School of Engineering Newsletter

School of Engineering Class of 2022

Back row: Dr. Pavel Navitski, Prof. Satia Schwarz, Dr. Robert Leland, Dr. Sophie Liu, Dr. Xiaomin Ma, Dr. Elena Gregg, Dr. John Matsson, Ethan Kaste, Kasey Spigle, Luke Ferguson, Mackenzie Edwards, Jared Adelmann, Josh Mathew, Isaac Rowaiye, Joshua Hunt, Kristoffer Matsson, Dr. Dominic Halsmer, Dr. Matthew Goelzer

Front row: Kenneth Daniel Welch, Allen Deibert, Tamaranlayif Onitsha, Rishav Shrestha, Daniel Oforji, Jesse Isaacs-Boyett, Matthew Downing, Garrett Smith, Justin Vandi, Zachary Schwarz, April Jones, Caleb Angell, Flavia Gutierrez Balcazar, Oluwatosin Aikulola, David Williams, Andre Russo, Alejandra Ruvalcaba, David Akinrinlola

Solar Concentrator Research and Design Internship

Jonathan Merheb

This summer, I had the opportunity to work on researching, designing, and building a solar concentrator that would be used to purify water. The goal of this project was to build an affordable, automated solar concentrator that could reflect the sun's light (using mirrors) throughout the day onto a black pipe to heat water. The heated water would then pass through a membrane, only letting pure water vapor out.

Before beginning the project, a lot of calculations had to be made. These calculations included the solar time, the altitude and azimuth angles, and beta, the mirror angle at a given date, time and location in the world. All of the calculations were done using MATLAB, where the inputs could be changed to make the code applicable anywhere.

The next step in this project was figuring out how to control the arduino stepper motors that would be used to control the mirror angles on the concentrator. For simplicity, I looked for a way to control the stepper motors by pairing Arduino and MATLAB code. That way, the MATLAB calculations could be linked to the motor control code and looped to change the mirror angles throughout the day. After a lot of research and trial and error, the code was finally able to move all four of the stepper motors, giving each one a different angle of rotation.

Finally, I could start thinking about building the concentrator. After designing the initial model on SOLIDWORKS, I consulted the professor overseeing me, and we found ways to optimize the design. I redesigned the model and started looking for the necessary parts to order. This process was tedious, as it took a lot of research and effort to find the right parts and have them ordered to the correct dimensions. It was very fulfilling, however, to see the whole project come together at the time of building.

Overall, I feel like this experience was very practical, and it put a lot of my engineering studies into perspective. Through this experience, I had to apply what I had learnt in several of my engineering courses at ORU. This experience turned out to be a blend of electrical, computer, and mechanical engineering. I am thankful for the opportunity that I had to participate in this project, and I look forward to the future projects that I will be able to be a part of.

```
hlimdeg= hlimrad*(180/pi); %limits in degrees (for azimuth right?)
hlimdegneg= hlimradneg*(180/pi);

hlimhr= hlimrad/(15*(pi/180)); %limits in hours
hlimhrneg= hlimradneg/(15*(pi/180));


% Solar Altitude angle equation in radians

sinalpha = sin(Lrad)*sin(deltarad) + cos(Lrad)*cos(deltarad)*cos(hsrad);
solaraltitudeangle = asin(sinalpha);
solaraltitudedegrees= solaraltitudeangle*(180/pi); %radian to degree conversion


% Azimuth angle equation in radians

sinazimuth = (cos(deltarad)*sin(hsrad))/(cos(solaraltitudeangle));
azimuthangle = asin(sinazimuth);
azimuthangledegrees = azimuthangle *(180/pi); %radian to degree conversion


% Azimuth correction for angles that exceed +- 90

for i= 1:1440
bnCOR = (360*(n-81)*pi)/(364*180); %calculates bn
ECOR = 9.87*sin(2*bnCOR) - 7.53*cos(bnCOR) - 1.5*sin(bnCOR); %calculates E
solartimeCOR = 1 k * 4*(SL-Ll) + ECOR; %calculates the solartime in minutes
solartimehourCOR = solartimeCOR/60; %converts solartime to hours
LradCOR = L*(pi/180);
deltaradCOR = (23.45*sin(((360*(284+n))/365)*(pi/180)))*(pi/180);
hsradCOR = ((solartimehourCOR - 12)*15)*(pi/180);

sinalphaCOR = sin(LradCOR)*sin(deltaradCOR) + cos(LradCOR)*cos(deltaradCOR)*cos(hsradCOR);
solaraltitudeangleCOR(i) = asin(sinalphaCOR);
solaraltitudedegreesCOR(i) = solaraltitudeangleCOR(i) *(180/pi); %radian to degree conversion

sinazimuthCOR = (cos(deltaradCOR)*sin(hsradCOR))/(cos(solaraltitudeangleCOR(i)));
azimuthangleCOR(i) = asin(sinazimuthCOR);
azimuthangledegreesCOR(i) = azimuthangleCOR(i) *(180/pi); %radian to degree conversion

end

[azimax, azimaxidx]= max(azimuthangledegreesCOR);
[azimin, azimidx]= min(azimuthangledegreesCOR);
```

Figure 1: Example calculation code.

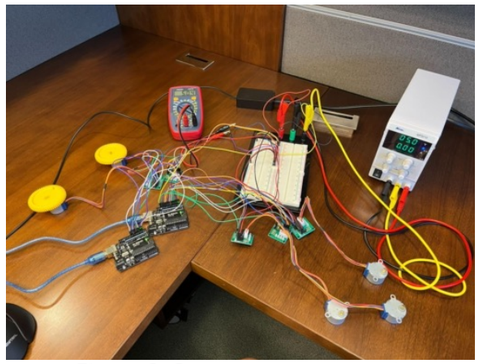


Figure 2: Stepper motor control.

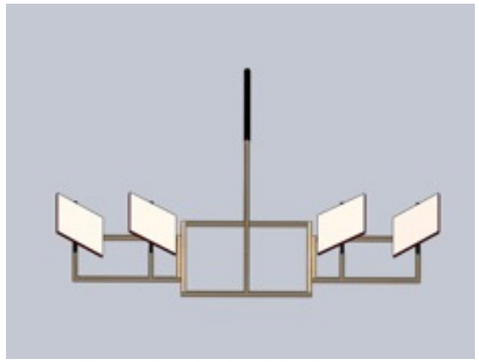


Figure 3: SOLIDWORKS design.

Figure 4: Built solar concentrator.

Summer Internship

Steven Roe

This summer I interned for Advanced Industrial Devices, as a Production Engineer. Advanced Industrial Devices is a VFD (Variable Frequency Drive) controls and automation manufacturer, located here in Tulsa, OK. Their products serve a variety of industries, but their biggest customer base is currently found in the Oil and Gas industry. Their VFD packages are designed to make sure well sites operate as consistently and efficiently as possible. Whether a company is recovering oil or natural gas, the AID solutions can help decrease downtime and maintenance issues, ultimately resulting in more uptime and increased profitability for their customers.

My internship included a wide variety of tasks each day. Over the course of the summer, I was focused on two major projects within the company. The first project was implementing new machinery, for in-house manufacturing of sheet metal parts. This equipment included a 1.5 KW Ermaksan Fibermak Hawk Laser Cutter, an Ermaksan Power Bend Falcon Press Brake, a Laser Welder, and a Spot Welder. I was responsible for many facets of this project, but my first step was to design the overall layout of the machines. This was a priority because of regulations and the various specifications of the machinery. I started by modeling the layout in Solidworks, and even ended up working with outside contractors to plan for shipping, delivery, and installation of the machines. Once these machines were onsite, I was responsible for reviewing the pre-installation manuals and then began buying all of the items needed for the installation. I also designed the airline schematic, which involved setting up for compressed air, nitrogen, and oxygen, which were all options the laser could cut with. This was a highly detailed process, which took several weeks. At the same time as these projects were taking place, I was also reverse engineering the sheet metal parts that had previously been ordered from 3rd party metal fabrication companies. This part of the project was essential, so we could be prepared to make our own versions, with these new machines. This was another part of the project that required many hours of work in Solidworks, modeling 2D sheet metal patterns for the laser cutter and 3D models for the press break. Ultimately, I successfully modeled every existing part, along with redesigning parts that needed changes.

The second major component of my internship was to design a new manufacturing lean cell, for the shop facility. This particular cell would be responsible for building the larger VFD's and needed to utilize a new way of building the panel called Man in Motion. Essentially, man in motion means workers move around with production carts, instead of moving the actual items themselves. For this project, I had to buy every piece necessary for the cell, within the space that was allocated. My biggest contribution to this project was designing a custom lifting attachment, for a forklift that lifts VFD's into enclosures, which eliminated the need for lift tables and created more working space. Overall, my summer at AID was incredible and the experience was extremely useful. I even have the privilege of continuing to work with them in the upcoming school year and will eventually move into a full time engineering position in the future.

Internship

Lucas Oliveira

I started my summer internship on June 13th. The company is called National Steak & Poultry. There are three locations around the United States, and my location is in Owasso. “NSP develops and offers custom protein products and formulations to all foodservice chains,” In our plant, we process chicken and steak.

When I started the internship, the engineering department had a common goal of decreasing the downtime in the factory. Downtime is when production stops, and it can be for many different reasons. My first project in the internship was being responsible for the downtime of a specific machine.

During the first half of the internship, I was responsible for improving this machine called Charmarker. I wrote different procedures for the operator, which helped them on how to operate the machine the right way, causing the machine to have less downtime. I was also responsible for the mechanical engineering of the machine, where I had to modify some things in the machine to work better for our purpose.

After getting excellent results for the Charmarker, during the second half of the internship, I was responsible for another machine called KSL – CBU/8, a slitter machine. After writing procedures and modifying the machine as needed, I was also able to obtain outstanding results.

This internship was an excellent experience for me. I developed my mechanical engineering skills by looking at different machines in theory and practical. Also, I got to be part of a bigger plan in the company, having to be in important meetings every day to discuss plans for the company and have the opportunity to speak out my opinions and thoughts.

The internship program ended on August 24th, when I gave my final presentation to the Vice-presidents and the President. However, I am glad to say that they offered me a part-time position, which I believe will be very good for me to learn many other things, develop my mechanical engineering skills and also be able to help and advance the company.

Summer Internship

James Stapleton

This summer I had the opportunity to work for Simmons Foods as an engineering intern. Simmons is a poultry company that was founded in 1949 and is based in Northwest Arkansas. The company provides chicken to well-known restaurants such as Chick-fil-a, Canes, and many more. Simmons also has a pet food division which sells products to a variety of high-quality pet food private labels. In 2021, Simmons was named the best mid-sized food and beverage company in the country by Forbes.

This summer, I had the opportunity to work with the automation team at Simmons. I was responsible for developing a reference guideline and standard for the automation practices for each facility. As a result, I had the opportunity to visit multiple processing facilities with various functions across several different states. I spoke with maintenance managers, engineers, programmers, and electricians to create a picture of what Simmons does in terms of automation. I was then responsible for compiling and presenting it to management in an understandable manner. For each facility, I documented the process flow, the equipment and hardware used, the software and programming languages, network structure, and everything else that has to do with automation.

In addition, I also had the opportunity to aid in the design of a new production layout for a processing facility in Delaware. I was responsible for preparing the piping and instrumentation diagram for the production lines in that facility. One of the primary goals of Simmons’ internship program is to provide opportunities for interns to do real work. The projects and tasks that I was responsible for are things that are currently being used by Simmons.

I gained a great deal of professional experience and was able to develop communication skills as well as acquire technical knowledge in the field of automation. My time at Simmons provided an excellent atmosphere of learning and presented opportunities to contribute in a meaningful way. Ultimately, my experience this summer at Simmons was a blessing and greatly contributed to my professional development.

2022 Summer Internship
Tinker Air Force Base – Zachary Wilbur

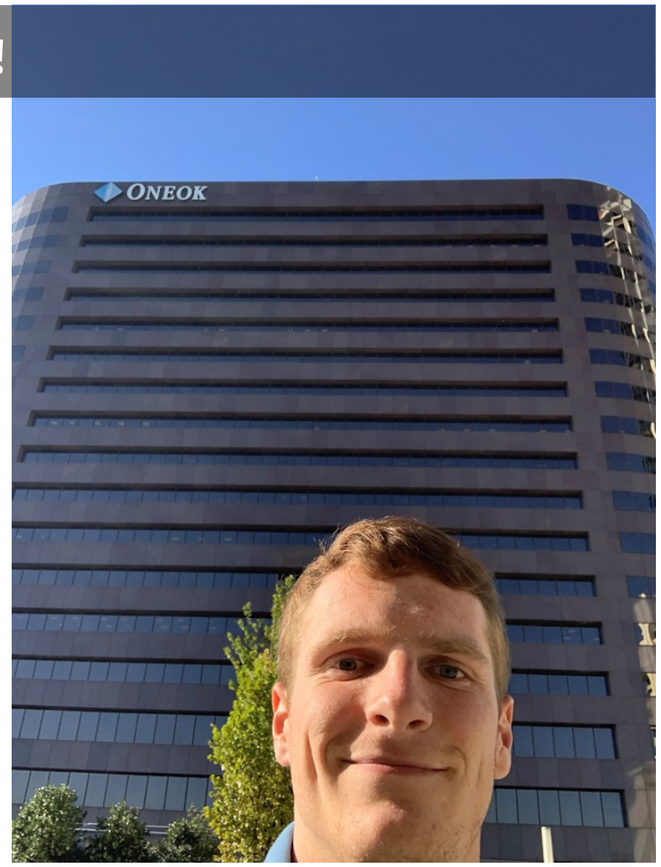
This summer, I was hired on to intern as an aircraft engineer at Tinker Air Force Base. Tinker is home to one of three national air logistic complexes, the OC-ALC. The OC-ALC houses and completes depot-level maintenance on the Air Force’s fleet. Upon arrival, I was placed in the AMXG offices. AMXG is a major department within the complex that focuses on maintaining the airframe and major structures of the aircraft. Most of their work occurs in the aircraft hangers. The mechanics, inspectors, and engineers work around and within the planes themselves. Even more specifically, I worked within the inspections sector of engineers, also known as NDI or Non-Destructive Inspections. NDI uses various methods of engineered technologies to inspect the aircraft without destroying the part to find the flaws. The five primary methods used within our department were Fluorescent Penetrant (PT), Magnetic Particle (MT), Eddy Currents (ET), Ultrasonic Technology (UT), and Radiography (RT).

This internship consisted of a few different, significant parts. At the beginning of the summer, I was assigned a project to analyze the trends of the shop. I was to do this by performing data analytics on the progress data that is logged daily. Outside of this project, I was tasked to study and learn hands-on about the different NDI methods. I was also allowed a few other minor projects, such as standardizing and documenting one of the major processes that happen in the department. In general, the engineers work to develop and maintain the equipment and processes used to inspect the aircraft. They do also have times where they are tasked with problems as they come up. This aspect of the internship exposed me to what being an engineer can fully entail in certain companies. It was cool to shadow the engineers here and make connections with them.

I also had the opportunity to attend a two-week radiography class that offered a lot of hands-on X-Ray practice. The course worked with film curves and varying amperage and voltage to obtain clear images that can be used for inspection. It was a great application of electrical and mechanical knowledge of the circuits involved and the part being X-Rayed. This summer was an excellent way to gain experience in the engineering field and with NDI, make connections and gain contacts in the Air Force, and learn from professionals in the aerospace world.

New Job at OneOK!

Ethan Kaste



This July I started working as an engineer at OneOK in downtown Tulsa. OneOK is a leading natural gas midstream company that processes and transports natural gases and natural gas liquids and a member of the Fortune 500. Being a midstream company, OneOK makes money in several ways. One is a fee-based manner of revenue, by transporting natural gas through pipelines all throughout the Midwest. In addition, a large part of their revenue comes from their use of fractional distilleries, or "fracs", that separate out natural gas components (Ethane, Propane, Butane, etc.) into their pure form, which sell for much higher prices than the raw feed that is produced through drilling. These fracs are large industrial plants that typically have 4 towers for separation, a de-ethanizer, de-propanizer, debutanizer, and an iso-normal splitter.

The raw product gets superheated before going through the frac, then goes through the towers. The frac-ing process uses the chemical composition and boiling point of each element to OneOK's advantage, where plant operators find a temperature and pressure balance in which parts of the gas turn to vapor and others turn to liquid, effectively separating the two products. This process is repeated under different conditions based on the purity products trying to be obtained. From the frac, each purity product gets shipped out to different locations, customers, and storage facilities. OneOK owns and operates fracs in Hutchinson, KS, Bushton, KS, Mont Belvieu, TX, and Medford, OK with pipelines mainly in Texas and Oklahoma, extending up to North Dakota and over to Chicago.

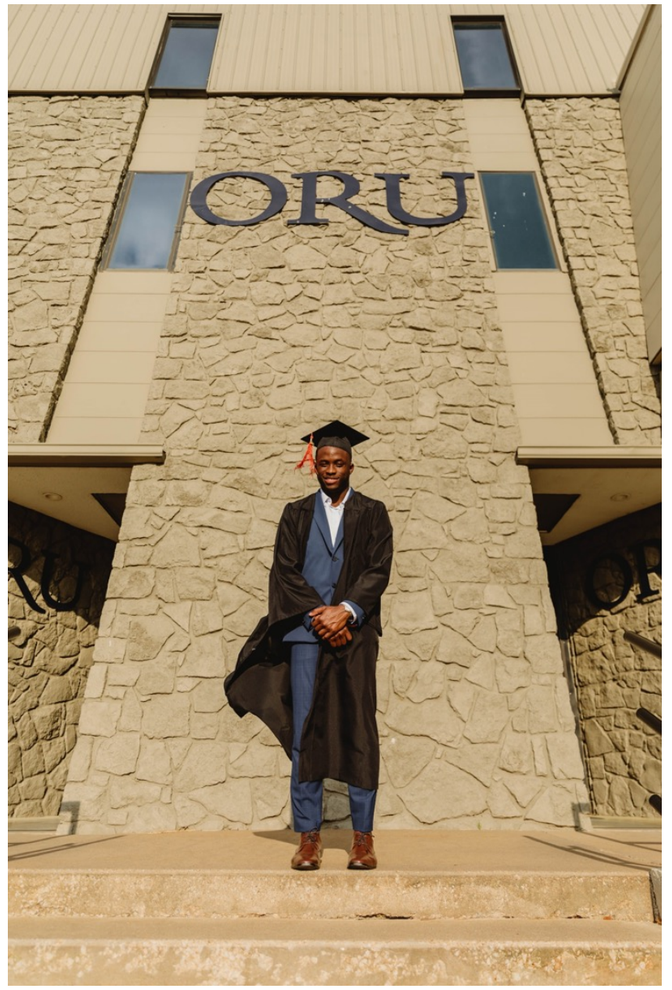
I began work on July 5th, 2022, and I am working in the natural gas liquids segment for the measurement team at OneOK. The measurement team analyzes, tests, and monitors all the measurement of natural gas liquids flow for the pipeline at OneOK. The team uses software and field equipment to read and log flowrates and flow data for the entire pipeline. Extensions of the team, measurement technicians, work in the field going around to monitor the measurement of each meter using a method called "meter proving". In this process, a known volume of natural gas is rerouted through a proving truck and measured, then compared to what the meter reads. This process allows the technician to adjust the meter factor of the meter to show the correct flow on the flow computer.

My title at OneOK is measurement engineer. Since it is still very early in my career, I am focused on learning all I can about what the company does and specifically going in-depth on how the measurements team operates. Eventually, my role will be to develop and optimize different processes completed on a weekly or monthly basis by the measurement team using software and elimination of unnecessary steps within processes. While I have several small projects I am already working on, I am still very young in my career, and I hope I can make a large impact not only in the measurements team, but in OneOK as a company.

MY NEW JOB EXPERIENCE

Oluwatosin Aikulola (2022 Graduate)

Graduating from Oral Roberts University was a big milestone for me and my family. Being an international student from Nigeria gave me more reason to celebrate. It is a school known for its cultural diversity and global reach, and for the first time, I felt like I made someone other than my mother proud. I made the country proud. I graduated from Oral Roberts University with honors in less than four years. But in our celebration, God proves that the story gets better.



After several interviews, I accepted a Project Engineer position at Diversified Conveyors International in Memphis, Tennessee. The one thing I was constantly commended for in my interviews was my confidence and willingness to learn. In the College of Science and Engineering, our professors always set up our tests and exams in ways we had to think outside the box. They challenged us to ask questions and tackle real-world problems, eventually preparing us for the workforce.

I started my full-time journey on the 6th of June; honestly, it was a mix of emotions. I am in the material handling industry, and we design conveyors for package delivery companies like FedEx and airport baggage handling services. So, it was a new world I was stepping into, but it was not entirely foreign to me. We use 3D modeling and 2D software to create the best solutions for customer needs. From my college days of using SolidWorks, this design phase did not take too long for me to grasp. All my class knowledge kicks in from time to time in different aspects of work. One day I saw the results of a class like Mechanics, where a particular material with specific properties has to be used in a design. The next day, I understood that due to some calculations, I would need to adjust the orientation of a design to achieve the team's goal effectively. And these designs are done while paying attention to the spec sheets provided by the company and the customer. I have also had the opportunity to visit the warehouse field workers a few times and see how these designs are converted from drawings to reality. This opportunity gave me an idea of how important it was for me to produce clear drawings and make the job of the installer easier. Also, being selected for the Project engineer role gives me the fluidity to work with cost estimators who create proposals for projects and project managers who order parts and components needed.

Teamwork in the company has stood out since the beginning. It has helped me bond with my colleagues and overall aid my growth. Luckily, I am used to working in teams for my class projects at Oral Roberts University. The training sessions and meetings in the company recently show that the workforce is not the end of education but only the application. I still learn every day, but my time spent at the School of Engineering has only made the journey easier.

The truth is our professors in class, seminars and laboratories, projects, campus leadership opportunities, and information relayed to us from the department's secretary (Mrs. Kerri Ophus) prepared me for this experience and atmosphere. And I am indeed grateful!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