

The Digital Plant

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Ergon Refining: A digital transformation story

A lot of what is written in the business media today about digital transformation—and there is certainly no shortage of it—fails to focus on what digitalization means as a practical process that enables deep, lasting organizational success. Almost none of it covers the issue from the perspective of the people out in the field and in the front offices who are charged with making it work.

What keeps many CEOs up at night are questions about how to integrate sophisticated technologies, such as big data analytics and machine learning, 3D printing or virtual reality (VR), into their operations, and how to do it with a forward-looking drive to revolutionize business practices.

Ergon Refining Inc., a subsidiary of Ergon Inc., a Mississippi, U.S.-based specialty lube refiner, is one organization that has cracked the digital transformation code. By embracing a judicious, culture-driven approach to applying new automation solutions, the company has achieved transformative results in a market that has seen significant volatility and increasing competition throughout the industry.

A specialty lube operation where quality is crucial. Ergon's digitalization journey is the story of a company that has made hard decisions about how and when to invest in new technology. It fostered collaboration between information technology (IT) and operational technology (OT) in a way that has served Ergon's vision for growth and diversification over the last decade.

Ergon Inc. was founded in Jackson, Mississippi, in 1954. It has since grown into a company with more than 3,000 employees and six business segments, including refining and marketing (R&M) and refineries in Vicksburg, Mississippi and Newell, West Virginia. Ergon's R&M facilities produce hundreds of high-qual-

ity specialty lubes, each with extremely precise specifications.

Ergon's refinery in Vicksburg has grown to become the largest manufacturer of naphthenic process oil in the world, with a capacity of up to 26,500 bpd of crude. Their process is unique: the plant produces specialty petroleum products using a distributed control system (DCS). During product loading, it is imperative to maintain the highest standards of product consistency, repeatability, quality and stability—all critical to Ergon's business model. Here is where the need for automation comes in.

Once production is completed, the specialty oils are stored near the refinery and then sent by barge, truck or rail directly to customers or to bulk storage tanks in terminals around the world. Naphthenic base, process and insulating oils produced in Vicksburg are used by Ergon's global customers in numerous applications, including, but not limited to, transformer oils, compound blending operations, rubber products, chemical processing, metalworking fluids, refrigeration oils, hydraulic fracturing oils, paints and greases.

A culture that embraces digitalization. What makes Ergon different from most other refiners is not only the specialty aspect of its business, but also its tightly woven, family-oriented corporate culture. The company's leadership has implemented a digitalization plan and a philosophy that has guided the organization through periods of change and modernization.

Ergon considers itself an early adopter of technology, but a shrewd one. "Our strategy over the years has been to adopt new technologies, new systems and new programs that will allow us to differentiate ourselves from our competitors and expand our global customer base," said Vice President of Refining Jeremy Kyser.

Like many refiners, the management at Ergon keeps close tabs on the latest innovations in process control, wireless instrumentation, analytics and other developments in automation. When it comes to its overall digital transformation strategy, however, the company's leadership has been vigilant in asking two key questions: Why change, and why risk investing in new, unproven technology?

"We've spent a lot of money on digital transformation, and we've justified it in several ways," says Steve Elwart, Ergon's Director of Systems Engineering. "One of them is simply following best practices. Another way is telling a story. We've been able to show where a lack of technology has affected us and then use that to paint a clearer picture of how we could improve performance, which helps upper management see the value in investing in automation."

A strategic approach to scaling up. Ergon has chosen a balanced strategy: establishing itself as an early adopter of new automation technology, but doing so in a way that has allowed the company to scale up solutions that work while remaining agile enough to try a variety of potential solutions until it finds the right fit for a given application.

One of the main drivers behind this approach has been Ergon's unique business model. Digitalization has enabled the company to augment core key performance metrics such as reliability, quality control, safety and regulatory compliance.

"Every product produced has different specifications and parameters," said Lance Puckett, Ergon Inc.'s Executive VP of Refining and Marketing. "Having real-time data around the manufacturing of those products is instrumental in maintaining the consistency that the market demands today."

Focusing on quality control has solidified the company's reputation as one of the leading manufacturers of specialized lube oils and increased its share of the global market. As a result, Ergon today exports products to more than 90 countries worldwide, and continues to grow.

Prioritizing projects for measurable results.

The key to Ergon's digital evolution has been determining how best to prioritize potential digitalization projects that would make the best sense operationally and financially.

When making these choices, the company has focused on three criteria: scal-

ability, workforce empowerment and IT/OT integration. Management identified a handful of operational challenges—some obvious and others that were added to the list over time—and set about searching for solutions that met the criteria. This process occurred organically. Flexibility, communication and collaboration among Ergon's business units were essential.

As the automation industry introduced new innovations over the years, the first benchmark Ergon applied, when deciding whether to integrate a new piece of hardware or software, was to ensure that if it ended up being a good fit, management could easily scale up the solution across a broader part of the operation. This not only ensured buy-in at the enterprise level, but it also meant the company could conduct pilot programs with minimal operational and financial risk, and then make decisions based on preliminary results.

Second, each new digital technology—whether an upgrade to the graphical

interface of a control system or predictive asset management software—must bolster worker productivity, not only due to experience gaps that might be created by retiring personnel, but also because the company is a strong believer in training staff to be competent in basic aspects of its operation and increasing their knowledge and skill over time.

Collaboration is key to continuous improvement.

When it comes to IT/OT integration, the company's Executive VP and Chief Information Officer, Jana Branham, takes a proactive, collaborative approach to her job. Ergon's IT group will regularly ask the OT staff what they need to make their jobs easier, and then the two teams will work together to create a solution that is customized and that leverages new technologies to serve the needs of the operational team.

"The role of IT in supporting operations is to understand more about what their goals are and what challenges they have, so that we can partner together, collaborate together and help them create solutions that support their needs," says Ms. Branham. While it does require time and a concerted effort, this type of collaboration is a key component to any successful digital transformation approach.

Ergon sees digital transformation as an ongoing, evolutionary process. It is the promise of continuous improvement that keeps the company one step ahead of the competition. That said, it is worth taking a closer look at how the company has implemented new technologies and executed capital improvement projects over the years, and what its vision for the future looks like at a time when new breakthroughs are being made virtually every day.

A transformation journey begins.

One of Ergon's first substantial ventures into digitalization was wireless networking and the use of remote sensors to provide operators with essential data. Before WirelessHART became the international standard protocol it is today, the team at the Vicksburg refinery chose an incremental approach, proving the technology on less critical applications first. "We began installing a proprietary wireless sensor on one pressure relief valve to detect potential issues with its rupture disc, as an extra safety layer," said Mr. Elwart. "Once



FIG. 1. Ergon has used digital technology to help gain greater insight into machinery health.



FIG. 2. Asset management software is embedded with prediction, protection and process expertise that identifies potential equipment breakdowns and ensures that critical asset health data gets into the hands of operators when and where they need it.



FIG. 3. Ergon worked closely with its partner to execute the blender modernization, from drawing up wiring schematics for the scale house and optimizing the control software, to minimizing the hardware footprint and aiding with the cutover.

we felt comfortable, we installed sensors on 33 more discs, saving us thousands of dollars on wiring costs."

From there, the Vicksburg team moved on to a project that involved installing a wireless transmitter on a remote chemical storage building where flammable chemicals were stored. Separated from the control room by several hundred yards, the storage building was not normally staffed, and the existing electrical and data network connections made it impossible to monitor the building for safety and security around the clock.

Comparing a hardwired solution to wireless, management was concerned about infrastructure cost, deployment time, construction logistics and safety. The solution: a solar-powered field network. The team installed wireless smoke sensors inside the building, which transmitted signals to a solar panel-powered wireless repeater within a direct line of sight to the refinery control system. The wireless solution eliminated the time and expense of fiber-optic cable trenching in a live process area, saving more than \$230,000.

The rupture disc and storage building applications were small projects, but they helped accomplish two important things: they built confidence in a new digital technology and its ease of use, and they showed how solutions can be piloted and scaled up by testing them on a limited number of applications first and then applying them to more assets across the plant.

Success leads to confidence for bigger projects. Some of those assets, such as blowers and fans, are being monitored automatically since Ergon has recently begun employing equipment integrity sensors, which send vibration data to asset management software (AMS) that gives operators greater insight into machinery health and helps instrument technicians diagnose problems before they lead to failures (FIG. 1). AMS can alert maintenance to potential issues with sensors and transmitters before operators in the control room notice that anything is amiss.

Asset management applications like this can be tied into broader plantwide digital ecosystems, which Ergon uses for, among other reasons, the convenience of having off-the-shelf digital solutions available from suppliers like the author's company that function as one-stop-shops for troubleshooting. The company sees com-

patibility among the products of disparate vendors as a vital aspect when deciding on a long-term digitalization strategy.

After Ergon built its networking and digital ecosystem capabilities, adding more sensors and instrumentation throughout different process areas, it began investing in analytics tools, such as a proprietary software^a that the Vicksburg facility uses for alarm management (FIG. 2). The software generates weekly reports by process area, enabling operators to confirm that alarms are working as they should. As a result, alarm rates and alarm criticality have dropped, and the number of disabled alarms has fallen to zero.

Maximizing on-spec production through modernization. In 2015, Ergon took on one of its biggest modernization projects to date—upgrading the control system in the scale house at the Vicksburg facility's blending unit (FIG. 3). It involved a mix of next-generation automation technologies that, if integrated successfully, would improve operational efficiency.

The blending system is an essential component of Ergon's operational model. The original control system that mixed the components of specialty lubes and blended them direct to trains, trucks and ships, was outdated. A downed system could result in demurrages and cancelled orders that quickly run into the millions of dollars in losses.

Ergon replaced the legacy system with a proprietary batch controller^b that made it easier to manage blend recipes and implement new recipes for new products, allowing Ergon to handle greater production volumes. Product shipments have increased by 30%. The project also included what turned out to be the first installation of one of the author's company's virtualization servers^c in North America. The virtualization system allows workstations and control system nodes to be run from a common host computer, significantly mitigating downtime and reducing the hardware footprint in the scale house. The virtualization system can also back up the entire control system data in one file, reducing reboot time in the event that the system needs to be restarted.

Transforming operations across the enterprise. The latest step in Ergon's dig-

italization journey has involved automating its order-entry system and integrating it with the company's business management software.^d Under the old system, when an order came in, a clerk in the scale house would type the order information into the blending system and have the blender enter the order information into a spreadsheet that generated a report of blends for the day. This procedure allowed for manual input error.

With the new system, when an order is entered into the SAP system at Ergon's customer service center, all the blender operator will do is pick out the correct order number when the customer's truck arrives, and the rest is automatic. The SAP system then automatically generates an invoice, which helps the front office track orders and close its books more quickly. Not only does this mean faster turnaround time for invoices, but it also reduces the potential for human error and the need for re-blends, which can cost thousands of dollars as a result of a single bad keystroke.

The journey continues. Where will Ergon go from here? Since digital transformation is a journey and not a destination, Ergon will continue to look for opportunities to improve operations well into the future. Mr. Elwart said, "Our goal is to get as much information as possible into the hands of the people who need it, whether it is in the control room or the board room."

One of the first things the company plans to do is to take advantage of the highly-customizable operator interface capabilities of a proprietary DCS^e that allows users to design operator screens that enable each worker in the plant to see what they need to see to do their jobs, on tablets, phones, laptops or control room workstations. This level of mobile access to process data and asset health information using standardized HMI graphics can help expedite loop-checking, turnarounds and maintenance, while generally simplifying workflows across the plant (FIG. 4).

While it may be still be a few years off, augmented reality (AR) is another innovation that the company is seriously looking at. "Soon, operators will be able to look at a piece of equipment from across the refinery and get real-time asset health data presented in their field of vision," said Mr. Elwart.

However, when it comes to high-tech applications like these or technologies



FIG. 4. Giving technicians secure remote access to control room data, using mobile tablets and smartphones empowers Ergon's workforce to monitor and control their processes from anywhere within the facility, boosting productivity.

that have yet to be invented, it is certain that Ergon will continue to apply its time-tested approach to digital transformation

that has enabled it to thrive. "Create a sound digitalization strategy and stick to it," advised Mr. Elwart. "Start small,

move incrementally and take advantage of scalable technology to keep risk at a minimum. Above all, let company culture drive technological change—not the other way around." **HP**

NOTES

For more information

Emerson.com/Refining

^a Emerson's DeltaV™ Analyze

^b Emerson's DeltaV Batch controller

^c Emerson's DeltaV Virtualization

^d Ergon's SAP® business management software

^e DeltaV Version 14



STEVE ELWART is the Information Systems Manager for Ergon Refining and has worked for Ergon for 35 yr. He has been involved with automation and information technology for more than 40 yr.



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