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IIoT Implementation Guide
for Meat & Poultry Processors

INTEGRATING PRODUCTION AND PROCESSING DATA TO INFORM INTELLIGENT DECISION MAKING

Foreword

If you're a protein processor that has yet to take a significant step into the world of Industry 4.0, then the technology involved and the advantages it offers can seem both daunting and unattainable. It can seem like a giant leap from the reality of your day-to-day operations to a world of data-driven optimized production lines, connected by myriad IIoT (Industrial Internet of Things) sensors, tied into a plant-wide network, that promises to make your business far more responsive and efficient.

We understand that. As experienced process specialists for the protein industry, we know first-hand the challenges of moving from one technological advancement to another while keeping production lines running and the business meeting its goals. For decades, we've worked at the leading edge of blending technology and manufacturing, and we know how to guide processors through practical approaches to digital adoption.

Most manufacturers with moderately modern infrastructure can find real Industry 4.0 projects that will deliver tangible benefits which justify the investment, while helping put the business further along their Industry 4.0 path to reap even greater rewards.

We've put together this handbook as a guide for implementing Industry 4.0 supported by real world examples and processes to overcome common roadblocks.

90%

Globally, 90 percent of manufacturing companies are Digital Novices, Followers, or Innovators, less than one third are well advanced on their digital journey.[1]

1 https://www.strategyand.pwc.com/media/file/Global-Digital-Operations-Study_Digital-Champions.pdf

Overview

Maturity model of Industry 4.0 adoption

Industry 4.0 incorporates a range of technologies and processes that include IIoT sensors collecting data on the production line, feeding data through advanced PLCs (Programmable Logic Controller) and MES (Manufacturing Execution System) via plantwide networks and using IT technologies to then analyze that data. Because of the breadth of technologies and processes that can be involved, not every business will be using Industry 4.0 to the same level of sophistication, while still being undeniably Industry 4.0-focused.

Many businesses that do not consider themselves as Industry 4.0 practitioners probably have a lot more in common with other Industry 4.0 adopters than they realize. Industry 4.0 projects aren't necessarily about building a new factory. They often are about finding synergies with your existing infrastructure that help you extend the life of that infrastructure, improve its productivity, and minimize its downtime.

Contents

Where do you sit?

Manually Managed

Manually manged businesses have yet to bring digital technology very far into their operations. Data collection likely uses the machine's standard sensors and there is no plan for what data needs to be collected or what sensors are needed. The data collected is only analyzed on an ad hoc basis and this analysis is reactive, rather than preventative (i.e., machine data is only accessed after a breakdown to find out what caused it). The manufacturer is aware that they should be collecting data, but they don't know where to start. It's likely that the business feels it lacks the time and money required to collect the right data, interpret it and make decisions. In the same vein, the business may perceive digital solutions as too costly and time-consuming to implement.

Repeatable

These businesses are looking to adopt more efficient, technology-driven manufacturing processes. A business will have legacy installations, potentially with some operational sensors installed, and is looking to improve efficiency or reduce downtime through programs such as predictive maintenance through sensors. Data collection and analysis are probably fairly manual; however, the machinery is not end-of-life and is modern enough to be tied into a more sophisticated data collection system via the addition of wireless sensors. The business will likely already have some clear goals about how it wants to cut waste and improve productivity.

Quantitatively Managed

A typical Industry 4.0 user at this level is likely using PLCs and MES, but in very task-oriented ways: they're using the data for discrete, use-specific functions rather than feeding it into deep analytics. They may have already tied plant sensors into a site-wide network that enables central collection and analysis. As a result of an existing focus on improving efficiency, businesses at this level will likely already have a culture in place that's receptive to implementing more advanced projects. The business has many of the building blocks of more sophisticated Industry 4.0 operations in place and is now looking to find a project that leverages this for some big benefits.

Continuously Optimized

A business sitting at the continuously optimized level has already run a project or two, analyzed the pros and cons and deployed what they've learned. What sets a business at this level apart from other businesses is they're collecting data at multiple levels (either from a particular piece of equipment or interactions across a wider plant) and are now starting to track and look at interrelationships and trends over time. They might be using that data to automatically manage the supply chain and stock control. They could have done the analysis to work out the variation in individual machines' performance on a production line and used that to tweak the line for optimal efficiency. Whatever the project, the point is they've embraced data not because of theoretical benefits, but because of proven ROI.

30%

Companies implementing Industry 4.0 projects can expect a 30% waste reduction due to less product defects identified via real-time monitoring, alerting, and reporting of production quality with traceability based on product specifications.

50%

Manufacturers can reduce implementation costs by over 50% through utilizing a single supplier offering modern and flexible new technologies, all based on a pay-per-use model.

Characteristics per maturity level

	Manually Managed	Repeatable	Quantitatively Managed	Continuously Optimized
Digitization of systems & processes	Uses Excel for MES purposes Production planning completed manually without the support of a central IT system Data is collected with sensors but it isn't used for decision making	MES and PLC systems in place A number of sensors (operational and informational) in use. The data collected is interpreted on occasion	MES and PLC systems in place A number of sensors (operational and information) in use. The data collected is frequently interpreted, but in a task-specific Manner	MES, PLC and other systems in place Utilizing multiple operational and informational sensors
Processes & integration	IT systems are isolated and data entry is manual	Most IT systems are integrated Utilizing advanced analytics for production analysis and operational efficiency. Often, this process occurs in silos with limited cross-facility collaboration	Most IT systems are integrated Utilizing advanced analytics for production analysis and operational efficiency. This process occurs with some cross-facility collaboration. However, this collaboration is limited to teams with similar business functions, such as maintenance and quality assurance teams	IT systems are fully automated and integrated across the supply and value chains Utilizing near real-time analytic capabilities to service monitoring, controlling and optimizing manufacturing and smart devices throughout the supply and value chains
IT architecture	No central system for data analytics, analysis is rarely completed Only have operational sensors	Homogeneous IT architecture in-house Have operational and some information sensors	Homogeneous IT architecture in-house Operational and informational sensors installed	Homogeneous IT architecture in-house Have multiple operational and information sensors
Compliance, risk & security	Focused on people safety, not data vulnerability	Aware of data security and privacy issues associated with IIoT	Aware of data security and privacy issues associated with IIoT	Proactively addressing data security and privacy issues Utilizing technology to manage staff access to machinery, traceability, and training
People & culture	No Industry 4.0 goals have been defined and set Reactive approach to operational maintenance Yet to commence an efficient manufacturing approach focused on waste reduction	Industry 4.0 goals are defined but a project has not commenced Overall, the approach to operations is efficient Starting to implement an efficient approach focused on waste reduction	Industry 4.0 goals are defined but a project has not commenced There is a company-wide culture of improving efficiencies The company's people recognize the value of Industry 4.0 technologies and are receptive to change	Industry 4.0 goals are clearly defined, related processes are implemented 100% efficiency-focused operations Broadly proactive approach to operations

Section 1
Situation analysis

Industry 4.0 as an overall concept is built on using a group of technologies, both hardware and software, to create a manufacturing environment where real-time data is collected from assets, processed, and analyzed to provide deep insight into both the minute-by-minute operational environment and long-term patterns. This allows you to maintain plant health and maximize production efficiency. At its heart, Industry 4.0 is the concept optimizing all aspects of your production to drive out waste – in time and resources – in an effort to maximize both efficiency and responsiveness.

Businesses embarking on Industry 4.0 projects will need to embrace these ideas. Without a culture that seeks to find efficiencies and is open to adopting new technologies, the business will struggle to overcome roadblocks along the way. Industry 4.0 is not just built on technology; it's most heavily built on the culture, training, and experience of the business's staff, both at the production line and in the management suite.

But if a business has the right culture in place, at least among key decision makers, then the first big question it needs to address is "What are we trying to achieve?" As with any investment a business makes, the secret to successfully implementing Industry 4.0 projects lies in first identifying a problem to solve or an opportunity to exploit.

Without a clear problem or opportunity to focus on, a business shouldn't be moving beyond the research phase of Industry 4.0. Once it has identified a real project where IIoT and Industry 4.0 can help, it's likely the business case is addressing one of the typical challenges:

- Decreasing time to market
- Improving quality
- Reducing give-away
- Optimizing inventory management
- Minimizing labor costs
- Enhancing asset productivity
- Increasing productivity through process optimization

From our experience these scenarios are expressed in more practical terms:

"We need to reduce maintenance downtime and increase production. Replacing our production line is too costly. I need to be able to predict failures well in advance so we can take machinery offline for the shortest possible maintenance time rather than having to deal with an unexpected shutdown."

"We're not reaching our OEE and waste KPIs. We don't have the budget for new machinery, so we need a way to get the most out of the existing equipment."

"Our reject rate is increasing. This increases costs and reduces productivity. We need a quality control system that addresses issues before raw material enters the line. We need to know about quality problems before production. Currently, we're wasting raw materials producing defective product."

79%

Predictive maintenance dominates 79 percent of respondents' current or tentative use cases for IIoT devices.[2]

[2]https://www.zdnet.com/article/survey-industrial-iot-deployment-thriving/

Section 2
Getting started, while avoiding the roadblocks

With a defined problem and a potential solution on the drawing board, the business's next step is to see if the proposed solution actually achieves the desired goal before moving to a full-scale implementation. When implementing a new solution – one that will most likely involve installing new digital technologies the business does not have extensive experience with – the first step is to define, run, and refine a pilot project.

A pilot project allows for the testing and refinement of Industry 4.0 technologies in a controlled and quantifiable way. It also allows for any roadblocks to be identified and resolved prior to technology implementation on a larger scale.

Pilot project

The pilot project will need to have:

- Measurable, specific goals
- A defined timeframe
- Key personnel
- A budget range

This is your proof of concept. As such, it will highlight potential roadblocks and inadequacies in the solution. The process of fault finding and implementation improvement during the course of the pilot project means it may run longer and cost more than originally planned. However, this extra spend is an investment in your operations as problems uncovered at the pilot stage are resolved prior to the implementation of a full-scale solution.

Roadblocks

While outlining the pilot project business case, it's important to keep in mind the most common roadblocks the project is likely to encounter:

- Understanding how and where to get started
- Perceived cost
- Short term ROI requirements
- Resistance from individuals or groups

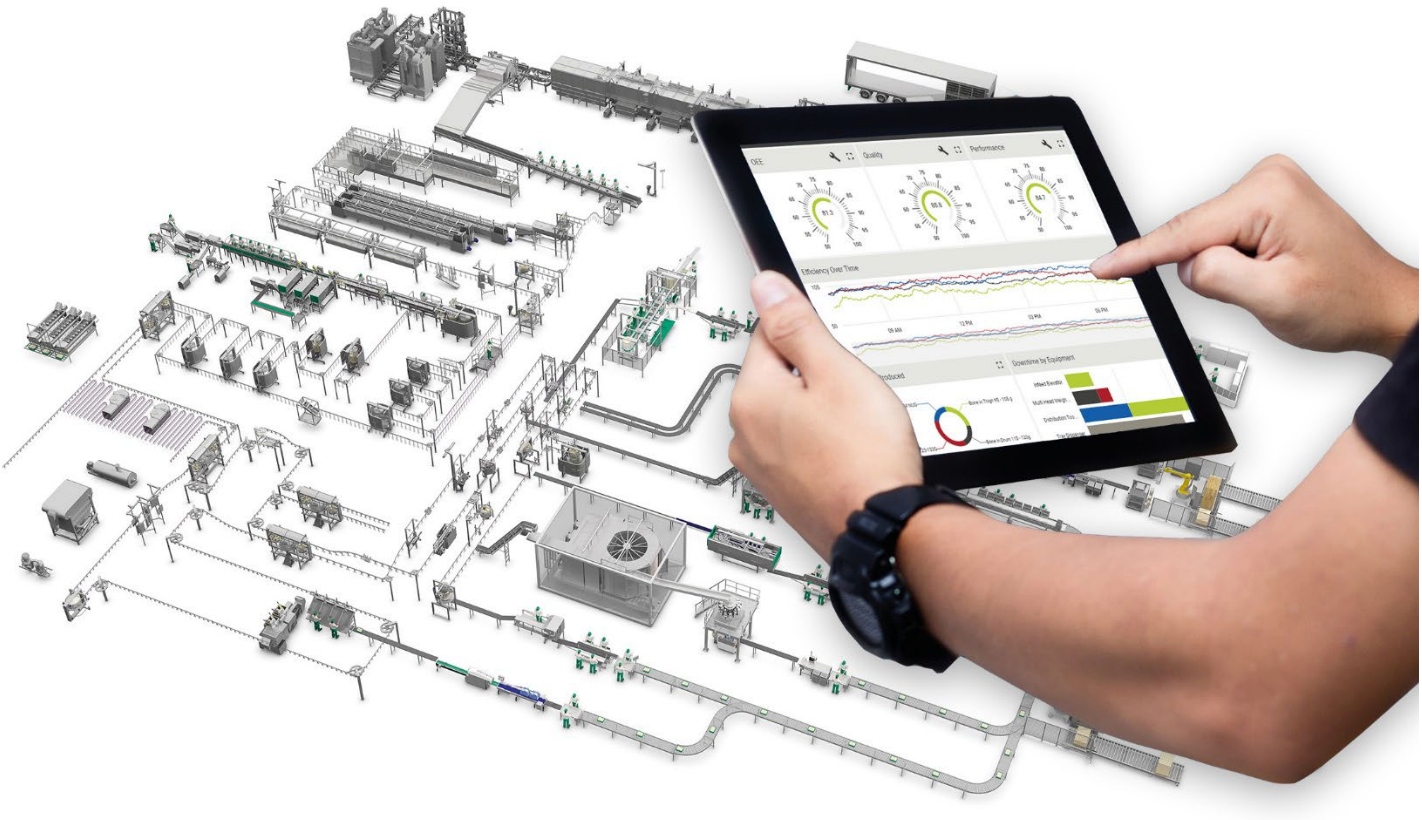
Let's look at these roadblocks in more detail and see how they can be avoided or overcome.

Roadblock 1: Where to start

Use what the business already has in place

A manufacturing business quite likely already has some of the foundations laid. If the business has already deployed operational sensors on the production line, it's possible these can be better utilized to deliver fresh benefits that weren't initially considered.

For example, a production line might include standard sequence sensors which are used to trigger a cylinder moving a load from point A to B and back. The sensors' job is purely operational and not related to maintenance, but by using the sensors to measure the time the cylinder took to move back and forth, a maintenance manager could be alerted to potential problems. Monitoring the data that is being produced by sensors that were already installed would help avoid machine downtime and improve OEE rates. A set of operational sensors thus become part of a predictive maintenance solution.



Add sensors

Adding sensors to a production line used to be expensive and potentially disruptive due to the need to hard-wire them in. However, modern sensors are now dramatically cheaper, and advances in technologies have made wireless sensors a logical option over their hard-wired counterparts. This combination offers plant managers a simpler solution that can add immense value with very little cost or machine downtime. By adding just one more sensor, production managers can greatly improve their uptime and quality of output.

For example, a further processor making chicken nuggets uses two lines that feed four forming machines. Sensors are placed on these machines to capture the run state and speed. PLCs send messages to a database every minute, providing the status of each machine. When both machines are down, the system logs the duration of that downtime event. From there, the plant uses a formula to accurately measure total downtime, ensuring the data is not being overstated or understated. With accurate reporting, the plant can better identify and control planned downtime, equipment failure, performance loss and quality loss.

The process also improves product consistency. Each SKU has a different product specification. There are different sizes and characteristics that the forming machines will mold the product into. Sensors identify if operators are using the incorrect drums to make the product. By simply adding sensors and PLCs, the plant can improve uptime and quality KPIs at the same time.

Add edge computers or update PLCs

Adding or updating PLCs can be a cost-effective way for businesses to get more value out of existing sensor installations on a production line. With the right PLCs in place, raw data capture and transformation can be automated thereby helping production managers to make better use of the resulting information.

A common scenario for many plant managers is that their older PLC is not equipped to draw value from IIoT and AI sensing technologies. A cost-effective alternative to purchasing a modern PLC is integrating an edge solution and specific sensors in your facility. An edge solution coupled with sensors can achieve equivalent or superior results at a fraction of the cost of standard PLCs.

Customer Story

Business challenge

A large company located in China running multiple lines had no way of monitoring or reporting on overall efficiency or quality specifications of outputs. While expected to improve production statistics such as quality output and OEE, they had no way of measuring their progress. At the most granular level, the plant manager had no way of determining the amount of power or air consumed on each line, so could not ascertain the cost of production per product produced. While on the processing floor, operators had no visibility or control over maintenance so were always responding reactively.

The solution

The plant manager seized the opportunity to utilize new technology on old lines, when two new lines were added.

Utilizing an edge computer, the team was able to capture the relevant data, send it to the Cloud-based IIoT software, leading to real-time monitoring and resulting efficiency reports.

The results

The client is still going through the internal onboarding process so specific KPIs are not yet available. But the indicative KPIs we recommend (which varies depending on the specific manufacturing environment, process, equipment, and operator skills) are as follows:

- Increase OEE efficiency by over 20% through improvements across equipment maintenance, real-time monitoring, alerting, and reporting of machine performance.
- Reduce waste by over 30% with less product defects through real-time monitoring, alerting, and reporting of production quality with traceability based on product specifications.
- Reduce implementation costs by over 50% through utilizing a single supplier offering modern and flexible new technologies, all based on a pay-per-use model.
- Start to realize value from new technologies within eight weeks.

12.3%

A manufacturer's average expected efficiency gain / cost reduction over five years due to investments in digital technologies[3]

What if equipment needs to be replaced?

If the project scoping reveals equipment upgrades are needed, seek out solutions with "plug-and-play" capabilities to reduce the time and cost of custom integrations. The Cynergy platform was developed with interoperability in mind. The system allows seamless connection for CTB equipment and easy data sharing with partners to build value-added digital services. Solutions are available from Chore-time, Meyn, Cabinplant, and CAT Squared capable of connecting natively to Cynergy's cloud-based platform.

[3]https://www.strategyand.pwc.com/media/file/GlobalDigital-Operations-Study_Digital-Champions.pdf

Roadblock 2: Cost

Concerns around cost is one of the most common roadblocks for businesses seeking to implement Industry 4.0 technologies. It can be particularly hard for businesses that have little experience with digital technologies on the production line to evaluate the required investment in IT, IIoT and networks. Even without experience in digital transformation, many businesses are aware of the reputation for IT. projects to run over both budget and time. That is, of course, one of the key reasons behind running a pilot project. An effective pilot project will measure actual versus projected performance gains, real versus budgeted costs and identify issues that could lead to project overspends on a larger scale. Having a clearly defined business case where costs are measured against projected gains changes the conversation from a cost-based one to a tangible ROI discussion.

There are three main categories of costs:

- CapEx – the upfront costs of physical sensors, software, and consultancy for the pilot project
- OpEx – the ongoing costs of running the project
- Opportunity costs – the downtime and potential time spent elsewhere

Let's look at these roadblocks in more detail and see how they can be avoided or overcome:

CapEx

Modern wireless sensors are reliable and a cost-effective choice for many manufactures. Many machinery designers and integrators now deliver machinery with operational and informational sensors installed.

Software, such as an MES, includes the upfront cost and ongoing licensing fees but many providers are now offering it via a SaaS engagement model, thereby moving the cost from CapEx to OpEx, making it more palatable for the finance team and resultant budget approval.

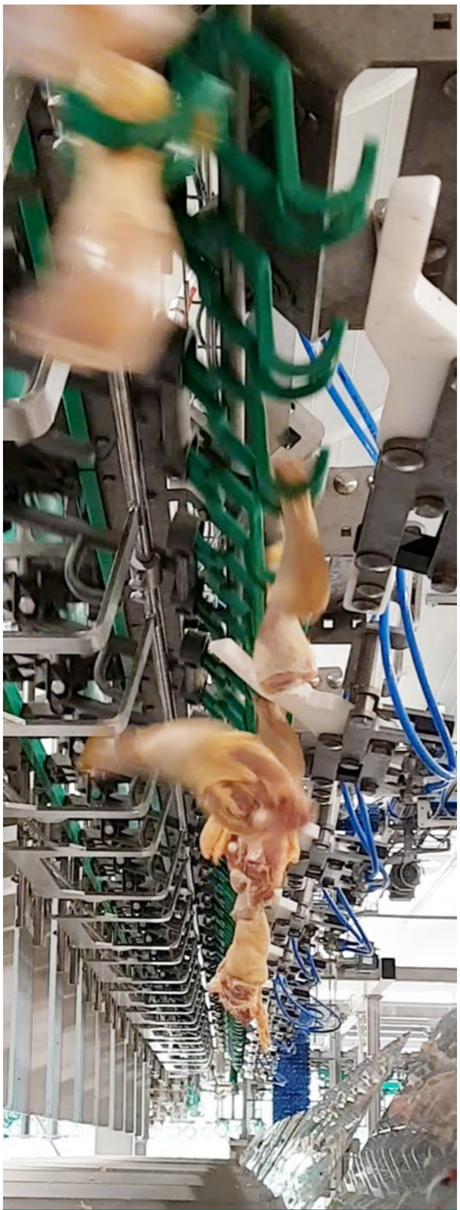
Finally, consultancy fees associated with these projects need not be excessive. By using small projects like the ones stated above, value can be easily proven and translated to ROI calculations for a pilot project.

OpEx

As noted, OpEx costs are minimal, especially when couched in terms of improvements in quality, uptime, and decreased waste.

Opportunity cost

The downtime for retrofitting sensors to equipment is minimal. It's essential to take a long-term view. Downtime in the present is an investment in the future state of your operations. In implementing Industry 4.0 and IIoT technologies in the present, your business will be better equipped to meet demand in an ever-changing manufacturing environment.



14.7%

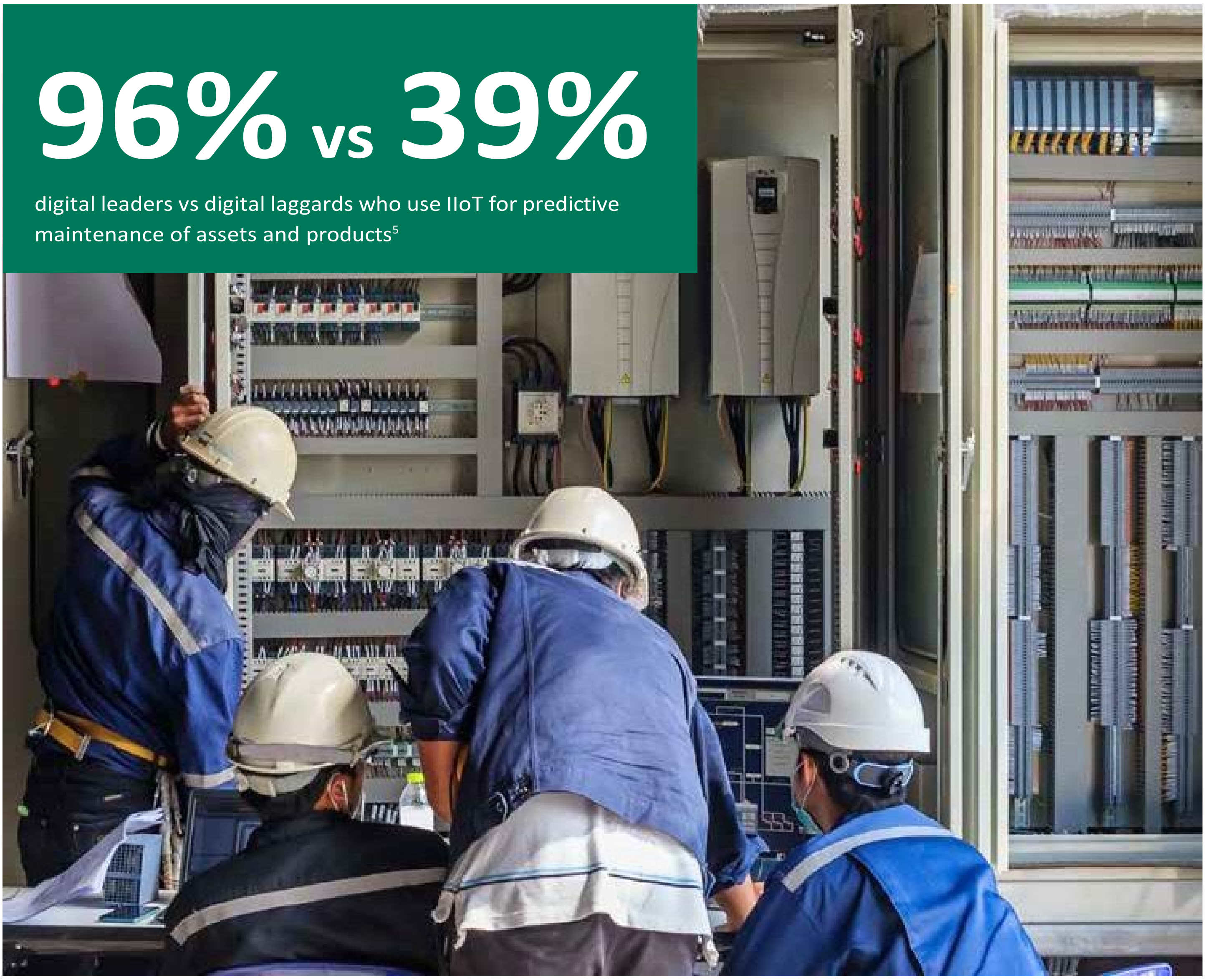
Average expected cumulative revenue increase over five years, due to investments in digital technologies[4]

[4]https://www.strategyand.pwc.com/media/file/Global-Digital-Operations-Study_Digital-Champions.pdf

Roadblock 3: Short term ROI

The need to demonstrate a short-term ROI is a typical concern from financial managers. While individual Industry 4.0 projects may be part of a larger program designed to affect a significant long-term change in the way the manufacturer operates, they still need to demonstrate a short to medium-term ROI. However, a key objective of pilot projects is to quantify ROI and a series of small, low-risk projects can build the case for more substantial projects by meeting short-term objections.

Additionally, Industry 4.0 projects can sometimes produce unexpected ROI gains. For example, a production line may be suffering a decrease in efficiency. Data delivered from sensors might reveal that the problem is related to one single component in the line. Adjusting the rest of the line to compensate for this station the entire line could be brought back to an acceptable level of productivity, saving the business significant downtime. These are the types of gains that aren't initially part of a project's planning but reveal themselves in the data once the solution has been implemented.



96% vs 39%

digital leaders vs digital laggards who use IIoT for predictive maintenance of assets and products[5]

[5]https://www.strategyand.pwc.com/media/file/Global-Digital-Operations-Study_Digital-Champions.pdf

Roadblock 4: Internal resistance

While senior management are usually the first to enact the change required to move to Industry 4.0, it is the people 'on the shop floor' so to speak, that will determine the success of this transition.

At a management level, the potential of reduced costs and improved productivity are enough to motivate the required behavioral changes. But for others, the introduction of digital transformation technology and the revised processes can be threatening and often regarded as a challenge rather than an opportunity.

Addressing concerns logically with information that speaks to the specific concern, rather than generalized 'advantages' is often the best solution.

Common points of resistance we've encountered, and our typical answers to those concerns include:

- **Production team resistance**
  Anxiety about the incursion of IT and software is understandable. Comments such as, "We're machine guys not software guys," are often heard, but this is a key area in which a good pilot project can help. A good pilot project will highlight the complexity of a digitally transformed environment while also showing that even digitally transformed manufacturing environments are still machine-based.
- **CEO resistance**
  As the key stakeholder with ultimate responsibility, CEOs need a strong case made before backing significant transformation in the business. While most CEOs recognize the inevitable impact of Industry 4.0, they equally don't want to be the guinea pig in their market. Again, the pilot project is usually the best answer to a CEO's apprehension combined with real talk about competitive advantage.
- **CIO resistance**
  Industry 4.0 projects bring new connected data networks into the business and with it comes cyber security concerns. Cyber security is never 100% defensible, but risks can be mitigated through good design, smart use of private clouds, encryption, and robust implementation.
- **CFO resistance**
  Most of the likely concerns the finance department will raise should be answerable by a well-designed pilot project, especially if the project is able to quantify results in real terms and highlight changes that will improve the ROI of the full-scale solution.

66%

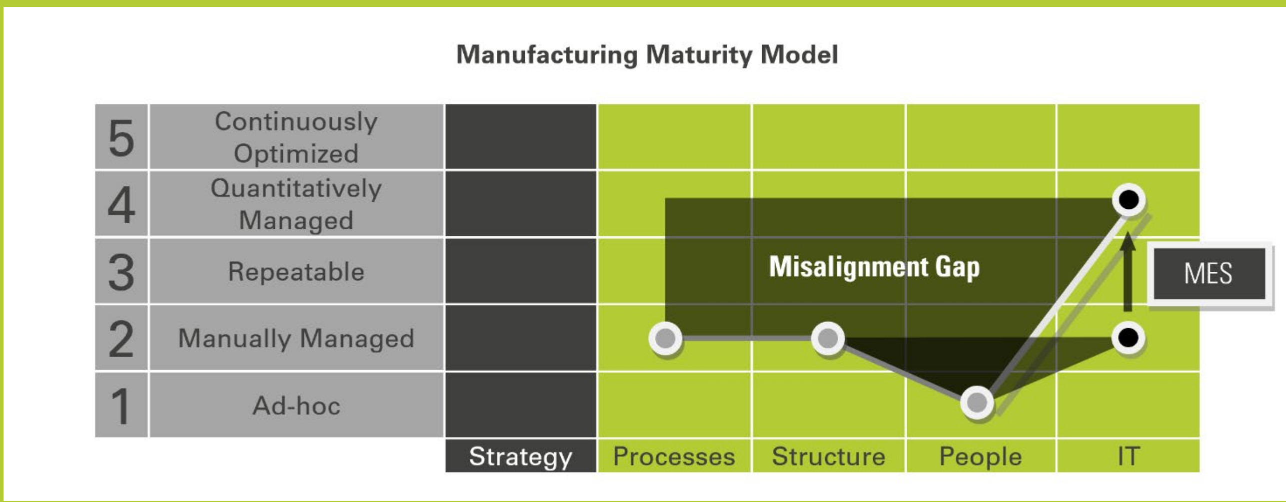
of early movers in manufacturing say IoT is now critical to competitive advantage[6]

[6]https://www.verizon.com/about/sites/default/files/state-of-the-internet-of-things-market-report-2016.pdf

Section 3 Roadmap per maturity level

We've talked about the current situation and expected roadblocks.

The next step is to undertake discrete projects to gain quick wins and move ahead on your Industry 4.0 journey.



Technology is a tool, not an end unto itself. As this table illustrates, manufacturing efficiency cannot be optimized beyond the business's weakest area of competency. For an organization to achieve continuous-improvement excellence, it must first have processes, structure, people and IT aligned with its business strategy.

Technology is an accelerator. Installing a best-in-breed MES system will not solve a process problem or a people problem. If a company attempts to solve a process problem by aligning technology to its current process, it will only accomplish performing a broken process more quickly.

Level 1: Manually Managed

To review, manually managed businesses have yet to bring digital technology very far into their operations. Data collection likely uses the machine's standard sensors and there's no plan for what data needs to be collected and, therefore, what sensors are needed. The data that is collected is only analyzed on an ad hoc basis and this analysis is reactive, rather than preventative (i.e., machine data is only accessed after a breakdown to find out what caused it).

As discussed earlier, businesses at the manually managed stage need to develop insight into how Industry 4.0 technologies can deliver benefits, assess the most suitable projects, and work out what they need to do to get ready.

Typical practical projects to undertake:

- **Digitization (systems and processes)**
  Identify top three reports that add the most value to production.
- **Processes and integration**
  Identify which machines (if any) already have suitable sensors installed.
- **IT architecture**
  Implement internet connectivity and edge computing to enable machine-to-cloud connectivity across pilot production lines.
- **Compliance, risk and security**
  Identify what are the regulatory compliance requirements for your industry, technical risks, including data security, and ensure that your selected Industry 4.0 solution provider is capable and experienced in addressing them.
- **People and culture**
  Establish a lean manufacturing culture that understands the value that digital manufacturing solutions can add to the overall business and their day-to-day responsibilities and embraces the required changes to implement digital transformation programs across the organization.

Level 2: Repeatable

To review, businesses with repeatable processes are looking to adopt more efficient, digital and data driven manufacturing solutions. They're looking to avoid or reduce downtime, reduce waste and increase efficiency. Data collection is probably collected in an old-fashioned manner with no transformation into actionable information and manual analysis, reporting and integration between existing systems. The machinery is not end-of-life and is modern enough to be tied into a more sophisticated data collection system via the addition of wireless sensors.

Typical practical projects to undertake:

- **Digitization (systems and processes)**
  Automation of reporting to minimize manual report writing. Automatic inventory or spare part control.
- **Processes and integration**
  Installation of sensors and an integrated maintenance system to give the factory greater visibility of maintenance tasks and equipment statuses.
- **IT architecture**
  Implement internet connectivity and edge computing to enable machine-to-cloud connectivity across pilot production lines, with a stronger focus on the migration of systems from on-premise to the cloud.
- **Compliance, risk and security**
  Identify risks associated with new technology, such as security. As part of any IT component of a project, put in place best-practice security measures.
- **People and culture**
  Establish a lean manufacturing culture that understands the value that digital manufacturing solutions can add to the overall business and their day-to-day responsibilities and embraces the required changes to implement digital transformation programs across the organization.

Level 3: Quantitatively Managed

Your typical Industry 4.0 user at this level is likely using PLCs and MES but in very task-oriented ways: they're using the data for discrete, use-specific functions rather than feeding it into deep analytics. The business has many of the building blocks of more sophisticated Industry 4.0 operation in place and is now looking to find a project that leverages that for some big benefits.

Typical practical projects to undertake:

- **Digitization (systems and processes)**
  Implement or extend the existing implementation of lean manufacturing process, targeting automation and integration between existing and new systems, to achieve a fully automated end-to-end machine to cloud connectivity across all systems. Connect every single touch point of a manufacturing process in the organization, from sales through production scheduling, manufacturing and delivery.
- **Processes and integration**
  Identify additional opportunities for the implementation of additional IIoT ready sensors that can cover gaps in the existing manufacturing process. Leverage AI capabilities from new IIoT systems, to further enhance predictability and automation of predicted actionable information.
- **IT architecture**
  Extend internet connectivity, edge computing across the entire factory floor, enabling internet connectivity and edge computing to enable machine-to-cloud connectivity across all production lines. Finally, establish an enterprise cloud infrastructure that hosts the entire organization's systems.
- **Compliance, risk and security**
  Identify what are the regulatory compliance requirements for your industry, technical risks, including data security, and ensure that your selected Industry 4.0 solution provider is capable and experienced in addressing them.
- **People and culture**
  Continue to foster your lean manufacturing culture that understands the value that digital manufacturing solutions can add to the overall business and their day-to-day responsibilities. Embrace the required changes to implement digital transformation programs across the organization.

Cynergy Drives Continuous Improvement

By employing Industry 4.0 capabilities, the Cynergy platform delivers intelligent information to CTB customers allowing them to continuously optimize performance in seven key areas:

Food safety

- Traceability
- Wholesomeness

Product quality

- Consistency
- Conformity

Profitability

- Value optimization
- Give-away reduction
- Yield improvements

Sustainability

- Energy use
- Waste reduction

Cost of ownership

- Operating costs
- Uptime
- Machine integration

Labor

- Worker safety
- Process optimization
- Planning

Animal welfare

- Compliance
- Consumer trust
- Business standards

With Industry 4.0, production safety and animal welfare metrics can be tracked and reported, downtime is minimized based on actionable data, and intelligent order matching reduces costs.

The rapidly changing workforce in our industry is resulting in a decline of knowledge, which means we must rely more on intelligent systems that are easy to operate and maintain. Industry 4.0 supports real-time reporting and analytics to have instant access to accurate, actionable data to drive continuous improvement across your operations.

20%

Increase OEE efficiency through improvements across equipment maintenance, real-time monitoring, alerting, and reporting of machine performance.

Business Value for Poultry Processors

The processing business is becoming more complex. Safety requirements and regulations are growing more stringent, which means processors are required to improve data transparency for their ingredients, animal welfare checks, processes, and supply chain movements. Complying with new standards is always challenging; however, we've learned in the digital age that data has value, and the right strategy can improve value-driver performance across your enterprise.

Two key benefits processors can realize from smart data management include:

1. Reducing downtime through preventative maintenance.
2. Improving quality and yield through decentralized decision making powered by prescriptive analytics and machine learning.

Once the right data is collected, aggregated, and normalized, it can be fed through a data loop to support AI capabilities and machine learning. Data looping is the entire data-collection process from start to finish and back to start again. It's a continual process that constantly brings in more and new data that then gets aggregated, mined, modeled and visualized. Cynergy accomplishes this by collecting process and machine data from the plant floor, feeding it through our cloud platform, performing advanced analytics, and feeding decision-support data back to the plant floor.

One example of these benefits is decentralized decision making to improve line efficiency. The Cynergy Distribution Manager controls sorting and cut-up by measuring incoming birds and making machine adjustments accordingly without the need for operator intervention. The system automatically feeds pieces to the line according to which would most optimally meet the product spec. With the right information available, it is possible to use resources in the most effective and efficient way, maximizing profit

Cynergy is supported by CTB businesses such as Meyn, CAT Squared and Cabinplant providing integrated sets of information without the need to transfer data from one system to another. This intelligence supports smarter decisions in maintenance and improves production by better forecasting and intelligently matching supplies and orders.

Level 4: Continuously Optimized

A business focused on continuous improvement has already run a project or two and is collecting data at multiple levels. They are tracking and looking at trends over time and interrelationships. These entities have embraced data not because of theoretical benefits, but because of proven ROI.

Typical practical projects to undertake:

- **Digitization (systems and processes)**
  Implement or extend the existing implementation of lean manufacturing processes, targeting automation and integration between existing and new systems, to achieve fully automated end-to-end machine to cloud connectivity across all systems, connecting every single touch point of a manufacturing process in the organization, from sales through production scheduling, manufacturing, and delivery.
- **Processes and integration**
  Identify additional opportunities for the implementation of additional IIoT sensors that can cover existing gaps in the existing manufacturing process, and leverage AI capabilities from new IIoT system capabilities, to further enhance predictability and automation of predicted actionable information.
- **IT architecture**
  Extend internet connectivity, edge computing across the entire factory floor, to enable machine-to-cloud connectivity across all production lines. Establish an enterprise cloud infrastructure base that hosts the entire organization's systems, and also offers a data lake solution architecture for quick and safe integration of new systems.
- **Compliance, risk, and security**
  Identify what are the regulatory compliance requirements for your industry, technical risks, including data security, and ensure that your selected Industry 4.0 solution provider is capable and experienced in addressing them.
- **People and culture**
  Continue to foster your lean manufacturing culture that understands the value digital manufacturing solutions can add to the overall business and people's day-to-day responsibilities. Embrace the required changes to implement digital transformation programs across the organization.

Section 4 Business case template

All great ideas need investment.

In this section we will layout the business case you can present to decision makers so you can get the support and funding you need.

1. Executive Summary

This section should provide general information on the issues surrounding the business problem and the proposed project or initiative created to address it. Usually, this section is completed last after all other sections of the business case have been written. This is because the executive summary is exactly that, a summary of the detail that is provided in subsequent sections of the document.

1.1 Issue

This section of the business case should briefly describe the business problem that the proposed project will address. This section should not describe how the problem will be addressed, only what the problem is.

1.2 Anticipated outcomes

This section should describe the anticipated outcome if the proposed project or initiative is implemented. It should include how the project will benefit the business and describe what the end state of the project should be.

1.3 Recommendation

This section of our business case template summarizes the approach for how the project will address the business problem. This section should also describe how desirable results will be achieved by moving forward with the project.

1.4 Justification

This section justifies why the recommended project should be implemented and why it was selected over other alternatives. Where applicable, quantitative support should be provided and the impact of not implementing the project should also be stated.

2. Business Case Analysis Team

This section of the business case template describes the roles of the team members who developed the business case. It is imperative that participants and roles are clearly defined for the business case as well as throughout the life of the project.

3. Problem Definition

3.1 Problem statement

This section describes the business problem this project was created to address. The problem may be process, technology, or product/service oriented. This section should not include any discussion related to the solution.

3.2 Organizational impact

This section describes how the proposed project will modify or affect the organizational processes, tools, hardware, and/or software. It should also explain any new roles which would be created or how existing roles may change as a result of the project.

3.3 Technology migration

This section provides a high-level overview of how the new technology will be implemented and how data from the legacy technology will be migrated. This section should also explain any outstanding technical requirements and obstacles which need to be addressed.

4. Project Overview

This section describes high-level information about the project to include a description, goals and objectives, performance criteria, assumptions, constraints, and milestones. This section consolidates all project-specific information into one chapter and allows for an easy understanding of the project since the baseline business problem, impacts, and recommendations have already been established.

4.1 Project description

This section describes the approach the project will use to address the business problem(s). This includes what the project will consist of a general description of how it will be executed, and the purpose of it.

4.2 Goals and objectives

This part of the template lists the business goals and objectives which are supported by the project and how the project will address them.

4.3 Project performance

This section describes the measures that will be used to gauge the project's performance and outcomes as they relate to key resources, processes, or services.

4.4 Project assumptions

This section lists the preliminary assumptions for the proposed project. As the project is selected and moves into detailed project planning, the list of assumptions will most likely grow as the project plan is developed. However, for the business case there should be at least a preliminary list from which to build.

4.5 Project constraints

This section of the business case template lists the preliminary constraints for the proposed project. As the project is selected and moves into detailed project planning, the list of constraints will most likely grow as the project plan is developed. However, for the business case there should be at least a preliminary list from which to build.

4.6 Major project milestones

This section of our template lists the major project milestones and their target completion dates. Since this is the business case, these milestones and target dates are general and in no way final. It is important to note that as the project planning moves forward, a base-lined schedule including all milestones will be completed.

5. Strategic Alignment

All projects should support the organization's strategy and strategic plans in order to add value and maintain executive and organizational support. This section of the business case template provides an overview of the organizational strategic plans that are related to the project. This includes the strategic plan, what the plan calls for, and how the project supports the strategic plan.

6. Cost Benefit Analysis

Many consider this one of the most important parts of a business case as it is often the costs or savings a project yields which win final approval to go forward. It is important to quantify the financial benefits of the project as much as possible in the business case. This is usually done in the form of a cost benefit analysis. The purpose of this is to illustrate the costs of the project and compare them with the benefits and savings to determine if the project is worth pursuing.

Statistics we suggest, based off numerous projects, include:

- Increase OEE efficiency by over 20% through improvements across equipment maintenance, real-time monitoring, alerting, and reporting of machine performance.
- Reduce waste by over 30% with less product defects through real-time monitoring, alerting, and reporting of production quality with traceability based on product specifications.
- Reduce implementation costs by over 50% through utilizing a single supplier offering modern and flexible new technologies, all based on a pay-per-use model.
- Start to realize value from new technologies within eight weeks.

7. Alternative Analysis

All business problems may be addressed by any number of alternative projects. While the business case is the result of having selected one such option, a brief summary of considered alternatives should also be included—one of which should be the status quo or doing nothing. The reasons for not selecting the alternatives should also be included.

8. Approvals

The business case is a document with which approval is granted or denied to move forward with the creation of a project. Therefore, the document should receive approval or disapproval from its executive review board.

Glossary of Industry 4.0

Big Data

Big Data references the vast quantities of data collected throughout the wide area network (WAN) from myriad IIoT sensors and devices. Analyzing and making effective use of this data is too complex a job for traditional manual processes but when done by software tools and automated machine learning processes big data is converted into valuable Smart Data. Collecting and analyzing Big Data, particularly to use it in real-time, requires an investment in the required IT systems and network bandwidth.

Collaborative Robots (Cobots)

Collaborative robots or cobots are robots designed to work alongside humans rather than fully replacing them on the production line. Where traditional industrial robots have been used on a production line for tasks that do not require human involvement, and therefore make no allowances for human presence, cobots are able to extend robot uses into areas where a human presence, e.g., quality control at the final stage of a production line, is required. They do this by integrating safety features, both physical and software, into their design to make human/robot collaboration possible.

Digital Supply Chain

In a digital supply chain, the business process of interconnected parties – manufacturer, supplier and customers – are able to talk to each other autonomously. This enables a more responsive and efficient supply chain. The digital supply chain eliminates complex, multi-stage interactions between parties in favor of automated actions triggered by pre-defined parameters.

Interoperability

Interoperability (IOP) describes the ability of your equipment, regardless of manufacturer, to communicate with other devices or machinery over the network. Without true IOP a business cannot create an environment in which the interface between physical and digital assets in the factory happens transparently without regard for the operating systems or technologies of the assets involved. This lack of restrictions in the movement of data is fundamental to creating a flexible and responsive Industry 4.0 environment.

Machine Learning

Machine learning refers to the ability of an artificial system to learn or adapt behavior through recognizing and analyzing patterns. Machine learning systems in the manufacturing environment, for example, can be used to recognize the default pattern of a system performing at optimal efficiency and thus detect when anomalies occur. Machine learning systems can be deployed at the micro (individual machine) level or at the macro (big data analysis in the cloud) level. Machine learning systems are particularly useful for processing unstructured data or data that comes from disparate sources, which is often the case in a manufacturing environment.

Predictive Maintenance

Predictive maintenance seeks to maximize machinery uptime and thus provide a manufacturing environment where production planning is dependable. Using both real-time and historical data the healthy operating parameters of all equipment are defined, and anomalies detected early. Intelligent predictive maintenance systems making use of machine learning processes can access and analyze data from across the network to provide accurate forward planning for maintenance across the whole plant.

Smart Data

While data by itself is useful in discrete, specific functions such as tracking operational parameters on individual machines, to unlock the value of large amounts of data collected from a variety of sensors, devices and equipment across the whole plant, the data needs to be transformed into information that has value beyond data's point of origin. This smart data becomes the key lifeblood of the Industry 4.0 manufacturing environment, providing the information that defines both human decision making and intelligent automation. Smart data is produced through analytics, process modeling and machine learning processes.

Get in touch

CAT Squared

p. +1 (501) 328-9178
e. TellMeMore@catsquared.com
w. catsquared.com

Cabinplant

p. +1 (404) 835-9410
e. cabinplant.inc@cabinplant.com
w. cabinplant.com

Chore-Time

p. +1 (574) 658-4101
e. choretime@choretime.com
w. choretime.com

Meyn

p. +1 (678) 865-8600
e. sales.usa@meyn.com
w. meyn.com