

CANADIAN CONSULTING ENGINEERING AWARDS 2019
HYLIFE PORK PROCESSING PLANT



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FULL PROJECT DESCRIPTION

INTRODUCTION

A new, 98,500 sq.ft. pork processing facility that would improve employee welfare, update food safety procedures to global standards, maximize return on investments, and improve efficiency for the facility and processes - all while minimizing disruption to current production - was a tall order from HyLife Foods. In 2016, KGS Group gladly took on the challenge with this Neepawa-based client.

HyLife's existing food production plant could not physically accommodate increased production demand. The new plant, built directly northwest of the existing facility, features an all new cut floor, packaging area, storage coolers, palletizing/shipping, and utility spaces to address future capacity and reduce operational costs.



Outside the facility, yard improvements include a new truck and refrigerated trailer parking area, building electrical service upgrade, gas line upgrade and municipal water main upgrade.

The cornerstone of a \$125 million infrastructure investment by HyLife, the facility resulted in the creation of 165 new permanent jobs at the Neepawa plant and employed over 90% of its construction trades from Manitoba.

KGS Group provided conceptual design, cost estimate and value engineering services to support project funding. Preliminary and detailed design of the facility to global meat industry standards was also provided by KGS Group, as well as the design of building utility service upgrades, integration of vendor equipment, procurement management and construction engineering support for this fast-track project. The project was completed on time and on budget, with production commencing in April of 2018.

“This is a strategic investment to make HyLife the best Canadian food company in the world.”

– Guy Baudry, HyLife COO

MAXIMIZING ENGINEERING TECHNIQUE, MATERIALS, EQUIPMENT & TECHNOLOGY

“It’s absolutely amazing. Brand new equipment, state of the art, some of it, (they’re) the first plant in Canada to use some of this stuff.”

– Andrew Dickson, MB Pork Council.

A MULTI-DISCIPLINE APPROACH

HyLife chose KGS Group because we provide all required engineering disciplines under one roof with a solid, local team. This project required a truly multi-discipline approach with services from KGS Group’s civil, structural, architectural, geotechnical, GIS, mechanical, electrical, instrumentation, environmental, and procurement areas. Specifically we provided the following services:



Mechanical

- Food grade piping and equipment design,
- HVAC,
- Piperack design from remote physical plant,
- New potable water service to building,
- Fire suppression,
- Process drainage,
- Process equipment coordination,
- Sanitation stations, and
- Spraybars.



Electrical

- Building service upgrade,
- CFIA compliant lighting,
- Life safety systems,
- Process power,
- Building services power,
- Coordination of CSA approval for non-CSA off-shore equipment,
- Heat trace for doors, rain leaders, and process piping,
- Custom sanitary cabling system,
- Coordinated fork-truck battery charging system, and
- Data/communications design.

Instrumentation & Controls

- Specified all building and utility instrumentation and controls, and
- Specified and programmed the PLC responsible for not only managing vendor supplied sub-control systems for process equipment, but also managing data from miscellaneous process equipment or instrumentation that was not part of a major equipment supply package.



Civil

- Site grading,
- Water main servicing, and
- Exterior fire protection hydrants.

Structural

- Building structure and foundation,
- Envelope,
- Equipment foundations,
- Flashing, and
- Sanitary finishes.

Geotechnical

- Provided geotechnical recommendation for appropriate foundation approach,
- Qualified a helical screw pile contractor, and
- Provided construction supervision to support the QA process.

GIS Survey

- Aerial LiDAR survey,
- Land-based 3D-scan high-definition survey of existing building envelope,
- Conventional total station survey of key benchmarks, and
- Coordination of underground services survey.

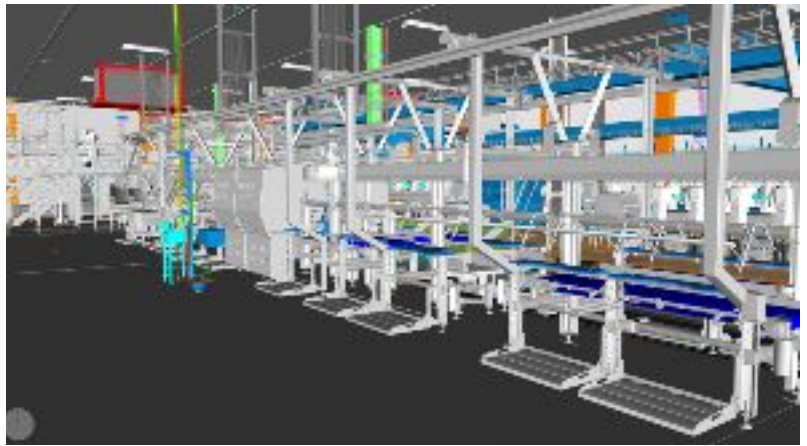
VENDOR/OEM INTEGRATION

KGS Group worked closely with food processing vendors to ensure the process would flow smoothly from one end of the facility to the other. Notable equipment packages included:

- Deboflex line (first of its kind in North America) – overhead shoulder deboning conveyor
- Water jet belly cutter
- Over 1.1 km of conveyance equipment with this optimized design provides efficient and linear material handling

LEVERAGING TECHNOLOGY - 3D DESIGN DEVELOPMENT AND MODELING

A 3D model of the entire site was a key component of the project toolbox from concept through to construction. In the early stages of the project, HyLife used the model to develop a business case and secure funding. As design progressed, the model was essential in coordinating the multiple engineering disciplines involved in the design. Constant review of the model resulted in an optimal, clash-free arrangement of the building, equipment and utilities.



The model also enhanced external coordination. KGS was able to provide concurrent structural design and steel fabrication shop drawing development. Frequent model reviews with contractors, KGS and owners leveraged the model to illustrate scope of work, facilitate installation and mitigate areas of concern. The model was even used to demonstrate the future of HyLife production to foreign clients.

NAVIGATING COMPLEXITY

Along with the challenges of altering an existing facility, the pork processing process itself, and the need to minimize disruption to current production, brought unique complexity to the project.

CUSTOM SOLUTIONS

In keeping with HyLife's commitment to quality, sanitation was an essential component of the design. Driving traditional piles for the new building would have caused debris-loosening vibration throughout the existing plant. As a result, KGS chose helical piles which could be installed without vibrations, allowing the existing plant to carry on working without inconvenience or interruption.

Sanitation provided additional challenges for electrical components. Traditional cable trays with grooves or inaccessible corners can harbour bacteria, water and biological material. In addition, the ceiling penetrations required to individually service the hundreds of motors on the cut floor would compromise the sanitary and temperature-resistant integrity of the insulated metal panel ceiling. To overcome these issues, KGS designed streamlined custom centralized power poles that provide a framework for the cables to descend without the harbourage points of traditional trays. The centralized location of the poles, as well as cable seals, ensured sanitary separation from the process and non-process areas while minimizing perforations in the insulated metal panel ceiling.

The sheer size of the site also provided challenges for building code requirements. Expanding directly onto the existing facility was not a feasible option for two reasons. First, the increased footprint of the building would be severely limited by building code restrictions. Second, expanding directly on the building would cause costly process interruptions. In order to prevent costly upgrades to the existing plant, it was imperative that the new facility be a separate building.

The electrical service for the site is 10MVA, however, the existing switchgear was not fully utilizing the total site service capacity. In order to service the new facility, KGS had to design a way to expand the switchgear, without disrupting power to the plant. Careful planning and design facilitated transition from the old switchgear to the new over the course of a single day outage without interrupting regular production operations.

Additionally, KGS Group and Malnar Industries collaborated to design a sophisticated HVAC system incorporating cascading pressure control from cut floor through to packaging, palletizing and shipping. Sensitive process areas are kept at higher pressures than adjacent secondary operations, thereby preventing ingress of contaminants and ensuring product integrity is maintained. HyLife directly measures this influence during routine microbial sampling for airborne contamination. Reducing foreign material contamination can result in longer shelf life (i.e. 55 days) and improved product quality. The net result is higher market value and increased profit. The product is suitable for shipping as far away as Japan in a refrigerated (not frozen) state, through to the end consumer.

MINIMIZING DISRUPTION TO PRODUCTION

The most dramatic challenge was the transition weekend. As part of the transition, contractors permanently severed the hog rail and the main table conveyor. Without this equipment, the entire process halted; carcasses could not continue into the existing building or be quartered into primal cuts. This was the point of no return and full commitment to the new building. A four-day surgery followed, grafting the new facility to the existing process, and transplanting equipment from the old cut floor to the new. KGS contributed our vast project implementation experience in the planning and execution of the transition. The weekend went as planned and the new facility successfully went online on the fourth day.

PROJECT MANAGEMENT AND MEETING CLIENT NEEDS

KGS Group collaborated with HyLife on overall project management of the project to achieve the project objectives. The focus of the project management team was largely risk mitigation as well as budget and schedule management.



HyLife's existing pork processing plant could not physically accommodate any further increases in production demand.

HYLIFE'S OBJECTIVES AND GOALS

The project's goals were to:

- Increase floorspace and working area in order to be more flexible towards fluctuations in market requirements,
- Increase process capacity and throughput,
- Maintain optimum temperature of the meat during the process,
- Incorporate automation to reduce costs and improve sustainability,
- Provide welfare and safety improvements for workers,
- Implement strict touch/time/temperature control strategies for improved product efficacy and/or production efficiency, and
- Prepare facility for global food safety certifications.

KGS Group successfully assisted HyLife in meeting all of their project goals. Working areas have increased from the existing plant, with ample room to add additional production lines and equipment. The existing throughput of the plant, due to integration of new technology, has increased by 1,250 hogs a day. Building infrastructure (HVAC behaviour, water consumption, power reports), as well as process components, are now coupled to the SCADA system for the purpose of monitoring and trending. Four new cooling units, coupled with pressure sensors throughout the building, maintain the product at optimal temperature. Air pressure gradients prevent contamination from being pulled into sensitive process areas, further increasing the quality and shelf life of the product. All of these achievements led to additional social, economic and environmental benefits.



The new, 98,500 sq.ft. pork processing facility enhanced employee welfare, elevated food safety procedures to global standards, expanded sightlines, maximized return on investments, and improved efficiency for the facility and processes.

RISK MITIGATION

KGS Group tackled the risks of this project by leaning heavily on coordination and teamwork. Consistent deployment of 3D model reviews resulted in risks being identified before construction. Issues were eliminated before they became a problem, or, if unavoidable, measures taken to mitigate the risk. For example, the 2,500A cable bus required custom design as it would arrive on site pre-manufactured. Using the 3D model, KGS was able to identify and resolve areas of clashes with other equipment installations, and retrieve exact measurements of the cable bus path for the manufacturer.

KGS Group also provided on-site coordination services for the client and contractors. This allowed the designers and installers to develop working solutions together. The project was kept on pace and costly re-installs and failed approaches were eliminated.

BUDGET AND SCHEDULE

The project entailed over 12 months of design, construction and commissioning. KGS performed value engineering to assist HyLife in creating a plant that would match their financial forecasts and the budget was established in the initial stages of the project. Due to HyLife's vertically integrated, farms to fork strategy, the number of hogs available to the Neepawa plant is set six months in advance. As a result, the April transition date was a hard deadline and could not be pushed back. Despite the fast track nature of the project and rapidly evolving challenges, final construction was completed on time and on budget without loss of production.

SOCIAL, ECONOMIC & ENVIRONMENTAL BENEFITS

SUSTAINABILITY

The new HyLife Hog Processing Plant incorporated a number of sustainable initiatives. A considerable portion of energy consumed on site is due to the refrigeration and cooling required for the process and storage areas. An insulated metal panel ceiling was installed to minimize heat losses. To further reduce the cooling load, LED lights with their high efficiency and low heat generation properties were chosen as the standard for all lights in the new facility. During sanitation shifts, the building rises in temperature from 4° to 10° and increases the ability of the HVAC system to extract moisture from the air. All of the exterior lighting is full cutoff, dark-sky-friendly, LEDs. These reduce light pollution, which means preserving night time vistas for residents and fewer disturbances for wildlife.

With the introduction of the Deboflex and water jet belly cutter, HyLife has also increased their yield per carcass. The Deboflex presents the meat to the workstation at the optimum position for butchering, resulting in precise cuts and maximum yield from the carcasses, reducing waste.

HyLife's on site water treatment plant, R3 Innovations, processes all of the waste water from the new and existing facility. With increased flows from the new plant, R3 was retro-fitted with a new centrifuge and buffer tank to operate at higher efficiency and require less processing effort to clean the water.

ECONOMIC DEVELOPMENT AND COMMUNITY BENEFIT

HyLife acted as their own general contractor for the project. Knowing that such a large project would have a significant economic impact, HyLife chose to give preference to local bidders. 90% of the trades selected were from Manitoba, with half of those located in southwestern Manitoba.

HyLife has over 2,000 employees (the Neepawa plant alone accounts for over 1,200). 165 new positions were created as a direct result of this project. With processing projections of 2 million hogs per year, the new facility becomes a nexus of Manitoba's hog farming industry.

This project also has a positive economic effect for Manitoba on the world stage. The new facility, with its state-of-the-art processing equipment and hygienic standards, has increased the storage life of HyLife's products. This premium, never frozen, product has allowed HyLife to target new markets that are willing to pay a premium for high quality Canadian products. Pork demand has increased in Canada and exports to Japan, China, Mexico and South Korea are increasing. HyLife's annual export sales to Japan are approximately \$200 million. These export sales are further supplemented by an additional 20% of sales to the emerging China, Mexico and South Korean markets.



Guy Baudry, (l to r) HyLife Foods division chief operating officer, HyLife executive chief operating officer Denis Vielfaure, local MP Robert Sopuck, Manitoba Agriculture Minister Ralph Eichler, HyLife president Claude Vielfaure, Neepawa Mayor Adrian de Groot, company board chair Don Janzen and CEO Grant Lazaruk cut the ribbon on April 3, 2018 at the newly expanded HyLife Foods plant in Neepawa. Photo: HyLife Foods

SERVICE TO THE COMMUNITY

In addition to the economic and environmental benefits mentioned above, the project also has an impact on surrounding communities. With the creation of new jobs, HyLife continues to inject vibrancy back into the town of Neepawa. New workers and their families are reversing the aging demographic trends of the surrounding area. Employment at HyLife's plant is often the first step for many people on the road to Canadian citizenship. While living in the community, these newcomers provide a new cultural mix to the existing population and Neepawa has embraced this change.

"...HyLife continues to add diversity and opportunity to not only Neepawa, but also the surrounding communities. There is a vibrancy that is felt throughout the region."

– Adrian de Groot, Neepawa Mayor

ENHANCED QUALITY OF LIFE THROUGH ENGINEERING

This project included a number of quality of life improvements. New equipment, such as the Deboflex, has a more ergonomic design and reduces repetitive strain. Each workstation has significantly more space than the original plant and some stations include adjustable risers to match the height of the worker to the working surface. Lighting levels were also increased at the cut floor, improving visibility and safety when working with blades.

KGS also designed an interstitial space above the cut floor. This area, with a six foot walkway to beam clearance, allows maintenance staff to service the equipment with minimal disruption to the process below. New PLCs and interconnections with the existing SCADA system allow trending, monitoring, and optimization of the process.

CONCLUSION

With undeniable benefits at home and abroad, this project is a vital element in realizing HyLife's commitment to be the best Canadian food company in the world. KGS Group is proud to have provided custom, innovative solutions and expert project management to achieve the objectives of this project on time and on budget.

PROJECT TEAM

Client: HyLife Foods LP

Project Management: HyLife Foods LP / KGS Group

Balance of Plant Engineering: KGS Group

Construction Management: HyLife Foods LP / GridIron Consulting Ltd.

Cut Floor Equipment Design: Frontmatec Inc.

Packaging Floor Equipment Design: Tri-Mach Group Inc.

Refrigeration Equipment Design and Integration: Malnar Industries Ltd.



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PROJECT OUTLINE

PROJECT SUMMARY

HyLife constructed a new pork processing plant in Neepawa, Manitoba to expand production capacity, improve efficiency and product quality. Using state-of-the-art technology and custom solutions, KGS designed the facility to global standards and integrated next-gen process equipment. Resulting in reduced waste, improved employee welfare and increased production, this innovative design has helped HyLife turn its \$125 million investment into a competitive advantage on the world stage while generating 165 permanent jobs in the local community.

INNOVATION

The goals of HyLife's 98,500 sq.ft. pork processing plant were to improve employee welfare, update the facility to global standards and improve efficiency. State-of-the-art 3D modeling was used by KGS Group to coordinate all aspects of design. In the early stages of the project, HyLife used the model to develop a business case and secure funding. As design progressed, the model was essential in coordinating the multiple engineering disciplines involved in the design to achieve an optimal, clash-free arrangement of the building, equipment and utilities. The model was later used to illustrate scope of work, facilitate installation and mitigate areas of concern during design, tender and construction. KGS developed steel fabrication shop drawings concurrent with structural steel design, reducing the lead time for construction. The model was even used to demonstrate the future of HyLife production to foreign clients.

Sophisticated HVAC controls were designed using cascading pressure control where sensitive process areas are kept at higher pressures, thereby preventing migration of contaminants. Reducing contamination results in longer shelf life and improved product quality leading to higher market value. Another innovation was the use of screw piles not only to satisfy the geotechnical requirements of the site, but to eliminate the vibration and noise that would be caused by driving pre-formed piles directly adjacent to the operating food processing plant.

KGS Group worked closely with leading food processing equipment vendors to integrate innovative new equipment. The computer-controlled water jet cutter, which does not require human contact while cutting meat (reducing foreign materials and increasing safety), operates with high repeatability & accuracy. The Deboflex overhead conveyor deboning system (first in North America) is ergonomically designed to reduce repetitive strain. It also optimizes pork shoulder positioning, resulting in precise cuts and minimized waste. Process lines were connected with a network of over 1.1 km of automated conveyors, providing efficient material handling. Improvements to plant efficiency have increased plant throughput by 1250 hogs/day (to 7,500 hogs/day).

The plant was also designed to showcase HyLife's premium pork products and innovative manufacturing technologies to a global audience of customers. The layout was optimized to maximize sightlines and present a clean, linear, and organized appearance. Plant photos are now used in marketing to convey high product quality to the end consumer.

"It's absolutely amazing. Brand new equipment, state of the art...(they're) the first plant in Canada to use some of this stuff."

– Andrew Dickson, MB Pork Council.

COMPLEXITY

In pursuit of a world-class facility, HyLife's intensive sanitation procedures demanded eliminating or minimizing debris-harboring areas and that all plant surfaces could withstand exposure to high pressure washdown, corrosive cleaning chemicals, and temperature cycling. "Off-the-shelf" options were not always available and required custom design solutions to minimize costs while still meeting objectives. In addition, the new facility had to be constructed without disturbing the operations of the existing plant as prolonged shutdowns were not allowed, imposing constraints on various aspects of construction, from piling, to major site electrical service upgrades, to transitioning existing production equipment over to the new facility.

The project required intense coordination of KGS Group's mechanical, electrical, instrumentation, civil, structural, geotechnical, and GIS multi-discipline team. Externally, KGS also coordinated key design elements between the refrigeration contractor, process equipment vendors, trades, and HyLife's internal project team. The large number of contributors meant that design changes were constantly incoming, presenting a formidable change management challenge.

The most dramatic challenge was the transition weekend, during which contractors permanently severed the hog rail and the main table conveyor. Without this equipment, the entire process halted. This was the point of no return and full commitment to the new building. A four-day surgery followed, grafting the new facility to the existing process, and transplanting equipment from the old cut floor to the new. KGS contributed our vast project implementation experience in the planning and execution of the transition to ensure a smooth changeover with minimal production down time.

SOCIAL & ECONOMIC BENEFITS

The project resulted in creation of 165 new permanent jobs with HyLife, bringing the total to over 2,000 employees in the region. HyLife's investment in Neepawa is helping to increase population and reverse the aging demographic trend typical to rural areas. Increased immigration of skilled workers and their families brings additional cultural diversity to the region and Neepawa has embraced this change. Employment at HyLife's plant is often the first step for many people on the road to Canadian citizenship. For employees of the plant, ergonomically designed workstations increase comfort and reduce repetitive strain. Increased work area and lighting levels on the cut floor, improve visibility and safety when working with blades.

In addition to job creation, this project has put Manitoba on the world economic stage. The new facility, with its state-of-the-art processing equipment and hygienic standards, has increased the shelf life of HyLife's products opening the door to emerging markets in Japan, China, Mexico, and South Korea. Over \$200 million dollars in global export sales are now being returned to the Canadian economy annually due to products being produced at this plant. Additionally, HyLife hired over 90% of construction trades from Manitoba (45% from southwestern Manitoba) as a result of the project, stimulating the local construction industry.

“Many rural communities struggle to find a strong employment base. For us, having the HyLife plant here is a key part of our employment in Neepawa and in the area.”

– Marilyn Crewe, Neepawa Economic Development Office

ENVIRONMENTAL BENEFITS

The new HyLife Hog Processing Plant incorporates a number of sustainability initiatives targeting reduced energy consumption and pollution. A considerable portion of energy consumed on site is due to the refrigeration and cooling required for the process and storage areas. Extensive use of insulated metal panel (IMP) walls and ceilings helps minimize energy losses. The resulting smooth surface of the IMP also improves effectiveness of sanitation operations, resulting in reduced consumption of hot water. The building HVAC controls permit the ambient temperature to rise from 4°C to 10°C during sanitation shifts, increasing the ability of the HVAC system to extract moisture from the air, thus reducing the energy required to dehumidify the space.

To further reduce the cooling load, LED lights with high efficiency and low heat generation properties were chosen as the standard for all lights in the new facility to meet the high lux requirements in the process areas. Additionally, all of the exterior lighting is full cut-off, dark-sky-friendly LEDs. This approach reduces light pollution, which means preserving night time vistas for residents and fewer disturbances for wildlife.

HyLife's on site water treatment plant, R3 Innovations, processes all of the waste water from both the new and existing production facilities. With increased flows from the new plant, R3 was retro-fitted with a new centrifuge, nutrient dosing equipment and pre-treatment buffer tank improving the wastewater treatment efficiency through load balancing. The efficiency gains resulted in improved throughput capacity to meet increased demands, and exceed national treatment standards.

MEETING OWNER'S/CLIENT'S NEEDS

HyLife's primary goals were to improve production flexibility and capacity, while improving product quality, increasing product shelf life, and enhancing employee welfare. The goals were to be met on a strict budget with minimal interruption to production.

KGS Group successfully assisted HyLife in meeting all of their project goals. Working areas provide ample room to add additional production equipment, providing flexibility to address fluctuations in market demand. Throughput of the plant, due to integration of new technology, has increased by 1,250 hogs a day. Hygienic air handling units maintain the product at optimal temperature of 4°C and maintain cascading air pressure control to prevent contamination from being pulled into sensitive process areas. This strategy, coupled with improved sanitation systems, has increased the quality and shelf life of the product. Building infrastructure (HVAC behaviour, water consumption, power reports), as well as process equipment, are now monitored by the SCADA system for the purpose of trending, providing valuable insight into energy consumption to meet sustainability targets and reduce operating costs. Ergonomic workstation design, increased space and improved lighting enhance employee welfare.

The \$125 million project was delivered in accordance with the project budget and on schedule in April 2018. The total outage to complete the transition of production to the new building was four days, scheduled over a single weekend, effectively reducing the total number of affected production days to two. The date for the transition was set 6 months in advance of the work due to the incoming hog growth cycle.

