

POLLUTION PREVENTION SERVICES 1990-2020

Thirty years of working together to achieve economic and environmental results



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INTRODUCTION

2020 has been a year to remember for all of us. Here at the DNR, 2020 marks the 30th Anniversary of our Pollution Prevention Services (P2S) program! Yes, we are celebrating three decades of providing confidential, non-regulatory assistance to business and industry.

Iowa businesses working with P2S to implement projects have saved, collectively, more than $109 million dollars and made them better stewards of their environment. Companies have taken major steps to reduce energy usage, water consumption, waste generation, CO2 emissions, and operating expenses.

As you will note in the timeline later in this document, 2020 also marks 20 years of our very successful Pollution Prevention Intern Program (PPIP). We invite you to join with us in celebrating twenty years of this unique partnership of business, academia, and government working together to achieve economic and environmental results.

This document highlights the power of this teamwork and achievements that we, as Iowans, can all celebrate. In this special anniversary document, you will find:

- Examples of the diversity of projects our interns have completed at Iowa companies,
- How are interns impacted by a P2 Internship? A sample of the diversity of career paths these talented individuals have taken,
- Testimonials from past interns and host company partners, and
- Statistics from the last 20 years of the PPIP.

As part of our celebration, we want to offer a huge THANK YOU to the 337 interns and 190 companies that have been a part of the Iowa Pollution Prevention Intern Program. Your commitment to environmental sustainability directly contributes to our DNR mission of improving the quality of life in Iowa and ensuring a legacy for future generations. And, we want to acknowledge the seven companies and interns that were selected for 2020. Due to the *novel coronavirus* the P2 Intern Program was temporarily suspended for the safety of the interns, companies, and their families.

Thank you also to the Iowa Department of Natural Resources for thirty years of program support, and to the U.S. Environmental Protection Agency, the U.S. Department of Energy, and U.S. Department of Agriculture for additional financial support through competitive grants.

With some modifications, the Iowa P2 Intern Program will be operating in 2021. We look forward to another thirty years of successful service to Iowa, partnering with industries and interns to achieve a clean and productive environment for generations to come.

Once again, for everyone's participation, support, and assistance we thank you! We could not have done this without any of you!

WHAT IS POLLUTION PREVENTION (P2)?

Pollution Prevention (P2) was created by Congress in 1990. The P2 Act focused public attention on reducing the amount of pollution in our air, water, and soil. Government implemented policies to effect change. Business, industry, and individuals started making cost-effective changes in production, operations, raw materials use, and waste management to reduce the pollution being generated and become better stewards of their environment.

P2 is the **reduction** or **elimination** of wastes at the **source** (source reduction) or a beginning of a process, instead of at the end-of-the-pipe or stack. So when employing P2 you are looking at the entire process to identify how and where the waste is generated and find ways to more efficiently use your resources. When applying P2 methods, you are also looking at ways to reduce or eliminate hazardous materials.

Seven P2 strategies that categorize most improvements include:

- Input substitution
- Equipment modifications
- Process modifications
- Product reformulation
- Raw material use & handling
- Material tracking & inventory control
- Improved housekeeping & maintenance

When using one or more of these P2 strategies to implement an environmental project you can almost always save your facility money. The project summaries in this document provide an example of how companies can implement environmental projects and at the same time save money.

Iowa's award-winning P2 Intern Program has a number of features that set it apart from other intern programs.

A thorough project development process, an in-depth training before the interns arrive onsite, and a comprehensive report package for the companies are just a few of these features. One specific key to the success of the program are the engineering advisors who partner with each P2 intern and their host company to provide direction and resources to keep the intern on track and focused on the project objective. The advisors also provide on-going follow up and support to host companies after the intern leaves to track and assist with implementation.

With the suspension of the P2 Intern Program in 2020 due to the COVID-19 virus, the P2 Services team refocused their time and energy into a couple of long-term team projects. A good share of their summer was spent on communication with previous host companies to follow up on the implementation status of past projects, provide project support, and identify current resource needs.

The pursuit of environmental excellence by Iowa companies has not stopped with the current challenges. In fact, it is more important than ever for companies to provide a safe and healthy environment for their employees while creating innovative ways to improve efficiency. The environmental improvement metrics and financial savings demonstrate what can be accomplished when we work together toward a common goal. With the partnership of industry, academia, and government we have been able to make this happen.

REPORTED IMPLEMENTED SAVINGS 2001-2020

CATEGORY	REDUCTION	UNITS	COST SAVINGS
WATER	5,595,981,164	GAL	14,913,247
SPECIAL WASTE	76,925	TONS	1,168,340
SOLID WASTE	179,004	TONS	17,117,742
HAZARDOUS WASTE	9,965	TONS	18,485,718
MERCURY ABATED	42,817	GRAMS	
ENERGY	498,143,049	KWH	28,289,669
	2,838,622	MMBTU*	
	20,762,626	THERMS	15,391,891
OTHER			14,017,476
TOTAL			**109,384,083**

*MMBTUs are calculated from kwh and therms for special reporting only. Dollar savings are reported under khw and therms as generated.

CONVENTIONAL AIR POLLUTANTS & GREENHOUSE GASES DIVERTED IN METRIC TONS

Total for all Sectors	
NH3	10.75
NOx	645.60
PM10	107.24
PM2.5	71.25
SO2	1,173.37
VOC	121.91
CO2	298,125.52
CH4	72,686.20
N2O	3,788.20
CFC	2,042.08
MTCO2e	385,502.62

- Air emissions and greenhouse gases shown here are life cycle estimates and include external activities such as purchasing utilities. Totals do not solely represent emissions generated at the plant sites.
- Greenhouse gas estimated for solid waste reduction projects are derived from U.S. EPA, Waste Reduction Model (WARM), Version 15, available at: www.epa.gov/warm.
- Life Cycle air emissions and greenhouse gas estimates for all sectors except solid waste are calculated using Carnegie Mellon University Green Design Institute, Economic Input-Output Life Cycle Assessment (EIO-LCA), US 2002 Industry Benchmark model [Internet], available from: www.eiolca.net.

POLLUTION PREVENTION SERVICES

We are celebrating three decades of providing confidential, non-regulatory assistance to business and industry. We serve Iowa business and industry through the following:

Opportunity & Focused Assessments

A brief site visit to identify opportunities or an in-depth analysis of a single media or process within a facility providing specific recommendations with data to make cost effective decisions.

Technical Assistance Support

Support is available to answer specific questions whether in person, on the phone or in email.

P2 Resource Library & P2 Infohouse

Our electronic reference library and searchable database of P2 best practices and new technologies is available for continued resource conservation and impact reduction.

Environmental Management Systems Assistance (EMS)

An EMS is an organized formal approach to managing environmental issues. We can assist in implementing your EMS.

Workshops

Workshop, webinars and training events offer companies an opportunity to exchange ideas, transfer best management practices and new technologies, and discover innovative source reduction ideas and strategies.

Pollution Prevention Intern Program

Companies submit project requests to obtain an upper-level undergraduate or graduate student to identify, evaluate and implement P2 projects in their facilities.

Iowa businesses working with P2S to implement projects have saved, collectively, more than $109 million dollars and made them better stewards of their environment. Companies have taken major steps to reduce energy usage, water consumption, waste generation, CO2 emissions, and operating expenses.

COMPRESSED AIR SYSTEMS

Compressed air is commonly seen as a 'fourth utility' and costs companies more than they realize. P2 interns conduct a full compressed air system analysis to create a baseline of energy usage. Interns are able to set up and utilize monitoring equipment over multiple weeks to gather robust data and document trends across changing demand conditions. The baseline analysis includes the supply and demand sides of the system to determine areas of improvement and greatest cost savings. Common recommendations for compressed air systems include leak detection and repair, preventive maintenance programs, end use equipment specifications, appropriate nozzles, moisture reduction, analyzing demand side storage, and evaluating compressor size and staging to optimize load efficiency.

Dubuque, IA | 2012

Eagle Window and Door

Eagle Window and Door is an Andersen Corporation company with two locations in Dubuque, Iowa. Eagle specializes in manufacturing aluminum clad wood windows and doors for high-end residential and commercial applications. In 2012, Eagle recognized an opportunity to reduce electrical costs associated with their compressed air system. Additionally, oil present in the air lines was resulting in considerable scrap and lost labor costs. Eagle submitted a project request for an intern through the P2 Intern Program.

> "THE P2 INTERN RECOMMENDED THE INSTALLATION OF A MIST ELIMINATING FILTER TO FILTER OUT THE OIL FROM THE COMPRESSED AIR LINES."

At the time of the intern project, oil in the air lines was contributing to about a quarter of the scrap generated. Ideally, 0.01 PPM of oil should be present in the air lines; inzstead, oil levels exceeded 1.37 PPM. The P2 intern recommended the installation of a mist eliminating filter to filter out the oil from the compressed air lines. The company acted on this recommendation and installed the filter immediately. Purging or replacing the lines was further recommended to optimize the performance of the new filter. The savings analysis provided to Eagle on this project proved accurate, as installation of the mist eliminator reduced energy usage by more than 40,000 kWh and saved the company $60,000 annually.

Marshalltown, IA | 2015

JBS USA, Marshalltown

JBS USA, LLC in Marshalltown, Iowa, is a large pork processing facility providing fresh quality pork products to international and domestic customers. JBS Marshalltown is continually innovating to improve their process and in 2015 they partnered with P2 Services to improve the efficiency of their 12 compressed air systems. Compressed air accounts for approximately 11 percent of JBS' total electrical usage. Optimizing the operating efficiency of the compressed air systems is critical to meeting production demands.

Maintaining sufficient storage helps to smooth the peaks in demand and creates a more stable compressed air supply. Large amounts of air were being used during the sanitation process, which placed strain on the compressors and reduced air supply for production start-up. Additionally, JBS had recently added another production line, which increased the plant's overall demand for compressed air. The intern recommended replacing the current air nozzles with high-efficiency nozzles to produce a higher velocity and utilize less air. Larger air receivers coupled with a flow control valve could improve system performance. The intern's research and recommendations provided JBS with a depth of data to make system improvements and generate significant cost savings.

"JBS IS ACHIEVING MORE THAN

$75,000 AND 1.3 MILLION KWH

SAVINGS ANNUALLY."

In the five years since this intern was onsite, JBS has seen significant savings from his project. The air nozzles used in Sanitation have been analyzed and alternative nozzles are in use. JBS has also since increased the amount of storage plant-wide to reduce peak demand and has seen significant savings. With the implementation of these two recommendations alone, JBS is achieving more than $75,000 and 1.3 million kWh savings annually. JBS continues to embrace projects that optimize the efficiency of their systems and have continued to partner with P2 Services over the past 5 years.

FACTOID:

ACCORDING TO THE U.S. DEPARTMENT OF ENERGY WEBSITE[1], LEAKS ARE A SIGNIFICANT SOURCE OF LOST ENERGY IN A COMPRESSED AIR SYSTEM, OFTEN WASTING AS MUCH AS 20 TO 30 PERCENT OF THE COMPRESSOR'S OUTPUT.

BOILERS & STEAM

Boilers and steam distribution systems are typically the largest natural gas consumer in a facility, fulfilling critical roles in processes and buildings. They provide process heating, building comfort, and other direct steam applications. Main system components include the boiler, deaerator, piping, and steam traps. Operating a steam system efficiently can reduce water, heat, and costly repairs. P2 interns assess boiler performance, quantify how much steam is being generated and how it is used in the facility. Common projects address boiler efficiency, heat recovery, repairing steam leaks and malfunctioning traps, preventative maintenance plans, optimizing condensate return, insulating system components, and minimizing the amount of steam needed to create process heat.

Woodward, IA | 2017

Woodward Resource Center (WRC)

Woodward Resource Center (WRC) is operated by the Iowa Department of Human Services and serves as an intermediate care facility for the Intellectually Disabled. The facility uses a steam heating system for 19 buildings on the WRC campus. WRC utilizes two water-tube boilers, each 50 years old, that burn natural gas to produce steam. The steam is then delivered to the 475,000 square feet of building space through a utility tunnel system that is more than 1.5 miles long.

In 2017, WRC employed a P2 intern for 24 weeks to assess the efficiency of the boiler and steam system. While onsite, the P2 intern established a baseline to facilitate the savings estimates of the recommendations to improve the efficiency of the steam system. Recommendations included repair or replacement of failed steam traps, insulation of piping and components of the steam system and a preventative maintenance program of all components to maintain optimum efficiency.

Since the intern project, WRC has implemented the recommendations with regards to the efficiency of the steam system. As steam traps have failed, WRC has been replacing them with new traps and keeping up to date with the preventative maintenance program put in place. Wet or damaged insulation has also been replaced, and new insulation has been installed, where needed. The combination of these recommendations has saved WRC more than $400,000, 350,000 therms, and 3.6 million gallons of water annually. WRC has embraced the preventative maintenance programs Ethan recommended and is continually seeking other opportunities to improve their environmental performance.

Nevada, IA | 2010

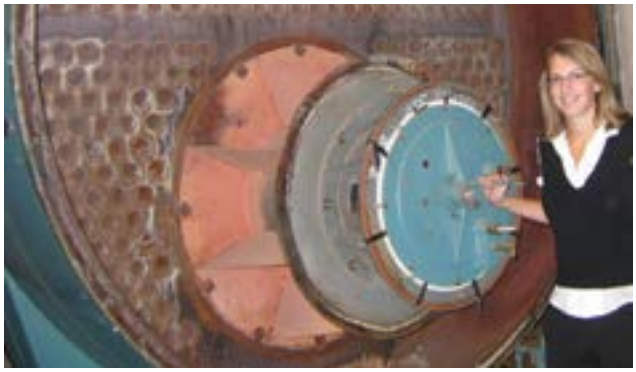
Burke Corporation

Burke Corporation, a subsidiary of Hormel Foods, produces pre-cooked pizza toppings at their facility in Nevada, Iowa. In 2010, the company partnered with P2 Services to evaluate opportunities to reduce natural gas usage at the plant. Steam is used for a variety of processes, the main one being the cooking process of the variety of meats. At the time of the project, the boiler and steam distribution system was the largest consumer of natural gas at this facility.

Burke's P2 intern, developed several recommendations that would help reduce natural gas use by the boiler and steam system and generate significant energy savings. Recommendations included reducing steam flow between production batches, insulating system components, and water and heat reuse opportunities, such as adding a boiler economizer to their largest boiler. A boiler economizer utilizes the exhaust heat from the boiler and uses it to preheat the boiler feedwater. This reduces the amount of natural gas needed to further heat the water and turn it into steam.

> **"...THE CONCLUSION OF THE 2010 PROJECT....SAVED THE COMPANY MORE THAN $100,000..."**

After the conclusion of the 2010 project Burke implemented a number of the recommendations, including the installation of a boiler economizer. This reduced natural gas consumption and saved the company more than $100,000 annually. The significant savings achieved by installing the new economizer set the stage for Burke to pursue additional improvements to reduce overall energy consumption. Burke continues to explore new and innovative ways to conserve resources and decrease fixed costs.



Recommendations to improve boiler efficiency at Drake University included: variable frequency drives on fans, variable air flow systems, and dampers with sensors in temperature controlled areas. Projected environmental savings were more than 500,000 kwh, 10,000 therms, and 200 metric tons of CO2e

FACTOID:

ACCORDING TO THE U.S. DEPARTMENT OF ENERGY WEBSITE[1], 15 TO 30 PERCENT OF THE STEAM TRAPS MAY HAVE FAILED IN STEAM SYSTEMS THAT HAVE NOT BEEN MAINTAINED FOR 3-5 YEARS.

HVAC/COOLING

Heating, Ventilation and Air Conditioning (HVAC) systems are tantamount to efficient production operations, quality control, and employee comfort. The systems and equipment used to generate heat and provide cooling and air conditioning include boilers, furnaces, heat pumps & heat exchangers, chillers, cooling towers, air handling units, ventilation and exhaust systems. Temperature changes are achieved through the use of air, water, or other fluids.

P2 interns develop a baseline analysis of a system's heating or cooling load and assess how demand varies based on production or environmental conditions. The information is used to generate recommendations that help to optimize system performance. Typical recommendations include insulation of piping and components, synchronous belts or variable frequency drives, set-point adjustments, control systems, destratification, and heat recovery.

Red Oak, IA | 2013

Clarios

Johnson Controls, now Clarios, in Red Oak, Iowa, specializes in the production of battery grids. With more than 90,000 square feet of building space to maintain, Clarios is consistently seeking ways to increase efficiency in the facility, especially within the process cooling system. Since battery production requires a specific cooling consistency for quality and customer specification purposes, it is imperative that the cooling system operates efficiently. In 2013, Clarios requested a 24-week P2 intern project to evaluate the process cooling system and make recommendations to improve its operating efficiency. Clarios' P2 intern explored the feasibility of implementing free-cooling to reduce operating costs while increasing efficiency. Free cooling technology is a cost saving option that redirects the cooling liquid through dry air coolers that are cooled using outside ambient air.

> "CLARIOS' P2 INTERN EXPLORED THE FEASIBILITY OF IMPLEMENTING FREE-COOLING TO REDUCE OPERATING COSTS WHILE INCREASING EFFICIENTY..."

The new cooling system utilizes a chiller with an added economizer to increase the energy savings. This piece of equipment utilizes the atmospheric temperatures to begin the cooling process of the liquid before going to the compressors. Using a variable drive function, this process gradually allows the compressors to run at lower loads until they eventually shut down and allow free-cooling to handle the whole load. Based on the average winter temperatures, integrating free-cooling technologies will provide significant energy and cost savings.

The intern was able to assist in initiating the implementation of the free cooling system while still onsite during his 24-week internship. Clarios completed installation of the system shortly after the internship concluded. They were able to decrease their payback period further by receiving a rebate for the project through their local utility provider.

Omaha, NE | 2010

Nebraska Medical Center

Nebraska Medical Center (NMC) in Omaha, Nebraska, is known globally as one of the top hospitals for oncology, neurology, cardiology and both organ and bone marrow transplant. The hospital is an acute care health facility with 689 beds and 37 operating rooms. In 2010, NMC hosted an Iowa P2 intern as part of a regional hospital assistance partnership, to analyze metering data for use in prioritizing energy reduction projects and development of a corresponding implementation schedule.

One of the more significant recommendations stemming from the P2 intern's work involved optimizing energy demand of the hospital's surgical suites. In order for NMC to be in constant readiness for the intense demands of surgical procedures, devoted air handling units and electrical loads are operated non-stop at full capacity. However, the actual need for this energy varies greatly throughout the day and drops off entirely during nights and weekends. The addition of an HVAC control system for the hospital's surgical suites could accurately dial up or dial down the energy load, which could result in more than $130,000 annual savings.

> **" ONE OF THE MORE SIGNIFICANT RECOMMENDATIONS STEMMING FROM THE P2 INTERN'S WORK INVOLVED OPTIMIZING ENERGY DEMAND OF THE HOSPITAL'S SURGICAL SUITES."**

> **"HOST COMPANIES OF THE P2 INTERN PROGRAM HAVE REDUCED ENERGY USAGE EQUIVALENT IN MMBTUS TO 1,416 RAIL CARS OF COAL.**

After the intern established the utility baseline and implementation schedule, NMC followed the implementation guide the intern had recommended, starting with the HVAC controls. Other recommendations included lighting retrofits, general energy management systems, and temperature control systems, culminating in more than $475,000 in recommended annual savings. NMC implemented nearly all of the intern's recommendations in the years following their partnership with the P2 program and have seen significant improvement in efficiency and savings across their energy systems.

HEAT RECOVERY

Recovering heat from a process or system and reusing it in other areas of a facility can help reduce energy costs by utilizing heat that has already been paid for and produced. Heat recovery can be particularly advantageous during winter months when natural gas usage spikes, and yet it is frequently underutilized. Waste heat can be captured from a variety of sources, including boilers or compressors in the mechanical systems, effluent from a cooling system, or a production heat process or oven.

One challenge of heat recovery projects is calculating exactly how much heat is available and identifying the most beneficial process or location for it to be feasibly reused. Throughout a heat recovery project, a P2 intern can evaluate a production operation and identify processes where heat can be captured and quantify specifically how much is available. After creating a baseline of heat available for recovery, they will calculate the cost and savings of reusing the heat in another application. Recovered heat is commonly used to supplement ovens or cookers, preheat boilers, heat process or sanitation water, or provide ambient heat in buildings.

Cedar Rapids, IA | 2009

Quaker Oats

Quaker Oats operates one of the largest cereal manufacturing facilities in the world, in Cedar Rapids, Iowa. With more than 1.9 million square feet of building space, efficiency in all systems is of the utmost importance to the operations of Quaker Oats. In 2009, Quaker Oats joined with the P2 Intern Program for an intern to evaluate their main energy systems and make recommendations to employ heat recovery methodologies to reduce energy usage.

Flash furnaces heat air to approximately 500 degrees Fahrenheit for cereal processing. At the time of the project, waste heat from the flash furnaces was being exhausted out of the roof, creating a lot of potential for heat recovery projects. The 2009 P2 intern developed a recommendation for rerouting the heat being vented out the roof back to the system to reduce natural gas consumption and utilize the waste heat in an efficient way. Quaker Oats implemented the intern's recommendation to recover the waste heat and use it to preheat air going into the flash furnace system. The company achieved a significant reduction in natural gas and confirmed annual savings of more than $45,000 from this one recommendation. Quaker Oats also implemented other recommendations from the intern's project and continues to seek opportunities to improve environmental performance.

West Burlington, IA | 2014

Shearer's Foods, Inc.

Shearer's Foods, Inc. in West Burlington, Iowa, manufactures private-branded saltine crackers, wire-cut cookies and sandwich cookies. On each of the ten production lines, an oven bakes the product to

certain specifications. The estimated rate of energy leaving the facility through the 53 exhaust stacks is 180.5 therms per hour. Capturing this thermal energy could provide opportunities to reduce natural gas usage in other areas of the plant such as heating water and intake air and help achieve a closer air balance in the plant.

Current operations involve rooftop heaters to heat air entering the building, which consume approximately 2.1 percent of the plant's annual natural gas use. With the installation of seven air to air heat exchangers, the facility could use 58,820 therms recovered from flues to warm incoming air. The addition of four air to water economizers would have noteworthy economic and environmental impacts for the West Burlington plant. These air to water systems could heat water using the thermal energy currently leaving the facility via exhaust stacks.

While this heat recovery project has great savings potential and a viable return on investment, implementation would require the production ovens to be down for an extended period of time, which adds a significant amount to the cost of implementation. This project is on hold until a time that it becomes logistically feasible. In the meantime, the intern's research and report, led to additional analysis and efficiency improvements to the ovens that have realized savings, including burner replacement and further combustion analysis to optimize exhaust stacks.

> **"THIS WAS A GOOD EXPERIENCE THAT IS WORTHY OF CONTINUATION TO ACHIEVE A CLEAN-AIR ENVIRONMENT. IT IS A VERY GOOD PROGRAM THAT YIELDS GOOD RESULTS."**
>
> -Ugo Mgbike, 2014 Site Coordinator at Shearer's Foods, Inc.

The 2012 P2 Intern at Infastech Decorah, LLC, now Stanley Engineered Fasteners, designed an Organic Rankine Cycle to facilitate recovery of lost heat from the plant's three heat treatment furnaces.

WATER REDUCTION

Increasing water costs, and an increased awareness of the true cost of water, factoring in energy and pre- and post-treatment costs, have helped to bring water use reduction and optimization to the forefront of environmental goals. Many facilities have clear knowledge of how much water their operation uses in total, but many processes are not sub-metered so companies may not have process-specific usage data.

P2 interns create a water use profile for a process or an entire facility using available data, engineering analysis, and monitoring equipment provided to them by P2 Services. The students can turn that profile into a long term tracking tool, allowing companies to continually monitor usage. Additionally, interns are able to use the profile to zero in on areas of greatest opportunity to reduce water usage and develop detailed optimization recommendations. Common areas of opportunity addressed by interns include: leak repair and condensate return in steam systems, make-up water in mechanical systems, review of process or equipment specifications, sanitation process efficiencies, closed-loop cooling, sensors, timers and flow controls, and exploring potential reuse applications.

West Libery, IA | 2012

West Liberty Foods, LLC

West Liberty Foods, founded in 1997 by the Iowa Turkey Growers Cooperative, harvests and processes turkeys into all types of cooked, processed, and ready-to-eat meat products. In 2012, the West Liberty, Iowa, facility partnered with the P2 intern program to track water flow and usage throughout the facility, and examine possible reduction and reuse opportunities.

The P2 intern, conducted a water balance analysis and developed a number of recommendations to reduce water usage in the production processes. Spray head replacements for a screen wash on the tumble filter in the offal room could minimize manual washing. "Best practice" process changes were recommended, such as turning off fresh water cooling pumps during idle production hours and eliminating an excess potable water supply to the picker wash. Water reuse opportunities were identified such as recapture of overflow water from the scalder and chiller. The intern established a weekly water audit and repair plan for the facility

to quickly recognize inefficiencies and provide on-going savings. All together the intern projected an annual reduction of 23.49 million gallons of water and $167,459 in cost savings for the company.

Less than two years later, all of the intern's recommendations had been implemented or were in process of being completed. West Liberty Foods reported the savings figures the intern had projected were on par with the achieved results. As an environmental leader in their industry, West Liberty Foods is committed to preserving natural resources and utilizing assistance partnerships like the Iowa P2 program to aid them in advancing their environmental goals.

Ottumwa, IA | 2018

JBS Swift Pork - Ottumwa

In 2018, JBS Swift Pork in Ottumwa, Iowa, pursued a water reduction project with the P2 intern program. The Ottumwa facility is a large pork production facility that processes more than 19,000 hogs per day. The project was to reduce water usage in process cooling and other water intense production processes to reduce the amount of excess moisture in the raw material entering the facility's onsite rendering operation. After analysis of the process water usage, the P2 intern recommended the implementation of dewatering equipment, such as screens, and procedural changes on the production floor, such as increasing dry pickup efforts prior to power washing.

> "IN THE TWO YEARS SINCE THIS PROJECT, JBS HAS SEEN A CONSIDERABLE AMOUNT OF WATER REDUCTION..."

In the two years since this project, JBS has seen a considerable amount of water reduction as a result of implementing these process changes. The rendering cooker has been able to reduce its daily run time by 10 percent, which also resulted in energy savings. Water savings associated with this project has conservatively reached 25 million gallons per year through the reduction in cooling water demand for the cooker and successful dry pickup efforts. The onsite coordinator stated that the P2 intern project helped set the stage for ongoing water reduction project successes achieved internally after the conclusion of the 2018 internship.

ANNUAL WATER SAVINGS REPORTED BY THESE TWO COMPANIES WOULD FILL THE WATER TOWER ON THE IOWA STATE UNIVERSITY CAMPUS

250 TIMES!

WATER & WASTEWATER TREATMENT

Pollution prevention opportunities tied to water are never strictly limited to process use itself. Many facilities expend significant resources treating water for both pre- and post-treatment. Interns are able to assess water use and quality needs and identify if treatment or filtration may benefit a given process application. They can analyze post-production treatment methods and optimize processes to maximize contaminant removal and minimize resource usage. Applying source reduction methodologies, interns look upstream to identify opportunities to reduce or eliminate the need for treatment or contaminant removal at the end of the process. Water quality projects have included evaluation of treatment systems such as reverse osmosis, skimmers and dissolved air flotation systems, lagoon or aeration systems, and coagulation processes. Other P2 methodologies include substitution of less hazardous treatment chemicals, dry cleaning prior to sanitation, and reduction of effluent loading levels through process modifications.

Des Moines, IA | 2017

Bridgestone Americas Tire Operations

Bridgestone is a global leader of tire manufacturing with a presence in more than 150 countries worldwide. The Des Moines, Iowa, facility produces their Firestone brand tires for industrial and agricultural equipment. In 2017, Bridgestone partnered with the P2 program to identify water conservation measures at the Des Moines plant that would support the company's water reduction goals.

The intern identified a number of water saving measures. Bridgestone's curing system represented a key opportunity for water conservation due to its high usage of steam and hot water. It was discovered that roughly 15 percent of the steam and water from the curing process is overflow water that is relatively clean and maintains a temperature of 140 degrees Fahrenheit. The intern determined

that filtering this hot water through a reverse osmosis (RO) system and reusing it as boiler feed water could have multiple cost-saving benefits. Reuse of hot water from the curing process could reduce the demand for city water and energy to heat the water. This process modification could also reduce boiler blowdown because RO water contains fewer minerals and impurities. With less blowdown, the boilers would require less water and heat input to produce the same amount of steam.

A little over two years after the conclusion of the 2017 project, Bridgestone had completed installation of the RO system and the system was working as designed. The company has also seen a noticeable decrease in chemical treatment costs as a result of the process modification, which was a value-added benefit.

Cedar Rapids, IA | 2015

Cargill, Inc.

Cargill is a privately-owned business that began in 1865 as a grain storage facility. It has grown to be a global producer and marketer of food, agricultural, financial, and industrial products and services. The Cargill facility in Cedar Rapids, Iowa, uses water from wells as a coolant for much of the process machinery. As the coolant flows through the equipment, heat is absorbed and eventually discharges into the river. While the effluent is free of contaminants, the temperature can impact the natural environment. In 2015, Cargill partnered with the P2 intern program to evaluate methods to lower the temperature of the effluent prior to discharge to alleviate the impact of the warmer water on the environment.

Cargill's 24-week P2 intern first catalogued all equipment that was using well water as coolant. Documentation included the proper identifications, location, and pictures of the equipment for ease of distinction and for use in the equipment files. This catalogue of data would also be useful in the maintenance of equipment to ensure that the equipment is operating within its designed parameters. The intern created a flow diagram as well as piping and instrumentation diagrams (P&IDs) to provide a detailed layout of the equipment, valves, sensors, pipe sizes, and flows of the well water. The intern recommended installing flow meters and temperature sensors in key areas to provide a greater understanding of the process impacts of the cooling water flow. The intern then used the compiled data to create a model of the well water system that predicts how the process will change when potential modifications are implemented.

> **"SINCE 2001, WATER CONSERVED FROM P2 INTERNS WOULD FILL 8,473 OLYMPIC SWIMMING POOLS."**

Various technologies were explored for decreasing the effluent water temperature and cooling towers were determined to be the most feasible approach. Process modifications for the installation of cooling towers were detailed and shared with the engineering team. The cooling towers proposed for this project were projected to save the company more than 1.1 billion gallons of water and $1.1 million annually.

In the years following the project's completion, Cargill Cedar Rapids moved forward with purchasing and installing the cooling towers recommended by their P2 intern. Installation was completed approximately two years later in 2017, and company engineering staff were confident in their intern's savings projections.

CHEMICAL & HAZARDOUS MATERIAL REDUCTION

There are a vast number of functions that chemicals serve in industrial processes, including plating, cleaning, rinsing and sanitizing. Chemical uses can be specific to given production applications, raw materials, or targeted end results. Any changes in chemical use can have dramatic impacts. Additionally, there are significant and important regulatory considerations and costs that govern all use and subsequent hazardous waste generation and disposal. Risk reduction is also a primary incentive for reducing the hazardous materials in the workplace. While difficult to quantify real dollar savings of an avoided incident, every company is well aware of the value of reducing risk and maintaining a safe and healthy environment for its employees.

Common project goals for intern projects include assessing opportunities for plant-wide chemical use reduction, dosing optimization, researching and running trials for possible chemical substitution or alternate removal options, and identifying overall hazardous waste reduction strategies. Recommendations have included scheduling of paint lines to reduce color changes, low VOC paints, distillers for solvent recovery, purchasing and management plans to reduce expiration of chemicals or pharmaceuticals, improved segregation of Red Bag Waste, substitutions for toxic chemicals, and alternative treatments for removing contaminates from wastewater such as aeration basins, lagoon systems, or electro-coagulation.

Davenport, IA | 2019

Cobham

Cobham Davenport is a manufacturer of aircraft components and systems for commercial and military aircraft, with headquarters in the United Kingdom. The products manufactured at Cobham Davenport are found in the air, on land, and beneath the sea with technologies that include oxygen systems, fuel tank inerting, aerial refueling, and mechanical systems. In 2019, Cobham partnered with the P2 intern program to investigate potential solutions to reduce solid and hazardous waste streams at the Davenport, Iowa, plant.

Identifying effective, less toxic substitutions to hazardous chemicals offers environmental, health, and safety benefits that are difficult to quantify but are of critical value. In one application, a less hazardous solvent proved viable but is more expensive to purchase. The alternative chemical offers a slower evaporation rate, which is a less toxic air pollutant and reduces the risk of exposure, subsequently generating environmental, health

and safety benefits for employees and the site. In addition, the lower evaporation rate is expected to decrease the quantity used and result in a 20 percent annual reduction of solvent purchased.

> **"THE SWITCH TO THE LESS HAZARDOUS SOLVENT HAS BEEN FULLY IMPLEMENTED AND COBHAM CONFIRMS THE PROJECTED ENVIRONMENTAL BENEFITS."**

One year later, the switch to the less hazardous solvent has been fully implemented and Cobham confirms the projected environmental benefits. Cobham has also prioritized ongoing employee training on the new solvent to help re-train staff on proper use.

Wever, IA | 2018

Iowa Fertilizer Company

Iowa Fertilizer Company, located near Wever, Iowa, is a nitrogen fertilizer plant that produces two million metric tons of nitrogen fertilizer annually. A permitted on-site sanitary wastewater treatment plant (WWTP) removes ammonia from the effluent of this process prior to discharge. In 2018, the company requested a P2 intern to optimize and automate chemical treatment of the plant's sanitary wastewater treatment system to ensure sufficient ammonia removal from the sanitary waste stream.

The WWTP uses bacterial nitrification for efficient removal of the ammonia. A precise pH level must be maintained in this process for the bacteria to properly complete the nitrification process. Based on lab testing, it was concluded that a different alkaline chemical, sodium carbonate, would be more effective at maintaining proper alkalinity levels, and an optimum dosage was determined. After implementing these changes, the system saw almost an immediate improvement in the reduction of ammonia levels. Additionally, sodium carbonate is considered a safer chemical to use than the sodium hydroxide previously in use.

Additional monitoring of the sanitary WWTP revealed how Iowa Fertilizer Company can observe the early signs of fluctuations in ammonia levels or in pH and make the necessary chemical treatment changes for optimization. These

chemical and dosing modifications improved the performance of the sanitary WWTP and saved Iowa Fertilizer Company $286,500 per year in supplemental sanitary waste removal costs, along with eliminating the use of 1.2 tons of sodium hydroxide and more than 2,000 gallons of diesel fuel. The company continues to use this project documentation as a reference document for operations staff.

SOLID WASTE

Reducing solid waste generation requires a commitment from all levels of staff at a company. Reuse and recycling of materials are often an important focus of a company's sustainability plan. However, true waste reduction is realized when facilities incorporate Pollution Prevention (P2) strategies to reduce or eliminate the generation of waste. A Waste Management Plan or standardized waste handling procedures can help with engaging employees and providing accountability in reaching sustainability goals.

A P2 intern coming in to tackle a solid waste project will complete a comprehensive analysis to create a waste profile for the entire facility. Based on those results they can begin to research and implement value-added solutions for solid waste streams, prioritizing source reduction wherever possible. Creative solutions may include optimizing raw material usage to minimize waste, product or equipment modifications to reduce or eliminate waste generated on the production line, developing reuse strategies for scrap, streamlined waste handling procedures, eliminating cross-contamination of segregated wastes, identifying reuse or recycling venders for challenging waste streams, and modified hauling schedules.

Cedar Rapids, IA | 2017

Danisco US, Inc.

Danisco US, Inc. in Cedar Rapids, Iowa, formerly DuPont Industrial Biosciences, is a world-class science and engineering company. At this location, the company produces industrial enzymes and fermentates via fermentation, which are used in detergents, preservatives for food, animal feed, and ethanol production. Environmental Stewardship is one of the company's four core values. In 2017, Dupont Industrial Biosciences submitted a project request with the P2 Intern Program to reduce solid waste generation at the facility, and achieve this key sustainability goal.

The facility's assigned P2 intern, conducted an analysis of the enzyme recovery process and assessed reduction opportunities for a variety of inputs and waste streams generated. The intern assessed reuse and recycling opportunities and determined that agricultural land application of the by-product material was a cost-effective and environmentally beneficial option. The P2 intern also recommended a process change for storage of one of the raw materials used in enzyme recovery. Use of a storage silo would allow more precise metering of material and allow for bulk purchasing. A silo could also eliminate the use of bags for this raw material and decrease labor for the

technicians. This recommendation was projected to eliminate 109 tons of wasted material and result in annual savings of $234,000 for the company.

> "THIS RECOMMENDATION WAS PROJECTED TO...RESULT IN ANNUAL SAVINGS OF **$234,000** FOR THE COMPANY."

Three years later, the company has found success in both of these intern recommendations. Beneficial land application of the enzyme recovery byproduct began gradually in 2019, and will continue to ramp up over the coming years, turning a former waste stream into a value-added material. Installation of the perlite storage silo also was completed in 2019, leading to a significant increase in efficient use of the raw material.

Dallas Center, IA | 2012

Hy-Line International

Hy-Line International is a poultry company in Dallas Center, Iowa, that specializes in genetic breeding stock. Hy-Line brand laying hens produce 44 percent of the world's eggs and 85 percent of the nation's white eggs at locations worldwide. Their facilities consist of three main production areas: hatchery, research farms, and cooperator farms.

In 2012, Hy-Line partnered with the Pollution Prevention Intern Program to evaluate current organic waste management practices and research alternative solutions to minimize costs and produce environmental benefits. Hy-Line generates a wide variety of wastes associated with poultry production including hatchery waste, whole eggs, liquid eggs, spent hens, manure, and manure slurry.

In this 24-week project, the intern evaluated current organic waste management practices, created a comprehensive organic waste baseline and researched alternative solutions to minimize costs and produce environmental benefits. Based on this data, the intern produced detailed feasibility analyses on specific viable alternatives for Hy-Line including anaerobic digestion and in-vessel composting systems. Both system options were shown to offer measurable environmental and economic benefits for Hy-Line's organic waste streams. Although capital costs for implementing both systems remain a barrier, Hy-Line continues to use the intern's analysis as a basis for ongoing operations and data tracking.

POLLUTION PREVENTION SERVICES HISTORIC TIMELINE

Iowa DNR's Pollution Prevention Services (P2S) Program was created in 1990 with the 1989 Waste Reduction & Recycling Act. P2S is excited to celebrate 30 years of environmental technical assistance to Iowa business and industry, institutions and government agencies to save money by implementing environmental projects and improving efficiencies. Many events in the life of the program have impacted our path and where the program is today.

A key event was the addition of the Pollution Prevention Intern Program in 2001 that joins business, academia and government working together to achieve economic and environmental results. Through the P2 Intern Program, our clients have reported annual savings of more than $109 million dollars by implementing projects that have made them better stewards of their resources. The following timeline shows the major events that have helped mold these programs into what they are today:

IOWA | 1989

Waste Reduction & Recycling Act: The DNR shall work with generators of hazardous wastes to develop and implement aggressive waste minimization programs. The DNR shall provide and promote educational and informational programs, provide confidential, voluntary technical assistance to hazardous waste generators.

NATIONALLY | 1990

Pollution Prevention Act: U.S. Environmental Protection Agency (EPA) is mandated to develop and implement a strategy to promote source reduction and provide grants to the States to promote source reduction by businesses.

Clean Air Act Amendment: EPA mandated to establish a national research and development program for prevention.

Emergency Planning and Community Right to Know (EPCRA): Facility operators covered under EPCRA must complete a toxic release inventory report.

Resource Conservation and Recovery Act (RCRA) amendment: Generators must certify in shipping manifests that they have a plan to reduce waste.

Clean Water Act Amendment: EPA mandated to develop programs for preventing, reducing, or eliminating the pollution of the navigable waters.

IOWA | 1990

DNR receives its first Pollution Prevention (P2) Grant and hires 12 retired Engineers to conduct assessments at Iowa industries using P2 strategies.

IOWA | 1991

The Waste Reduction Assistance Program (WRAP), conducts its first confidential P2 Assessment.

IOWA | 1992

Iowa legislature adopts a confidentiality law to protect businesses from litigation if an assistance provider were to find a non-compliance issue while conducting an assessment or assistance a facility.

IOWA | 1995

WRAP offers workshops to assist clients in implementing P2 recommendations made by the program.

IOWA | 2000

An industry advisory group recommended the development of an Iowa P2 Intern Program to assist industry in implementation of recommendations.

IOWA | 2001

The P2 Intern Program began with 15 internships with environmental and financial resulting totaling $1,516,800.

WRAP begins a multi-year project to assist food processors.

IOWA | 2002

WRAP begins working with EPA and 5 meat producers to implement environmental management systems.

IOWA | 2003

WRAP changes its name to Pollution Prevention Services (P2S) to align with the Pollution Prevention Intern Program (PPIP).

IOWA | 2004

P2S began using EIOLCA* to calculate the greenhouse gas reductions resulting from P2 actions with industry.

* Carnegie Mellon University Green Design Institute, Economic Input-Output Life Cycle Assessment, (EIO-LCA), 2002 Industry benchmark model, available at www.eiolca.net.

IOWA | 2005

P2S partnered with the Kansas Pollution Prevention Institute to develop a regional Hospital Assistance Program, resulting in three regional workshops for hospital facilities' staff.

IOWA | 2006

Funding from the U.S. Department of Energy (DOE) funded 36 energy efficiency P2 interns.

IOWA | 2007

PPIP partners with the University of Iowa's Engineers for a Sustainable World (ESW) exchange program to host two international students from Mexico and Chile to complete energy efficiency projects at the University of Iowa Facilities Management, to be replicated at their home universities.

IOWA | 2009

The first of three annual hospital circuit rider projects to assist regional hospitals in reducing sources of mercury and other environmental wastes.

IOWA | 2010

P2S begins a multi-year partnership with U.S. Department of Agriculture (USDA) funding energy efficiency projects in rural Iowa.

P2S develops an Environmental Management Systems (EMS) Industrial Workgroup. EMS is an efficiency tool designed to facilitate and validate ongoing improvement of environmental stewardship that also generate cost savings. Annual trainings continue.

A PPIP circuit rider project assists industry in identifying sources of heat loss through thermographic assessments using an infrared camera.

IOWA | 2016

P2S enters into an Economy Energy Environment (E3) project at the Davis County School with assistance from EPA, USDA, the Small Business Administration, the Iowa Energy Center and the Iowa Waste Reduction Center.

IOWA | 2020

The P2 Intern Program is temporarily suspended due to the COVID-19 virus due to safety concerns of our P2 interns, host companies and program staff.

P2S looks forward to resume the intern program in 2021 and sets new protocols and procedures for providing ongoing assistance to business and industry within the presence of the COVID-19 pandemic.

FORMER INTERN PERSPECTIVES

In the twenty years of the Iowa Pollution Prevention (P2) Intern Program, 337 college interns have partnered with Iowa companies to tackle complex pollution prevention projects. These students used their academic training and their passion for solving environmental challenges to generate more than $109 million in cumulative implemented savings and 385,500 $MTCO_2e$ of greenhouse gas emissions reductions. The impacts they left on their host companies and the Iowa environment have been significant and long-lasting.

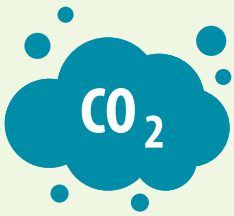
In August 2020, the program conducted a survey of former interns to learn where their career paths had taken them since their time with the P2 program. From established professionals in their fields to those just starting out their career journeys, responses were received from more than 70 former P2 interns representing sectors including process engineering, consulting, management, government, and academia. All of them spoke of how their time with the P2 internship program shaped not only their professional journeys but also their ongoing efforts to incorporate the principles of pollution prevention - as they learned them as interns - into their work and daily life today.

337

P2 PROGRAM COLLEGE INTERNS

$109

MILLION IN CUMULATIVE IMPLEMENTED SAVINGS



385,500

METRIC TONS OF GREENHOUSE GAS EMISSIONS REDUCTIONS

Addison Ardolino

Degree(s): BS, Industrial Engineering, University of Iowa

P2 Host Company (Internship Year): Bridgestone America Tires Operations (2013)

Current Position: Applications Engineer, Musco Lighting (Oskaloosa, IA)

What I Do:

I design LED lighting systems for sports lighting applications, with responsibility for Musco projects in the Southwest US region. I work with our sales representatives to ensure that each project plan meets the light needs of the sport(s) to be played, the site conditions, and the surrounding neighborhood areas. I also prioritize energy efficient design in all my projects; always looking for ways our sites can maximize their energy performance.

How did your time as a P2 intern help you choose your current career path?

By the time my internship concluded I was inspired and wanted to continue working on these types of challenges. When I returned to school, I recruited fellow engineering students to form a team to compete in the U.S. Department of Energy's, Better Buildings Challenge. We were the first team from The University of Iowa ever to participate. Long-term I knew that whatever career path I pursued, I wanted to bring a P2 perspective into my work. Not everyone will be able to work directly in the environmental field, but true change will come when every person in every job can view their work through the lens of "How can I make this process more sustainable?"

What Pollution Prevention methodologies do you use at your current job, or in your day-to-day life?

Many of them! The internship taught me to embrace the P2 hierarchy and the importance of source reduction. When you think about "Reduce, Reuse, Recycle" - we've all gotten pretty good at 'Recycle' and even 'Reuse', but most people sleep on 'Reduce' and it's the most critical part! Procedurally, I still utilize the same step-by-step assessment process now that I learned during my internship. The process taught me how to identify a focused goal and build a case to overcome challenges and costs to implement changes that provide long-term environmental and economic benefits.

Why should students be interested in a P2 internship?

The P2 internship for me was an incredible introduction to consulting practices within a fast-paced manufacturing environment. With boots on the ground, I was able to gather detailed observations and formulate unique solutions that would ultimately reduce the cost of operations & have a positive impact on the environment. Two things that stood out to me with the P2 program were the stressed importance of gathering internal support as you build your project recommendations and providing a detailed financial evaluation. These two factors will serve as a strong foundation for any engineer in their professional work, as well as anyone looking to manage people and products at a high-level.

What advice would you give to a student who wants to pursue a career in sustainability?

Take initiative to build your experience in sustainability projects early on, even if you have to create those opportunities yourself. There is always an opportunity within any role to support good environmental practices. Be willing to voice your opinion, but also do your research to ensure that your idea is ideologically sound, financially feasible, and provides for the interests of your team, your company, your community, and the future.

Angela (Jacobson) Weiss

Degree(s): BS, Mechanical Engineering, Iowa State University; MS, Mechanical Engineering, University of Wisconsin-Madison

P2 Host Company (Internship Year): John Deere Foundry (2003)

Current Position: Senior Project Engineer, Thermal Energy System Specialists (TESS), Madison, WI

What I Do:

I work on transient simulation software used by universities, labs, and industries to model energy performance of thermal and electrical systems, such as solar hot water systems, PV and wind energy systems, and building technologies. We can run simulations to help clients make system design or operational decisions that maximize their energy performance, before investing the capital to make changes.

How did your time as a P2 intern help you choose your current career path?

I still remember being really excited in my P2 interview, saying that this was exactly the type of job I wanted before I even knew it existed! This internship gave me my first real-world work experience in energy efficiency, which led to internships with the Industrial Assessment Center at Iowa State University and the Alliance to Save Energy, a coalition in Washington, D.C., and to my first post graduate school job as an energy efficiency auditor. My early experience with the P2 program was the key that opened many of those doors for me.

What Pollution Prevention methodologies do you use at your current job, or in your day-to-day life?

My energy-efficiency calculations have evolved in sophistication over the years, but I can still trace their earliest foundations to our P2 intern training where we did a simple case study calculating energy savings from lighting upgrades, occupancy sensors, or the combined effects of both. I'm glad I started from the very beginning with those good fundamentals. And thinking about the concept of "Don't limit yourself to formally defined P2 strategies" - my P2 summer was the first summer I biked 6 miles each way to/from my internship. I am still a bicycle commuter today!

Why should students be interested in a P2 internship?

It was so unique - everyone was working as individuals at their host companies, but with a common goal. Just knowing there were 20 like-minded interns across the state kept me from feeling alone (and may have fueled a spirit of healthy competition as well). The occasional interactions we had bolstered my confidence and commitment to the cause in intangible ways. I would highly recommend the P2 internship to any student fortunate enough to be selected.

What advice would you give to a student who wants to pursue a career in sustainability?

DO IT! It is a rewarding career path in every way - for you personally, for your community, and for the planet. I can't promise that every solution you dream up will be technically feasible, or cost-effective, or without other barriers. I can say from experience, though, that people are interested in your insights, and they are willing to change their practices, if you shine a light in the right direction. Plus it's fun to solve brain-y math problems and run simulations all day.

Sara Schmieg

Degree(s): BS, Civil Engineering, Iowa State University; MS, Civil Engineering, Iowa State University

P2 Host Company (Internship Year): Burke Corporation (2008); Drake University (2009); Mercy Medical Center (2010)

Current Position: Director, Department of Energy and Nuclear Programs, Tetra Tech (Arlington, VA)

What I Do:

I work on projects in the nuclear industry, primarily supporting business development activities. My main responsibilities involve developing strategy and capture for major environmental cleanup projects for U.S. Department of Energy and international nuclear sites. Our teams work with engineering and technical experts to develop strategies to remediate each site and return it to its original state, when feasible.

How did your time as a P2 intern help you choose your current career path?

The P2 program gave me a passion for solving environmental challenges. I completed three separate internships through the program and each of them helped further develop my skillset. When it came time to enter the job market, the case summaries published for the P2 projects were extremely beneficial. I used the website links for my three P2 case summaries in my resume and several companies told me the case summaries were incredibly insightful to my experience. The P2 program fosters leadership skills and creates opportunities that helped develop me into who I am today as a professional environmental engineer.

What Pollution Prevention methodologies do you use at your current job, or in your day-to-day life?

The P2 program instilled a mindset of sustainability that guides my approach to projects today. Optimization of resources and source reduction in particular is key to drive sustainability on my projects. The program also taught me the concepts and importance of life-cycle analysis, which is central to what I do now.

Why should students be interested in a P2 internship?

My internships gave me so much freedom and autonomy to build my project management and problem-solving skills. The projects were very self-driven and allowed me to take ownership of my internship experience. For the students that want to manage projects and have a lot of drive and motivation – the P2 program is a great opportunity.

What advice would you give to a student who wants to pursue a career in sustainability?

Keep your drive and curiosity alive by seeking out new experiences and knowledge. When it comes to jobs in sustainability, many new hire and post-graduate jobs aren't going to be in management roles right out of the gate. One thing I learned as a young engineer was to make the most of my opportunities to learn and broaden my experiences - be proactive, ask smart questions, and challenge established ways of thinking. Build the career you want, one experience at a time.

Dr. Muhammad Ali

Degree(s): B.S., Mechanical Engineering, University of Engineering and Technology; M.S., Mechanical Engineering, Grand Valley State University; Ph.D., Mechanical Engineering, Iowa State University

P2 Host Company (Internship Year): Terex Cranes (2006); Linwood Mining and Materials (2007)

Current Position: Professor of Mechanical Engineering, Ohio University

What I Do:

My research work centers on a number of environmental/energy/renewable energy topics. One major area of research is working to make electrostatic precipitators (pollution control devices used at coal-burning power plants) more efficient and effective at removing particulates from coal exhaust. Another major research area is in the renewable energy field, where I'm working on improving tidal turbine technology and components to make them an effective renewable energy option for the coasts of Alaska.

How did your time as a P2 intern help you choose your current career path?

It had a huge effect on me. It helped me gain valuable industry experience and more broadly, it gave me a passion for solving industrial energy problems. I was able to serve as a "fresh set of eyes" for my companies then, and I continue to serve in that role in my research work now. My internships also led to industry connections that I still maintain today. My career path definitely would have been different than what I have now if the P2 opportunity hadn't crossed my path.

What Pollution Prevention methodologies do you use at your current job, or in your day-to-day life?

My P2 internship introduced the concept of bringing in new eyes to look at site-specific energy problems, a philosophy that has shaped me significantly professionally. It taught me how to break systems down into individual sections in order to really assess what's going on and how to improve them.

Why should students be interested in a P2 internship?

This internship program is one of the best opportunities there is to interact with industry and earn valuable hands-on experience while helping companies overcome environmental challenges. The P2 staff worked incredibly hard training the interns to be prepared for the types of projects they were tasked with. Other internships I had didn't have anywhere near that type of preparation or support. But with the P2 Intern Program there is this fantastic training that prepares you for your challenge and enables you to really learn how to be a problem-solver in a real-life industrial environment. The training, the research materials, having access to your P2 technical advisor - that type of support is invaluable. They're not just throwing you in the deep end of the pool, they're teaching you how to swim.

What advice would you give to a student who wants to pursue a career in sustainability?

Go for it! We need the best minds to deal with some very serious environmental challenges that this world is currently facing. The sooner we address it, the better it will be for our future generations. Consider internships like this your launching pad. Even today I'm involved in a number of projects where I utilize many of the things I first learned in my P2 internship.

POLLUTION PREVENTION APPLICATION PROCESS

Student application and business request forms are available online at www.iowap2interns.com.

Forms may be submitted electronically or faxed.

The Iowa Department of Natural Resources is an EEO/AA Employer

FOR COMPANIES

Pollution Prevention Services is currently accepting requests for 2021 intern projects. Companies must submit a project request that identifies a focus project and outlines the desired objectives and impacts. Technical assistance is available to help identify or develop projects, or to complete the Project Request Form. Companies should contact P2Services@dnr.Iowa.gov by December 2020 to be considered for a 2021 intern placement.

Project requests are reviewed upon receipt and companies contacted within two weeks for review and clarification. Final determination of acceptance will be made within 30 days after project review and clarification of details is completed. Intern assignments for finalized projects will begin in January of 2021.

Please note: Students are not trained in or qualified to assessregulatory compliance issues.

» **SUBMIT COMPANY INQUIRIES & PROJECT REQUESTS TO: P2Services@dnr.iowa.gov**

FOR STUDENTS

Graduate and junior or senior-level undergraduate engineering students are encouraged to submit the following documents for consideration:

- **Application**
- **Cover letter**
- **Résumé**
- **Unofficial transcript**
- **List of Fall 2020 and Spring 2021 courses**

Selection of 2021 interns will begin in November and continue into the spring until project assignments are finalized. Selected applicants will be matched to a project based on academic performance, relative experience and technical skills. Pollution Prevention Internships will begin on May 24 and end on August 13, 2021. Selected students are expected to commit to the full internship timeline.

» **SUBMIT STUDENT APPLICATION PACKETS TO: Danielle.Roseland@dnr.iowa.gov**

PROJECT INDEX

Full versions of the case summaries featured in this document, as well as all 377 P2 Intern project summaries from 2001-2020 may be viewed at www.iowap2interns.com. If you have questions about any of these summaries or want to know more about our services you can contact us at P2services@dnr.iowa.gov.

www.iowap2services.com

POLLUTION PREVENTION SERVICES
1990-2020

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