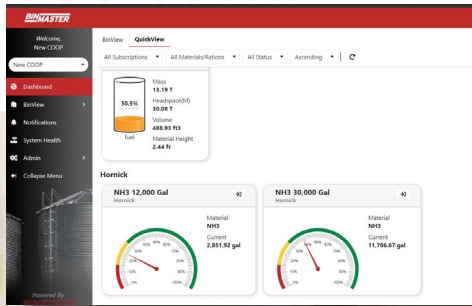


## White paper

# SUPPLY CHAIN EDUCATION FOCUSED ON TECHNOLOGY

## Taking inventory to a smarter level

You've heard of Industry 4.0, but have you heard of Inventory 4.0? Manufacturing leaders are tackling supply chain issues with digital solutions. Leveraging Industry 4.0 solutions, a recent McKinsey survey showed 39 percent have implemented a control-tower approach to increase supply chain transparency. About 25 percent are fast-tracking automation to stem worker shortages. Steve Schulz, Ph.D., Associate Professor of Logistics & Supply Chain Management, said the program has taken a quick trajectory towards all the technology needed for this technological revolution.



## SUPPLY CHAIN EDUCATION AND INDUSTRY 4.0

The University of Nebraska at Omaha operates one of the state's few programs dedicated to supply chain. Steve Schulz, Ph.D., Associate Professor of Logistics & Supply Chain Management, said the program focuses on all the latest innovations regarding supply chain technology. "Covid accelerated our move into more technology," Schulz said. "Our students have to be ready to implement the latest software and tools. They need to understand data and to develop great strategies leading to great results."

Schulz said the recent supply chain crunch was driven by the pandemic, but it's been strained because of a move towards more e-commerce and home delivery. "When people stayed home, they ordered doorstep service and our system just couldn't turn on a dime like that," he said. "We're becoming more agile. The need for supply chain professionals is huge right now."

Technology may be a path towards, "catching up," he said. It requires assembling reliable data and deciphering it into actionable intelligence. Schulz also cautioned against information overload and pointed to a more open sharing of information using the cloud.

## WHAT IS INDUSTRY 4.0?

Manufacturers have been transforming technology since before the pandemic. The speed of change has increased due labor shortage, component shortage, inflation and supply chain woes. One answer is Industry 4.0 which revolutionizes automation and data exchange in manufacturing technologies and processes. This includes IoT, Internet of Things, cloud computing, cognitive computing, and artificial intelligence.

### Industry 4.0 Concepts

- > Interconnective IoT cloud pulls software, sensors, devices and people together.
- > Transparency Employees have comprehensive data to make decisions. Connectivity allows for immense amounts of data from multiple manufacturing points. Better data helps people point energy towards the best processes.
- > Decentralized Workers make decisions on their own to perform tasks autonomously. Better delegation to a lower level.
- > Tech Assist Simplify or automate decision-making, reduce human intervention with unsafe tasks (like climbing bins to measure level).

"We were Industry 4.0 before the term got popular, said Nathan Grube, BinMaster regional VP. "The biggest leap in technology has been our cloud integration. We devoted an entire department to constantly improving our platform. We have programmers and even a UX/IX designer constantly collaborating to make the user experience more effective. Software shouldn't get in the way of data. Our report can feed into other reporting tools or we can bring data into our BinCloud application so customers can get one report on all their inventory data."

Sensors and cloud software are considered a foundation of Industry 4.0 and Inventory 4.0. BinMaster technology fits into the category of Internet of Things (IoT) which describes a wireless network of devices embedded with sensors for the purpose of connecting and exchanging data. IoT is growing in the manufacturing industry, however many processes have yet to incorporate the potential.



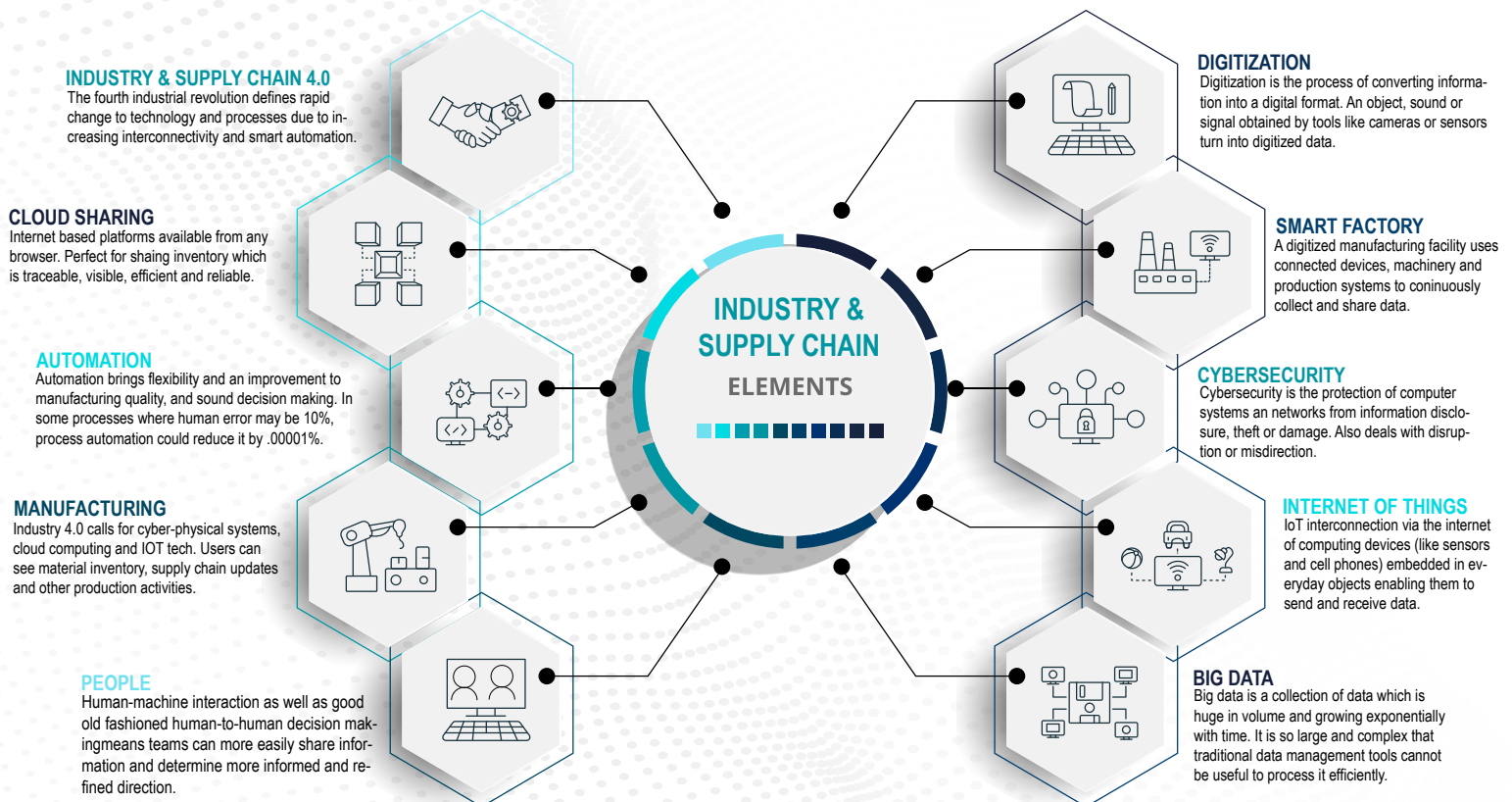
#### BinMaster IoT inventory sensors and software:

- > Provide insights for data-driven decisions to increase efficiency and drive down costs
- > Shorten lead times for production
- > Reduce carrying costs and last-minute purchases
- > Reduce waste on bulk inventory that could spoil
- > Accurate inventory feeds data to Enterprise Resource Planning systems
- > Streamline transportation and timely ordering

Sensors and instrumentation drive the central forces of innovation, not only for Industry 4.0, but also for other “smart” megatrends, such as smart production, smart logistics, and smart factories. Smart sensors are devices, that generate data and allow further functionality through the use of Cloud-based processing power. With the added capability of wireless communication, they greatly reduce installation effort and help streamline and consolidate a wide array of manual tasks.

“More and more, I’m working with IT people,” Grube said. “Production and inventory managers are combining their efforts with technology managers. They understand the importance of continuously improving their supply chain understanding. They know technology can help with the worker shortage. They continue to challenge us to get better and we love it.”

Grube said IT is heavily involved with sensors and software because of a heavy emphasis on the integration into cloud systems. He said BinMaster can ease security concerns and simplify software maintenance.



## CASE IN POINT: AN AGROCHEMICAL PLANT

An agrochemical plant in southeast U.S. maintained more than 150 stainless steel tanks, each about 30 feet tall. Their end product includes chemicals, fertilizers, seed treatments and biological nutrition for farms.

Grube said for years, the company was feeling the “stress of success” with more need than capacity. Several years ago, owners made technology a priority of operations. While they didn’t declare a move to Industry 4.0, their purchases and newly-implemented systems reflect a change.







“It was all about automation,” said Grube. “Early on, they looked at the beginning of the process, and that was all about bulk inventory. They wanted our sensors right away.”

Bonine said sensor technology freed a lot of time for on-site employees, but it took time to develop practices to use the data.

“We’ve learned from each other and—as other technology entered the picture—we knew the way to get inventory data integrated into their new processes was going to be the cloud,” he said. “In fact, some of the features of our BinCloud and Bininventory software was a result of companies like this that are breaking ground on high-tech production.”

Fully implemented, BinMaster systems now allow the plant to anticipate inventory with quick turnover. Purchasing keeps up with orders and deliveries. Low or out-of-stock tanks no longer stop production. Time taking inventory was cut by 75%. This agrochemical plant, increased the speed of automation as the pandemic hit. Now, inventory is coupled with multiple cloud-based reports often used by employees monitoring from their phones. Suppliers and truckers can view activity on site.



Industry	Bulk Material	Sensors	Software	Applications
 Agriculture Farming Livestock	Grain Flour Beans Fertilizer Seed Liquids  Bins, silos, tanks, piles, domes	Rotary level indicator Capacitance probe Vibrating rods Diaphragm switch Tilt switch Radar SmartBob 3D sensors Ultrasonic Flow detector	BinCloud BinView AgriView Binventory FeedView 3D Multivision	Prevent overflows Process control Inventory management Remote monitoring Monitor piles Flow detection Bin aeration Dust detection Aeration Ag Chemical Storage
 Bioenergy	Corn DDG Biomass Wood pellets Wood fiber Forest residue  Bins, silos, tanks, piles, domes	Rotary level indicator Capacitance probe Vibrating rods Diaphragm switch Tilt switch Radar SmartBob 3D level scanner Ultrasonic Flow detector	BinCloud BinView Binventory 3D Multivision ResinView	Prevent overflows and outages Process control Inventory management Remote monitoring Flow detection Slurry tank detection Measure DDGS
 Cement	Sand Gravel Clinker Rock Powder  Bins, clinker silos, tanks, piles, domes, chutes, crushers	Rotary level indicator Capacitance probe Vibrating rods Diaphragm switch Tilt switch Radar SmartBob 3D level scanner Ultrasonic sensor Flow detector Plugged chute detector Airbrator Diffuser air pad	BinCloud BinView Binventory 3D Multivision CementView	Prevent overflows and outages Process control Inventory management Remote monitoring Monitor piles and bunkers Inventory domes Plugged chutes Measure crusher levels ESPs or clinker silos Prevent conveyor overloads Silo aeration
 Food processing	Brewing Foodstuffs Solids Slurries So much more...  Silos, mixers, batching tanks, conveyors, pipelines	Rotary level indicator Capacitance probe Vibrating rods Diaphragm switch Tilt switch Radar SmartBob 3D level scanner Ultrasonic sensor Flow detector Airbrator Diffuser air pad	BinCloud BinView AgriView Binventory 3D Multivision	Prevent overflows Inventory management Remote monitoring and VMI Process control Sanitary level measurement Detect levels in mix or slurry tank Detect levels on conveyors Flow detection Silo aeration
 Mining	Lump coal Ores Aggregates Fine alumina powder  Silos, crushers, conveyors, domes	Rotary level indicator Capacitance probe Vibrating rods Diaphragm switch Tilt switch Radar SmartBob 3D level scanner Ultrasonic sensor Flow detector Airbrator Diffuser air pad	BinCloud BinView Binventory 3D Multivision CementView	Inventory management Monitor piles Prevent overfills or outages Detecting plugged chutes Measuring inventory in domes Level measure in crushers or bins Prevent overloading Process tanks Remote monitoring Silo aeration Dust detection
 Plastics	Resins Flakes Powders Granules Regrind  Silos, bins, containers, hoppers, tanks	Rotary level indicator Capacitance probe Vibrating rods Diaphragm switch Tilt switch Radar SmartBob 3D level scanner Ultrasonic sensor Flow detector Airbrator Diffuser air pad	BinCloud BinView ResinView Binventory 3D Multivision	Prevent silo overflow Eliminate outages Inventory management Remote monitoring Vendor managed inventory Flow detection Bin Aeration Dust Detection

