We have a clear vision: a fully automated supply chain from planning and production control through to physical flow of material, meaning incoming material to production supplies to product delivery.

– Jürgen Braunstetter
(Head of Automotive SCM at Continental)
About the Project

A vision turns into reality.

Cost savings and increased efficiency – these are Continental’s main drivers for their smart factory.

Creating a smart factory is almost a universal goal across industries. According to recent studies, there is no sector that implements more smart initiatives than automobile manufacturers and suppliers. Increasingly, they are converting their rigid, linear processes into dynamic, data-controlled process flows.

One of the most ambitious players is leading automobile supplier Continental. With more than 235,000 employees at 400 locations in over 60 countries and annual sales topping EUR 40 billion, the Germany-based enterprise is one of the largest suppliers globally.

At Continental, the smart factory is a company-wide future-proofing venture. This includes revolutionizing operations, IT, and logistics with a fixed investment budget and clear objectives.

The Goal

To meet the overall objective of a smart factory, repetitive processes and routines were to be improved, and production speed increased. Intralogistics, more specifically material flow, was identified as the key area for improvement. The vision: fully automating the flow of material.

The Solution

Continental needed a solution that could be adapted to its factories and allowed for highly versatile applications. The real-time locating system (RTLS) from KINEXON Industries met all their criteria. The system allows for complete and ultra-precise real-time tracking of all assets associated with material and production flow. In addition, the location data can be analyzed live via a real-time IoT platform and controlled in value-adding applications. 360-degree connectivity also enables a seamless integration of platforms and data into the existing IT landscape.

The Result

In total, six applications have been in use in Continental’s Industry 4.0 model factory since 2018. Together with KINEXON, Continental is able to maximize throughput times without compromising production quality, and to reduce costly activities that do not add value to a minimum. A seventh, to date still visionary application is being jointly developed in a collaborative, customer-centric effort.

ABOUT

KINEXON Industries

KINEXON Industries develops solutions for ultra-precise real-time locating of assets and people, thereby paving the way for Industry 4.0. In addition to innovative sensor technology for data generation, KINEXON’s portfolio includes powerful software for intelligent analysis and integration of further data sources. The award-winning full-stack company was founded in 2012 and employs over 200 staff in Munich, New York City, and Chicago.

ABOUT

Continental

Continental Group develops groundbreaking technologies and services for sustainable and networked mobility of people and their goods. The technology company, founded in 1871, offers secure, efficient, intelligent, and affordable solutions for vehicles, machinery, traffic, and transport. In 2020, Continental generated sales of almost EUR 40 billion, and currently employs more than 235,000 people in 60 countries and markets.
Continental identified key technologies to achieve a smart supply chain for their smart factory. These would enable 15 fields of application in various areas of production and intralogistics.

KINEXON’s smart real-time technology meets the requirements for a global roll-out in multiple application areas.

As Continental implements a total of six key technologies, KINEXON’s geolocation and big data analysis support four of the 15 areas of application:

1. **Locating & Networking**
   - Everything on the shop floor associated with the production process will be networked. This means that process-relevant information becomes digitally available instantaneously.
   - **RTLS (Real-Time Locating System)** from KINEXON Industries locates and networks assets or people on the shop floor. UWB sensors are used to record positions and movements in real-time, down to the inch and without omissions.

2. **Location-Based Services**
   - Live location data opens up entirely new opportunities to automate recurring processes in the company’s material flow.
   - **KINEXON IoT** is a real-time IoT software that enables Continental to process all location data centrally while seamlessly linking it to existing IT systems. IoT provides an open platform for managing new location-based applications.

3. **Real-Time & Predictive Analytics**
   - Automated and digitalized processes can be analyzed and evaluated using state-of-the-art technology – in real time.
   - **KINEXON Process Mining** helps sort, visualize, and interpret large volumes of data. Artificial intelligence generates predictions on bottlenecks, blockages, or wait times. Preventive action can help avoid production downtimes. Cross-location comparative analyses provide helpful insight.

4. **Autonomous End-to-End Material Flow**
   - Once the entire material flow is localized, networked, automated, and optimized, maximum throughput and minimum delays can be achieved.
   - **The KINEXON Industries consulting team** ensures the implementation of technologies, develops innovative, customer-centric solutions, and provides support in the development of new applications on a partnership basis.
Tested Regionally, Rolled Out Globally

From the German model factory into the world.

With KINEXON Industries, we have succeeded in implementing a pilot area in geolocation – a strategically important field of innovation for us – within just one year. The decision to roll this out at the entire site was therefore an easy one.

Anna Buchecker
(Project Manager Industry 4.0, Continental Regensburg)

"In an additional project, the aim is to integrate a supplier and possibly a customer into the system – thereby creating a transparent material flow in the supply chain."

Dr. Markus Fischer
(Industrial Engineering Lead, Continental Regensburg)

"We were looking for a full-stack provider with industrial and logistics experience that could offer highly accurate UWB technology and a software platform from a single source. KINEXON fulfills these high demands, plus it provides capacities for a global roll-out. This includes reliable 24/7 support, agility, and connectivity for example. The main advantage: The IoT platform RIoT is intuitive and can be customized, both for the administrator and the end user."

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(Strategic Area Lead, Continental Regensburg)
Locating and Networking

UWB is the key technology.

Continental relies on KINEXON’s precise UWB-based real-time locating technology (RTLS). KINEXON’s RTLS solution enables seamless digitalization, location, analysis, and automation of the material flow – all the way from goods acceptance through the delivery of end products.

Stationary anchors and mobile tags on any asset calculate and capture all movements and send live location data to the KINEXON real-time IoT software (RIoT). Processes such as storage, intralogistic transportation, scanning procedures, logging and more can subsequently be digitalized and automated.

An area of approximately 30,000 m² in one logistics center and three production areas in Regensburg are equipped with and tracked live by KINEXON technology.

It takes only around 50 working days for the first functional application to go live.

> 50 transportation machines are tracked live

> 3,200 carriers are tracked live

< 50 ms latency in the transmission of data guarantees usage in real time.

ZERO interference with other networks – compared to other locating technologies such as Bluetooth or WLAN, UWB is virtually interference-free.

No other technology was as reliable as UWB when it came to locating objects of all types during our research phase. With KINEXON Industries, we can also trust in a partner that offers tried and tested logistics and production technology as well as agile experience, rather than a rigid product. KINEXON focused on our needs right from the start. For example, new sensors have been developed that are tailored to our requirements.”

Marcel Steding
(Project Lead, Continental Regensburg)
Location-Based Services

in material provision.

1 INTERNAL MATERIAL PROVISION

Internal material provision takes place via a conveyor to a buffer area in the production hall.

The Challenge
Due to spatial separation, staff in the goods receiving department have limited insight into material demand and buffer zone capacity. This leads to inefficient use of storage areas and incorrect personnel utilization.

The Solution with KINEXON
Pallets are equipped with KINEXON Asset Tags and are tracked live. To ensure that the buffer zone is not overloaded, a traffic light system was integrated. Additional material is only supplied when the light is green.

Pull Principle
- Sufficient storage spaces available
  → Replenish
- All storage spaces occupied
  → No replenishment
  → Pallets must be emptied

2 PICKING

The material is transported from the picking area to the assembly line via automated guided vehicles (AGVs).

The Challenge
Staff have no real-time location data of picked material to be delivered. This can result in delays in the supply replenishment for the production process.

The Solution with KINEXON
Picking boxes are equipped with KINEXON Asset Tag, and AGVs are tracked using KINEXON Vehicle Tags. A machine-learning algorithm calculates how long the material will take to reach the assembly line. In this way, staff are always informed about the location and arrival time of all material. An additional benefit: Analysis of AGV downtimes increases their utilization significantly.
Location-Based Services

in the processing of material.

3 SETUP

Continental staff requires set-up tables for individual production stages. These set-up tables are stored in buffer zones and a paternoster lift. The lift is managed manually using a magnetic board.

The Challenge
Manual input on the magnetic board can cause incorrect entries. The precise positions of the set-up tables and equipment are not known and can change quickly. Manual search activities add up to several hours per day.

The Solution with KINEXON
KINEXON uses sensors to track set-up tables and equipment. The sensors automatically register and manage the equipment. In addition, equipment storage is optimized based on production planning. RIoT enables staff to locate tables and equipment in seconds.

4 PROCESS TIMING

Individual product components are required to acclimatize for 120 minutes before they can be processed further. For this, staff place them in defined storage spaces and set a manual timer.

The Challenge
Manual timing is prone to errors. Forgotten or overlooked timers can put production at risk. The required transparency of different acclimatization states to guarantee a continuous material flow is an additional challenge.

The Solution with KINEXON
Carts with components are tracked using KINEXON Asset Tags. Storage spaces for acclimatization are defined as a geofence. When carts are parked within a geofence, the timer is automatically triggered. As soon as the timer elapses, staff are actively informed via RIoT. Warnings for premature cart removals guarantee supply replenishment and perfect acclimatization.
Semi-finished material is placed on around 1,200 carts and is temporarily stored in buffer zones before being processed further.

The Challenge
Continental did not have an overview of the live location, status, and usage of the material. In some instances, manual check-ups on paper required a lot of resources. This poses a challenge to the compliance with the FIFO principle.

The Solution with KINEXON
All carts are tracked using KINEXON Asset Tags. Geofences are defined around production machines. If a cart enters a geofence, usage of the semi-finished material is recorded and automatically sent from the MES to RIoT in real-time. The FIFO principle is guaranteed by means of the timestamp and the display in RIoT.

Automation opportunities through RTLS go far beyond the applications discussed in this case study. This holds true particularly for processes that don't lend themselves to tracking through individual sensors.

The Challenge
At the outgoing goods department in the logistics center, systems such as ‘Pick by Voice’ should ensure correct, documented delivery of products. However, live positions of shippable pallets are not currently known. This leads to extensive and costly search and scan efforts.

The Solution with KINEXON
Continental and KINEXON Industries are working on a sensor-free asset tracking technology in a joint development partnership. The technology will display assets in a 3D visualization, recording goods automatically at acceptance and preventing errors in manual processing.
Impressions
Insights into the Regensburg model factory.

Internal Material Provision
Material enters the buffer zone via the gate on the left. Their utilization is automatically recorded.

Picking
An AGV with picking boxes (left). The AGVs paths and the position of the boxes are tracked.

Setup
A ‘set-up table’ (center) in a production machine. All set-up tables are tracked with KINEXON sensors, eliminating search times.

Detail: KINEXON Anchor
Anchors for recording sensor data can be easily installed.

Process Timing
Carts with components during acclimatization. Their storage time is automatically recorded through geofences.

Detail: KINEXON Asset Tag
One of the smallest industry-specific UWB sensors. Its size and versatility allow for tracking even large quantities of assets.
Real-Time and Predictive Analytics

Real-time data as fuel for immediate optimization.

KINEXON RIoT, a powerful real-time IoT platform, provides 360-degree connectivity. This means: All relevant systems and data sources can be connected. In addition, data generated via the KINEXON RTLS is transmitted to other in-house Continental systems. This provides unlimited opportunities for data analysis at Continental.

The diagram illustrates: KINEXON RIoT can be seamlessly integrated into the entire Continental IT infrastructure via one interface.

The Advantages
✓ Fast connection
✓ Clear data architecture
✓ Easy data administration
✓ Full data control by Continental
✓ Flexible and fast customization
✓ Alerting via e-mail, traffic light, texts or similar options
✓ Notification services via e-mail, texts, industry traffic light or similar options

“Storage areas here are limited and expensive. Efficient use of our storage areas is therefore important not only on financial grounds but also for process reasons. In addition, there are challenges such as the tendency towards product customization and other market dynamics.

We are becoming more agile in a limited space, thanks to real-time locating. And at the same time this gives us a new information dimension. Now that we know exactly where our assets are at all times, we are ready to fully embrace new concepts such as lean management and predictive analytics.”

Benjamin Fieger
(Strategic Area Lead, Continental Regensburg)
The smart factory is within easy reach at Continental. Partners such as KINEXON play a major role in this endeavor. KINEXON is a good example of the fact that it is not really so much about what technology can do. Rather, it is about how you can leverage technology to create applications that are focused and efficient; applications that contribute to our vision and could be seamlessly integrated into our existing global concept.

Our partners at KINEXON recognize this and have consequently provided our project team with proactive and result-oriented advice throughout our journey. If we keep progressing in this way across all areas, I am very optimistic that we will reduce costs very quickly through our smart factory.

Dr. Markus Fischer
(Industrial Engineering Lead, Continental Regensburg)