FERMI NATIONAL ACCELARATOR LABORATORY

Developing Partnerships with Industry

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Abstract

Fermilab's Office of Partnerships and Technology Transfer was established a few years ago to establish and promote collaboration as well as engage in technology transfer with industry. Technology transfer is the process by which technology or knowledge developed in one place is used in another place, possibly for a different purpose. Technology transfer at Fermilab may include licensing patent-pending technology or it can also include performing agreements with industry, universities, and other institutions outside of the Department of Energy. This paper describes two methods. The first is a method in which an agreement with industry is performed. The second is a method in which a lead is followed after attending a technology innovation conference.

Introduction

Recently, Fermilab introduced a new office under the office of the Chief Operating Officer. This office is the Office of Partnerships and Technology transfer. The office is responsible for taking existing knowledge, facilities, or capabilities developed under federal research and development funding and utilizing them to fulfill private or public needs. The purpose of this newly established office is to establish and maintain collaboration efforts with other organizations, to understand intellectual property issues, prepare assessments of selected potential technology, and to raise technology transfer awareness throughout the laboratory.

This is the second summer that I have been assigned to work in Fermilab's office of Partnerships and Technology Transfer. My project this summer was split up into two parts. Half of my project was learning how agreements are developed and then performing an agreement with industry.

My role this summer was to assist in the following:

- Learn about how agreements are formed
- Follow procedures and develop agreement with Industry partner
- Attend the Summit and talk to potential partners
- Attend Summit Workshops
- Follow up on Lead from Summit
- Do research on industrial electron beam accelerators

Methods

Developing Agreements with Industry

Fermilab is one of the greatest physics laboratories in the word. This is attributed not only to the great facilities that we have but also because we work with people from various backgrounds and institutions. The beautiful thing about science is that it is not restricted to one language or culture, anyone can do physics. Facilities from the Department of Energy have several mechanisms at their disposal that facilitate technology transfer efforts between labs and outside partners. Among them are User Agreements, Strategic Partnership Projects, and Cooperative Research and Development Agreements (or CRADA for short). A CRADA is used for collaborative research between DOE labs and public/private entities for the mutual benefit of both parties. This summer I worked on developing a CRADA with MuPlus, Inc and the steps I took to do this are shown below.

1. Identify and read the OPTT procedures for developing agreements

Developing a CRADA agreement is a complex process. Luckily, OPTT has put together various procedural documents that allow someone to carry out an agreement. The development of an agreement requires the presence of various personnel including: External Partner, Principal Investigator, Environmental Officer, Field Financial Manager, and the Legal Department. The main person I contacted was the Principal Investigator (PI). They are responsible for doing much of the paper work associated with the agreement with the

assistance of OPTT. These people were reached by email to ensure the proper completion for the agreement. Several people must work together to make sure that the agreement is beneficial to both parties and follows DOE guidelines.

2. Revise the Statement of Work (SOW)

The Statement of Work clearly defines the scope, approach, deliverables, schedule, and resource requirements. Together along with the PI, we made sure that all of the information including the estimated budget are correct.

3. Complete the Partnership Proposal Data Sheet

This sheet includes information such as a description of work, information dealing with intellectual property, and information on how the partnership was proposed. This form needs to be signed by the PI and the appropriate Division Head. The PI signs affirming that the project is consistent with their responsibilities and the DOE mission. The Division Head signs affirming that they have reviewed the proposal with the Principle Investigator and agree that the work described is important and consistent with Fermilab's responsibilities and the DOE mission. The Division Head acknowledges that performance of this project will not adversely impact other DOE-funded programs and will not place a future burden on DOE resources. Both the PI and Division head also agree that neither they, nor any FRA employee involved in the preparation and approval of this agreement, nor their family members have any current or planned personal or financial interest in any other organization involved in this agreement.

4. Complete Joint Work Statement (JWS)

This form is specific to Cooperative Research and Development Agreements. This form must be submitted with every CRADA package that is submitted to DOE for approval. This form includes a short abstract, information on how the project will benefit the lab, the partner, and DOE. This form makes sure that proper safety and environmental review have been performed before the start of the project.

5. Complete the National Environmental Policy Act (NEPA) Review

Every proposed project at the laboratory requires a review and determination under the National Environmental Protection Act (NEPA) to ensure that the proposed work will not create an adverse environmental impact at the laboratory. The laboratory procedures for NEPA are part of the Environment, Safety and Health (ES&H) Management System. In addition, the Fermi Site Office (FSO) requires confirmation that the NEPA review and determination has been completed for every Partnering Agreement. The PI was responsible for making sure this review was done properly. They then sent it to me so I could put together the CRADA package.

6. Draft the Terms and Conditions of the agreement

This is one of the most vital parts of developing any agreement. This document articulates the rights and obligations of each of the parties to the agreement. There is a model agreement that already exists and for the most part a few blanks can be filled to complete the form. Other times a section or two can be changed depending on the nature of the project. I worked on the terms and conditions and added it to the CRADA package.

7. Complete the OPTT Checklist

This checklist is done to ensure that all the appropriate documents have been completed. Items are checked, double checked, and triple checked in order to make sure that all the documents are in order.

8. Prepare the agreement for Internal Review

In this step I sent out an email for various Fermilab staff to take a look at. The Manager, Grants and Contracts, and Finance Section will perform an independent validation of the budget information and forward an electronic approval to the Partnership Coordinator (me in this case). The Laboratory Counsel will also perform a final review of the terms and conditions. The Principal Investigator and D/S/C Head may also review the Statement of Work and budget if necessary. All reviewers will notify the Partnership Coordinator of any changes made or any

issues that need to be resolved before sending out a transmittal email to the Fermilab Site Office.

TechConnect Innovation Summit

TechConnect hosted the 2015 TechConnect Innovation Showcase & Expo, highlighting global transformational technologies, federal funding agencies, leading technology development partners and top corporate technology prospectors. This is one of the largest showcases and accelerators for industry-vetted emerging-technologies ready for commercialization. Participants and representatives showcased their emerging technologies and were also able to visit other booths to inquire about their projects and technologies. Fermilab's Office of Partnerships and Technology Transfer submitted a total of six patent-pending technologies to present at the summit. One of the inventions was awarded a TechConnect Innovation Award. These awards identify the top 20% of submitted technologies as ranked by the TechConnect Corporate & Investment Partner Committee. Innovation rankings are based on the potential positive impact the submitted technology will have on a specific industry sector.

During the time at the Summit I was responsible for:

- Showcasing Fermilab technology
- Talk to representatives from other companies institutions
- Attend workshops on emerging technologies

Research on Industrial Accelerators

After the Summit was over, I received notice that we got a hot lead from a well know running shoe manufacturer. They wanted to see if they could somehow use accelerators to improve their production of shoes. So what I did was to do basic research on the use of electron beam (EB) accelerators in industry. I examined the use of EB accelerators for the purpose of cross-linking.

Results

During the summer, the following tasks were accomplished:

1. A CRADA with Industry was completed

I successfully developed a CRADA with MuPlus, Inc. Following all the appropriate steps and processes I was able to complete the agreement in a timely manner. My CRADA was also approved by DOE quite quickly.

2. Research on industrial electron beam accelerators completed

Industrial electron beam accelerators have been used for many years for various purposes. These accelerators are reliable equipment and have been found to be more energy efficient than traditional machinery. EB accelerators use produce ionizing energy without radioactive isotopes. In industry, EB accelerators are categorized by their maximum electron energies.

Low energy EB accelerators have an energy range of about 75-300 keV. These accelerators employ a long linear cathode or multiple cathodes. The acceleration within these devices is done inside a long evacuated tube connected to a DC voltage generator. Applications of low energy EB accelerators include the curing of inks, coatings, and adhesives. By using EB curing in this way air pollutants are eliminated and energy efficiency is increased.

Medium energy EB accelerators have an energy range of 300 keV-5 MeV. These accelerators are high current DC potential-drop devices. Medium energy EB accelerators use rectifiers and transformers. Applications include cross-linking of wire and cable insulation, heat shrinkable tubing, and for the sterilization of medical equipment.

For this study I focused on using EB processing to cross-link polymers. A cross-link is a bond that links one bond to another. Doing this renders materials insoluble in solvents that would dissolve non-cross-linked materials. The cross-linking of polymers is one of the biggest markets for EB processing. When cross-linked this way, the process can be done at room

temperature instead of at a high temperature. There is also no need for the use of catalysts or cross-linking agents.

Vulcanization is essentially the cross-linking of rubber to convert it into a better, stronger material. In the radial tire industry, tires are vulcanized. Traditionally, they have been vulcanized in a high temperature, high pressure mold. But in 1933, Goodrich Company came up with a way to vulcanize tires through the use of electron beams. The process was patented as patent No. 1,906,402. Now the process is being used by various tire companies to efficiently vulcanize their tires. Using EB beams to vulcanize tires helps the tire keep its shape and allows the tire to maintain the tacky surface condition needed to allow the different layers to stick together.

Discussion and Conclusion

The Office of Partnerships and Technology Transfer (OPTT) may not participate in experiments here at the lab but it is an essential part of the laboratory. They are responsible for developing agreements that deal with technology transfer. The CRADA I developed is one of many that are developed by OPTT. It was also a great experience to attend a conference and meet various representatives from other institutions and companies. Doing events such as these is an amazing way to search for partnerships and just get Fermilab's name out there. I also learned that there are a multiple ways in which EB accelerators are being used in industry. As time goes by, accelerators will become more accepted and become more efficient as well. My hope is that Fermilab will be able to develop EB accelerators that have commercial applications alongside companies or institutions.

Literature Cited

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