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INSIDE THE MIND OF THE CEO

Keeping Cool under Pressure

For Greg Lehmkuhl, president and CEO of Lineage Logistics, temperature-controlled supply chains for perishables are one of the world's next great platforms.

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Refrigerated transportation and storage is one of those specialized industrial sectors in which new approaches to strategy and operational excellence can make a huge difference. It's also an enabler of civilization that nobody notices much – unless they have to live without it. Over the last 20 years, the temperature-controlled logistics sector, as it's officially called, has quietly but dramatically changed, thanks to three simultaneous global trends. The first is the broadening of nutritional awareness, as people around the world become more accustomed to eating fresh meats, fruits, vegetables, dairy products, and other perishables every day. The second has to do with lengthening food transportation distance. More and more consumers eat food that was sourced thousands of miles away. The third is the changing natural environment. Climate change and pollution, as they affect local agricultural and water supplies, are making society more reliant on diverse sources of fresh food and drink.

The technological infrastructure that makes these changes possible is the temperature-controlled supply chain, which dates back about 150 years, to horse-drawn “iceman” carriages. Today's systems use digitized controls that customize cold temperatures in warehouses and trucks for a wide variety of fresh and frozen foods. Most of this sector has, until recently, been run by small family businesses, but an ongoing wave of consolidation has changed that.

Even today, however, gaps remain. Issues of food waste and food shortages are common in all regions, and most of the world is not yet served by truly efficient cold transportation and storage systems. As Lineage Logistics president and chief executive officer Greg Lehmkuhl points out, bringing cooling technology

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up to global scale could be part of the answer to these issues.

Based in Novi, Mich. (a suburb of Detroit), Lineage was launched in 2008 by Bay Grove Capital, a private equity startup founded by two investment bankers, Adam Forste and Kevin Marchetti, seeking enterprises with “lifespans measured in decades, not years,” according to the Bay Grove website. Lineage was the company’s first (and so far only) major venture. It has grown through mergers and acquisitions into a large temperature-controlled warehouse and transportation network, operating in the U.S., the U.K., the Netherlands, and Belgium.

Lehmkuhl has been CEO of Lineage since July 2015. With a background in the non-temperature-controlled (he calls it “ambient”) logistics industry, he is an advocate for sector-wide coordination in chaotic, multifaceted systems such as food supply chains. He sat down with strategy+business in a PwC office in New York, where we shared the cold comfort of a warm look at this hot business.

S+B: How does an underappreciated industry such as temperature-controlled logistics sustain itself and grow?

LEHMKUHL: Let me answer that by telling our story. Our founders saw an opportunity to consolidate and innovate a very fragmented industry into an interconnected platform, first in the U.S., and perhaps eventually around the world. When they started, the temperature-controlled logistics sector was largely composed of regional family-owned businesses. But their customers — the groceries and food manufacturers — were merging and growing more global. Food safety

was paramount, technology was increasingly digital, and many family-owned businesses couldn't keep up with the demands of their customers, or didn't have a new generation of family members who wanted to continue running a cold storage business.

So in 2008, Forste and Marchetti bought a single refrigerated warehouse in Seattle. Ten years later, we have 120-plus buildings in four countries, nearly complete supply chain coverage here in the U.S., and a good foothold in Europe.

S+B: Was all that growth through acquisition?

LEHMKUHL: Most of it was, but [Forste and Marchetti] went about it in an interesting way. They were very people-oriented — the opposite of the stereotype of ruthless private equity. This is their only platform; 95 percent of their net worth is in temperature-controlled logistics. They always had a long-term vision for the company; they didn't want to just make money and move on.

They befriended the Global Cold Chain Alliance, the industry group that all these family-owned businesses belonged to. They got to know the [business owners], met the founders, learned what the children and grandchildren were doing, and what their challenges were. Often, what the current owners wanted for the future — having a broader network, more investment in food safety, more investment in the physical infrastructure, expanding their services — would be easier to realize if they joined Lineage.

After 10 years, the original owners of these family businesses are still friends of the company. Many are still investors. They still help us, giving us insight into the industry and its interrelationships. We continue to expand both organically and through M&A. That network effect of having 120-plus buildings along with other services — transportation, high-pressure processing, redistribution, manufacturing, and applied sciences and technology — makes us unique.

S+B: Your platform does only refrigerated logistics.

LEHMKUHL: Correct. It's a niche segment. We call it temperature control, because it's sometimes refrigerated, sometimes frozen. The majority of our space is frozen.

The regular third-party ambient logistics business is very transactional. In

“Mainstream food manufacturers desperately need new products, so they are doing a lot of innovation and acquisition.”

temperature control, I feel like there's way more trust. The facilities are more capital intensive to build [compared with] an ordinary ambient warehouse. Customers see our buildings as their buildings, and they get used to the safety of having high-quality infrastructure. Switching providers is an emotional event for them, unlike what I saw on the ambient side before I came to this company.

S+B: Who are Lineage's customers?

LEHMKUHL: Our customer base is really the “who's who” of the food industry. They include the commodity companies, producers of protein, peanuts, fruits and vegetables, and seafood. We also serve food manufacturers, food distributors, retailers, and restaurants. It's soup to nuts.

The manufacturers include a lot of small startups. They have [US]\$5 million to \$300 million in revenues, and great new fresh or frozen organic products that everybody wants. But they lack scale and sophistication. They need to store their products, and take them to market, in a safe and efficient way. They want a platform to take over all of their distribution: to hire and contract the carriers, and track the product from the farm to the fork.

Our bigger customer segment is mainstream food manufacturers. In general, they are under unbelievable pressure. Smaller, innovative startups are taking their shelf space and eroding their margins; white-label supermarket brands are attracting their customers. Many of their traditional big-margin products are losing ground. They desperately need new products, so they are doing a lot of innovation and acquisition. They also need help redesigning their supply chains,

for instance, choosing what SKUs to put where, modeling transportation costs, and complying with Walmart's "on-time and full" requirements [an initiative to make suppliers manage inventory control more cost effectively].

We're not just a distributor. We're a platform that pulls together all this transportation and storage, and the data analytics to go with it.

S+B: How does e-commerce affect your platform? Do you see food shopping moving online in the same way that shopping for other consumer products did?

LEHMKUHL: We do. About 10 percent of consumer goods are purchased through e-commerce now. In food, it's less than 3 percent, but it's projected to be 20 percent by 2025.

As e-commerce grows, there will be more need for smaller-quantity transactions. Traditionally this industry ran on truckloads of pallets, and now we're providing individual cases to the retailer or food distributor. Whether the meal-kit idea takes off or doesn't, we'll see more and more "each-picks": sending one yogurt to a consumer rather than 24 of them to a corner store.

This shift will require more temperature-controlled warehouses. [The ambient logistics company] Prologis has created \$10 billion in market value in the last two years, partly because warehousing space is at a premium with e-commerce. Instead of you going to Best Buy to pick out your video game, a warehouse worker grabs it from the shelf for you.

S+B: What do you think of refrigerated food delivery into the home — for example, Walmart's idea of having employees enter customers' homes to deliver groceries directly into refrigerators, or the "echo fridge" concept, which would be installed on an exterior wall of the kitchen, and could be accessed from both the home's exterior, for deliveries, and interior?

LEHMKUHL: It's possible. But no one's cracked the code yet on how to do it profitably. The last mile for food — from the store or warehouse to the home — is a wildly complicated logistics exercise. It requires quality, delivery accuracy, and timing. Temperature control is also very difficult, and so is security, particularly when people aren't home. Will homeowners really give Whole Foods the key to their kingdom? And labor will be another challenge. It's not easy to find

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employees who will pick the right length of celery, bag it the right way, and combine it with the right amount of parsley.

S+B: Is labor already a challenge for your industry?

LEHMKUHL: It's a major challenge. We have almost 8,000 employees now and we're growing all the time. But no one wants to be a warehouse worker when they grow up. Even fewer people want to work in a 20-below-zero ice cream storeroom. The turnover in our industry is staggering.

In 2017, we shifted our focus to retention. Our chief operating officer said to the head of HR, "We're not getting enough people." And the HR head replied, "I've gotten you 1,600 so far this year. What did you do with them?"

The retention challenge drives two things. First, we try to be very people-oriented as managers, in how we recruit people, treat them, pay them, and help them manage their time off. We do everything we can to keep them happy, because there aren't many replacements.

Second, we're exploring automation. With the acquisition of Partner Logistics in Europe in 2017, we've become the largest temp-controlled automated warehousing company on the planet. We are innovating in every possible way to continue to keep that leadership position.

S+B: For example?

LEHMKUHL: Our buildings in Europe have 550,000 pallet positions. Most of them are automated. In our Bergen op Zoom facility in the Netherlands, there's

a conveyor that takes each pick right from the truck, checks the quality, checks the SKUs, and then puts it away with little or no manual intervention. Automation also lets us build taller, more sustainable warehouses that use less energy and less land. You can store things more densely because you don't need the space for forklifts.

S+B: To what extent do you use AI and data analytics?

LEHMKUHL: One of the most interesting aspects of our business is the convergence of the traditional supply chain, warehousing capability, and information technology. We have a team of engineers, applied scientists, physicists, biologists, mathematicians, data scientists, and simulation engineers all nested together in Silicon Valley. Their purpose is to reimagine the food supply chain.

Being environmentally sustainable is extremely important to us and our customers. It means a lot to our team members, especially the younger generation. So we have been doing work with energy conservation, like insulation and LED lighting, for a long time. We temperature-control the equivalent of over 40,000 homes in our network. Our electric bill would cover every house in Scottsdale, Arizona.

When we set up this Silicon Valley group, we went further. Most of our rooms can now operate at adjustable temperatures, with up to 2,000 real-time IoT [Internet of Things] sensors in a single building. Through the software displays, we can see exactly how our rooms interact with the environment. When it gets hot, we know what part of the room is hottest, and we know which are slow or fast to cool. If someone leaves a freezer door open, we see the leakage immediately.

We have also set up a machine-learning proprietary algorithm to show how each building interacts with its environment. We use this algorithm to control our engine rooms. A temperature-controlled warehouse is like a very large, expensive air conditioner; the engine rooms are about nine times the size of a typical conference room, and they use a lot of energy. We use National Weather Service data to forecast the next few days, and we've built algorithms that analyze the utility tables and calculate what they are going to charge us. The system knows that in central Washington State, the utility may pay us to run our engine room at 4 a.m. In Southern California in mid-afternoon, the charges

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can be 3,000 percent higher than at dawn. The algorithms optimize when the engine room gets turned on and when it gets turned off.

For instance, if it's in Southern California, and it is controlling a room cold enough to keep frozen pizza at the customer's specified temperature to ensure food safety compliance, it doesn't need to be running all day; it can turn on at midnight, run through 3 in the afternoon, and then shut off for the next nine hours, when there are peak utility rates, and the room will still stay cold enough.

S+B: Can you use this kind of optimization to improve the shelf life of perishable products, such as fish or fruit?

LEHMKUHL: Yes. Keeping every product at its optimal temperature throughout the supply chain is the number one way to do this. And in traditional temp-controlled supply chains, that didn't happen. In China, the ice cream is fully thawed and refrozen as many as seven times before it is eaten.

We have an applied sciences team that works on innovations to address this problem. For example, one of our customers in central California, a major producer of strawberries, had a bumper crop three years ago. Typically, we blast-freeze strawberries, running negative 20 to 25 degrees Fahrenheit air through them, and then store them for thawing before their ultimate distribution to the market.

But there were too many strawberries for our blast-freezing capacity. So literally over a weekend, we sent our applied sciences team into the building to find a solution. Otherwise, the customer would have had to waste the strawberries or

juice them. We created simulations of the freezing process, which hadn't changed much since the 1950s, showing how the physical packaging interacted with the airflow. We used CFD [computational fluid dynamics] formulas like those previously used by Boeing to model airplane lift. By working with customers to redesign the packaging and the process, we took the blast-freezing time down by 40 percent, increasing blast throughput. The new system also used significantly less energy.

S+B: What other opportunities have come up around sustainability?

LEHMKUHL: When I first came to this company and met with the top 20 clients, their number one concern was the lack of warehouse space. But building new buildings can be time consuming and requires intense coordination with customers. Moreover, with 100 different clients with different seasonality and packaging sizes, requiring four or five different temperatures in the same building, it's very difficult to optimize physical space.

We asked our applied scientists to look at this problem. They went into the warehouse with light detection and radar (LIDAR) technology, which is used for positioning autonomous vehicles, and they modeled the exact configuration of the room, down to the light switches and pipes. Now that we had a model of supply, we had to understand demand. So we looked at three years of logistics data for one warehouse, and saw the peaks of different types of pallet characteristics. To model maximizing the physical space, we borrowed algorithms from the computer server industry; if you think about data farms, they're hit by airlines at certain times, by banks at other times, and they're always trying to maximize the capacity of a server. The problem is similar for warehouses.

Once we had an optimal design, we asked our simulation engineers to error-proof it. We now have displays showing the physical pallets coming in and out of the room. We then did this for another 20 buildings. In 36 months, by using data to revise our logistics, temperature control, and energy practices, we found the equivalent of 600,000 square feet of new capacity in our existing real estate. It would have cost us \$50 million more to build a new structure that size. And customers were thrilled because they got the space in three months instead of two years or more.

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S+B: Do any other threats or external issues concern you?

LEHMKUHL: Sure. Along with our customers, we follow the news about trade barriers closely. The core problem is uncertainty. Many of the large protein producers — companies like Cargill, JBS, Tyson, Purdue, Smithfield, Bob Evans, and many more — are reaching global markets; in fact, American food is generally regarded as superior. But as tariffs change, our customers have to switch their export strategy on the fly, say from China to Africa and the Middle East. Fortunately, most of them have the capability to do this. They already know how to penetrate global markets and deliver high-quality product to them. So it probably won't change the competitive dynamic. Small producers may be wondering how to get their products into all of these new countries, but most already know how.

S+B: It seems as if the world has progressed over the past few decades in its ability to avoid or manage famines. Does that reflect the way logistics for food evolved over the years?

LEHMKUHL: To some extent, the world has progressed. But sadly, maybe it's become more desensitized as well. Even here in the U.S., which is one of the best countries for preventing food waste, there's still a long way to go. Our company is partnering with Feeding America, the largest food charitable organization in the U.S., as a way to manage food donations from our system.

We ultimately see ourselves serving a higher purpose in eliminating waste

“AI is helping us be more sustainable and efficient, utilize our buildings better, and keep food safer.”

and feeding the world. There is still a great deal to do in developing markets — in China, for example. If you took all the temperature-controlled facilities in the U.S., flew them to China, and dropped them there, there would still be a shortage of temp-controlled space. Members of the emerging middle class do not want their children to eat the chicken hanging in the market anymore. The demand for high-quality process and temperature control in Asia is unbelievable. That may be an opportunity for us in the future, but we still have plenty of innovation and growth opportunities here.

And that’s central to my thinking. Demand for fresh food is growing at about 3.2 percent a year and demand for frozen’s growing at about 4.5 percent. Millennials are more accepting of high-quality frozen food that often locks in nutrients better than fresh does. When we optimize the supply chain, it helps those trends happen, and allows you to eat the food that you want to eat any time of year, even if it was caught or killed or grown in an off season. Salmon from certain markets may be caught only once a year, for example, but people can eat it all year long.

S+B: So food may be local but logistics is global.

LEHMKUHL: That’s fair. Yes, I like that.

S+B: How else do you see artificial intelligence affecting the food business?

LEHMKUHL: Our company has visibility to more than \$35 billion per year in transportation spend. We have access to a war chest of data: for example, where

trucks are going, if they're full, who the carrier is, and whether they're on time. We are working diligently to create a machine-learning product that will be able to optimize the system on the fly. If a carrier is late at Walmart, we'll know immediately why, and work to resolve the situation in real time. This can take an amazing amount of waste out of the food chain. Currently, as much as 50 percent of food truck capacity is not used; either a truck's not full [going out] or it's coming back empty. We have an opportunity to make a giant impact on that. We're also launching an app to manage this. It will be like an Uber app for food logistics; you'll be able to see where any item is going, whether the truck's full, and how to reorient the truck if need be. This will create greater efficiencies in transportation costs for our customers.

We're also using artificial intelligence inside the warehouse. We're putting stereoscopic cameras on forklifts, and making them more autonomous. Today, forklift operators spend as much as 50 percent of their miles in subzero temperature. That's a very tough environment for our team members. With machine learning, we'll be able to give them step-by-step forklift routes that have the potential to cut operators' time in the freezer in half.

S+B: How do you think AI will affect society?

LEHMKUHL: We're very bullish about AI. It's helping us be more sustainable and efficient, utilize our buildings better, and keep food safer — all our key objectives.

S+B: Does this suggest that, in general, people around the world will have better nutrition for less cost in the future than they do today?

LEHMKUHL: I think it's likely. As the world's middle class keeps growing, and infrastructure continues to improve, there will be more food available to people at lower cost and higher quality. But I don't think the supply chain for fresh and frozen food will ever be taken for granted. Too much goes into it. +

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