2019 Intern Partnership Projects

OCAST

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Project Title	Organization
Thermal package design and web development intern	MaxQ Research LLC
Distribution and quantity of iodine with relationship to oilfield brine waters in central and western Oklahoma	Northwestern Oklahoma State University / Iofina Resources
TCC and XWorks: Student Intern Partnership program	Tulsa Community College / XWorks Technologies
Engineering internships to improve quality controls within Michelin's North American plant in Ardmore, OK	University of Oklahoma / Michelin North America
Implementation of innovative technologies for improved performance and service life of asphalt pavements	University of Oklahoma / Silver Star Construction Company
Low-cost disposable point of care interferon gamma release assay	University of Oklahoma / IMMY
Applications of data analytics in simulation industry	University of Tulsa / CymSTAR
Building an Enterprise Resource Planning (ERP) system and SolidWorks Finite Element Analysis (FEA) of tools for tank head manufacturing	University of Tulsa / Prescor
Design and development of aircraft components	University of Tulsa / American Airlines
Design and development of composite pressure vessels	University of Tulsa / Infinite Composites Technologies
Development of analytical methods for Marshall Brewery	University of Tulsa / Marshall Brewing Company
Assist in the commercial scale production and fulfillment of XploSafe's XCel+ vapor sampling badges and XploTrain, explosive training and testing aids	XploSafe, LLC
Commercial scale production of XploSafe's new biodegradable sorbents for consumer, industrial and municipal water treatment	XploSafe, LLC

Thermal package design and web development intern

Dr. Arif Rahman, MaxQ Research LLC

MaxQ is revolutionizing the shipping of temperature-sensitive biologics with advanced breakthroughs in thermal insulation sciences. Its proprietary MAXIFY™ technology enables a new category of biologic-specific, No-Bench-Time packaging solutions with unprecedented usable volume, thermal performance, and cost efficiencies. Combined with its deep support, MAX-Q delivers TOTAL VALUE to customers worldwide. The MaxPlus series of packaging, storage and transport systems exclusively encompasses the complete blood transfusion supply chain from collection - to processing - to point of use.

Some of our current customers include Mayo Clinic, Mercy Hospitals, Memorial Blood Centers, Versiti blood conglomerate, level 1 trauma centers, blood-based reagent manufacturers, cord blood banks, clinical trial practitioners and many more in the U.S. and abroad.

In this proposed Intern partnership program, MaxQ plans to employ a minimum of 2 engineering interns to work on two separate product development projects – (1) Development of flexible thermal insulation and level 1 trauma shipper, and (2) Development of mobile application and web-based server interface for MaxQ's smart container. Preferred intern qualifications include undergraduate (senior) or graduate level students having background have a background and specialization in thermodynamics, computational and experimental heat transfer, mobile application development, web page development, and computer engineering.

Working on these proposed projects, the interns will gain hands-on experience in finite element modeling, product development, testing and validation of thermal package designs, mobile application development and web based server and interface development. The work that the interns will be performing towards these projects will create a significant influence on MaxQ's current and future products.

These projects will have a sustainable impact on the testing, validation and manufacturing capabilities and aid MaxQ to deliver high value solutions to both existing and new customers. MaxQ through these efforts will contribute to the local economy by creation of high paying scientific jobs by employing thermal, mechanical and electronic engineers from the State of Oklahoma.

Distribution and quantity of iodine with relationship to oilfield brine waters in central and western Oklahoma

Dr. Jason Wickham, Northwestern Oklahoma State University with Iofina Resources, LLC

The research partnership between NWOSU and Iofina is an excellent opportunity for students to experience the world of discovery and exploration that is research. It is hard for students to connect their chemistry classrooms with the "real world" regardless of how well designed lab experiments are. However, research is by far one of the most effective methods due to the direct relevance that research has with both the "real world" and science courses.

The goal of our project is to determine the distribution, quantity, and stability of Iodine in the brine waters of central and western Oklahoma. The student interns will focus on analyzing brine water field samples from a variety of oil companies for iodine concentration, and monitoring the stability and seasonal dependence of iodine concentrations. Through this research we will also be mapping Iodine concentrations with respect to various brine reservoirs and relating them to core samples from these formations, which may lead to a better understanding of why the significant Iodine deposits occur where they do. The mapping of additional sites may lead to new production sites, and additional Iodine plants. The interns will also be investigating methods to recycle chloroform that has been used during sample analysis. Since 2013 Iofina has built six Iodine plants (the last one was built February 2018) and has hired over 13 NWOSU science students as employees. With additional production of Iodine due to the findings of this project, Oklahoma will be producing a higher percentage of the world's Iodine, which may lead to additional Iodine plants, and an improved local and state economy.

Our partnership is based on a three-fold mechanism that will inspire students to become future scientists. The first mechanism is that students will relate the classroom teachings to the "real world". The second mechanism is the mentoring is not only by the PI, but also by the Iofina's geologist, giving students firsthand knowledge of how industrial research affects commercialization. The third mechanism is the students' involvement in the scientific and local communities. Students will present their findings at regional/national research conferences, and to the regional communities of NW OK. This will give them experience in organizing their results, writing and presenting their findings in a scientific format. This exposes them to a wealth of knowledge that may open avenues and options that they did not even know existed.

TCC and XWorks: Student Intern Partnership program

Dr. Thomas Henderson, Tulsa Community College with XWorks Technologies, LLC

This process through the OCAST program will help identify manufacturing opportunities in the engineering and science fields and facilitate collaboration between two partners: Tulsa Community College (TCC) and XWorks of Tulsa, OK.

The company's growth in Unmanned Arial Vehicles (UAV's) and electronic sensors necessitates more trainable students in the engineering technology fields to take their product to the next level. This engagement will require feedback from XWorks on specific training needs, and TCC will utilize feedback to inform course curriculum and better prepare students to meet industry needs. The results of this student internship partnership program will be positive outcomes in the advancement of UAV's, IR sensors, micro-controllers, and RF telemetry systems for XWorks.

The UNIVERSITY of OKLAHOMA

MICHELIN
A BETTER WAY FORWARD

Engineering internships to improve quality controls within Michelin's North American plant in Ardmore, OK

Dr. Keisha Walters, University of Oklahoma with Michelin North America Inc.

Michelin's product quality is the heart of its success as the leading U.S. tire manufacturer. Product quality depends on the materials, procedures and people involved with production. The proposed effort builds on the intern program Michelin started five years ago and will support two additional engineering undergraduate interns to gain industrial training, implement hands-on engineering problem solving and develop professional skills and contacts, all while improving quality assurance at Michelin's Ardmore, OK plant. The interns will work on two projects, both focused on improving quality performance within the tire production plant.

A chemical engineering intern will design an improved control plan for the measurement systems affecting products, processes, and procedures within the plant's mixing and calendaring shops. This intern will also implement the control improvements and communicate the new processes/procedures plant-wide. The project centers on improved (i) measurement techniques for raw material (e.g. natural rubber, synthetic rubber, oils, resins, carbon black, silica) and final product and (ii) calculations to ensure accurate rubber mix formulations.

A mechanical engineering intern will identify process and manufacturing points where product becomes off-quality, generate a quality database, and train affected users to access and use the database. After identification of root causes for off-quality products, the intern will work with a specialist team on problem resolutions, including consultation with internal groups within Michelin, such as engineering, safety, quality, and production departments. Key process improvements include (i) software-based (e.g. Solid Works, AutoCAD) manufacturing equipment redesign and (ii) material flow and production work methods.

Efforts of these engineering interns will yield significant decreases in the frequency and severity of off-specification product. Outcomes include reduced waste and associated costs, improved efficiencies, and a stronger position for the Ardmore plant to continue being Michelin's largest production facility in North America and a major employer in Oklahoma. Successful interns are offered subsequent internships (if they are not yet graduated) and permanent positions after graduation. Michelin's Ardmore plant currently has seven young engineers employed full-time as a result of this intern program—an opportunity to keep Oklahoma engineering students employed in Oklahoma.

The UNIVERSITY of OKLAHOMA

Silver Star Construction Co., Inc.

Implementation of innovative technologies for improved performance and service life of asphalt pavements

Dr. Musharraf Zaman, University of Oklahoma with Silver Star Construction Company, Inc.

Surface transportation infrastructure is an important and integral part of Oklahoma's economy, its growth, and prosperity. In 2017 Oklahoma motorists spent $1.9 billion annually in extra vehicle repair and operating costs because of poor pavements. In the recent ASCE report, Oklahoma pavements received a grade of D, meaning the infrastructure is in poor to fair condition, with many elements approaching the end of service life. Equally alarming is our transportation workforce development and learning needs.

The OCAST Student Intern Partnership program provides an excellent opportunity for students to engage in advancing and implementing innovative and cost-effective technologies that are expected to save millions of dollars through better performing and longer lasting pavements.

In the proposed project, four interns (preferably two undergraduate and two graduate students, divided equally between Year 1 and Year 2) will be involved in advancing and implementing innovative technologies in Oklahoma for improved performance and service life of asphalt pavements.

In Topic 1 (Intelligent Compaction or IC), the interns will develop correlations between ICMV (intelligent compaction machine value) and commonly used compaction quality indicators (density, air voids). No such correlations are currently available, making the use of ICMV difficult and subjective in real-time monitoring of construction quality.

In Topic 2 (Balanced Mix Design or BMD) the interns will enhance the implementation of BMD in Oklahoma through incorporation of reclaimed asphalt pavement (RAP) in asphalt mixes, using the actual performance grade (PG) of the blended binders. Both of these topics are of regional and national significance.

The interns will be working with two local award-winning companies in pursuing these innovations. The knowledge and experience gained by the interns will motivate them to pursue advanced studies and seek gainful careers in transportation. The proposed project will significantly collaboration between OU and two Oklahoma companies, and OU's internship program sustainable. In view of these and other impacts, both of these companies will provide cash match for this project.

The UNIVERSITY of OKLAHOMA

IMMY

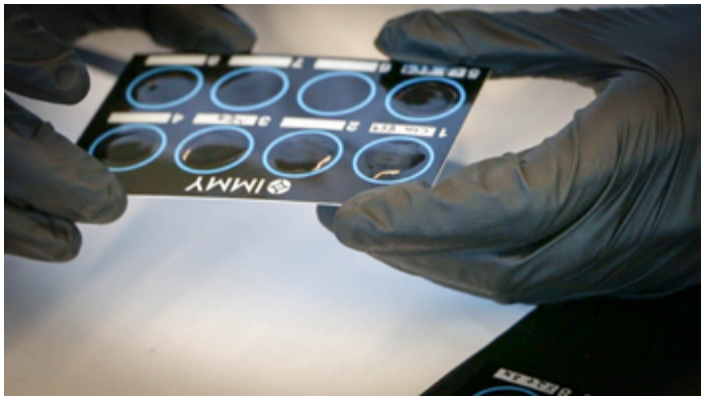
Low-cost disposable point of care interferon gamma release assay

Dr. Marc Christopher Moore, University of Oklahoma with IMMY, Inc.

The objective of this application is to hire an intern who will successfully develop an improved, high-sensitivity, low-cost, portable interferon-gamma release assay (IGRA) that can aid in diagnosing Mycobacerium tuberculosis (TB) infection.

IGRAs, including QuantiFERON-TB Gold In Tube (Cellestis, Carnegie, Australia) and T-SPOT. TB (Oxford Immunotec, Oxfordshire, UK), are immunological tests that are widely used to detect latent tuberculosis infection (LTBI) in high-income settings. IGRAs have higher specificity than tuberculin skin testing (TST), are less likely than TSTs to cross-react with the Bacille Calmette-Guerin (BCG) vaccine.

However, in 2011 the World Health Organization (WHO) issued a statement advising against the use does of IGRAs as a replacement for TST because IGRAs are more costly and complex than TST, in addition current tests cannot accurately predict the risk of an infected individual developing active TB disease.



Our intern will develop a novel, low-cost IGRA lab-on-a-chip device that is able to simultaneously measure and compare interferon gamma (IFN-g) concentrations in three separate chambers or wells containing whole blood from the patient. The three wells will consist of a negative control well to provide a baseline concentration of IFN-g, a positive control well containing mitogen to induce production of IFN-g, and a test well consisting of the target antigens of interest.

Wells coated with capture reagents will induce a change in the conductivity of the sample in the presence of IFN-g coupled with some simple circuitry to compare the wells in real-time and deliver a signal through an LED output or similar mechanism. The final device will meet the World Health Organization (WHO) A.S.S.U.R.E.D. Criteria for resource limited countries and environments.

Namely, the device should be Affordable, Sensitive, Specific, User-friendly, Robust and rapid, Equipment Free, and Deliverable to end-users.

The proposed Specific Aims of this project are as follows: 1) Develop and prototype a generic lab-on-a-chip electrochemical sensor system using readily available antibody-antigen binding pairs., 2) Apply IFN-g specific binding reagents and related reagents capable of generating an electrochemical signal in our generic lab-on-chip device, and 3) Convert prototype design to mass production design, with consideration for value engineering and cost reduction.

Applications of data analytics in simulation industry

Dr. Kaveh Ashenayi, University of Tulsa with CymSTAR, LLC

CymStar, LLC (CYM) is an Oklahoma company headquartered in Broken Arrow (BA), Oklahoma. In 2003, CYM was formed as a Historically Underutilized Business (HUB) Zone Certified and a Service Disabled Veteran Owned Small Business specializing in engineering and systems integration with new development and modification of virtual and constructive training devices for all branches of the United States military. CYM's core in-house engineering capability consists of approximately 100 highly skilled personnel housed in their corporate and manufacturing facilities in Tulsa and BA. CYM intends to utilize two interns for two different projects. The first project will focus on software interface design as it applies to USAF C-5 Aircraft Flight Simulators. The primary problem to be solved is the specific software interfaces between computer systems in a flight simulation system.

As the company has grown, the systems used to conduct business administration have not kept pace. The current tools (new business forecasting, time account, manpower allocation and accounting) rely on a mix of excel spreadsheets and disparate databases. Often a given value is entered multiple times into different applications in order to meet all information needs of CYM. As the firm continues to grow, this mode of operation will become untenable. The ultimate goal of the second project is to work on a more integrated custom enterprise management system, moving from the current state to the desired future state.

Interns will work full time during the summer months and part time (10 hours/week) during the regular academic year. The students will become familiar with different applicable standards and development environment that are used at CYM. Interns will be involved with problem solving and debugging code. Practical programming and design skills developed by the student intern working on a real project with experienced programmers will better prepare the intern for joining the workforce upon graduation.

Contract organization (TU) will benefit by the opportunity to enhance their student's education by gaining access to real life engineering projects. In addition, the working relation between CYM and TU can be expanded to include future internship programs and/or research projects. State of Oklahoma will benefit as this collaboration between two Oklahoma based entities (TU and CYM) could potentially create/increase educational, employment and economic opportunities in Oklahoma.

Building an Enterprise Resource Planning (ERP) System and SolidWorks Finite Element Analysis (FEA) of tools for tank head manufacturing

Dr. Peter Hawrylak, University of Tulsa with Prescor, LLC

Prescor manufactures tank heads, primarily for propane tanks. At their facilities in Tulsa, Oklahoma, their hydraulic presses hot form steel discs into tank heads up to 8 feet in diameter, of thickness from 1/4" to 6". The discs are cut first from large plates of steel into precise circles, and then placed in furnaces and heated above 1650 degrees Fahrenheit. Then, the discs are moved to a press where they are formed to specifications. Following cooling and any required heat-treat, all heads are properly cleaned, and the edges are prepared to provide an ideal welding surface.

Prescor is expanding its operations and needs to move to an ERP system and expand its engineering staff to support this expansion. This internship will assist Prescor with building the nucleus of their engineering team. The two overarching goals of the internship is to (1) deploy an ERP system for their operations and populate it with the necessary data, and (2) to construct FEA models of tooling heads to model their wear and tear to determine when to replace them. Currently, they do not have an ERP system and this is limiting their expansion capabilities, and the FEA models will help them to reduce expenses by replacing tooling heads when needed and not before.

Design and development of aircraft components

Dr. Surendra Singh, University of Tulsa with American Airlines

The student intern will be involved in the design of new maintenance docks for aero optimization and the design and installation to handle combustible dust. Both of these projects will require the intern to use technical concepts from electrical and mechanical engineering disciplines. The intern will need to coordinate this work with multiple teams, thereby, developing much needed interpersonal skills.

One undergraduate student from The University of Tulsa (TU) will work full time during summer and part time during the school year. The intern will work under the guidance of two experienced mentors. The intern will have an opportunity to work in American's world class engineering facility. The intern will interact with engineering as well as business professionals. The intern will learn workplace ethics and expectations.

The report writing and presentations are one of the key components of this internship program. The intern will write monthly progress reports and make presentations before their peers and in local technical conferences. The intern will be provided format for the reports as well as regular feedback on their written reports.

The intern will have opportunity to attend local trade shows and technical conferences to broaden their view of the industry. This will provide them with valuable experience in sales and marketing aspects of the business. The experience gained will provide the interns with job opportunities in the aircraft industries in Oklahoma and the nation.

The internship program will serve as a recruiting tool to attract students to the University of Tulsa. The internships provide a unique opportunity for the students to complement their educational experience. Lectures and demonstrations of the systems by the mentors in the classroom and student meetings will help other students to see practical applications in the real world. This will enhance the undergraduate engineering curriculum.

This program will help American in the recruitment of local engineering talent. The experience gained by the intern as part of this project will enhance their engineering skills and make them potential employees for the company. American hired a previous intern who graduated in 2016. The success of this program will allow American to set up a self funded intern program. American expects to be awarded contracts for maintenance of newer aircrafts that will provide job opportunities for additional engineers and technicians in Oklahoma.

Design and development of composite pressure vessels

Dr. Surendra Singh, University of Tulsa with Infinite Composites Technologies

The student interns will participate in the design and development of a System for Monitoring Applications of Real-Time (SMART) gas storage that uses embedded sensors, a secure identification system, and data collection for pressure vessels in aerospace and transportation markets.

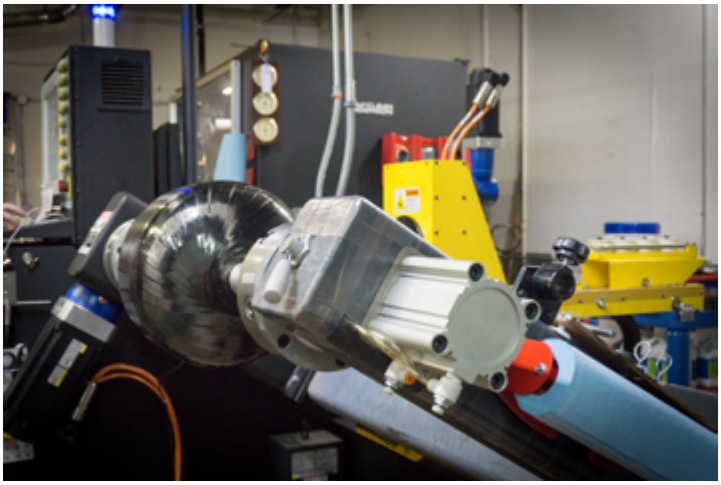
Two undergraduate students from The University of Tulsa (TU) will work full time during summer and part time during the school year. The interns will work under the guidance of two research mentors. The interns will be involved in the engineering design, specifications, development, testing, and manufacturing phases. The interns will learn to utilize 3-D mechanical modeling tools (Autodesk and Catia). They will also be introduced to the business aspects of engineering, such as the benefit-cost analysis.

The interns will learn workplace ethics and expectations. The report writing and presentations are one of the key components of this internship program. The interns will write monthly progress reports and make presentations before their peers and in regional technical conferences. The interns will be provided format for the reports as well as regular feedback on their written reports.

The interns will have opportunity to attend local trade shows and technical conferences to broaden their view of the industry. This will provide them with valuable experience in sales and marketing aspects of the business. The experience gained will provide the interns with job opportunities in the aerospace and transportation industries in Oklahoma and across the nation.

The internship program will serve as a recruiting tool to attract students to the engineering programs at The University of Tulsa. The internship provides a unique opportunity for the students to complement their educational experience with industrial experience. Lectures by the mentors in the classroom and at student meetings will help other students to see practical applications in the real world. This will enhance the undergraduate engineering curriculum and also help in developing a unique partnership with the local aerospace company.

This program will help ICT in recruiting local engineering talent. The experience gained by the interns as part of this project will enhance their engineering skills and make them potential employees for the company. The innovations in ICT's product line will help in increasing the company's revenue base and hence create job opportunities for engineers and technicians in Oklahoma.



Development of analytical methods for Marshall Brewery

Keith Symcox, University of Tulsa with Marshall Brewing Company

We propose to continue a productive internship program between Marshall Brewing Company (MBC) of Tulsa, OK and the University of Tulsa (TU). The brewing industry in Oklahoma had a $504 million dollar impact on the state economy in 2017. This impact is accelerating due to the changes in beverage laws after the passage of SQ 792.

Tulsa alone has seen a 7 fold increase in the number of breweries in the last 5 years, with a concomitant need for trained workers in the industry. One of the oldest and largest breweries in Tulsa is the Marshall Brewing Company. Since the start of the internship partnership in 2016, MBC has raised its output by approximately 15% yearly.

Currently producing roughly 8000 Bbl of product per year, the company believes that a threefold expansion to over 20,000 Bbl/yr is within the capabilities of the company. To do this, they will have to continue to implement quality control systems (QC) that allow them to tightly control batch to batch consistency.

With the assistance of prior interns and the experience that this has allowed the brewery to gain, MBC has created space for a formal QC lab. This internship will allow MBC to keep on board the skills necessary to run a quality control section and research new analytical methods to improve the efficiency of their production decisions while ramping up production.

Additionally, MBC allows the interns to research new methodologies that are currently not in use at the brewery during the summer in conjunction with the TU Chemistry department. These newly trained staff will be able to apply new and novel analytical techniques to the brewing process, resulting in better beer and an increased market share for their product.

This internship allows the intern to be on the ground floor of this exciting opportunity in an expanding industry, providing an extremely valuable work experience for the student and providing exceptional value to the state.

Future years of the internship will allow for the intern and company to work together to design new beers and new techniques to enhance the brewery operations.

XPLOSAFE
TECHNOLOGIES FOR A SAFER WORLD

Assist in the commercial scale production and fulfillment of XploSafe's XCel+ vapor sampling badges and XploTrain – explosive training / testing aids

Dr. Michael Teicheira, XploSafe, LLC

This student intern partnership project will support the employment of two promising undergraduate/ graduate student intern positions over the next two years. It will facilitate an opportunity for the interns to engage in applied research objectives focused on establishing and executing the synthesis and commercial-scale production of OSU-6 mesoporous silica and its two derivative product lines: a line of wearable dosimeter badges for passive occupational exposure monitoring, and a line of nondetonable, explosives-loaded training-aids for explosives-detecting canines employed in military, law enforcement, and homeland security roles.

The overall technical objectives, tasks, and milestones have been planned to advance the technology from the current pilot-scale batch production up to full commercial scale fulfillment in order to support the growth in market demand by the end of the intern-funding period.

The interns will play an active role in assisting the core product development team in expanding production capabilities and completion of tasks necessary for commercial full-scale production and fulfillment. The interns will gain exposure to chemical synthesis, reactor design, production line planning, synthesis optimization, and analytical characterization of mesoporous silica-based, high surface area adsorbents.

Paramount to these efforts will be the goal to train undergraduate and graduate students in research and development projects so that they could become future employees at XploSafe. XploSafe is committed to the economic development and the creation of high-paying jobs employing electrical engineers, chemical engineers, electronics technicians, chemists, and materials scientists in the State of Oklahoma.

XPLOSAFE
TECHNOLOGIES FOR A SAFER WORLD

Commercial scale production of XploSafe's new biodegradable sorbents for consumer, industrial and municipal water treatment

Dr. Michael Teicheira, XploSafe, LLC

This student intern partnership project will support the employment of two promising undergraduate/ graduate student intern positions over the next two years. It will facilitate an opportunity for the interns to engage in applied research objectives focused on establishing and executing the synthesis and commercial scale production of a new class of biodegradable sorbents for water treatment.

The overall technical objectives, tasks, and milestones have been planned to advance the technology from the current small-scale batch production to full-scale commercialization to meet the market needs by end of the intern-funding period.

The interns will play an active role in assisting the core product development team in expanding production capabilities and resources for successful technology transition. The interns will gain exposure to chemical synthesis, reactor design, and characterization of various physical properties for batches of produced sorbent media beads.

Paramount to these efforts will be the goal to train undergraduate and graduate students in research and development projects so that they could become future employees at XploSafe.

XploSafe is committed to the economic development and the creation of high-paying jobs employing electrical engineers, chemical engineers, electronics technicians, chemists, and materials scientists in the State of Oklahoma. The interns will play an essential role in technology transition and commercialization of XploSafe's novel nutrient-removal media for wastewater treatment.

INTERN PARTNERSHIPS

What is Intern?

The Intern Partnerships (Intern) program helps retain Oklahoma's best and brightest students by matching undergraduate students with an Oklahoma company to complete an innovative project together which benefits the student and company. To foster a successful project outcome, the Oklahoma Center for the Advancement of Science and Technology (OCAST) provides matching funding for a skilled student to support the pursuit of high tech research.

- Businesses gain access to funding for a skilled intern to help accomplish R&D
- Provides students with hands-on experience, outside of the classroom
- Develops Oklahoma's next generation of scientists and engineers
- Encourages industry-university collaboration
- Encourages students to prepare for STEM careers in Oklahoma

"It's given people a chance to see my value to a company, or to a graduate program, outside of my GPA."
***Adam Polcha** - Intern, MIRATECH*

Why Intern?

The Intern program provides up to $30,000 a year to Oklahoma businesses interested in pursuing innovative R&D projects and teaming with an undergraduate student who helps accomplish project goals. The program grants students hands-on experience with R&D in a business environment while increasing collaboration between industry and academia to achieve mutually beneficial research goals.

Funding Opportunity

$10,000 minimum per year
$30,000 maximum per year
1-2 years of funding
(Requires a one-to-one match)

"The OCAST Intern program gives us an opportunity basically for an extended job interview."
***Sean Bauman** - CEO, IMMY*

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