Data Management Suite Enables Highly Automated New Press Line at G.James

G.James Group is one of Australia's leading manufacturers of aluminum windows and doors, as well as one of the country's largest extruders. The private family-owned company has maintained its growth throughout its 100 year history through a strong reinvestment policy, enhancing its manufacturing capabilities with advanced technologies. The company has been expanding its operations in Brisbane, Australia, through an ongoing investment program that has culminated in the construction of a new extrusion plant. This includes the installation of a new 10 inch press line with the highest levels of automation and process management tools available in order to optimize the production process.

Company Profile

After emigrating from England to Australia as a skilled glass-cutter, George James founded the company in 1917 and worked as a glass merchant, sourcing and supplying glass for timber joiners. The business flourished up until his death in 1958, when it came under the stewardship of George's two daughters, Pearl and Gertrude, and his son-in-law, Joe Saragossi. Under this new corporate structure, the company broadened its activities into commercial contracting and the fabrication of aluminum windows and doors using extrusions sourced from the U.S.

As demand for aluminum fenestration products grew, the company recognized the need to become more autonomous in its sourcing of aluminum extrusions. As a result of this ambition, G.James Extrusion Co. Pty. Ltd. opened their first aluminum extrusion press and surface finishing plants in 1981. The ensuing decades witnessed G.James undertake a continual program of expansion as they embraced new technologies and developed their range of manufacturing capabilities.

The G.James Group currently comprises four individual business entities—Aluminum Products, Glass Products, Windows and Doors, and Façade Solutions. Each of these businesses serves an extensive customer base and is recognized as a leader within their respective field of expertise. The company's divisions operate from 35 locations throughout Australia. G.James Extrusion has two production facilities—one in Sydney housing a 9 inch press and the main plant in Brisbane, which operates two 7 inch presses, a 9 inch press, and the new 10 inch Presezzi press. In addition to its extrusion capabilities, the company provides a complete die design and manufacturing service. Post-extrusion services include anodized and powder coat surface finishing, CNC machining, and thermal break framing. The extrusion division serves a variety of industries, including marine, road transport, and window and door fabrication. Their profiles are shipped throughout Australia, with a growing export market in the shipbuilding sector.

New Extrusion Operations

G.James has been investing in and modernizing its Brisbane facility for the past 15 years. The initial stages saw the installation of new anodizing and powder coating equipment and a high rack storage facility. The company's most recent project has been the construction of a 20,000 sq m greenfield facility to house its new extrusion operations. The company designed the building layout and infrastructure to specifically suit their operational requirements. The extrusion project includes the installation of new 10 inch and 8 inch presses to replace the aging 7 and 9 inch presses. Lewis Saragossi, managing director for G.James, explained that the reasons for this expansion were three-fold. "First, there was the age of our existing plant and the ongoing requirement for us to control our

internal supply chain," he said. "Second, we wanted to continue to offer our customers competitive pricing and optimum quality. Third, was the need to create a productive and safe workplace environment."

Several highly qualified G.James engineers and managers formed a project team in order to apply their years of extrusion knowledge toward ensuring that any investments would not only be towards the latest technology, but would also be well suited to the company's individual requirements. After a careful review, the company selected Presezzi Extrusion Group as the sole supplier for the project. "We awarded the project to Presezzi based on their ability to meet and exceed our plant design and specifications," said Saragossi. "They were able to supply the entire plant from within their own group of companies."

The G.James project team worked closely with engineers from Presezzi during the project design phase in order to limit any oversights in the implementation phase. "The project was a large undertaking, involving over 170 containers of plant and equipment," said Saragossi. "With so many machines and processes in the mix, the assembly and installation proved a real challenge for the G.James project team who worked alongside the visiting Presezzi technicians to successfully complete the installation and commissioning of the press and associated handling facilities. Good cooperation between the two parties was essential to ensure the complete automation and system integration was achieved."

The new extrusion plant started up operation in late 2017. The operations include die shop and storage, die heating, log storage and heating, the 10 inch extrusion press and handling systems, high efficiency quenching, aging ovens, quality control area, and integration with existing machines. All of the production processes are automated through a data management suite (DMS), a powerful software system supplied by Presezzi that can manage all of the machines in the extrusion process on a single data platform. The DMS is able to collect data for each extrusion line and optimize the process with automated set up and self-adjustment of the profile recipes. In this way the plant is able to avoid manual interaction and associated human error, thus increasing productivity and reducing scrap. For G.James, which produces a diverse range of products, the DMS provides the ability to increase quality while reducing manufacturing costs.

The automated die storage system can house up to 9,000 dies at once (Figure 1). When a profile recipe is input into the DMS, the system selects the appropriate die from the vertical storage area and transfers it to a station where the die is automatically inserted into the die ring. The system then transfers the completed die stack (die and bolster) to a monorail that carries it over to the die ovens. After being heated to the correct temperature, the monorail picks up the die and places it into the press cassette. No human interaction is required during this entire process, avoiding many of the typical accidents and injuries that can occur when a heavy die is handled incorrectly.

Figure 1. The automated die storage system requires minimal interaction from operators.

With the die in place, the DMS schedules the correct alloy from the vertical log storage system (Figure 2), which can hold up to 500 tons of aluminum billet. The vertical storage system is designed to drastically reduce manual operation, with operators only interacting with the logs to unload deliveries upon arrival at the plant. The logs are moved to a loading table, where the DMS then scans the bar code in order to move them into the appropriate place within the storage system. In this way, logs for two press lines can be handled by only a single person. Once an alloy has been scheduled, an automated crane picks up the selected log from storage and delivers it to the log heating furnace, supplied by COIM, part of the Presezzi Extrusion Group.

Figure 2. The vertical log storage system maintains logs until they are required by the press.

Before entering into the furnace, the logs are mechanically brushed to remove any oxidation on the surface. Using Isothermal software, the DMS sets the temperature within the log heating furnace to provide tapered heating of the billet. The furnace will automatically adjust the heating parameters in order to archive data to achieve the best productivity with the least consumption of gas. The DMS will also correct the billet length (up to 63 inches) at this stage in order to optimize the profile's extruded length and the billet's butt end.

The heated billet is transferred to a 4,000 ton short stroke front-loading Presezzi press (Figure 3). The press along with the handling systems are designed to extrude heavy profiles with a maximum dimension of 18 inches x 10 inches and a maximum weight of 14 lbs/foot. The line can extrude any kind of alloy for a variety of markets, focusing in particular on heavy and long shapes for truck and trailers or courting walls. The press is also equipped with the Presezzi Extrusion Energy Saving System (PEESS), which can provide more than 30% of energy savings compared to traditional hydraulic systems. During the extrusion process, the dies are automatically cooled with nitrogen in order to maintain a low temperature and increase their life.

In order to ensure the final properties of the complicated and heavy shapes being produced, the press line includes an intensive quenching system (Figure 4). The double

Figure 3. The 10 inch extrusion press features high levels of automation to improve production and product quality.

High Efficiency Cooling System (HECS) quenches the first 25 ft of the extruded profile using water. This is followed by multiple movable air-cooling hoods for a total length of 145 ft. Each hood can descend when needed, bringing the air flow close to the profiles to increase the cooling rate. Since the system is able to cool the profiles to a temperature below 120°F, no cooling fans are required for the cooling table, thus reducing the maintenance costs. One important feature of the quenching system is the HECS-OS optimization software, which automatically simulates and suggests the best extrusion speed and cooling parameters (air or water) to the operator, based on the shape and alloy of the profile. The use of HECS-OS combined with the Isothermal software is able to support G.James in achieving consistent quality at maximum extrusion speeds, which drastically increases the production of the entire line.

Figure 4. High efficiency quenching system.

The double length runout table is equipped with a double electric lateral-type puller with a hot saw that can perform a flying cut on the profile die mark during the press dead cycle time. Moving on separate rails, each puller is able to approach the platen, where a fixed saw removes the first few feet of the profile (in particular, for multi-cavity extrusions that may be uneven). The puller takes the previous profile from the platen and introduces the new profile inside the puller jaw.

The handling tables include five sets of belts, an automatic sampling saw, and a 135 ton stretcher for profiles up to 170 ft. The stretcher can be operated either manually or in full automatic mode without human supervision. The finishing saw automatically removes the head and tail sections, and the cut-to-length table saw cuts the profiles to a maximum length of 55 ft. At the cut-to-length table exit, the operator can reject defective profiles using a movable belt that drops the pieces into the underground scrap area.

The scrap area features two long underground belt conveyors that feed a 150 ton scrap shear (Figure 5). The system divides the scrap—including the billet butt ends and all the profile process scrap—into hard and soft alloys and then delivers it directly to the remelt building at the Brisbane facility. Since the DMS supervises the process, the possibility of different alloys being mixed together is significantly reduced. No manual intervention is required for removal of scrap and butt ends from the extrusion plant.

Figure 5. An underground scrap area includes two belts for sorting and transferring all process scrap out of the building.

With the profiles cut to size, the profile stacker loads them into extrusion baskets, which use the Presezzi spacers handling system. The spacer bins are moved automatically to and from the stacker and destacker, avoiding manual handling of the spacer bins. The transportation systems moves the baskets into position for the overhead 3-axis bridge crane to load the baskets in preparation for one of the three aging ovens installed (Figure 6).

G.James requested side cross flow aging oven technology for its aging ovens in order to achieve flexible heat treatments with accurate temperature control for optimal heat treatment. The Presezzi cross flow ovens feature multiple independent heating zones and fans in order to control the heat flow. It also includes an internal door that provides the opportunity to change the layout of the fur-

Figure 6. An overhead crane prepares baskets for loading into the aging ovens.

nace, providing the ability to treat 55 ft profiles when the door is up or to divide the furnace into two chambers to provide individual heat treatments for profiles up to 30 ft long when the door is down.

After the profiles exit the aging ovens, a 2-axis crossover crane with a 60 ft span carries the material into the main logistic center. The center is designed to automatically handle the baskets, delivering them to the painting line, anodizing line, or mill finish packing lines as necessary. Profiles designated for the painting or anodizing lines are sent to a profile basket transferring system that moves the profiles from the production baskets to special baskets designed for the warehouse.

A machine within the automatic warehouse, previously installed by PA Profile Automation (part of Presezzi Extrusion Group), prepares the profiles for surface treatment. The machine schedules painting and anodizing production by selecting baskets from the warehouse. It then prepares individual baskets with many different profile shapes, which will be treated with the same color for a customer. This machine reduces handling requirements and correctly tracks orders to the different customers.

Profiles that will not be painted or anodized are packed using an automatic packing line and transferred to the Presezzi honeycomb automatic warehouse (Figure 7). Shipments are organized by the DMS software, which schedules and prepares the orders in the truck shipping/loading area. A master bundle incorporating many small bundles is loaded all at once, reducing the loading time for each single truck.

Figure 7. Packed profiles are stored in a warehouse ready for shipping.

Conclusion

With the installation and start up of the new 10 inch press line, the first phase of the extrusion plant expansion has been completed. The second phase will include the installation of a new 8 inch press line, set to be installed by 2019 and in full production by Q1, 2020. The new extrusion plant will enable G.James to consolidate the company's capabilities in order to best serve the needs of their large customer base. "The primary focus for our business is to meet and, where possible, exceed the expectations of our customers," said Saragossi. "G.James will continue to evolve as new technologies and 'best practice' systems are recognized and evaluated as being beneficial to the operation and our customers long term. G.James Extrusion Co. is confident in our ability to adapt to the ever-changing market conditions, and to progress and promote the advantages associated with Australian-based manufacturing." ■