Moulding a productive future with digital technology: case study
National Research Council of Canada. Industrial Research Assistance Program. Digital Technology Adoption Pilot Program; Carlson Engineered Composites

Digital Technology Adoption Learning Series, 2014-04

Digital Technology Adoption Learning Series

Digital Technology Adoption Pilot Program

Carlson Engineered Composites

Moulding a productive future with digital technology

Case Study

April 2014

National Research Council Canada
Conseil national de recherches Canada
Canada

Introduction

For more than 35 years, Winnipeg, Manitoba-based Carlson Engineered Composites Inc. has been manufacturing cost-effective composite fibreglass parts and sub-assemblies for equipment suppliers in the transportation and agriculture industries. With 300 employees in two facilities, and a 122,000-square-foot production facility in Canada, Carlson is one of the largest manufacturers of its kind.

The company's history of success is being challenged by unprecedented competition from manufacturers around the world. To remain competitive in the global arena, Carlson needed to re-examine its operations with a view to increasing efficiency and productivity, improving the customer experience, and ensuring ongoing profitability.

"In addition to parts, we provide wide-ranging composite solutions," says Dieter Loewen, Carlson's vice-president of Operations. This means interacting with customers to define their needs, identifying how the company can continuously improve operations and service, and demonstrating how customers can benefit from the solutions.

This case study shows how the Digital Technology Adoption Pilot Program (DTAPP) delivered by the National Research Council of Canada Industrial Research Assistance Program (NRC-IRAP) helped Carlson introduce digital technology such as a barcode system and a digital dashboard on the shop floor and integrate them into their enterprise resource planning (ERP) system. It demonstrates how this technology led to substantial improvements in the firm's efficiency, productivity, shipping, production and operations. It also sheds light on how Carlson successfully managed these dramatic changes to ensure employee buy-in and satisfaction.

> "I CAN'T IMAGINE HAVING DONE THIS WITHOUT DTAPP'S HELP. WE WOULD PROBABLY HAVE SPENT CONSIDERABLY MORE MONEY AND WASTED A LOT MORE TIME LOOKING FOR THE RIGHT SOLUTIONS."
>
> Dieter Loewen,
> vice-president of Operations,
> Carlson Engineered Composites

"We consider ourselves very lucky to have connected with DTAPP," says Loewen. "We benefitted greatly from the expert advice of our NRC-IRAP Industrial Technology Advisor (ITA), Tim Mitchell and found DTAPP's introductions to other manufacturing firms on the same journey as ours very helpful." By networking with other firms, Loewen not only learned more about digital solutions on the market, but also had a chance to discuss common problems and share insights.

Resolving the Issues with Digital Technology

Carlson's priority items to effect the necessary changes included increasing visibility of the production flow, eliminating waste, reducing errors and speeding up the processes. "Digital technology and Lean manufacturing principles go hand in hand, so all the technology we adopted contributed to Lean manufacturing," says Loewen.

As bar-coded labels are scanned, information is transferred to the TrackIT system.

Issue #1: Process visibility

Before implementing digital technology, the company had difficulty determining where a specific part was in the production pipeline at any given time. "That was our biggest issue," he reports. "We spent too much time trying to find parts, chasing parts and putting everything together to meet the production requirements." While the parts had product labels, they did not contain critical information such as which part was earmarked for which day, or for which bus or tractor.

The solution was to introduce a digital tracking system (TrackIT) based on barcoded labels for parts. "We needed to trace the progress of each part through the production floor," adds Loewen. The barcode allows each item to be scanned from one workcentre to the next, recording how fast the parts are moving, who is working on a part and how many parts are clustered in certain areas. TrackIT quickly identifies bottlenecks so management can reschedule resources to deal with problems. And a digital dashboard at each workstation puts live data at everyone's fingertips.

Issue #2: Waste and errors

In the past, taking physical inventory was a cumbersome task because it meant halting the movement of parts between departments while they were counted. "This led to considerable waste, since it tied up shop-floor employee time for counting, and slowed down production because the parts were not on the floor at the start of a shift," says Loewen. He also points out that manually keying information into the system led to errors and rekeying, adding to the wastage and delays.

TrackIT has eliminated the need to take inventory since all the information resides on the company server and is readily accessible on digital dashboards at workstations. It also allows supervisors to move whatever parts are needed from one department to the next at the beginning of a shift to ensure everything flows smoothly.

Robots use high-pressure water jets to cut and trim composite parts.

Before adopting TrackIT, the company had ventured into digital technology with two robots that use high-pressure water jets to cut and trim the composite parts. The robots provide consistent repeatability, reduce human intervention, cut errors and improve accuracy. They also contribute to a healthier workplace since, unlike in manual cutting and grinding, the dust is eliminated.

Issue #3: Production speed

According to Loewen, product movement on the shop floor was "chaotic" before TrackIT was introduced. Due to the bottlenecks and disorganized handling of parts, information was not readily available since so much was done manually. Answers to questions about the status of parts were often vague and based on guesswork, thus slowing down production.

"During the implementation of digital technology, we had to reorganize the shop floor," he says. "We need to know where the parts are at any given point, so we now have a cleaner, leaner way of operating." This has led to greater efficiency and job satisfaction because employees have the right information and the right parts at their fingertips when needed.

"DIGITAL TECHNOLOGY AND LEAN MANUFACTURING PRINCIPLES GO HAND IN HAND, SO ALL THE TECHNOLOGY WE ADOPTED CONTRIBUTED TO LEAN MANUFACTURING."—

Dieter Loewen, vice-president of Operations, Carlson Engineered Composites

The robots, too, have made a huge contribution to production speed, approximately doubling output with half as many employees in the trimming department.

Effective change management oils the wheels

Installing new hardware and software on the shop floor is one aspect of implementing digital technology. The other is changing the mentality of employees so they will not only use it effectively, but also buy into a cultural shift. With that realization, Carlson took great care to strategically introduce the changes.

"We cannot manage the plant from the office," says Loewen. "I encourage my managers to spend time on the floor interacting with plant employees and understanding their culture—and that makes all the difference." In addition to hiring top information technology (IT) talent to work in house, he chose human resources and quality assurance people who understand the shop floor.

Top three change management strategies for successful technology adoption

Strategy #1: Understand shop-floor processes to change habits

One of the most important aspects of introducing digital technology, according to Loewen, was to really understand the entire process flows in the plant because the shop floor had to be reorganized. The result was a cleaner, leaner way of operating that improves not only processes, but also employee job satisfaction.

"While the changes are better for plant employees, they did require changing habits," he says. "You can't rock the boat too much because the shock will be counterproductive. During implementation, I was careful not to disrupt normal production too much; otherwise we would have created some additional issues."

Understanding process flows guided the company's approach to introducing TrackIT. For example, they realized that changing the product labels completely at the outset would create considerable confusion. Therefore, while the new labels added a barcode and a spot for employees' initials, they closely resembled the old ones, and contained similar amounts of information. "In Lean terms, this was a waste because we were both scanning and manually entering information on the labels, but we have now eliminated the handwriting and are just doing it electronically," says Loewen. "And as the information is scanned, it goes straight into the network."

Strategy #2: Assign the right resources

Carlson soon realized that with all the new technology coming on board, it was important to have in-house information technology (IT) resources. After finding that outsourcing the IT function was not working, they retained a director of IT to manage the changes and ongoing technology challenges.

A bar-coded label is affixed to each part for easy scanning.

“Companies today are relying increasingly on hardware and software for just about everything,” says Loewen. “You need to have it all working right or you lose opportunities, and the only way we could do that was to have someone inside the company who understands it and can react quickly.” He points out that the IT department ensures smooth functioning of important tools such as internet connections, effects modifications to TrackIT and other software, and conceives new uses for existing technology.

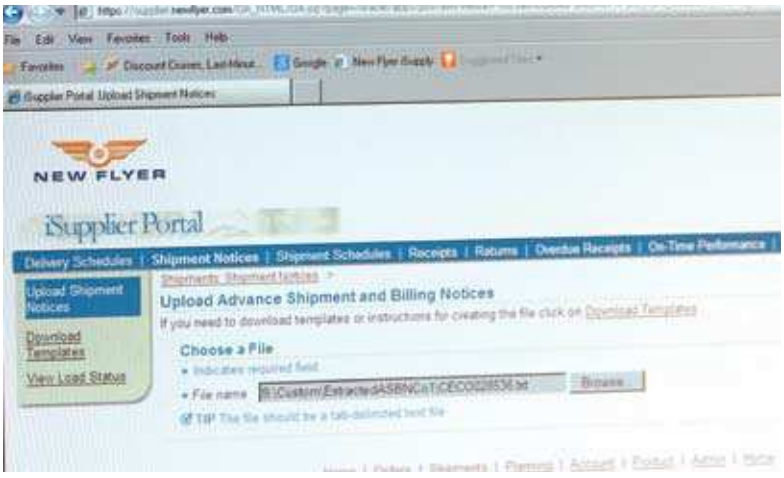
“If I could do this again from scratch, I would assign a few more resources at the beginning,” says Loewen. “But I do realize that it’s not always possible to get everything you need.”

Strategy #3: Build the employee “trust account”

Loewen points out that the participation of shop-floor employees is critical to successfully introducing improvements and effecting change. To accomplish this, managers must demonstrate leadership by proving that their goals are not to punish employees, but to help them succeed in adapting to change. “We must earn their trust, interact with them, show that we are interested in and care about their situations, and treat them with respect,” he says. “Once they understand that management is there to lead and not punish, they will support new initiatives.”

Training was a critical aspect of successfully introducing the new process and software. “You have to provide employees with proper training so they understand the new way of doing things as well as learn the associated terminology,” he adds. “We needed to invest time in explaining what each term or word means, especially given Canada’s multicultural workforce.”

Now that employees have been trained and understand all aspects of the new technology, they welcome it. “This has helped us to become leaner in a shorter period of time,” says Loewen. “In addition, their job satisfaction has increased. They have new opportunities for growth, and the work environment is safer and cleaner.”



Carlson’s ERP system provides digital linkages to suppliers’ portals that electronically advise Carlson of shipments and billings.

Nevertheless, ongoing change will always pose challenges. But with Carlson’s consultative, educational approach to introducing change, it becomes a more seamless effort.

The most recent change—using TrackIT software to give each employee a personal punch card and barcode ID—is a case in point. In the past, plant employees would have to punch in and out for breaks and lunches by walking to and from the plant entrance, where the technology resided. Piggybacking on TrackIT software saves considerable time

and increases efficiency because employees can now punch in and out at their workstations.

After the composite parts are cut they must be polished.

"We knew we would get resistance to this change from shop-floor employees, so we started the consultations three to four weeks in advance," says Loewen. "We discussed our rationale with the union executive, laid out the issues and got their feedback." The union agreed, and its vice-president offered to present the change to employees—something Loewen had not seen before at Carlson. "The union took ownership of communicating change here," he says. "This showed they were working with us not against us, helped us build trust with employees, and made their buy-in smoother."

Results

"Digital technology is a tool that helps us operate leaner every day," says Loewen. "It has eliminated waste on the shop floor, and allows us to respon d to issues quickly because we have the right information in the right place." And the improvements have gone straight to the bottom line, leading to greater profitability and future promise.

Since the implementation of digital technology:

- Shop-floor productivity increased 30 percent
- Customer on-time delivery rose to 98 percent from 95
- Production in water-jet cutting (robotics) increased by 50 percent
- Overtime dropped to below 3 percent per month from 11
- Absenteeism declined to below 1 percent (previously 3 to 4 percent).
- Anticipated revenue growth is at least 10 percent annually

"WE CANNOT MANAGE THE PLANT FROM THE OFFICE. I ENCOURAGE MY MANAGERS TO SPEND TIME ON THE FLOOR INTERACTING WITH PLANT EMPLOYEES AND UNDERSTANDING THEIR CULTURE."

Dieter Loewen, vice-president of Operations, Carlson Engineered Composites

"I can't imagine having done this without DTAPP's help," says Loewen. "We would probably have spent considerably more money and wasted a lot more time looking for the right solutions."

Moulding the future

The opportunities for leveraging digital technology—especially the TrackIT software—for broader usage are huge. While TrackIT now captures information on each part, the next step is logging the amount of time spent on each piece. “That will help improve our costing and time spent, as well as show us areas where we can increase productivity in each process,” says Loewen.

Customer experience

More visibility into processes for customers is also part of the future. At the moment, when customers send in their work orders, Carlson staff type them manually into the existing system. Digital technology can link those two functions together and take out human intervention, thereby reducing errors and increasing efficiency.

Every week, between 2,500 and 3,500 parts go through the plant. Loewen believes it would be beneficial for customers to see how many parts they need for each mould, and compare it to Carlson’s capacity. And digital technology can make that happen.

New markets

Loewen is confident that, with the new technology and improved processes, the company can easily deliver on a 10-percent increase in sales annually. To that end, it is brainstorming market opportunities for increasing its industrial and supply parts for mass transit and agriculture. In addition, it sees the aerospace sector as a possible new market.

The new technology itself is also a selling feature. For example, a recent demonstration of Carlson’s robotic water-jet cutter impressed Britain’s largest bus manufacturer with its accuracy, cleanliness, speed and quality. “The technology was a real eye-opener for them,” reports Loewen.

Going green

A step beyond barcoding is embedding radio-frequency identification (RFID) chips into the parts that will remain in place for their lifespan. Vehicles such as buses must be recyclable, so the chips can contain information about the ingredients in the parts. When the aged vehicles are ready for disposal, recyclers can scan the chips for content and recycle them appropriately.

For Carlson, the digital technology journey continues. “At the end of the day, we are a manufacturing facility, and digital technology should help us improve the manufacturing process,” he concludes. “We have learned important lessons, and will continue to build on our successes.”

About the Digital Technology Adoption Pilot Program (DTAPP)

As part of the Government of Canada's Digital Economy Strategy, NRC-IRAP is delivering the Digital Technology Adoption Pilot Program (DTAPP). DTAPP was created as a pilot program to deliver support from November 2011 to March 31, 2014.

DTAPP represents a significant investment in the Canadian economy to increase the productivity growth of small and medium-sized enterprises (SMEs) in Canada across all sectors through the adoption of digital technologies.

An important component of DTAPP is to assess and measure the outcomes of digital technology adoption on the productivity of SMEs. DTAPP will utilize this aggregate knowledge and transfer successful practices and lessons learned to the broader SME community in order to:

- improve the rate of digital technology adoption by SMEs
- improve understanding of the link between digital technologies and productivity
- raise awareness of the benefits and importance of adopting these technologies

This information will be a critical tool to encourage prospective adopters of digital technologies and will continue to impact the potential productivity growth of the Canadian economy well into the future.