FPSolutions newsletter, in collaboration with the FIBRE Network, features an R&D story from one of the eight FIBRE member networks. This issue highlights university-led research from the Value Chain Optimization (VCO) Network and its collaboration with FPInnovations and the highly qualified personnel (HQP) talent of master's student Alvaro Gil.

Value Chain Optimization Network – Agile manufacturing strategies for sawmills to improve the competitiveness of hardwood

What evidence-based research strategies can sawmills apply to increase use for hardwood? How can novel strategies assist with log sorting (grade and quality) for processing within a sawmill? VCO Network and FPInnovations are addressing these questions in their collaborative research project. The project's ultimate aim is to develop and then transfer its results and strategies into hardwood mill processing. Jean-Marc Frayret and Alvaro Gil, professor and master's student, respectively, at École Polytechnique de Montréal, along with Jean McDonald, an FPInnovations scientist, are working together within this project.

Several issues have led to a hardwood market crisis. There has been decreased demand from the American market, along with displacement of production capacity for furniture and other goods to Asian countries. Additionally, there is a resource problem with hardwood logs. In order to improve Canada's forest quality, potential high-grade hardwood largely remains uncut in the forest and lower grade logs are harvested. Sawmill manufacturing equipment's original purpose was engineered to manufacture high-grade logs. The lower grade harvested logs are not economically processed within sawmills.

Taking all this into account, the timing was right for the VCO Network and FPInnovations to collaborate. When the project began, FPInnovations had recently developed a hardwood research initiative to support the industry in its effort to shift

toward a client-focused industrial structure. One research opportunity in the VCO Network program was to improve sawmill manufacturing agility through a demand driven approach.

FPInnovations held existing data in relation to hardwood log quality and yield for applications such as: flooring, pallet, kitchen cabinetry, stairs, molding, furniture and paneling. FPInnovations already knew it was important to select the best logs for every application. Prior to getting involved with the VCO Network, FPInnovations had also worked with a statistician to look at the data. However, little progress had been made using the traditional approaches trying to forecast the overall yield from the data. "When we began work with Jean-Marc Frayret and Alvaro Gil, they proposed a new approach, which tried to avoid the forecasting error by separating the samples with similar attributes," said Jean McDonald. "Their approach was to devise a classification grid which would forecast a better yield for each category. The suggested approach uses data mining techniques and agent-based simulation to, first, identify the best logs for every application, and, then, simulate log yard and sawmill operations to assess the cost/benefit of log sorting operations." For example, the VCO team was able test their approach on real data from McDonald's previous project that involved the processing of 180 logs to around 2,100 lumber pieces.

The project has also been fruitful for VCO master's student, Alvaro Gil. VCO Network supports the training and development of highly qualified personnel (HQP) like Gil. The training received within all eight FIBRE research networks assists in creating a newly trained workforce with a keen eye on innovation and commercialization. "For this research project, Gil has been a huge part of the success of our project on many levels and has had many responsibilities along the way," said Jean-Marc Frayret.

Gil has benefitted from the collaborative research approach. "The collaboration between VCO and FPInnovations allowed me the ability to tie our research directly in with industry objectives and both organizations have mentored me throughout the entire process. From the beginning, we have always had both the academic and the industrial perspectives in mind. This may be the key to the project's success."

The research project is in its final year. The next step for the project is work on simulation and modelling to predict what the impact will be for the sawmill process. Upon the project's completion, the results will be summarized into a report and the report will be disseminated to the hardwood industry.

FIBRE works within the Forest Sector Innovation System contributing to the transformation of the Canadian forest sector. FIBRE offers a conduit to university research capacity among the eight NSERC forest sector networks (100 professors and more than 400 students). The mandate comes from a partnership comprising: FPInnovations, Natural Resources Canada, NSERC, and Forest Products Association of Canada (FPAC).

The University R&D networks comprise seven NSERC strategic initiatives, which are: ForValueNet Network, and Value Chain Optimization Network, both led by Laval University; Bioconversion Network, led by the University of Guelph; Lignoworks, led by the University of British Columbia; Innovative Green Wood Fibre Products Network, led by McGill University; Sentinel Bioactive Paper Network, led by McMaster University; NEWBuildS, led by the University of New Brunswick. The eighth R&D network is ArboraNano, the Canadian Forest NanoProducts Network, a business-led Centre of Excellence.

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