

Engineering a new  
source of

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# ENERGY AND REVENUE

A clean energy initiative by the provincial power utility provided the impetus for Nanaimo Forest Products to invest in a biomass electrical generation project. Upon completion, the mill became energy self-sufficient and also gained an additional revenue stream. ANDRITZ AUTOMATION served as the electrical engineering partner.



Operating under several different owners, the Harmac Pacific pulp mill has been a cornerstone of Nanaimo's business life. Built in the late 1940's in British Columbia, Canada, and named after Harvey Reginald MacMillan (Har-Mac), the mill became one of the world's foremost producers of northern bleached softwood kraft pulp.

When Pope & Talbot, Harmac's owner at the time, filed for bankruptcy in 2007, the mill was shuttered in 2008. That spurred a group of unemployed mill workers to put together their own money, and persuade two local investment groups to put up the additional capital required (75% of the equity) to purchase the mill, save as many jobs as possible, and defy the odds.

Proving the naysayers wrong seven years later, the mill is operating well. It recently mustered the financing and showed excellent dexterity in a project to install a new 25 MW condensing steam turbo-generator (called G4 by the mill). Ryan Prontack, Engineering Superintendent, says about the project, "Added to our existing power generation capacity, G4 allows us to meet all our electricity needs and also send about 190 GWh of electricity each year to BC Hydro's power grid. This adds a good and predictable revenue stream to help us even out the cycles in the pulp business."

"The turbine creates energy using steam produced from waste wood (mostly bark)

burned in the power boiler," says Rinus Jellema, Steam Plant Superintendent. "To create this extra energy for the grid, we burn about 40% more hog fuel, but the fuel is carbon-neutral."

#### Global expertise – locally

Harmac was fortunate to have in its backyard an office of ANDRITZ AUTOMATION which has supported numerous projects with the local utility, BC Hydro, and is well-equipped to provide Electrical, Instrumentation and Controls (EI&C) engineering and project supervision services for the G4 project.

"We have done several projects with ANDRITZ AUTOMATION in the past five or six years," says Graham Cant, Electrical Project Supervisor. "Each time, the quality of work and flexibility in meeting our requirements has been excellent. They have a strong group of guys who really understand power and electrical generation."

One of those guys is Bernie Schmidtke, Power Specialist. "Bernie was a huge help on this project," Cant says. "He has more than 25 years' experience in the design of power and control systems and really knows cogeneration projects in British Columbia. He was ANDRITZ's Engineer of Record and our liaison with BC Hydro and really helped us through the application and review process."

#### New power for an older mill

"We have one backpressure turbine installed in the 1960's which was recently rebuilt, that

generates up to 33 MW of power," says Russ Lang, Steam Plant Supervisor who represented his department as the ultimate "owner" of the G4 system on the project team. "G4 shares some infrastructure with G3, but is installed in a new building."

Earlier funding from a federal Green Transformation Program allowed Harmac to complete a series of smaller energy saving projects. According to Saul Spearing, Harmac's Project Manager, "These smaller projects paved the way for us to seek financing for the turbo-generator project. Each was designed to improve our mill operations and energy efficiency."

#### EI&C scope

According to Tom Spence, ANDRITZ AUTOMATION's Project Manager, "The new turbo-generator is connected to an existing 13.8 kV system at Harmac. However, to allow for the additional fault current it provides, the existing 13.8 kV BUS-1 switchgear had to be replaced. Our detail design work for both the BUS-1 replacement and the G4 installation was occurring at about the same time."

Spence was involved in much of the work, including the upgrading of BUS-1 switchgear. "A lot of the electrical infrastructure improvement was accomplished when we did the design for the replacement of one of the two medium-voltage buses in the mill," Spence says.

Harmac Pacific selected ANDRITZ AUTOMATION to perform Electrical, Instrumentation and Controls engineering for its project to install a new 25 MW condensing steam turbo-generator. The new unit allows the mill to meet all its electricity needs and send enough electricity to BC Hydro's power grid to light 17,000 homes annually.





▲ (Left to right): Tom Spence, ANDRITZ AUTOMATION Project Manager; Graham Cant, Harmac's Electrical Project Supervisor; and Saul Spearing, Harmac's Project Manager for the G4 project.



▲ Doug Tymos, Steam Plant Operator, checks the readings on a meter on the BUS-1 switchgear.

In addition to replacement of the switchgear, Harmac's existing generator G3 electrical connection was relocated. "The necessity to switch generators to different buses required us to revisit the entire power system in this mill," Spence says. "Virtually every part of the 13.8 kV electrical system was touched, or at least reviewed in depth. This meant we had to understand and document each system in detail before we designed modifications to it."

"ANDRITZ AUTOMATION did an outstanding job on this project," says Spearing. "We had a lot of work to accomplish in a very short time-frame during an eight-day shutdown. Not only did they do the design work, but they were on site continuously helping to get the work done."

ANDRITZ AUTOMATION did a number of power and control system studies to ensure that the G4 system would be integrated into the existing mill systems in a safe, economical, and reliable way. They also worked with Harmac to develop a control strategy, with control loop narratives, to help Harmac avoid any instabilities in the steam plant as a result of the addition of another steam turbine.

The bulk of the work, however, was in the design and detailed engineering required to write the equipment specs and provide the electrical contractors with proper drawings and work documents. "We had people on site

throughout the project to answer questions or address any issues," Spence says.

In July 2013, the G4 unit went into commercial operation. Unfortunately, 10 days later, the system came to a full stop due to a significant mechanical issue with the turbine. Corrections were made and the unit started back up three months later and has been running reliably ever since.

#### Unique condenser and cooling loop

"We now take all of the mill's process water and send it through the turbine's steam surface condenser to warm it before using it in the process," Prontack says. "Before this project, we had seasonal steam demand, because the water temperatures would vary considerably. Now, we have smoothed out

this variability, which flattens our steam demand and makes things much more steady state. Plus, we eliminated the requirement for a cooling tower. This has increased our thermal efficiency from the standard 30% for a condensing turbine to 42%."

#### In-depth knowledge

"The work we did on this project gives us so much visibility into what we have now," Cant says. "We are very confident that our drawings and specifications are up to date. Considering that the original switchgear was installed in 1963, we now have a power network that will serve us well for a long, long time."

**CONTACT**  
Chris Madin  
[chris.madin@andritz.com](mailto:chris.madin@andritz.com)



Russ Lang, Supervisor (left), with Rinus Jellema, Steam Plant Superintendent in front of the new turbine. ▶