hard hat and safety glasses. Hearing protection will be available but will not be required. DCP will be able to provide this additional PPE, but they request folks bring their own FR if possible.

The tour will being promptly at 6:15 to take advantage of daylight, and will be followed by a buffet dinner from Qdoba and Brian's presentation.

THANK YOU TO MIKE MUTNAN

Mike Mutnan annually organizes the AIChE judges for the State Science Fair at CSU and we are so grateful for his commitment to the future engineers of America. Here's a thank you from one of this year's winners. A big thank you to Mike Mutnan and Rebecca Spearott for judging the science fair contest this year.

SCIENCE FAIR NEWS

The judging is over and the winners were formally announced at a luncheon in Fort Collins on Friday April 11.

Our judging was again intense and exhausting, but we have identified 1st and 2nd place winners. Below are the 2014 AICHE-Rocky Mountain Section winners. The abstract for each project is included:

1st Place Junior Division

Project Title: Solar Desalination
Individual Leader's Name: Kayla Nasralla
School & City: Pagosa Springs Middle School, Pagosa Springs
Sponsor's Name: Thomas Caffrey
Category: Engineering

Abstract- The purpose of this investigation was to determine if water could be desalinated with a salvaged TV screen and the sun. An accessible source of fresh water is not available in some developing nations. Having something that could possibly convert salt water to fresh water could be life saving. After much research, I hypothesized that one liter of water could be desalinated in one hour with a TV screen (Fresnel lens) and the sun.

For this project, the Fresnel lens was removed from a 65" rear projection Toshiba TV. Once removed from the TV, it was placed in an adjustable frame. A desalination station was set up outside and consisted of the lens, two beakers, a copper coil, salt water, and a workbench. The timer was set for one hour and the experiment started. Focusing the lens on the beaker caused the salt-water to

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boil. The subsequent steam was condensed in the copper coil and recovered in the second beaker. After one hour, the lens was removed and the fresh water beaker was recovered. I measured the amount of desalinated water and tasted it to check for the presence of salt. No salt was detected.

My hypothesis was partially verified. I could desalinate water with the Fresnel lens and the sun. However, I only desalinated 300mL rather than **i** liter, which I had hypothesized. These results demonstrate the viability of this technique for desalinating water in remote areas.

2nd Place Junior Division

Project Title: The More Sugar the Better!!!
Individual Leader's Name: Elizabeth Valdez
School & City: Ignacio Middle School, Ignacio
Sponsor's Name: Johnny T. Valdez
Category: Chemistry

Abstract-
Crystals are all around us. One can find crystals many different places, ranging from candy stores to jewelry stores. The purpose of my experiment was to determine which substance (sugar compound) would grow the biggest and best rock candy the fastest (amount and speed). In my hypothesis I believed that the thicker the sugar (like brown sugar and cane sugar) the better the rock candy I would create.

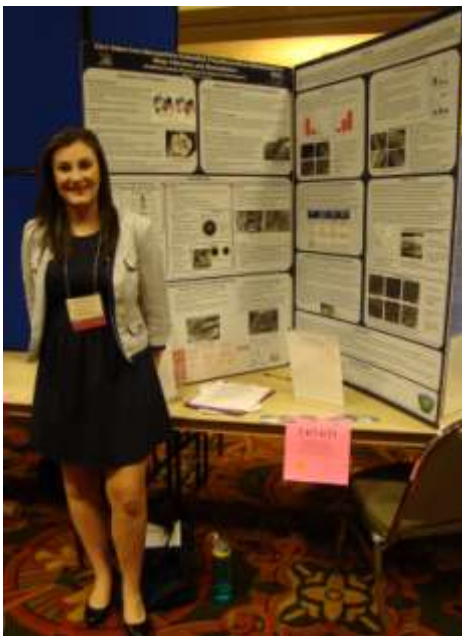
The project used all types of sugars in all of its forms: monosaccharides like glucose, fructose and galactose as well as disaccharides like lactose, sucrose and maltose. I took these sugars in many types (table cane sugar, brown sugar, maple syrup, cola, honey and chokecherry syrup) and created rock candy by boiling water and adding a predetermined amount of cane sugar to each solution jar. I then used the solutions to place sticks coated with the types of sugar above to create my rock candy. I waited for several days to see what happened. I used the same process for each type and waited for the rock crystals to grow.
After days of waiting I found that each type provided a different amount of rock candy crystals. I weighed them and measured their diameter, width and length.

It was great to see that my hypothesis was correct. The thicker sugars did perform the best.

1st Place Senior Division

Project Title: Zero Valent Iron Nanoparticle Enhanced Membranes for Water Filtration: Optimizing Casting Parameters for Global Applications
Individual Leader's Name: Hope Weinstein
School & City: Fairview High School, Boulder
Sponsor's Name: Dr. Paul Strode
Category: Environmental Sciences

Abstract-
Many newly identified organic contaminants and disinfection by-products have been found in natural water sources and treated drinking water. Current water filtration membranes do not always remove these harmful substances, but new water treatment innovations such as nanoparticle enhanced filtration membranes have shown increased interest and promise. This research focuses on the effect of embedded iron nanoparticles on the thickness and water flux of polyethersulfone membranes produced by phase inversion. The study evaluated membranes that were cast from solutions that contain stabilized nanoparticles, pore former, polyethersulfone and solvent. Parameters evaluated



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include the concentration of zero valent iron (ZVI) nanoparticles, the type of nanoparticle stabilizer, the type of pore former, the concentration of ethanol, and the type of solvent. Membranes were evaluated using dead end filtration, micrometer measurements, and scanning electron microscopy (SEM). Results indicate that
casting parameters, in addition to nanoparticle concentration, affected the behavior of the membranes. Additionally, oxidation of the iron nanoparticles was observed to cause morphological changes to the surface and internal structure of the membrane as well as decrease the flux of the membrane. Only certain casting parameters, for example, those membranes cast from dimethylacetamide or dimethylformamide, were observed to result in this oxidative degradation in the membranes.

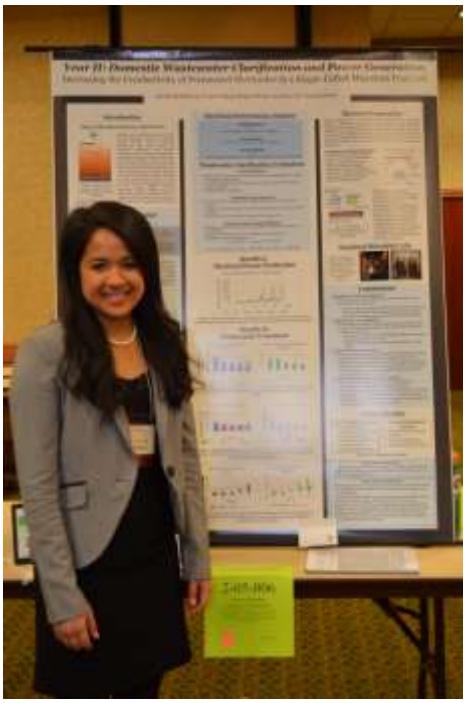
2nd Place Senior Division

Project Title: Year II: Domestic Wastewater Clarification and Power Generation- Increasing the Conductivity of Permeated Electrodes in a Single-Celled Microbial Fuel Cell
Individual Leader's Name: Nurul MohdReza
School & City: Union Colony School ,Greeley
Sponsor's Name: Zabedah Sa ad
Category: Energy & Transportation

Abstract-
Enhancing the efficiency of single-celled microbial fuel cells (SCMFC) provides the opportunity for wastewater treatment plants to invest in green technology that will allow these facilities to become sustainable. SCMFCs comprise of a dualistic nature by producing electricity through the clarification of wastewater. In a SCMFC, the electrode compartment is a vital component of a stabilized fuel cell. This experiment focuses on the durability of electrodes when permeated with various electron acceptors.

Nine SCMFCs were developed and later permeated with the specific electron acceptors, potassium ferricyanide (PF) and manganese dioxide (Mn02). Both have proven to be high reduction and oxidation compounds but PF releases a greater toxic concentration. Several tests were conducted to quantify the effects of specific electrode permeations and catalyst's in SCMFCs. To determine treatment efficiency, fuel cell inoculum was measured for chemical oxygen demand (COD), total phosphorus, and conductivity. To assess the fuel cells ability to generate electricity, experimentation included measuring the voltage and current for each day of experimentation. For this study, two statistical analyses were performed: repeated measures analysis of variance (ANOVA) and a three-factor ANOV A. Through the repeated measures results, there was an insignificant interaction between week*chemical*electrode. However, the highest electrical power production was achieved with the Mn02 fuel cells (2506.9mW).

Developing an efficient combination of electrodes and catalyst compounds will allow SCMFCs to achieve high electron transfer. By decreasing the cost and the operational parameters of SCMFCs, this biotechnology will become a promising outlook for the future of wastewater treatment sustainability.



NOTE: The two Senior Division winners have been invited to the Intel International Science and Engineering Fair to be held in Los Angeles, CA on May 11-16, 2014

Hope Weinstein was chosen from the Boulder Valley Regional judging. Nurul MohdReza was chosen from the Longs Peak Regional judging.

Participants from the Colorado Science Fair for this event have not yet been identified.

CONGRATULATIONS TO ALL!!!!!

Our Rocky Mountain AIChE website has changed. Check out our new site at http://www.aiche.org/community/sites/local-sections/rocky-mountain

AIChE Meetings

2014

June 10-12	2014 Process Development Symposium, Courtyard Philadelphia
June 15-19	Metabolic Engineering X Westin Bayshore Vancouver, BC
June 17	Summer 2014 Online Career Fair – Jobseekers
July 14-17	Synthetic Biology: Engineering, Evolution & Design (SEED) Los Angeles, CA
July 23-25	RCN Conference on Pan American Biofuels and Bioenergy Sustainability, Recife, Brazil

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The objectives of AIChE are to advance chemical engineering in theory and practice, to maintain a high professional standard among its members, and to serve society, particularly where chemical, engineering can contribute to the public interest.

Rocky Mountain AIChE News Publication Schedule

September 2014 issue
Articles due Wednesday, September 3th
Publish on Friday, September 5th
Meeting on Tuesday, September 16th

MEETING SCHEDULE

The Rocky Mountain District of AIChE generally meets the third Tuesday of every month, September through November and January through May.

Rocky Mountain AIChE News
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On the Web at:
http://www.aiche.org/community/sites/local-sections/rocky-mountain

Send your E-MAIL address to mmoes@ekiconsult.com to receive this newsletter electronically!

From downtown Denver: Travel I-25 North to I-76. Travel east on I-76 about 15.4 miles to exit 34, Kersey Road (Weld County Road 49). Travel north on Kersey Rd about 17.1 miles to Weld County Road 50. Turn right onto Weld County Rd 50 and travel about 1 mile to the first left and turn onto Weld County Road 51. The plant entrance is about ¼ mile from the intersection of WCR50/51).