Solution Brief

Manufacturing
Industrial Internet of Things (IIoT) Platform

Accelerate Adoption of Industry 4.0 with an End-to-End IIoT Platform

Connect thousands of disparate machines, decrease equipment downtime and boost factory productivity with the toii® Industrial Internet of Things (IIoT) Market Ready Solution.

At a Glance:

- Reduce equipment downtime by up to 50 percent[1]
- Increase factory production by up to 20 percent[2]
- Available as an Intel® IoT Market Ready Solution, toii® makes it easy to adopt Industry 4.0
- High-performance and reliable compute, storage and networking is provided by Intel® hardware
- The solution reflects thyssenkrupp Materials IoT GmbH's (tkMIoT's) manufacturing expertise and Intel's deep knowledge of the Industrial Internet of Things (IIoT) and analytics at the edge

thyssenkrupp Materials IoT GmbH (tkMIoT) is a subsidiary of thyssenkrupp AG—the largest materials distributor in the Western world. The company is embracing Industry 4.0 and the Industrial Internet of Things (IIoT) to improve manufacturing productivity and efficiency. Recognizing the growth potential for IIoT solutions, tkMIoT is now marketing its internally developed IIoT platform—toii®—hoping to help other manufacturers achieve the efficiency gains that tkMIoT has already realized.

Challenge

With more than 4,500 manufacturing machines across thyssenkrupp Material Services' factories, tkMIoT struggled to find a commercially available and flexible solution to improve plant productivity while still maintaining proven but often non-standardized production setups. The large platform providers' offerings were complex and inflexible, and didn't support the type of connected data collection that tkMIoT needed.

Solution

tkMIoT developed its own IIoT platform that is able to meet the company's digital requirements for system integration and shop floor services while still working with the existing infrastructure. toii allows a wide range of machines and production equipment from different manufacturers to communicate with each other. The solution, enabled by software developed by tkMIoT and hardware from Intel, is now an Intel® IoT Market Ready Solution and is available to other manufacturers seeking to digitize their factories.

Result

The full range of machinery at tkMIoT can now be connected to the company's end-to-end digital IIoT platform, toii. According to tkMIoT, process automation through the toii platform reduced downtime by up to 50 percent and increased production by 20 percent, compared to the previous year.[3] toii's user interface enables tkMIoT employees to operate the platform efficiently and ergonomically. Various error-prone handwritten procedures have also been eliminated.

Finding a Scalable, Comprehensive and Flexible Platform

Business-to-business (B2B) trading in the industrial sector is challenging. Deliveries to the supply chain are usually expected "just in time" or "just in sequence." In addition, the market is subject to high price pressure, making it imperative that manufacturers streamline their processes as much as possible. Recognizing the potential of smart factories and the IIoT—experts valued the IIoT market at USD 71.7 billion in 2019 and expect it to reach USD 156.6 billion by 2024 (see Figure 1)—tkMIoT decided to make existing operations more efficient and performant by adding the latest digital technologies. A particular area of focus was tkMIoT's shop floors. tkMIoT sought to strengthen its business by implementing a fully digitalized production chain that could connect all of the shop floor equipment, both modern machines and reliable machines from a pre-digital era.

But as tkMIoT explored commercially available options for an IIoT platform, it found that no suitable architecture was available. What solutions were available weren't flexible enough to improve plant productivity while still maintaining tkMIoT's proven but often non-standardized production setups. Plus, these solutions were highly complex while still lacking the ability to meet tkMIoT's data collection requirements.

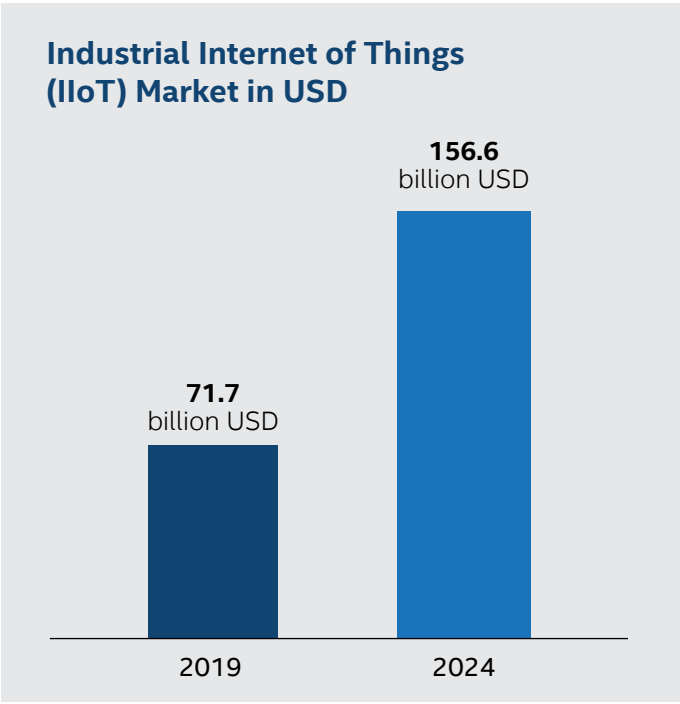

Figure 1. The Industrial Internet of Things (IIoT) market is predicted to grow in value to 156.6 billion USD by 2024.[5]

End-to-End Industrial Internet of Things (IIoT) Platform Powered by Intel® Technology

In the world of digitalized production, the customer defines an order, the subsequent production processes run independently and automatically, while the system guards against unplanned downtimes and supply-related disruptions. As a result, production costs can be reduced. To make all this possible, toii takes advantage of a broad variety of hardware and software options from Intel. From gateway technology, to connectivity and artificial intelligence at the edge, all the way to advanced analytics on-premises or in the cloud, toii paves the way for an intelligent and data-powered future for all companies, whatever their size.

The solution consists of ready-made servers and industrial PCs (IPCs), with the necessary storage and networking resources. Servers are powered by Intel® Xeon® Scalable processors and large-capacity SATA- and NVMe-based Intel® SSDs, with a 10 GBE Intel® Ethernet network interface card (NIC). IPCs are equipped with Intel® Core™ i3 and i5 processors and high-performance NVMe-based SSDs, with an Intel® Ethernet Controller.

Besides the core application, toii includes seven additional modules that perform data collection, machine control, wireless connectivity functions, machine status monitoring, data visualization, and more. The individual modules of toii mean the platform can be customized to serve many versatile application possibilities. With its modular structure, toii is highly scalable. Whether a manufacturer is well on its way to full adoption of Industry 4.0 or is just beginning the journey, toii can be implemented to suit a wide variety of use cases.

"The pace of innovation has picked up significantly in recent years and processes are becoming increasingly digitalized and connected. In this environment it is becoming more and more important for companies to have competent partners they can rely on for innovative solutions to help secure competitive advantages and gain a foothold in Industry 4.0. We established thyssenkrupp Materials IoT GmbH (tkMIoT) to respond to this need."

—Sebastian Lang, Managing Director
thyssenkrupp Materials IoT GmbH

Some Industrial Internet of Things (IIoT) Use Cases for toii®

- Machine data gathering (connection, transfer, storage)
- Production data gathering from users and devices
- Machine automation with bi-directional communication
- Production data visualization, such as for benchmarking
- Data integration from third-party data sources such as an enterprise resource planning application
- Edge analytics for production optimization
- Workload consolidation for production processes and data
- Manufacturing Execution System (MES) integration
- Quality assurance with real-time production screening

"We chose Intel as a partner because Intel has a comprehensive architecture and world-class edge-to-cloud technology. With the Intel® IoT Market Ready Solutions program, Intel offers us new channels to find customers as well as partners, with real market-ready solutions in the Internet of Things (IoT) sector."

—Sebastian Lang, Managing Director,
thyssenkrupp Materials IoT GmbH

Collaboration Merges IT and Manufacturing Expertise

An IIoT platform is a combination of hardware and software. tkMIoT had in-depth knowledge of its manufacturing equipment and what sorts of connections needed to exist to automate and streamline shop floor services. But it didn't have extensive software development expertise. Intel, on the other hand, is an Industry 4.0 leader with tremendous experience developing IIoT solutions for a wide range of use cases. By working together, tkMIoT was able to build an end-to-end solution, developing its own software and choosing the right combination of enabling hardware technologies. Intel technical experts and engineers supported tkMIoT's development of toii, helping the company reach new production standards and accelerate its business.

And while toii is helping tkMIoT digitally transform its factories, the company had a bigger vision. The goal was to share the platform with other manufacturers around the world, driving adoption of Industry 4.0 globally. Attracted by Intel's comprehensive architecture, world-class edge-to-cloud technology and strong partner ecosystem, tkMIoT decided to market toii as an Intel IoT Market Ready Solutions program. This program helps open new channels that can make it easier for enterprises to pick partners that offer solutions which really work. By helping raise awareness of the toii solution, Intel can help Industry 4.0 become a reality for a growing number of manufacturers.

Connectivity Across the Entire Shop Floor

The full range of machinery, such as calipers, manual bandsaws and multi-stage production systems, as well as IT systems at tkMIoT can now be connected to toii. tkMIoT has successfully implemented toii at more than 30 sites since 2017. Process automation through the toii platform has reduced downtime by up to 50 percent and increased production by 20 percent, compared to the previous year.[6]

toii's user interface enables tkMIoT employees to operate the platform efficiently and ergonomically. Various error-prone handwritten procedures have also been eliminated from the process and replaced by digital data, which has helped reduce human error, such as mistakes that can occur when rendering handwritten notes into digital documents.

With its modular structure, toii is highly scalable because it allows machines of different makes and generations to communicate with each other. toii can be implemented even when companies are just beginning to discover the benefits of Industry 4.0. And while other solutions often require machines to be able to transfer data directly into a cloud, toii also supports keeping data on-premises, which makes it easier to implement into an existing shop floor environment. Specific benefits that tkMIoT has experienced by deploying toii in its factories include the following:

- Optimized machine utilization
- Automation of entire production processes
- Ability to bundle resources and optimize their use across the entire value chain
- Visibility into the status, progress and performance of production at all times and the ability to link production planning with actual production data
- Avoidance of impending machine failures with predictive maintenance
- Delivery of timely information for shop floor management that is fed back into ongoing improvement of technology and processes

Now that tkMIoT has succeeded in bringing digital transformation to the core area of its business, the company wants to help other companies take this step too. Experienced tkMIoT consultants can help other manufacturers adopt toii as a Market Ready Solution; a team of DevOps software engineers can build customized solutions for a wide variety of use cases.

Customer Success Story: thyssenkrupp Materials Schweiz AG

thyssenkrupp Materials Schweiz AG produces metallic semi-finished products that must be machined to fine-tuned specifications. These products are used in several industries, including additive manufacturing, aerospace, plastic injection molding applications, time-piece production and medical technology.

Maintaining the very highest quality requires constant monitoring of the machines that saw, mill, grind and otherwise work with the metals. If any machine's status changes, a quick reaction is needed to prevent lesser quality work or product damage. But with more than 40 machines to maintain, manual analysis of a machine's productivity was extremely time-consuming.

thyssenkrupp Materials Schweiz AG worked with thyssenkrupp Materials IoT to deploy toii®—the Industrial Internet of Things platform (IIoT) developed by thyssenkrupp Materials IoT. The toii platform can collect and analyze data from all of the manufacturing components at thyssenkrupp Materials Schweiz AG, and thus serves as the basis for optimizing production and making the shift to Industry 4.0.

The results:

- toii's automated processes reduced machine downtime by over 10 percent[7].
- Workers can react quickly in the event of failures or disruptions to restore productivity.
- Accumulation of machine data enables smart analysis of recurring machine failures and the development of mitigations.
- Data about machine utilization can lead to efficiency improvements.
- Increased automation and optimization help reduce employees' workloads so that they can work on additional productive services.

Spotlight on thyssenkrupp and thyssenkrupp Materials IoT GmbH

thyssenkrupp's portfolio of services ranges from providing high-quality raw and basic materials to technical services and the development of intelligent processes in automation, extended supply chain, and warehouse and inventory management. The company serves 250,000 customers worldwide. In 2019, thyssenkrupp created a subsidiary, thyssenkrupp Materials IoT GmbH (tkMIoT), which focuses on providing integrated solutions for connecting production and digitalizing customers' value chains, with the aim of supporting other companies in their transition to digitalized production. tkMIoT has an experienced team with extensive experience in industrial projects and combines a start-up culture with the traditions of a global group with more than 200 combined years of industrial experience.

Learn More

You may find the following resources helpful:

- thyssenkrupp Materials IoT GmbH
- toii® Intel® IoT Market Ready Solution

Find the solution that is right for your organization. Contact your Intel representative or visit **intel.de/industrie-4-0**

[1] https://www.linkedin.com/posts/pfrank_1-jahr-gemeinsam-mit-toii-activity-6653540644327424001-I_nq/ ; thyssenkrupp Materials Processing Europe (LT3 Krefeld)
[2] Internal tkMIoT measurements. See endnote 1.
[3] Internal tkMIoT measurements. See endnote 1.
[4] https://www.marketsandmarkets.com/PressReleases/industry-4.asp
[5] See endnote 4.
[6] Internal tkMIoT measurements. See endnote 1.
[7] https://www.thyssenkrupp-materials-services.com/en/newsroom/stories/the-digital-transformation-of-manufacturing

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