The Department of Wood Science & Forest Products at Virginia Tech
Volume 6 — July–August 2011

INSIDE VT WOOD

Earthquakes a Shakin' and Hurricanes a Blowin'

...and all that just from the commotion of the students moving back to campus last week!

Yes, we have been having some dramatic natural events in Virginia over the couple of weeks, but life at the University forges ahead. The earthquake last week in central Virginia resulted in a small tremor and aftershock in Blacksburg, but nothing more than some rattling windows. Our prayers go out to those in the coastal and inland regions who suffered losses last week in Hurricane Irene along the East Coast. But in Blacksburg, all is well.

The students are back, classes have started, and we have some great things planned for the year. Just a few of these are:

- At the end of September, Dr. Dan Hindman is coordinating a series of "Sustainable Blacksburg" demos for the Department to link to the community in a week-long 'town and gown' event.
- Urs Buehlmann is spearheading a major hardwood processing conference in Blacksburg in October, with the the 3rd International Scientific Conference on Hardwood Processing (ISCHP^{3}11) which will be a very well attended conference highlighting the significance of this important area.
- Our packaging group, Packaging Systems and Design, are organizing a planning meeting and also a Center for Unit Load - Advisory Board meeting for the Fall, and there has been strong interest in both of those as our programming in that area continues to grow.
- On November 12th, the Department and College will host an Open House as part of the broader Virginia Tech Open House, and we hope to see many of you there — more details on that in coming months.
- Several of our faculty in the Department will also attend the Virginia Forest Products Association next week in Virginia Beach. And that should also be a good time to renew connections, and for me to meet some of the people in the industry that I have only spoken to over the phone.

More great things from the faculty and the department can be found inside this newsletter. But also, please take a look in the very back pages at our "Equipment Wishlist" for the Department. Any help from our supporters to help us keep our facilities updated with good equipment is always appreciated.

As always, if you have any questions or comments about our work highlighted in the newsletter, or about the Department in general, please feel free to call or email me. Goodell@vt.edu.

Thank you.

Barry Goodell

ALUMNI PROFILE

Omid Parhizkar

Omid Parhizkar ('08 Ph.D. in forest products marketing and management) recently stepped into a new position with the World Bank—just a part of the career success he has already experienced since joining the organization in 2008. He credits his early success to his motto of never saying no to an opportunity. "You have to look for what you're hungry for," he affirmed. "Then you just have to be persistent in your goals."

That persistence is what Parhizkar claims has given him the ability to be successful. It led him to leave his native country of Iran to pursue a higher education; he eventually came to Virginia Tech to earn his doctorate. For eight years, he was unable to visit his family because of student visa restrictions, but opportunities continued to present themselves, and his persistence grew stronger.

"I worked on a number of projects, mostly international development for natural resources, with a focus on renewable energy and private sector development," he recalled. "Working on those projects helped me reach a new level of effectiveness and credibility in this arena."

After completing his doctorate, Parhizkar joined the World Bank's International Finance Corporation (IFC), where he was part of a larger global financial and indus- try specialist team that developed IFC strategy related to climate change and sustainable development. His expertise in climate change led him to his current position as a monitoring analyst with the organization's Global Environment Facility (GEF), a multilateral financial mechanism that provides sustainable development funds to recipient countries.

"My new job includes helping program teams facilitate their operations and business strategies for projects related to biodiversity, climate change, and sustainable forest management," he explained. His team at the GEF has about $5 billion in grants currently under implementation, including over 500 projects across the globe. "The World Bank is a fantastic working environment. I work with a very diverse group, and at the same time, I see what's happening around the world."

Working for the World Bank has gotten Parhizkar's career off to a great start, but he continues his professional development outside the office as well. He is an adjunct faculty member in Virginia Tech's National Capital Region, teaching a course entitled Sustainability, Clean Energy, and Climate Change for International Development. "I enjoy teaching because it gives me the opportunity to give back the experience that I have learned."

Although Parhizkar is happy with his current profes- sional career, he is unsure about what the future holds for him. "I would love to be an effective contributor to help economic productivity with sustainable practices both nationally and internationally, in the area of natural resources," he noted.

Perhaps that same persistence will lead him to do just that.

From CNRE's Summer 2011 Newsmagazine

Wood 5004 Seminar

Date: September 2, 2011
Time: 3:00-4:00 pm
Place: 102 Brooks Center

Junia Pereira

Synthesis of New Pullulan Derivatives for Oral Drug Delivery

Abstract

Pullulan is a natural water-soluble polysaccharide, produced from starch by the fungus *Aureobasidium pullulans*. Pullulan has several commercial applications, especially in the food and pharmaceutical industries. It is biodegradable, blood compatible, non-toxic, and non-immunogenic. As a result, pullulan is currently also being investigated for biomedical applications in several areas, for example targeted drug and gene delivery, tissue engineering, and wound healing. We are interested in obtaining new pullulan derivatives to be used as drug carriers in oral drug delivery applications.

Bio

Junia Pereira is a 3rd year Ph.D. student in the Macromolecular Science and Engineering Program. She received a B.S. in chemistry from the Federal University of São Carlos in Brazil in 2004 and an M.S. in synthetic organic chemistry from the same university in 2007. Before pursuing her Ph.D. degree, Junia worked for two years in the Department of Biological Systems Engineering at Virginia Tech. Junia's doctoral research focuses on the synthesis of polysaccharide derivatives for application in drug delivery.

The Department of Wood Science & Forest Products at Virginia Tech

25th Anniversary of the Establishment of the First Biobased Materials Center

By Wolfgang G. Glasser

It is 25 years ago this fall that Virginia's Center for Innovative Technology (CIT) in Herndon, VA, and the Bio-Regional Energy Associates, Ltd. (B-REAL) of Floyd County, VA, jointly funded the establishment of the first *Biobased Materials Center* at Virginia Tech. Whereas CIT officials at first resisted the designation of "biobased" for reasons that the term was yet unknown, the designation was eventually adopted by VT in all resulting news stories, websites, theses, publications and patents. In the ensuing 25 years, "biobased" has become a term frequently used in academic and commercial references, and now results in hundreds of citations when "googled" or searched on SciFinder. Dozens of "Biobased Materials Centers" have sprung up worldwide. CIT's Biobased Materials Center focused first on the establishment and operation of a steam explosion pilot plant capable of fractionating hardwood chips and agricultural harvesting residues into three constitutive biopolymers, cellulose, hemicelluloses and lignin, at the 100 lb/day scale. Steam explosion services were made available to numerous corporate parties between 1986 and 1992 and beyond. Over the span of 6 years, the members of the Biobased Materials Center conducted research into value-added applications of biopolymers and their derivatives. The effort resulted in the graduate studies of 23 students and post-doctoral fellows, 10 theses and dissertations, 21 publications, and 7 patents. Members of the highly interdisciplinary Biobased Materials Center came from five different colleges and 8 departments. The research results laid the foundation for two start-up companies.

Highlights of the Center's activities were the annual research retreats by its students and research fellows. These retreats were held in various timeshare properties of the Center Director (Prof. W. Glasser), at Lake Lure, NC; Edisto Is., SC; Duck (Outer Banks), NC; and Myrtle Beach, NC. The gatherings were structured in Gordon Research Conference-style with 3-hour presentations ("show-and-tell") and discussion sessions, mornings and evenings, by individual fellows. Afternoons were reserved for social and group activities.

Group of research fellows of the Biobased Materials Center during a visit to Charleston, SC (1988). From left: Rajesh Jain (post-doc), Ingemar Falkehag (R&D researcher of Westvaco, host and tour guide in Charleston), Willer de Oliveira (Ph.D.-cand., MESC), Vipul Dave (Ph.D.-cand., MESC), Will Kaar (post-doc), Charles E. ("Chip") Frazier (Ph.D.-cand., WSFP), Wolfgang G. Glasser (Prof., WSFP), Klaus Hofmann (Ph.D.-cand., MESC), Nancy Rauschenberg (MS-cand., Chem. E.), and Gil Garnier (Ph.D.-cand., Chem. E.).

The Center fellows also regularly attended the conferences, and participated in the poster sessions, of the Polymer Materials and Interfaces Laboratory (PMIL) of VT.

The Biobased Materials Center had an Industrial Advisory Board that consisted of representatives of regional industry and corporate sponsors. Board meetings usually involved representation from the Eastman Kodak Company (the predecessor of Eastman Chemicals), B-REAL, ALKO Ltd. AKZO America Inc., ARCO Chemicals, and Philip Morris, among several others.

The research efforts leading to start-up companies involved separation materials and biodegradable films (barrier materials) on the basis of various polysaccharides, cellulose, chitosan and xylan. Hydrogel "beads" for separations in biotechnology and pharmaceutical and medical processes played a particularly important role in the interdisciplinary research of the Biobased Materials Center during the period of 1990-1994. The Center's location had expanded from the Thomas M. Brooks Forest Products facility to the Corporate Research Park, where it was housed in a 2-story office/lab complex.

The lasting pride of the Biobased Materials Technology Development Center of CIT is its highly accomplished graduates that are dispersed into various academic, governmental and industrial positions with high responsibility all over the world. Students having graduated with Ph.D. degrees in this field during, before and after the CIT sponsorship-period, found employment in such places as UC-Berkeley, McGill University, Clemson, NC State U, Virginia Tech, Monash U (Australian Pulp and Paper Institute), UT-Knoxville, NREL, USDA-FS, EASTMAN KODAK, International Paper, Weyerhaeuser, Kimberly Clark, Jonson&Johnson, Westvaco, Hercules, Krems Chemie/Neste/Dynea, 3M, Masonite, Rohm&Haas, and many others.

Wolfgang G. Glasser is Professor emeritus of Wood Science, Virginia Tech, and is currently residing in Richmond, VA.

Glasser, Prof. of Wood Chemistry and Biobased Materials Center Director, receiving a patent award from Len Peters, Sr. Vice President of VT, during an annual VT-Intellectual Property, Inc., ceremony (ca. 1993).

News From the FPS and SWST Meetings in Oregon

THE "WOOD BOWL"

"WOOD BOWL" 2011 2nd Place Winners

From left to right: Scott McDonald – 2011 VT graduate, Adam Scouse, VT alum and OSU graduate student, "TJ" Robinson – Auburn University.

The annual quiz competition for FPS and SWST students occurred at the end of June in Portland. Oddly enough, even though we had five students from Virginia Tech attending the FPS meeting, only one showed up to the student "Wood Bowl" competition on Sunday afternoon. Thank you Scott McDonald!! (Note to self: Make sure to discuss that matter with the students in the Department who were provided funding to attend the meetings!)

The Wood Bowl competition is always great fun. Questions are asked in a "team-Jeopardy" style format, with participants probed on subjects ranging from the basics of wood anatomy, to the details of milling and machining, to the intricacies of cellulose nanotechnology -- and everything in between. With a little help from an alum of our program - Adam Scouse,

now a graduate student at Oregon State University; and "TJ" Robinson - a "ringer" from Auburn University, the Virginia Tech team did quite well and we ended up taking 2nd place overall to one of the Oregon State grad student teams that captured first place. Although an Auburn student, TJ Robinson's major Professor at Auburn, Dr. Brian Via, is a Hokie alum. So we think we can claim part of TJ through that lineage. The "Wood Bowl: event alone is worth attendance at the meeting every year.

Jesse Paris at the FPS meetings in Portland, Oregon.

Jesse graduated from Virginia Tech last year, and is now a graduate student at Oregon State University. Jesse was the student organizer of the Wood Bowl this year and did an outstanding job.

Congratulations to Professor and Department Head at Oregon State University, Dr. Thomas McLain.

Tom is stepping down from his post at OSU and will be retiring to North Carolina. Many of you will remember Tom from his time on the faculty at Virginia Tech, as well as for his leadership in the field of Forest Products over many years. Congratulations Tom on an outstanding career, with hopes that we can continue to count on you for your valued insights even in retirement.

Thomas McLain at the FPS Paul Bunyan Party, held at the World Forestry Center in Portland, Oregon . June 2011

Wood Anatomy for Dendrochronologists Workshop at North American Dendroecological Fieldweek, August 2011

By Audrey Zink-Sharp

Carolyn Copenheaver (FREC) and Audrey Zink-Sharp (WS/FP) were group leaders for the Wood Anatomy for Dendrochronologists workshop held during the 21st annual North America Dendroecological Fieldweek (NADEF) at the Mountain Lake Biological Station, Pembroke, Virginia, August 1 – August 8. Carolyn was also the local coordinator for NADEF 2011.

This year's fieldweek attracted over 60 participants from a wide variety of disciplines and included people from five continents. The 2011 group got to chose from six different workshops as part of their fieldweek experience that included an introduction to dendrochronology, fire history, dendroarchaeology, dendroclimatology, sclerochronology, and wood anatomy for dendrochronologists. Each workshop group toured local points of dendroecological interest and undertook fieldwork, laboratory preparation, and analysis of their

Part of Team Anatomy at NADEF 2011 hard at work in the Quantitative Wood Anatomy lab at Virginia Tech.

results. On the last day of fieldweek, each group made a presentation of their findings to the entire group.

Team Anatomy learned tree ring crossdating techniques and wood anatomy basics, techniques for free-hand and microtome sectioning, and digital image analysis with light and scanning electron microscopy. Ultimately, participants were interested in learning to crossdate tree cores as well as quantify abnormal growth trends and identify unusual anatomical features that relate to environmental and management factors. It was a very intense week with a large amount of work accomplished by highly dedicated participants. Past fieldweek projects have been published in peer reviewed journals, used as bases for proposals, and formed core parts of research dissertations.

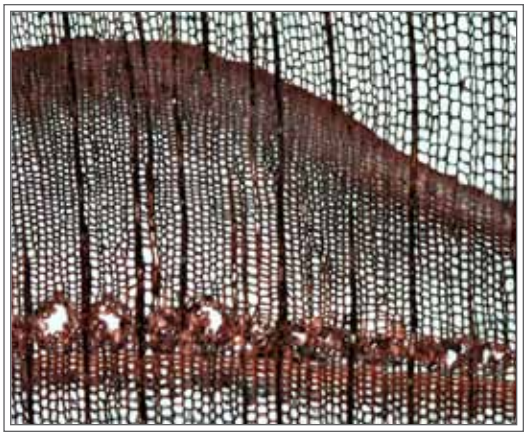
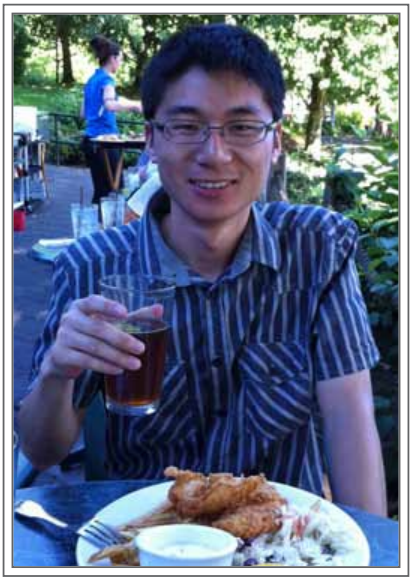


Image produced during the Wood Anatomy Workshop illustrating the anatomical features of eastern hemlock produced under infestation by the hemlock wooly adelgid. Notice the unusual growth ring structure and the distinct callous tissue.

Xing Yang Experiences Two Dimensions of Research

In July 2011, Xing Yang was hosted by the Willamette Valley Company in Eugene Oregon. Xing is a Ph.D. student and a graduate research fellow in the Wood-Based Composites Center (WBC). Xing's research advisor is Chip Frazier. The Willamette Valley Company is a WBC member company, and they hosted Xing on an all-expenses-paid trip to Eugene so that he could prepare specimens for his research. Xing is studying phenolic adhesives for veneer bonding applications, like laminated veneer lumber; he is investigating how the particle size and size distribution of organic fillers impacts adhesive performance. The Willamette Valley Company supplies organic fillers for the manufacture of structural wood-based composites. Shown here is Xing in the laboratory while he is fractionating fillers by particle size. The other image shows Xing contemplating the implications of his research over a cold beverage. Many thanks to the Willamette Valley Company for helping with Xing's research, and also for supporting the WBC. The WBC is a National Science Foundation, Industry/University Cooperative Research Center.



Xing Yang

VT Faculty Led Team Wins First Prize From Masco Corporation

Urs Buehlmann, faculty at the Department of Wood Science and Forest Products at Virginia Tech has won first price in Masco Corp. President's Award competition for operational environmental stewardship (Picture 1). Together with his Masco team-mates Charlie Burkett, Tommy Sykes, Chris Crawford, and Denis Carter (Picture 2) working at Merillat Kitchen Cabinetry, Atkins, VA, Urs improved the plant's rough mill operation and reduced the volume of raw material required. Masco Corporation is one of the world's largest home construction and home improvement products manufacturer with sales in excess of 8 billion dollars. Brands owned by Masco include, among others, Millgard Windows & Doors, Duraflex Ltd., Perless Faucet, Kraftmaid Cabinetry, and Merillat kitchen cabinets. Merillat is the largest kitchen cabinet producer in the U.S. and has manufacturing and assembly plants all over the continental U.S., with three locations in Virginia (Atkins, Mount Jackson, and Culpeper).

The award was given for the team's achievements in increasing Merillat's Atkins plant rough mill yield by almost 3 percent, saving the company over $300,000 annually and reducing lumber requirements accordingly (see Inside VTWood 6, April-May, pp. 7-8).

President's Award of Operations for Environmental Stewardship of the Masco Corporation.

Chris Crawford, Charlie Burkett, and Tommy Sykes at the award ceremony (missing: Denis Carter and Urs Buehlmann).

Quesada, Hindman Visit With Senator Mark Warner

On Thursday, August 25th, Senator Mark Warner, center, visited the Southern Virginia Higher Education Center in South Boston, Virginia. In attendance were Drs. Henry Quesada and Daniel Hindman from Virginia Tech Wood Science and Forest Products Department. The visit included a tour of the new SVHEC Innovation Center at the South Boston campus and met with faculty, staff, local business owners and visitors. Drs. Quesada and Hindman discussed collaborations between Virginia Tech and the SVHEC.

Virginia Tech Faculty Presents to West Virginia's Forest Management Review Commission (FMRC)

By Urs Buehlmann, Al Schuler, and Jan Wiedenbeck

On August 1, 2011 Department of Wood Science and Forest Products faculty member Urs Buehlmann with his collaborators, Al Schuler and Jan Wiedenbeck, both with the U.S. Forest Service in Princeton, WV, was giving a presentation on the status of the U.S. and West Virginia's forest products industry to West Virginia's Forest Management Review Commission (FMRC) at the State Capitol in Charleston. West Virginia's FMRC consists of five senators, five delegates, and five citizen members (one of them being Lanny Williamson, a member of the Department's advisory board of the Center for Unit Load Design) and their objective is to provide West Virginia's government with advice on matters relating to the State's forest and forest products industry.

The message to the members of the FMRC included some sobering facts, including some background information on the federal government's debt deal announced on the same day, the revised 1st Quarter GDP numbers (revised down

to a meager 0.4%), 2nd Quarter GDP growth (1.3%, not a stellar number either), which all influence the well-being of the U.S. and West Virginia's forest products industries. With stimulus spending gone, all levels of government cutting spending, and private consumption not picking up, another recession remains a possibility. And, most important to the forest products industry, housing remains mired in the foreclosure crisis. Figure 1 shows how deep the fall of U.S. new home sales is that started in 2006, with only 312,000 homes being sold in June 2011 on an annualized basis.

Figure 1: U.S. new home sales 1963 - 2010.

New housing starts were, somewhat stronger in June 2011 (435,000 starts annual rate), but remain below a healthy number. Also, housing resales remain weak at a little over 4 million units annualized and a large part of these sales are distressed (e.g., foreclosed homes). Indeed, home ownership rates in the U.S. have fallen from a peak of 69.2% in 2006 to 67% in the 1st quarter of 2011, a trend that, if sustained, has negative implications to the U.S. residential construction and the forest products industries.

The focus on housing was based on the importance of the housing sector to the U.S. forest products industry as 70 percent of all softwood lumber produced in the U.S. is sold to the residential construction market and the housing market is the second largest consumer of U.S. hardwood lumber (see Figure 2).

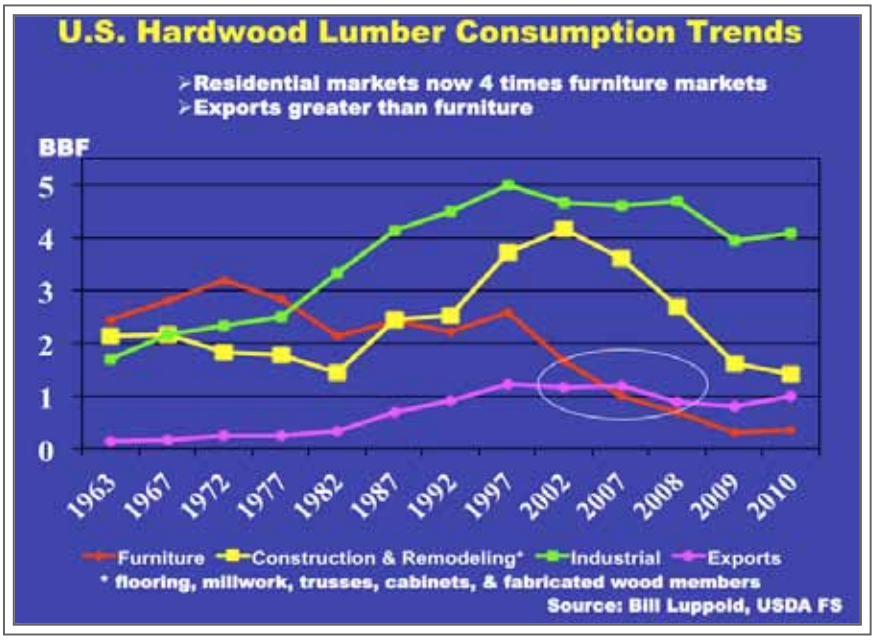


Figure 2: U.S. hardwood lumber consumption trends 1963 - 2010.

Given the dismal state of activity with the housing industry, it is no surprise that the U.S. forest products industries are struggling to survive. However, there is some good news. According to several sources, population growth and replacement of old homes would require the production of about 1.5 million new homes in the U.S. Thus, at current levels, this demand is not met and lays the foundation for higher demand in the future, once the foreclosed properties and the shadow inventory (homes that are not put on the market due to the poor market conditions) is worked off. The mountain pine beetle in Canada, which is devastating the softwood forests in the West, will reduce the supply of lumber from our Northern neighbor and increase prices, further helping the U.S. industry.

The low U.S. dollar exchange rate, not a good sign per se but highly beneficial for the nation's exporters, makes U.S. logs and lumber competitive around the globe. With Russia raising its export taxes on wood, China in particular has become an interesting market for U.S. firms (China imports 40% of its wood and has a deficit of an estimated 150

million m3 per year). Japan, too, will need to import wood to help its rebuilding efforts after the earthquake initiated disasters this past March. Additionally, European countries need wood fiber to meet their renewable energy quotas and their green building requirements. The amended Lacey Act, which requires suppliers of wood products to the U.S. to only use wood from legal sources, also drives demand for U.S. wood, as there are no questions about the legality of the source for wood derived from U.S. forests.

In the U.S., there are some good things happening to the forest industry. Resource constraints, climate change policies, and shifting consumer values will benefit the industry and forest landowners. The Energy Independence Act of 2008 sets targets for cellulosic biofuels production through 2022 to produce 36 billion gallons of renewable fuels. Twenty-one billion gallons must come from "advanced" biofuels, such as cellulosic ethanol. Also, the American clean energy and security act of 2009 establishes targets to obtain 17% of U.S. electricity from renewable resources such as wood. The biggest positive impact on the economic well-being of the U.S. forest industry, however, can be expected from the recovery of the U.S. housing market. Once this market returns to some semblance of normality, the struggle of the industry will be lessened and, hopefully, a healthy, sustainable cycle of profit making and re-investment into people, plants, and equipment will follow.

VT Faculty Obtains Six Sigma Green Belt

Urs Buehlmann, faculty at the Department of Wood Science and Forest Products, recently obtained his Six Sigma Green Belt from the Juran Institute in Southbury, CT (www.juran.com). The Juran Institute, founded by the late Statistician Dr. Joseph M. Juran, an architect of quality and quality management who wrote several influential books on those subjects, is widely recognized for its teachings. The requirements of the Juran Institute for obtaining a Six Sigma Green Belt include passing a theoretical test after extensive training and the successful completion of an industrial project employing Six Sigma methodologies.

VTLeanTeam Supports Lean Transformation at Rochester Shoe Tree

By Mathias Schmitt, Ana Serrano, and Urs Buehlmann

Rochester Shoe Tree (RST), a medium-sized company in Ashland, NH serving the upper end fashion market with cedar shoe trees, cedar hangers, and other shoe care products in related markets, worked with the VTLeanTeam on creating value stream maps (VSM) of their shoe tree and hanger production lines. Picture 1 shows examples of the company's products for which value stream maps were created.

Picture 1: Two of Rochester Shoe Tree's (RST) products, shoe trees (left) and hangers (right). The company produces these items predominantly in aromatic cedar wood and sells them to higher-end fashion stores.

Ten members of the VTLeanTeam spent the week of July 10, 2011 in Ashland working with twelve members of RST on mapping the current and future state value streams of RST's shoe trees and hangers production lines. Picture 2 shows the value stream mapping team (members from RST and the VTLeanTeam) in front of the company's manufacturing facility.

Picture 2: The VTLeanTeam and RST's team members in front of the company's manufacturing facility in Ashland, New Hampshire. (first row left to right: Akiko Nakata; Patricia Hyde, Ana Serrano, Adrienn Andersch, Angela Zhou, Steve Kidder, Dennis Mausewitz; second row left to right: Penny McClay, Shirley Willey, Dave Maxam, Earl Kline, Mathias Schmitt, Lou LaCourse, Laszlo Horvath; third row left to right: Michael Sperber, Shawn Crawford, and Wayne Baker; not in the picture: Kelly Latuch and Urs Buehlmann).

The first day of the week was dedicated to get a better understanding of RST's manufacturing processes, the products RST sell, and to teach RST's team members Lean Manufacturing principles. Picture 3 shows VTLeanTeam members in discussion with RST's president, Deb French.

After the introductory plant tour, VTLeanTeam members conducted Lean training with RST's team members. For most of RST's employees, Lean was an unknown concept, which was, thus, regarded with some suspicion. However, the VTLeanTeam worked hard to involve all RST team members in the VTLeanTeam's manufacturing simulation game developed by the Team (Picture 4), offering newcomers an easy way to learn about Lean concepts. The involvement of all VSM team members in the simulation allowed everyone to interact, to get to know each other, and to experience the power of Lean in a lively and playful way. Picture 5 shows the resulting current state VSM (e.g., the situation as it is at the present time) of the VTLeanTeam's simulation game.

Picture 3: VTLeanTeam members in discussion with Deb French (from left to right: Deb French, Shawn Crawford, Adrienn Andersch, Laszlo Horvath, Angela Zhou, Mathias Schmitt, Ana Serrano, Michael Sperber, and Akiko Nakata).

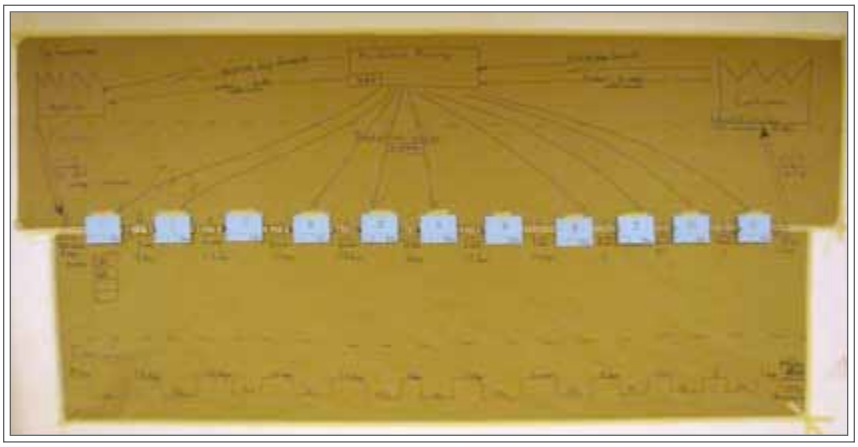
A value stream map shows the three critical areas of manufacturing, e.g., information flow, the process and material flows, and the timeline at the bottom of the map showing processing and lead times. The VSM team members mapped the current state of the simulation to better understand the processes involved and the problems existing (Picture 5). Then, the VSM team members (the experts of the process, e.g., employee involvement) worked out a future state using lean principles combined with their own knowledge and creativity. The improvements made by the participants resulted in a balancing and leveling of process steps, which resulted in shorter lead times, less work-in-progress, and one piece flow. Improvements included a reduction of lead time by 84%, a reduction of WIP by 91%, and an increase in per-employee productivity of 50%.

By Tuesday morning, after the VSM team was split into two, the shoe tree and the hanger's teams started gathering the necessary data to create a current state VSM of both RST's products.

The shoe tree team, consisting of Wayne Baker, Steve Kidder, Dave Maxam, Penny McClay, and Shirley Willey of RST and Angela Zhou, Earl Kline, Laszlo Horvath, Shawn Crawford, and Mathias Schmitt of the VTLeanTeam, started off to discuss and better understand RST's customer needs and demand. This was followed by a discussion about the product family, products that are made with almost the same process steps, and in-depth training session of how

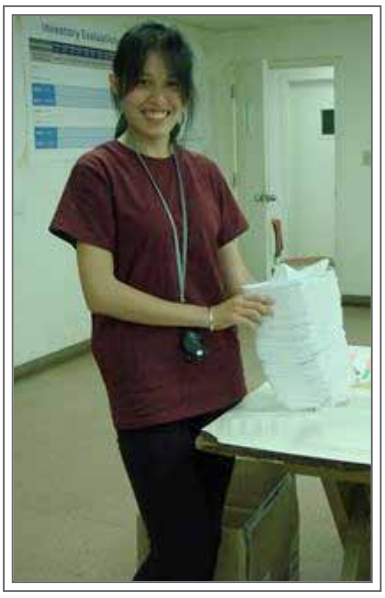
Picture 4: VSM event team members discussing the results of the Lean simulation (from left to right: Shirley Willey, Dennis Matusewitz, Deb French, Penny McClay).

to gather the necessary data for Value Stream Mapping. With the knowledge acquired, and equipped with pencil and paper, the shoe tree team walked the shop floor (go and see) to map the current state value stream. The VSM walk included the gathering of necessary figures like cycle time, lead time, changeover time, inventory in between process steps, and other relevant information. The shoe tree team finished their current state shoe tree value stream map by Wednesday (day 3 of the event) and also highlighted problems associated with process steps on the VSM. Examples of such problems include, for example, high scrap rates, insufficient machine reliabilities, or lack of communication. Picture 6 shows members of the VTLeanTeam working on assignments for the shoe tree value stream maps.



Picture 5: VSM depicting the current state of VTLean's Lean manufacturing simulation.

On Thursday morning then, the shoe tree team conducted a short training session about Lean methods and how to get from push to pull. This training session included discussions about supermarkets, Kanban, Heijunka boxes, two-bin systems, replenishment cycles, leveling and balancing of process steps, and many other helpful tools for improving the current state. With this knowledge, the team went on to draw the future state value stream map from supplier, to kiln drying, rough cutting to final assembly and shipping. New processes were mapped and new ideas incorporated. With the future state value stream map in place, the team also created an implementation plan of what needs to be done in which sequence to transform RST's shoe tree production line to the future state.



Picture 6: The shoe tree team working on their assignment (left picture: Angela Zhou; right picture from left to right: Shawn Crawford, Mathias Schmitt and Laszlo Horvath).

The hanger team, consisting of Patricia Hyde, Lou LaCourse, Kelly Latuch and Dennis Matusewitz of RST and Adrienn Andersch, Akiko Nakata, Ana Serrano, Urs Buehlmann, and Michael Sperber of the VTLeanTeam, basically followed the same procedure as described for the shoe tree team to develop a current state and a future state value stream

map including an implementation plan. However, when comparing the shoe tree and hanger production processes, little commonalities were found after drying of the lumber, justifying the idea of working in two separate, independent teams. Also, since the demand of hangers is increasing, focus was given on balancing and leveling the workload to meet customer demand in the future. Picture 7 and 8 show the hanger team members on the shop floor discussing the processes and taking time to better understand implications of suggested changes.

Picture 7 and 8: The hanger team investigating on the shop floor (left picture from left to right: Ana Serrano, Michael Sperber, Adrienn Andersch, and Kelly Latuch; right picture from left to right: Patricia Hyde, Dennis Matusewitz, and Akiko Nakata).

By Friday, both teams had created future state value stream maps with estimated reductions in lead time by more than 67 percent while reducing inventory by 73 percent. Additionally, both teams had created a list of action items to facilitate RST's implementation of the future state. Steve Kidder, Assistant Plant Manager in charge of Lean, expressed his gratitude to the team and stated that "… the contributions of the VTLeanTeam were absolutely critical for RST to have created executable VSMs including action items in one week's time." A notion that was seconded by plant manager Lou LaCourse by stating that "… It was great fun and we took a giant step forward in our thinking." Deb French, President of RST, underscored the importance of RST to continuously improve, especially in light of relentless pressure from imported products in the market place. "The VTLeanTeam has enabled RST to improve its market position by supporting the company's improvement efforts and by motivating all team members involved." She indicated that RST would remain focused on pursuing Lean and will be glad to continue the company's collaboration with the VTLeanTeam.

Special thanks is extended to the Regional Wood Products Consortium, represented by Collin Miller, for initially connecting RST to the VTLeanTeam through their Specialized Innovation Workshop series on Lean Manufacturing for Small to Medium Sized Wood Products Companies and to Sustainable Forest Futures for providing partial funding to support the team's visit to the company.

VTLeanTeam Works With Financial Services Company

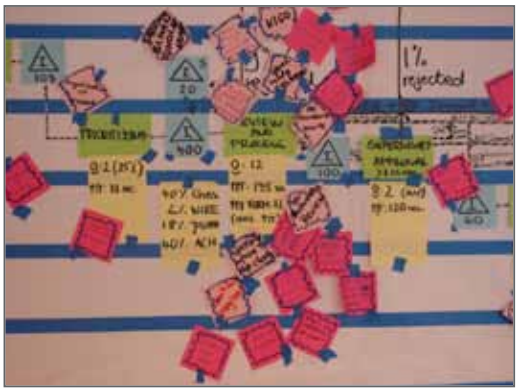
by Urs Buehlmann

During the week of July 25, 2011, six members of the VTLeanTeam teamed-up with LPL Financial (LPL) to conduct a Kaizen event in their retirement investment management department. LPL, the largest independent broker/dealer and the leading national distributor of financial products with net revenue of $3.1 billion (2010) is a publicly traded company (LPLA), headquartered in Boston with locations in San Diego and Charlotte and is in a phase of rapid expansion. LPL focuses on serving over 12,600 independent financial advisors, and approximately 750 financial institutions by providing an integrated platform of proprietary technology, brokerage and investment advisory services. An area of high growth for LPL is the area of retirement investment management, where the Kaizen event in which the VTLeanTeam participated was focused. Picture 1 shows the VTLeanTeam members working on LPL's value stream map (VSM) of the retirement money management department in the evening in their hotel room.

Picture 1: VTLeanTeam members working on their swim lane VSM (from left to right: Adrienn Andersch, Shawn Crawford, Michael Sperber, Angela Zhou, Ana Serrano). Team member Mathias Schmitt, who stayed behind in Blacksburg, joined the evening session by VOIP.

The Kaizen event focused on reviewing LPL retirement funds transaction processes. In particular, the process of keeping records of all transactions demanded by the customer or the customer's financial advisor while, at the same time, ensuring legal compliance with all applicable Federal, State, and local laws and ordinances – a gigantic task for a company doing business in all 50 States and managing assets of $315.6 billion.

On Monday, July 25, 2011, the VTLeanTeam joined 15 LPL team members to participate in some basic lean training. Then, the team established, based on their memories, a first current state value stream map (VSM) of the retirement account transaction recording process. By Tuesday, the team members could be seen all over LPL's Charlotte building observing, measuring, and verifying processes and data. By Wednesday, team members realized that the value stream they created, based on their memories, was not an accurate reflection of reality and many processes and data points had to be changed to create a realistic current state VSM. To create a record of a typical retirement account transaction, the transaction is processed for 150 seconds, yet spends 18 hours (more than 2 days) in queues awaiting the different processing steps necessary. A large part of the delay stems from problems in the processes, such as, for example, missing information, illegible forms, inefficient data entry interfaces, doubling of processes, waiting for approvals, or lost data. Thus, the team identified some of the existing problems using the current state VSM. A detail of the problems identified in one process is shown in Picture 2.



Picture 2: Detail of current state VSM of the retirement transaction recording process at LPL including problems identified.

After having created an accurate representation of the current state of LPL's retirement transaction processes value stream, and a listing of existing problems, the Kaizen team spent Thursday and Friday creating a future state VSM and to identify the action items necessary to execute the transformation from current to future state. By simplifying processes, eliminating unnecessary work and approvals, leveraging the power of IT, and applying lean principles to every aspect of the process, the resulting future state VSM resulted in a processing time of 29 seconds (a 87% improvement compared to the current state) and a lead time of 2.5 hours (improvement of 86%), while work in process inventory (WIP) was reduced by 90%. Picture 3 shows the Kaizen team members discussing their work in front of the future state VSM.

Picture 3: Kaizen team members discussing solutions in front of the future state VSM (from left to right: Ana Serrano, Tim Graham, Shawn Crawford, Angela Zhou, Michael Sperber).

The unique opportunity for Lean@VirginiaTech to collaborate with a financial services company in a Lean transformation event was made possible by Cindy Swank, Executive Vice President of Service Value Commitment at LPL Financial. Cindy is an acknowledged Lean expert, having published in Harvard Business Review and other quality outlets, and is a frequent presenter about Lean (among other venues, Cindy was the guest speaker at the highly acclaimed Lean@VirginiaTech Lean Administration workshop in Spring 2011). Cindy and her three Lean transformation specialist team members at LPL Financial, Vinny Yakoobian, Eugene Shapiro and Eris Allen, proved to

be a deep pool of knowledge and experience to all team members of the VTLeanTeam. Together with all the other team members from LPL Financial (pictured in Picture 4), a truly unique and highly efficient Kaizen event did happen over this week. John Childress, Assistant VP Customer Services, stated his impressions by saying "Thank you and your team for the education! I admit that I had initial doubts about the effectiveness of applying Lean concepts to the service environment. The experience was definitely eye opening and helped eliminate these concerns," while Garrett Beam, VP of Strategic Planning, added that "Using … University labor for Kaizen events should be part of LPL's best Lean practices." In any case, the VTLeanTeam had a tremendous week in Charlotte with first-class, hands-on education, and an opportunity to learn from experts. To the VTLeanTeam, an interesting challenge was to work with digital processes in an electronic financial services environment where no physical objects are visible. A highly positive experience that will, hopefully, be repeated.

Picture 4: The LPL Financial retirement Kaizen event team (from left to right: Eugene Shapiro, Megan Polizzi, Shaun Christensen, Paula Griesser, Garrett Beam, Whitney Keane, Matt Boyd, Angela Zhou, Shawn Crawford, Adrienn Andersch, Michael Sperber, Ana Serrano, Anita Nunemaker, Tim Graham, John Childress, Nicole McRavion, Vinny Yakoobian, and Lisa Hughes. Not on picture: Cindy Swank, Lisa Hall, Urs Buehlmann).

Faculty from China Visits Brooks Center

Three scientists and professors from China accompanied by Dr. Zhangjing Chen from our Department, visited the Brooks Laboratory on June 16th and 17th. The scientists, Cheng Fang and Pan Bin from Chinese Academy of Forestry (CAF) and professor, Li Yanjun from Zhejiang Agriculture and Forestry University, work in the fields of wood machining and instrumentation, and bamboo and its secondary products. Dr. Marshall White showed them research on pallets in the Brooks lab, and also other new research on packaging materials and the equipment. CAF, located in Beijing, is a leading forestry research institute in China and the Academy has had a long relationship with our Department. Dr. Geza Ifju and Dr. Robert Youngs visited the CAF in 1990s. Dr. Goodell gave lectures at CAF three years ago. Dr. Chen was invited to CAF last year where he gave a presentation, and he still is assisting CAF scientists in a project on the drying of Chinese larch species. CAF has also sent many students to our department at Tech over the years to pursue higher degrees. If anyone is interested in contacts with these scientists or others at CAF or Zhejiang Agr. and Forestry Univ., please write to Zhangjing Chen at chengo@vt.edu.

From left, Bin Pan, Zhangjing Chen, Jody Jellison, Yanjun Li, Fang Cheng, Barry Goodell

Reflections of Blacksburg:

When they saw the blue sky and white clouds, they wanted to live here. When they took pictures of the green trees growing on the isle and their reflection in the water with geese in the duck pond, they wanted to put them up as desktop photos. While touring our labs, they were inspired to collaborate with all of us in research.

Who's Got Sustainability? We Got Sustainability!

On September 18 to 24th, Virginia Tech will be hosting the annual Sustainability Week. This year, the event is sponsored jointly by the Office of Energy and Sustainability at Virginia Tech and Sustainable Blacksburg, a community-based non-profit organization. The schedule of events is listed at http://www.recycle.vt.edu/sustain/. Of the approximately twenty events listed, six events are sponsored by the Department of Wood Science and Forest Products, including:

- How to Improve Your Business by Applying Lean Principles (VT Lean Team)
- Sustainable Packaging (Dr. Bush)
- Help Reuse a Building (Dr. Hindman)
- Sustainable Materials – Where Do They Come From and Where Do They Go? (Drs. Hindman and Bond)
- Making and Using Sustainable Materials and Bioenergy (Dr. Goodell and Dr. Zink-Sharp)
- Corrugated Board Design Contest (Dr. Bush)

Times and locations of events are listed on the webpage given above. All events are free and open to the public. This is the largest showing of events from a single group at Virginia Tech and represents the commitment that the Department has made in exploring sustainability and the new area of Sustainable Biomaterials.

Why Lean Safety?

LEAN @ Virginia Tech

Two-day Workshop on Lean and Safety
October 26-27, 2011

$600 per person
(Lunch and coffee breaks included)
Free for Lean Club Members

Continuous Education Credits (CE) available

Location

Holiday Inn Express Hotel & Suites
(Reservation code "VT Lean")
4912 S. Miami Blvd.
Durham, NC 27703
(919) 474-9800

Contact Us

Web: www.vtlean.org/club/workshops/
Mail: 1650 Ramble Road,
Blacksburg, VA 24061
Phone: (540) 443 6688
E-mail: info@vtlean.org

Day 1 - 8:00am - 5:00pm

- Welcome and introduction
- Expert speaker
- What keeps you awake at night? - discussion about your problems regarding safety
- Value stream mapping and safety - current state
- Real world business case - part one
- Lean and safety - introduction and principles
- Reception

Day 2 - 8:00am - 4:00pm

- Real world business case - part two
- Value stream mapping and safety - future state
- Lean and safety - organization, culture, and regulations
- What keeps you awake at night? - problem solving and lessons learned

Outcomes

- Understand how lean and safety are interrelated
- Improve safety outcomes
- Manage safety more effectively and efficiently
- Access to lean community

ISCHP^{3}11

INTERNATIONAL SCIENTIFIC CONFERENCE ON HARDWOOD PROCESSING

VirginiaTech

WERC Wood Education and Resource Center

WEINIG

Announcement:

ISCHP^{3}11, the third International Scientific Conference on Hardwood Processing will be held from October 16th to 18th at The Inn at VirginiaTech. Over 100 participants from all over the world are expected to listen to more than 60 presenters delivering the latest insights about hardwoods from trees to final products. Mark Barford, President NHLA, Ed Pepke, Senior Timber Trade Analyst, European Forest Institute, Alex Finkral, Senior Forester, The Forest Land Group, and Maud Hinchee, Chief Technology Officer, ArborGen, Inc., the conference's invited speakers, will provide up-to-date information about the status of the hardwood industry and hardwood markets, about hardwood certification, and about the future of the hardwood resource. Concurrent sessions will be held covering the following areas:

- Forestry practices and hardwood quality
- Supply chain management
- Hardwood processing and optimization
- Markets, trade, and business insights
- Certification and sustainability
- Hardwood innovations of the future

ISCHP^{3}11 will bring industry professionals, scientists, association representatives, government employees, suppliers, and customers together to share knowledge, ideas, and to network. The conference will cover hardwood related issues from the source to the customer, discuss recent developments, and show paths into the future. ISCHP^{3}11 will have a special focus on sustainability and certification and help to further promote the important role of the world's leading renewable, carbon-absorbing raw material.

ISCHP^{3}11 will benefit attendees with ideas and knowledge from practitioners, scientists, and other experts from around the globe about the hardwood value chain—from the forest to the end customer.

CONFERENCE EVENTS

ISCHP^{3}11

Timetable of conference events

Oct. 16, 2011

6:00pm - 8:00pm	ISCHP^{3}11 reception

Oct. 17, 2011

8:00am - 10:00am	ISCHP^{3}11 opening session
10:00am - 5:00pm	Presentation and poster sessions
6:30pm - 10:00pm	Banquet

Oct. 18, 2011

8:00am - 12:00pm	Presentation and poster sessions
1:00pm - 3:00pm	ISCHP^{3}11 closing session

Oct. 19, 2011

8:00am - 5:00pm	Optional industry tour

ADDITIONAL INFO

ISCHP^{3}11

For additional information, contact:

Urs Buehlmann 540-231-9759 (phone),
buehlmann@gmail.com (email)
http://www.ischp2011.org (web)

Supporters:

CNR-IVALSA Trees and Timber Institute

WCMA

NHLA

FPInnovations

FCBA Institut Technologique

HMR Executive

Wood Products Manufacturers Association

AWI Architectural Woodwork Institute

Equipment "Wishlist" in the Department to Enhance the Undergraduate Student Experience

CAN YOU HELP US?

With advances in technology and limited budgets, it is often difficult for Universities to keep up and provide students with hands-on experience using the latest equipment. Often, it is not even necessary to have the very latest equipment as the "base model" can provide a good educational experience in our classes and labs.

With that in mind, the Department has put together an Equipment Wishlist to send out to our Alumni and Friends. The hope is that those of you in a position to provide either new or used equipment, or funding to purchase such equipment, might help us out in the Department. Many of these are "big ticket" items, but some are more modest. Depending on your sub-field, some of the equipment may not even have recognizable names! We thought we would try this approach though and see what it might net. Some folks in Industry may be aware of equipment that is being changed out, and the older system may be just perfect for our needs.

Please note that we have limited space in our Brooks Lab facility, so we do need to be selective. The faculty have discussed the list and developed the list based on what they think is most needed, and that will be maximally used.

Thank you for any help, and if you have ideas for other ways to help us bring in important equipment pieces to grow the educational experience for our students, please let us know. Thank you.

Equipment needs for Teaching and Student Learning in Packaging, Mechanics, and Innovation and Design activities at Virginia Tech

Vision: To create a world-class undergraduate student workspace that is recognized and respected as a leading student learning environment for creativity, innovation, and entrepreneurship.

Innovation and Design	Teaching Purpose	Short/Long Term Need
CNC Machine	Rapid prototyping, proof-of-concept testing	Short
CIM Cell (robot/PLC/ conveyor/bar code/RFID)	Automation, materials management	Long
Dust collection system	Minimize/eliminate dust–sustain cleanliness	Short
Finishing/spray booth	Finish technologies and "green" finishes	Long
CAD/CAM studio (hardware & software – Pro E, SolidWorks, etc.)	Product concept, design, and modeling	Short*
3-D scanner	Rapid prototyping, product modeling	Short*
Video conferencing system	Meetings, distance teaching/learning	Short
Electric lift	Facility maintenance	Long
Flexible electrical/air service	Flexible manufacturing and work cells	Short
Saw-stop safety table saw (2)	Safety for students	Short
Mobile end-feed table	Materials management	Short

*Similar to Packaging System & Design request

Mechanics/Sustainable Structures	Teaching Purpose	Short/Long Term Need
MTS controller and data acquisition system	Current system no longer supported by MTS; WOOD 3314, WOOD 2554, WOOD 1234, other classes conducting testing	Short
12 Stereo Microscopes	WOOD 1234, special study; provide more student access to microscopes	Short
Dual Axis Force Plate (2)	WOOD 3314, WOOD 5324; physical demonstrations, biomechanics,	Short
V20 Nail Kicker by Reconnix (2)	WOOD 3324, Deconstruction; disassembly of wooden structures, preparing bioenergy sources	Short
High End (Ergonomic) Safety Harnesses (2-4, possibly different brands, quality)	WOOD 3314,WOOD 4984 (DWS), safety training; demonstrate use/quality of different safety harness	Short
Vermeer HG200 Portable Grinder	WOOD 3324, Deconstruction, Bioenergy generation source	Short

Packaging Systems & Design	Teaching Purpose	Short/Long Term Need
3D Scanner	Accelerate the primary package and product design	Short
Texture analyzer and/or MTS 250 lbs load cell	Testing various mechanical properties of packaging products and contents	Short
Rapid Prototype maker	Rapid prototyping and primary packaging design concepts	Short
Gas Permeability Tester (O2, H2O, CO2)	Studying the interaction between packaging materials and products	Short
Digital printer	Package design concepts, printing and labeling studies	Short
Bench top Extruders (single/ twin screw type for casting or blown film)	Primary units for Packaging polymers and production areas	Short
Digital Micrometer	Measuring the thickness	Short
Vacuum sealer	Producing Vacuum packaging system	Short
SolidWorks CAD program	Accelerate the product design	Long

Controller for the vibration table	The current controller barely works	Long
Hot seal maker	Study of sealing effect of packaging materials	Long
UV/Visible/Fluorescent/ Chemiluminescent spectrometers	Designing smart packaging sensor for Food packaging	Long
Melt Index/Rheometer	Understanding of viscosity of plastic polymers	Long
Colorimeter	Measuring the optical transparency	Long
Bench top Injection /Blow molding machines	Understanding of rigid plastic packaging productions	Long
Newer HPLC/ GC-MASS spectrometer	Analyzing various physical properties of packaging materials and system	Long
DSC/DMA/TGA/TMA	Understanding of thermal properties of packaging materials	Long