

Economic Development Incentive Grant 2014-15 Final Report

Institution Name(s): University of Wisconsin-Stevens Point	Project Title: Economic Development through Innovation in Specialty Paper, Packaging & Converting
Principal Investigator: Paul Fowler Email: Paul.Fowler@uwsp.edu	Person submitting Report: Katherine Jore Contact Phone #: (715) 346-3710
Grant Award Amount: \$1,445,336	Report Date: January 11, 2016
Grant Funding Spent (to date): \$1,445,336	Date project began: January 1, 2014 Date project ends: December 31, 2015

I. Status Report

This report documents activities and outcomes delivered during the entire project period under the joint leadership of principal investigator Dr. Paul Fowler, executive director of the Wisconsin Institute for Sustainable Technology (WIST) and co-principal investigator, Dr. Karyn Biasca, chair of the Paper Science and Engineering Department (PS&E).

Project activities and goals associated with the UW-Stevens Point Pilot Paper Machine

The pilot paper machine at UW-Stevens Point is used as an educational tool by students in the Paper Science & Engineering Department and by WIST to provide services to the papermaking industry.

Specific activities and goals under the EDI grant were to **install coating and laminating capability, install wet-end chemical additive equipment, and to develop and offer three hands-on courses for industry.** Packaging represents the second-largest overall driver industry in Wisconsin. Specialty packaging materials, such as those designed to keep food fresh, typically comprise multiple layers of different materials to provide the specific qualities required. One layer may provide a moisture barrier while another layer provides strength and yet another layer provides a printable surface. Pilot-scale **lamination and coating equipment** for analysis as well as for small production runs enables the reproduction of the precise working conditions available on production machinery to simulate various laminating and coating possibilities. The equipment enables pilot-scale evaluation at UW-Stevens Point to help Wisconsin remain competitive in coated and laminated papers.

Status: A LabMaster™ Coating and Laminating Line comprising two unwinds, roll coater, dryer, laminator with chill rolls and rewind with integrated drives and controls was installed in the week of July 21, 2014. Additional capability exists in being able to coat using a slot die method. Staff has been trained in the use of the equipment and trials have been made using paper, film and foil substrates on roll sizes up to 300mm wide and at speeds of up to 30m/min. The team has undertaken gravure roll and slot die coating techniques with water-based formulations; and dry bond laminating. Small scale production runs, product development runs and tests with various substrates and coating materials have all been carried out since the installation was completed. At the time of writing, a project is underway with a major specialty paper producer that will continue beyond the end of this grant funding. Further work is under consideration. PS&E faculty member, Prof. Roland Gong has incorporated the coater and laminator pilot line into his undergraduate instructional program. Prof. Gong also developed an industry short course to introduce attendees to the techniques of coating and laminating. The first course was offered August 20-21, 2015 with participants attending from Wisconsin Rapids, Wisconsin and Chicago, Illinois. Another course is being offered January 21-22, 2016 with participants, to date, attending from Appleton, Neenah, Peshtigo and Rothschild, Wisconsin as well as from

Cloquet, Minnesota and Portland, Maine. A hands-on component of the course provides course attendees with practical experience using and operating the coater and laminator. Additionally, we have hosted a number of companies with interest to contract with UW-Stevens Point to carry out pilot scale development projects on the new equipment.

Chemical additives are needed in the production of certain papers to provide particular qualities such as wet strength, color, printability or brightness. Until now, on the UW-Stevens Point pilot paper machine the chemicals were added at only one point in the process in the initial pulp preparation stock tank. Installation of **chemical additive equipment** at multiple points at the “wet end” of the paper machine allows more precise control and effective use of the chemicals and more closely matches industry practice. Availability of this capability on a pilot scale will help businesses that wish to test certain chemicals to do so on a smaller scale and more flexibly and efficiently saving time, money and chemicals.

Status: In a senior design project of the PS&E program, students designed and installed the chemical additive equipment. Students gained valuable experience working on a real-world project. Seven ports were installed, which creates flexibility by allowing chemical addition at different points. This is important because the order in which chemicals are added may affect how they perform or interact with each other. The equipment design also allows quick change-out of chemicals so that different chemicals can be tested with the same pulp batch and/or the order of chemical addition easily changed. The system uses peristaltic pumps, allowing continuous flow of materials. The new capability has proved extremely useful since its installation and its use has been incorporated into the undergraduate teaching program and has been used in the fulfillment of several pieces of work for industrial clients.

WIST regularly offers a hands-on papermaking course and a hands-on pulping and bleaching course to paper industry professionals. In these short courses scheduled over two and three days, students split time between classroom lectures and “hands-on” experience running the university’s pilot paper machine and equipment. To further assist the paper industry in developing and retaining high-quality employees, **additional hands-on courses** were developed.

Status: Courses were offered to a maximum of sixteen participants in each session. The hands-on papermaking course was overhauled to reflect the addition of new capability on the machine and to reflect current content for the industry. This revised course was run four times (April 3-4, 2014, April 9-10, 2014, September 25-26, 2014 and March 26-27, 2015) with 10, 15, 16 and 14 participants, respectively. The two new courses were run in the fall of 2014 and spring of 2015: Measuring and Controlling Paper Formation (October 23-24, 2014 [13 participants] and April 16-17, 2015 [8 participants]) and Introduction to Paper Additives (November 6-7, 2014 [14 participants] and April 30-May 1, 2015 [10 participants]). There were 11 participants who attended more than one of the courses, resulting in a total of 89 individuals trained. Participant evaluations were conducted at the end of each course. All but three participants provided an evaluation. Participants’ reaction was overwhelmingly positive. Of the 98 evaluations, 92 reported that they would recommend the course to others. Course documentation was also rated favorably, with an average score of 4.6 on a five point scale. Participants were asked to provide email contact information for their supervisors for survey purposes: 65 did so, with many having the same supervisor. A total of 22 supervisors were surveyed, asked whether they perceived an improvement in their employees’ performance (91% agree/strongly agree) and if they would send additional employees to the course(s) (82% yes/maybe).

WIST has developed a timetable to offer the courses throughout calendar year 2016 and is collaborating with TAPPI (Technical Association of the Pulp and Paper Industry) to promote the courses to industry professionals nationwide with the goal to increase awareness of the technical expertise and capability available on the UW-Stevens Point campus to the nation’s paper making and affiliated industries.

Activities and goals associated with RiverPoint® fine art paper

In May 2011, personnel in UW-Stevens Point's Department of Art & Design, Paper Science & Engineering and WIST began a unique, collaborative project to develop a new fine art paper. The original goal of the collaboration was to create an affordable printmaking paper comparable in quality to expensive papers made in Europe, for use by students and faculty in the university's Department of Art & Design. The paper is made from 100% cotton fiber and exhibits performance qualities that are highly desirable to both printmaking professionals and hobbyists. The paper development was so successful that we decided to make it more widely available and made a "soft launch" of the paper to the public at a printmaking conference in Milwaukee in 2013. WIST and the Department of Art & Design created marketing materials, including naming the product as RiverPoint, for the launch. RiverPoint was well-received and WIST saw an economic development opportunity through its commercialization.

Specific goals under the EDI grant were to **trademark the RiverPoint name and word mark, develop two additional grades of RiverPoint fine art paper, and commercialize RiverPoint.**

With assistance of the UW-System Office of General Counsel, **trademark protection** for both the RiverPoint name and the stylized logo was granted effective March 25, 2014.

In early 2014, the project team began the development of a new color of RiverPoint paper in part fulfillment of the new grade development outcomes for this project. Up till that point, the only color available was dictated by the color of the cotton fibers. Work was undertaken to develop a sand/beige colored paper that would be desirable to the printmaking community with the intention of launching the new color at the Southern Graphics Council International Conference and Exhibition in San Francisco. In 2015, work was undertaken to develop a grey colored paper as well.

Also, in early 2014 the project team began working with an Appleton, Wisconsin-based art paper supplier, Strathmore Artist Papers™, a division of Pacon Corporation, on **grade development and commercialization** of RiverPoint paper. Strathmore markets art paper for a wide range of uses including water color, sketching and mixed media. However, at that time it had no printmaking grade paper in its portfolio. The company's market researchers had identified a need for a line of printmaking papers and believed that RiverPoint had the potential to fill some of this unmet market need. Pacon markets its portfolio of art paper grades as Strathmore Artist Papers® 300 Series, 400 Series and 500 Series, where each higher series represents a step up in quality with 500 being a premium quality product.

Pacon determined that the original RiverPoint paper, a heavy weight, 100 percent cotton paper, would meet the demand for a premium quality printmaking paper and is marketing the paper as 500 Series. However, Pacon also desired to offer 300 and 400 Series printmaking papers to complete their printmaking range. These were intended to be, respectively, low-cost, excellent value, entry level printmaking papers and expert, day-to-day use, high quality papers for professionals and hobbyists. WIST and PS&E undertook to develop two additional grades of paper to meet the needs of a 300 Series and 400 Series paper.

Status: Trademark protection has been achieved; two new color of RiverPoint, 'Sand' and 'Grey' have been developed. Sand was introduced to the printmaking community at the Southern Graphics Council International Conference in San Francisco; two new grades of RiverPoint fine art paper have been developed. Students in the Paper Science and Engineering department, under the guidance of former department chair, Prof Gerry Ring, played an integral role in grade development making several paper machine trials and undertaking physical testing of the trial samples to assess key properties described by Pacon. Students in the department of Art and Design along with printmaking Prof Bob Erickson, provided invaluable in-use feedback to enable grade development to occur in line with the aggressive timetable we had set. Commercialization of a complete new range of RiverPoint fine art paper through a licensing agreement has been achieved. The range is co-branded

as Strathmore Artist Paper and RiverPoint Printmaking. Cover art for the retail sale pads of the 300 Series printmaking paper was done by a UW-Stevens Point printmaking student chosen from a competition amongst peers and judged by members of the Pacon project management team. The original RiverPoint paper is being manufactured at UW-Stevens Point on the university's pilot paper machine. In the case of the 300 and 400 series printmaking papers, UW-Stevens Point does not have the capacity on its machine to meet the forecast demand for these products. Hence, Pacon Corporation is having the paper manufactured to UW-Stevens Point's specification at a Wisconsin paper mill. Commercialization of this product is generating increased economic activity in Wisconsin, supporting the paper industry and two Wisconsin companies. The range is available in national retail outlets including Staples, Hobby Lobby and Dick Blick. Printmaking paper is still being made available to faculty and students of the UW-Stevens Point Art and Design department, reflective of the initial intent of the early development work.

The collaboration with Pacon continues to proceed well. During the course of the project we have manufactured 6,335 lbs of RiverPoint 500 Series Printmaking paper for Pacon in line with the terms of our agreement. The commercial relationship will endure beyond the period of the EDI grant, governed by a five-year supply agreement, along with modest royalties flowing to UW-Stevens Point as the 300 and 400 Series papers are commercialized.

Activity and Goal: Automate compostability testing procedures

In 2012, WIST purchased equipment and developed a protocol to provide an industry-facing testing service for bioplastics and coated papers to determine if the materials are compostable in accordance with appropriate ASTM standards. As packaging materials' suppliers work to meet increasing demand for compostable products, independent, third-party testing such as that provided by WIST will assist in product development. Although the WIST system was operational before the award of this grant, its design required time-intensive system monitoring and recording of data and limited the amount of samples that could be evaluated simultaneously. A goal of this project was to make modifications and upgrades to automate certain procedures and added efficiencies and capability for simultaneous testing of additional samples. We also sought to achieve expert, third-party assessment of the laboratory to secure nationally recognized accreditation of our facility which is being increasingly required by customers and clients.

Status: Funding under this grant has enabled automation of the biodegradation testing protocols. Briefly, that method involves the monitoring of the evolution of carbon dioxide from a test item. Previously an arduous, manual monitoring and recording process was in place that has now been superseded by a continuous, automated process. This has resulted in test method measurement efficiency and reduces the chances for operator error. In addition, we have successfully achieved independent accreditation of our laboratory and methods to the ISO 17025 international standard for the competence of testing and calibration laboratories. The scope of the accreditation includes the testing of plastic and paper items in accordance with ASTM D6400 and ASTM D6868 standard specifications, respectively. Naturally, the underlying test methods also fall within our scope. The certificate of accreditation (Certificate number AT-2016) is valid to December 17 2017. WIST compliance with ISO 17025 assures provision of competent and reliable scientific evidence in accordance with Section 260.2 of the Federal Trade Commission's "Green Guides". Therefore, any compostability claim a customer or client would wish to make on a product that has been tested (and passed) by WIST in accordance with ASTM D6400 or ASTM D6868 would have the requisite scientific data and report in place to substantiate the claim. Compostability testing studies are currently underway which will endure beyond the duration of this EDI grant support and further work is currently under negotiation.

Activity and Goal: Provide three new networking opportunities for the specialty paper, packaging and converting industries

In 2013, WIST's Focal Point event, a one-day conference targeting industry professionals in some sphere of sustainability practices developed as a theme, 'frontiers in packaging', cognizant of the importance of the fiber and film based packaging industry supply chain to Wisconsin's economy. The event was very successful attracting delegates from across the nation. As an outcome of this grant, we will build on last year's success and host a similar event as well as augment with other networking opportunities in the packaging and packaging waste management arenas.

Status:

- 1. Focal Point 2014: Packaging at the Leading Edge, took place on October 14, 2014. The event targeted the latest challenges and solutions in packaging and converting right across the value chain. The conference opened with a keynote presentation by Craig Culver, co-founder of the Culver's chain of quick serve restaurants. Presentations were also made by representatives of Asia Pulp & Paper, Avery Dennison, Braskem, Cedar Grove Composting, Gass Weber Mullins, NewPage, Ocean Spray, Placon, and Sealed Air.*
- 2. A Special Composting Workshop was delivered to attendees of the Wisconsin Integrated Resource Management conference in Oconomowoc, Wisconsin on February 25, 2015. The workshop set out to address the various components of implementation of a successful municipal composting program and the part that incorporation of appropriate food packaging and garbage bags could play. Speakers from the city of Seattle and Cedar Grove Composting provided a case study of their long-standing successful venture operating on the west coast and processing over 500,000 tons of green/food waste per year. Presentations were also made by representatives of Biobag USA, Novamont and Organic Waste Systems.*
- 3. Focal Point 2015: Paper-Based Food Packaging and Serviceware took place on October 20, 2015. The conference featured presenters from LBP Manufacturing, Cargill, HAVI Global Solutions, WestRock, Dow Chemical and WIST. The conference kicked off with a keynote presentation from Brent Denniston, senior vice president, business development and international operations for LBP Manufacturing. Having previously worked at Starbucks, where he was vice president, global sourcing and supplier relations, Denniston shared his perspective from both the brand owner and manufacturing sides.*

Brian Lansing of Cargill heads a division that purchases \$1.2 billion in packaging each year, \$600 million of that in fiber-based packaging. He touched on brand owner demands that will drive innovation toward packaging with greater strength at lower weight, finishing and graphics that will require more sophisticated converting equipment, and the growing trend toward just-in-time shipping which will result in smaller production runs.

Michael Richmond of HAVI reviewed results of his company's surveys of industry leaders, who defined trends and challenges they foresee in the next decade. Cost pressures and sustainability/sourcing ranked high as challenges; greater customization of packaging, such as with graphics for specific retailers, and technology integration including intelligent packaging are areas of opportunity.

Research presented by Erin Weinland of WestRock showed that 36 percent of consumers say "packaging is extremely or very impactful when purchasing carry-out food" but just 7 percent of consumers are completely satisfied with to-go food packaging. Companies that develop products that exceed consumer expectations can expand market share. Weinland said that paper packaging benefits from positive sustainability perceptions "but the product has to perform."

Performance was the focus of a presentation by Dow's Jeff Leitinger, who described research the company is undertaking to improve coating performance of paper and paperboard. He described innovation trends

such as binders for improved strength and efficiency.

Paul Fowler, WIST executive director, provided an overview of product compostability testing, covering not only the process and terminology but how testing and certification of compostability is seen by regulatory agencies.

Activity and Goal: Attract 10 repeat customers as a measure of customer satisfaction and continuous improvement

Status: We have provided contract services for 18 repeat customers and so have exceeded the target.

Activity and Goal: Generate \$825,000 in revenue

The project team has generated \$710,053.90 revenue through December 31, 2015. This revenue capture (86% of target) falls shy of our target amount in large part as a result of additional effort being directed to delivery of the RiverPoint project. WIST has some significant work in progress as well as a strong stream of inquiries relating to laboratory services. Economic development activities through the provision of contracted laboratory services will endure beyond the funding period of this EDI grant.

II. Updated Goals/Performance Metrics and Assessment Plans

The attached Excel spreadsheet and the following narrative reports the current status of project goals/performance metrics, anticipated completion date(s), actual completion date(s), and assessment plans.

Number of Jobs Created

Two jobs were forecast to be created at the outset of the project. Two jobs have been created: both a full time Compostability Laboratory Manager and a full time Paper Making & Laboratory Specialist have been appointed to the project. This outcome is in line with the project goals and performance metrics. Both these positions remained staffed with 12-month contracts in place and expectation that they will be renewed in the next fiscal year thus enduring beyond the funding period of this EDI grant.

Number of Jobs Retained

Eleven jobs were targeted to be retained in the current project year and 10 jobs have been retained as follows: WIST Finance Manager, WIST Communications Manager, WIST Program Development Coordinator, Assistant Professor in Soil and Waste Resources Discipline, Assistant Professor in Fisheries and Water Resources Discipline, Assistant Professor in Paper Science & Engineering, Professor in Paper Science & Engineering, Compostability Laboratory Manager, Paper Making & Laboratory Specialist, and Paper Machine Maintenance Specialist. The difference in the projection and actual jobs retained revolves around re-assignment of one member of staff's duties to another Economic Development Incentive grant project.

Number of Businesses Assisted

Thirty five businesses were forecast to be assisted as a result of the project and 36 have been assisted thus exceeding the target for the project.

Number of NDAs Signed

22 confidentiality agreements have been signed during the project period against a target of 20. Further agreements remain in negotiation regarding additional work that will take place beyond the project funding period.

Number of Invention Disclosures

Four invention disclosures were forecast to be made in the first full project year and two have been made. This is largely due to the fact that in this current year, activities and resources have been directed towards fee-for-service work where the opportunity to develop new intellectual property is limited. Rather, effort targets the

delivery of customers' specific needs wherein they typically supply a detailed process or recipe which we then fulfill for them on the laboratory or pilot scale.

Number of Internships Created (paid)

The equivalent of six student internships were projected during the project. This was based on 10 hours of paid activity per week for two 16-week semesters for a total of 1,920 hours. Twenty-one individual students made contributions to the project contributing in all aspects of project outcomes. The total number of actual paid hours worked was 2,037. This outcome met and slightly exceeded the project goals and performance metrics.

General Project Outcomes/Goals

Other project outcomes/goals have been met as set out in the attached spreadsheet.

III. Project/Program Budget and Expenditures

Table 1 reports project expenditures detailed by category. The source of all funds is the Economic Development Incentive grant.

Table 1 Expenditure report for the complete project

Budget Item	Original (\$)	Actual (\$)	Remaining (\$)
Salary	326,891	376,512	-49,621
Fringe	137,311	148,650	-11,339
Travel	7,600	20,832	-13,232
Supplies	160,705	146,043	14,662
Equipment	577,816	499,350	78,466
Consultant	16,798	15,198	1,600
Indirect Costs	218,215	238,752	-20,537
TOTAL	1,445,336	1,445,336	0

Actual expenditure for the project overall was running behind forecast expenditures at the close of fiscal year 2015. Having anticipated this underspend half-way through the fiscal year, we requested and were approved a six month no-cost extension by UW System. The remaining balance was expended by the revised project end date of December 31, 2015.

Equipment expenditure was within budget. The procurement process resulted in the identification of a more appropriate coating and laminating line that was a cheaper option than the originally identified item. Cost savings arising from equipment procurement were directed to salary (and fringe) to maximize effort on the project.

With regard to travel expenditure, we were approved a budget line transfer request of \$10,000 from the supplies budget to offset the overspend. The overspend on travel was associated with the opportunity to showcase RiverPoint art paper at the Southern Graphics Council conference in March 2014.

IV. Changes

Following a request for, and approval by UW System, a six-month no-cost extension was granted to the project. We extended the timeline to meet proposal targets of three networking events and to increase revenue capture with a new project completion date of December 31, 2015.