

IADC Spark Tank Presentation: igus Smartplastics – Industry 4.0 Solution



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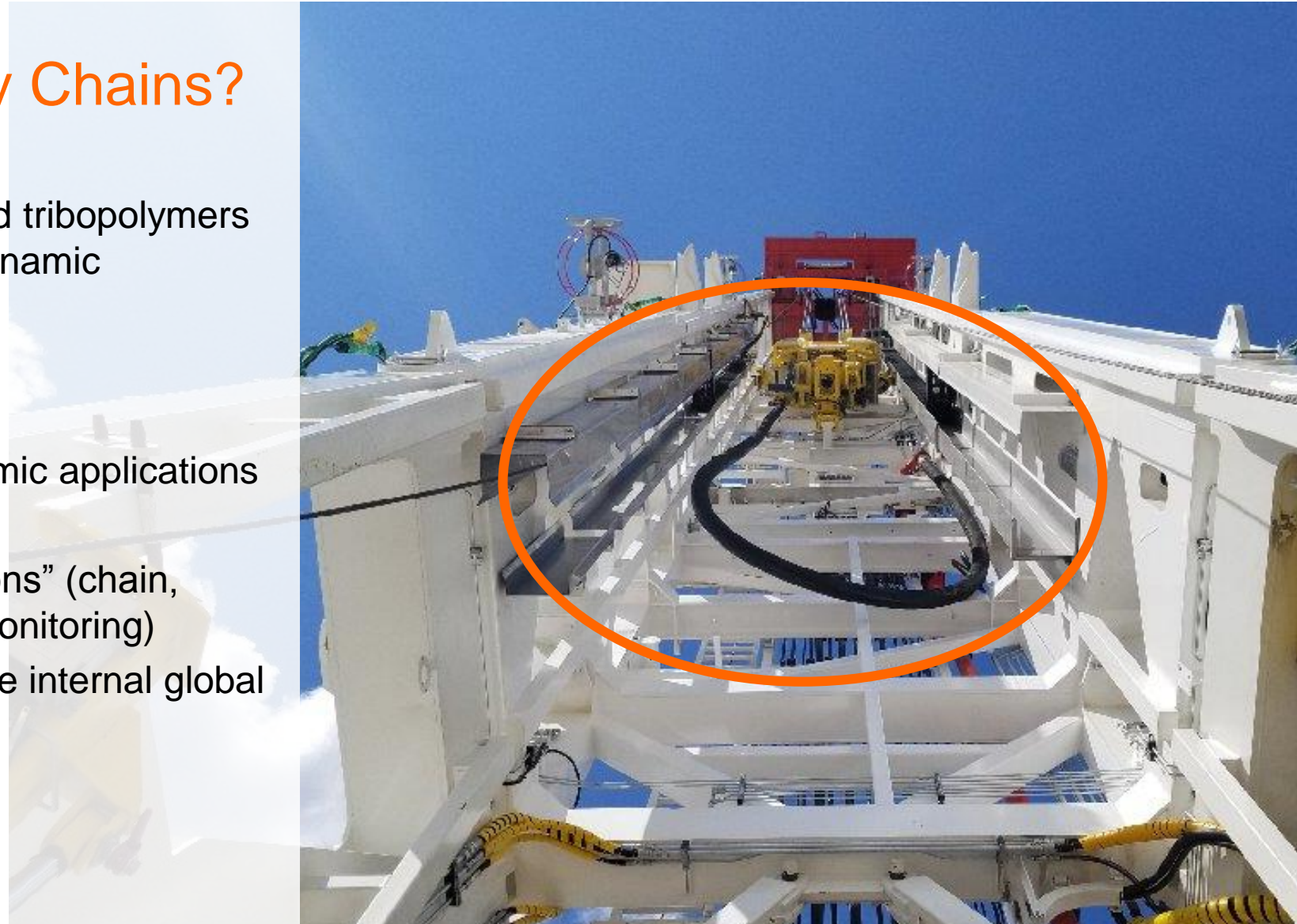
Who is igus?

- Igus is a world leader in composite polymer materials
- Founded in 1964 in Cologne Germany
- Between 1985 and 2019 we have grown from 40 employees to over 4100
- Subsidiaries in 35 countries with annual revenue approaching \$1B Euros
- 200,000+ products from stock
- 1400+ different electrical cables in stock
- In the US, we ship 98% of orders within 24-48 hours
- He have dedicated Engineering (US and Germany) to handle any application
- Local sales support in every major market in the US
- Ability to reach any application anywhere in the world



Why Use Polymer Energy Chains?

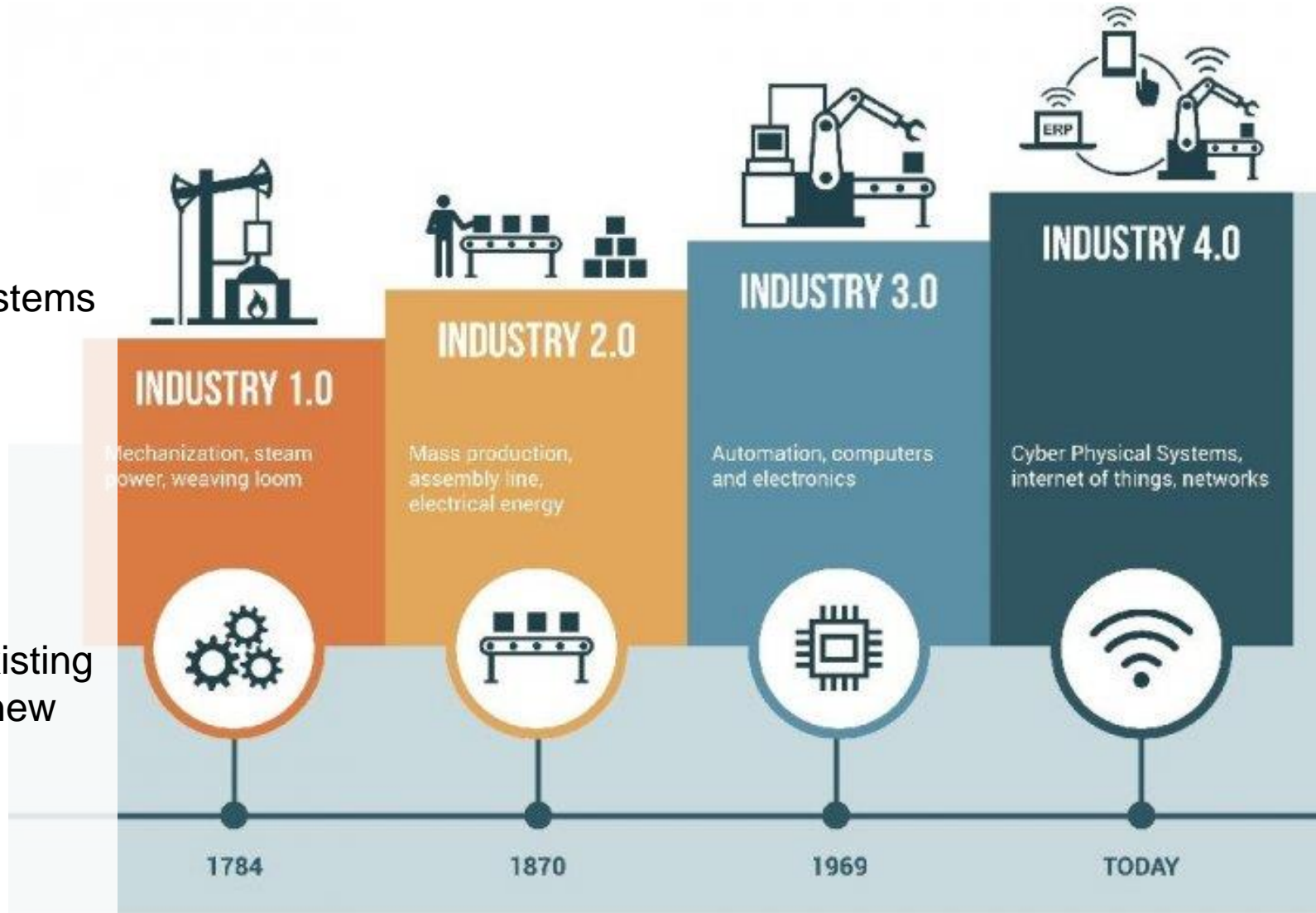
- Specifically engineered and designed tribopolymers to meet environmental and higher dynamic application demands
- Goal is to extend cable life cycle
- More economical solution
- Modular design to fit almost all dynamic applications
- Save space and weight
- Igus can provide full “turn-key solutions” (chain, cable, connectors, installation and monitoring)
- Worldwide service and support to due internal global network

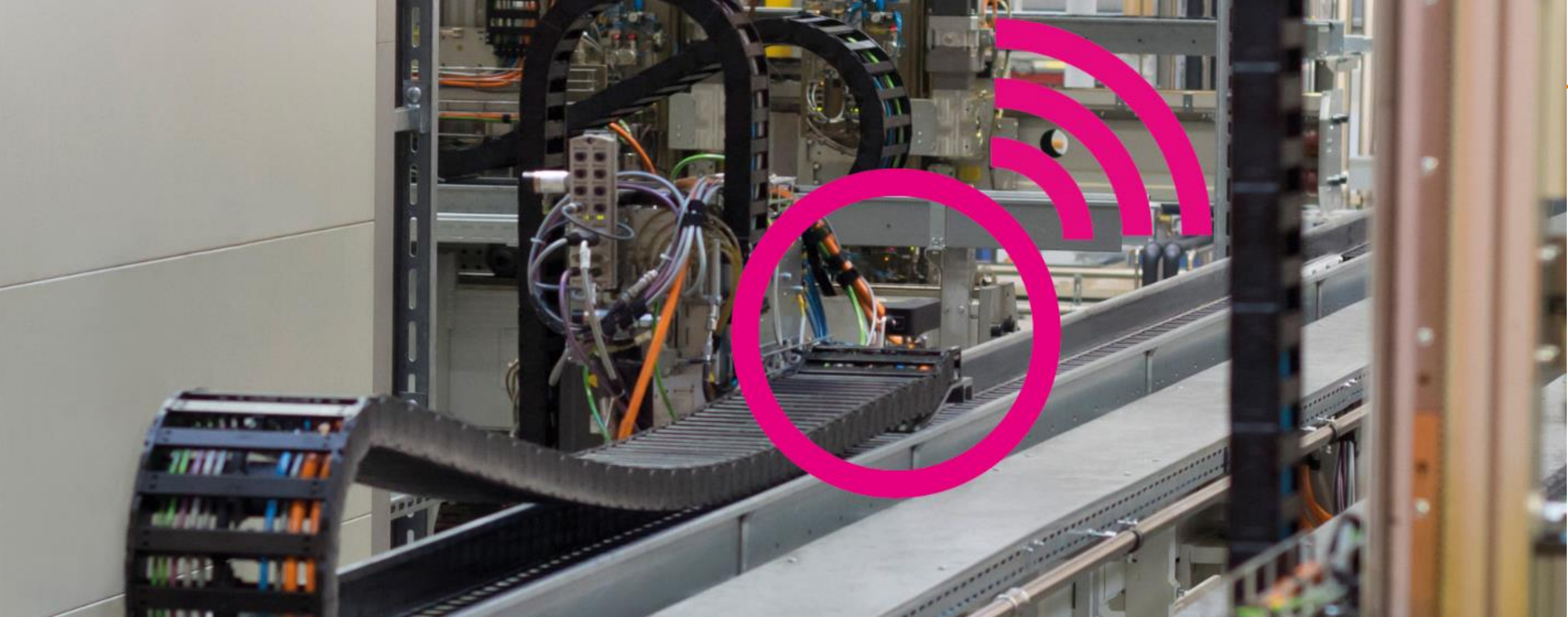


igus EC installed on Top Drive in Anadarko Ba

Key Realizations

- Industry desire for automation to drive safety and increased productivity
- Feedback from the field showed us systems need to become more reliable with a demand for remote monitoring and scheduled maintenance
- Early detection of issues and potential failures
- Move from Hydraulic to AC driven rigs
- Can we meet these challenges with existing technology or do we need to develop new solutions?



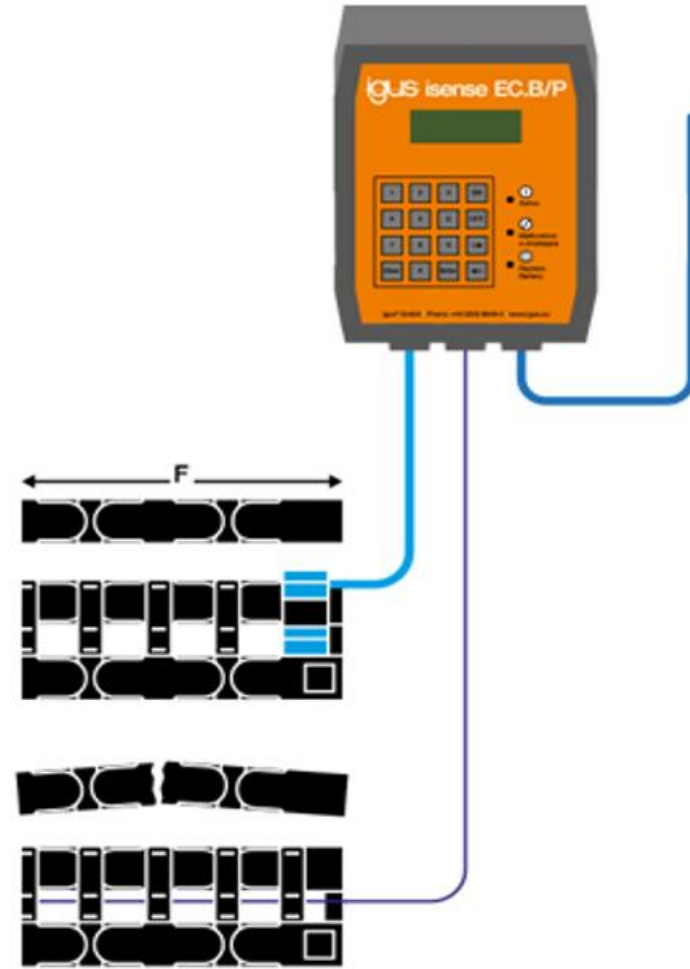
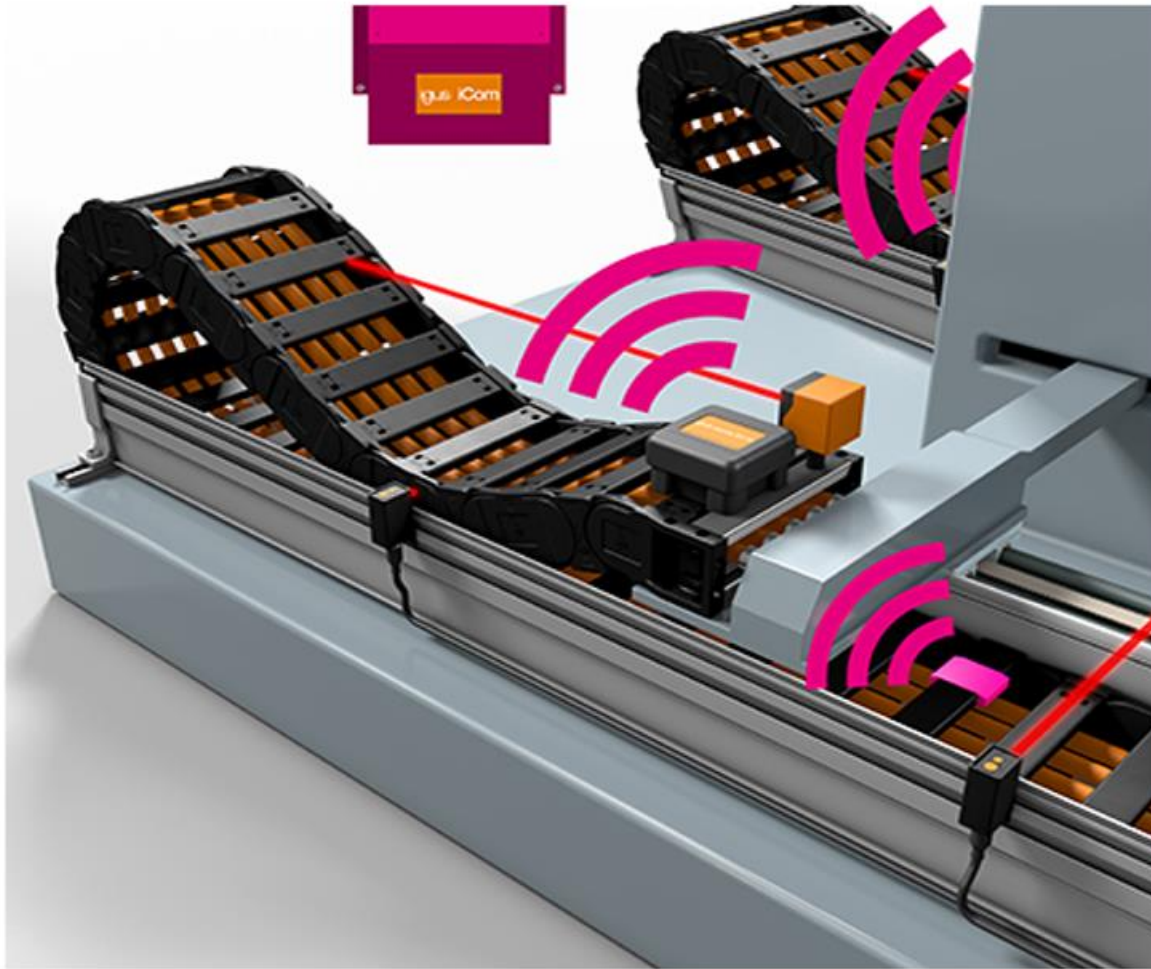


History of Chain Monitoring

- Push-Pull Detection System (PPDS) started our remote monitoring systems 14 years ago
- Testing and development led us to our entire suite of igus Smart Plastic products

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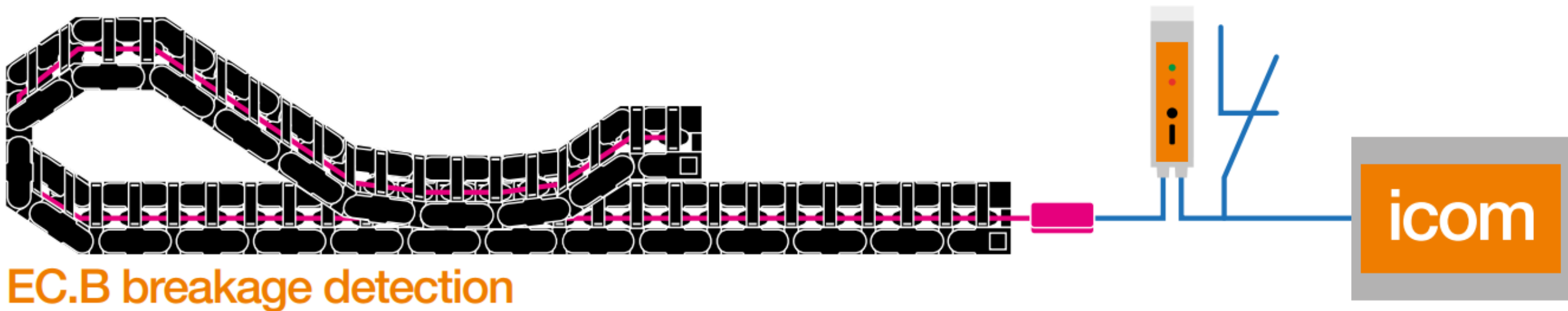


- iSense EC.P(Push/Pull) – formerly the igus PPDS

Used to monitor the push/pull forces of igus e-chains over long travel distances. EC.P is a combination of load cell (force monitoring, push/pull force monitoring) and the iSense EC.P (PPDS box). The load cell is either built into the connecting element of the e-chain (moving bracket) or integrated into the floating tow arm assembly.

EC.B Breakage Detection System

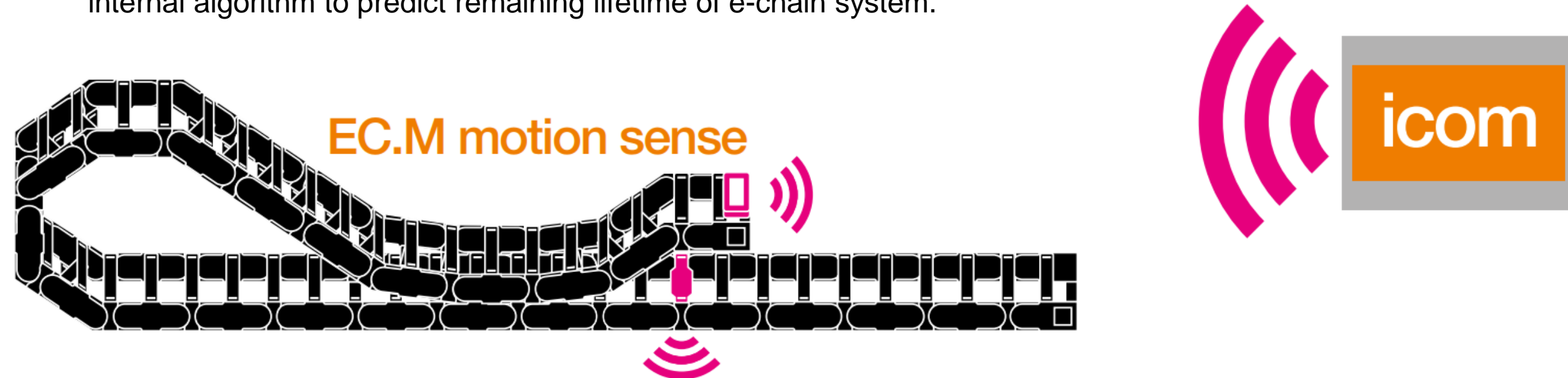
- EC.B e-chain Breakage
- EC.B monitors the overall length of the energy chain and sends continuous data feed to the icom module and can be operated in two ways:
 - Directly by means of the NC contact terminal in the module
 - Evaluation via I/O of customer PLC
- The sensor can detect chain breakage and stop operation quickly to minimize downtime
- Small problems stay small instead of catastrophic chain failures in the field



EC.B breakage detection

EC.M: e-chain movement & EC.W: e-chain abrasion

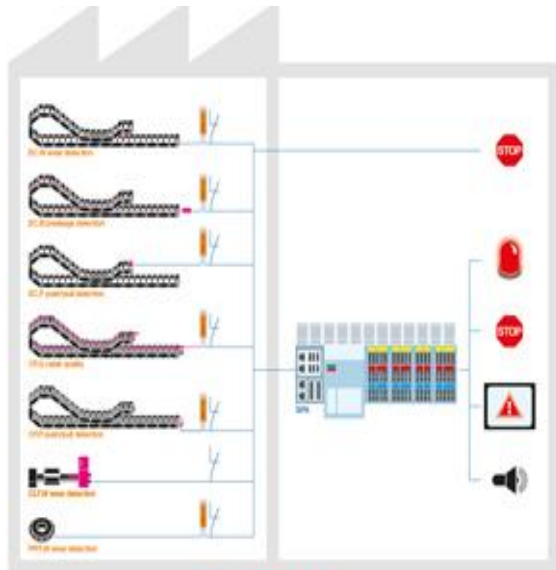
- The EC.M sensor is mounted on the moving end of the energy chain in order to record the dynamic data. The sensor feeds data to the icom module such as acceleration, velocity, temperature, number of cycles, which can then determine the distance traveled as well as the remaining service life of the system.
- EC.W An abrasion sensor measures chain wear by determining the distance between crossbars and when a predetermined amount of wear is achieved the systems correlates this data with internal algorithm to predict remaining lifetime of e-chain system.



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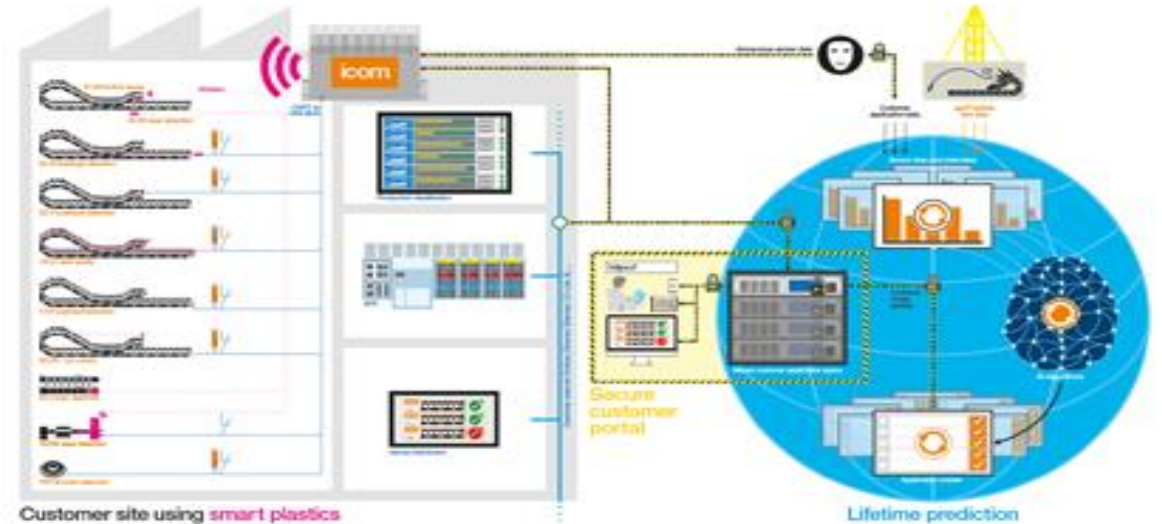
- icom Data Concentrator is data hub for all sensor data to be consolidated and transmitted.
- iSense Standalone
- iSense Offline (internal)
- iSense Integration
 - into customer software
- iSense Online



Customer site using smart plastics

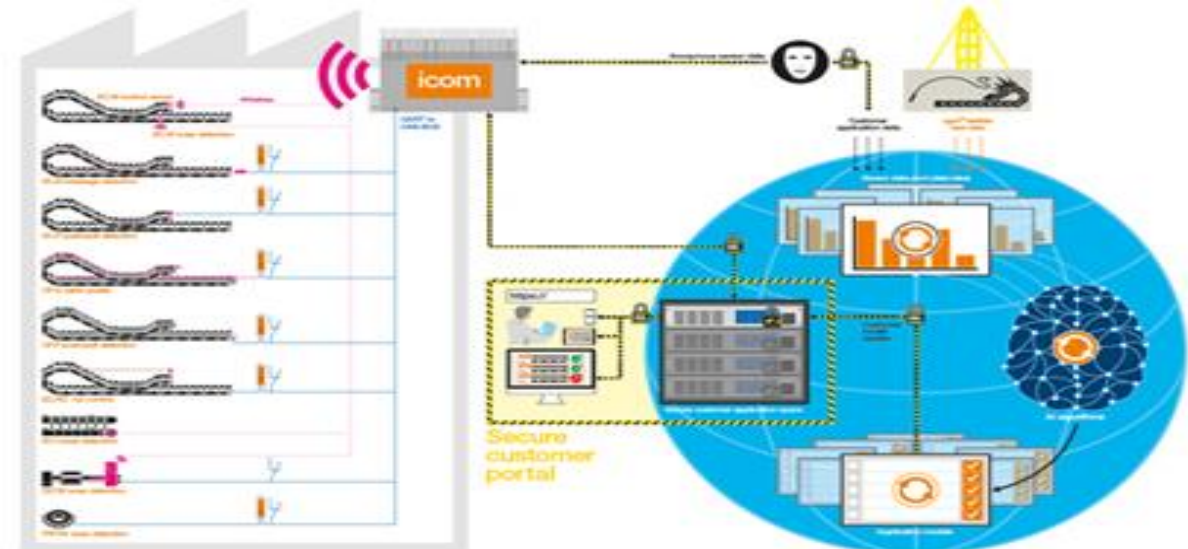


Customer site using smart plastics



Customer site using smart plastics

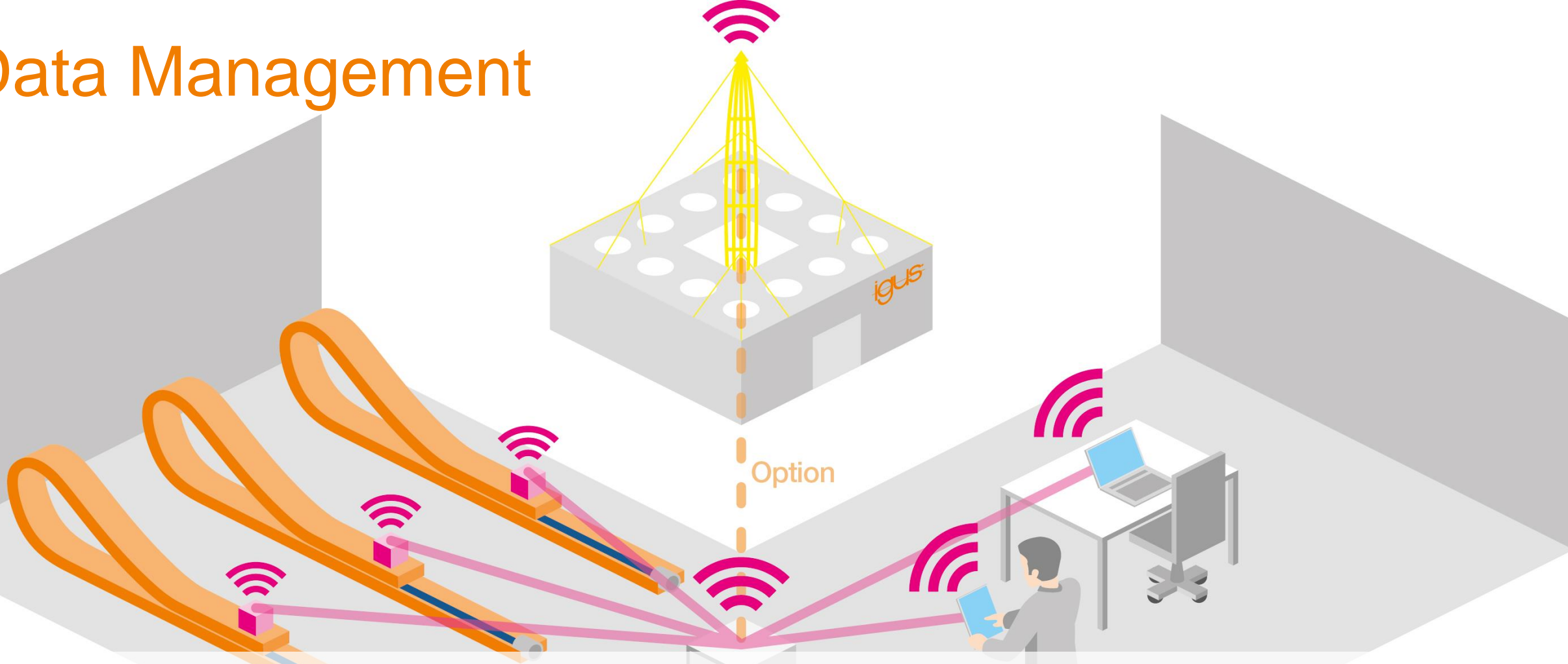
Lifetime prediction



Customer site using smart plastics

Lifetime prediction

Data Management

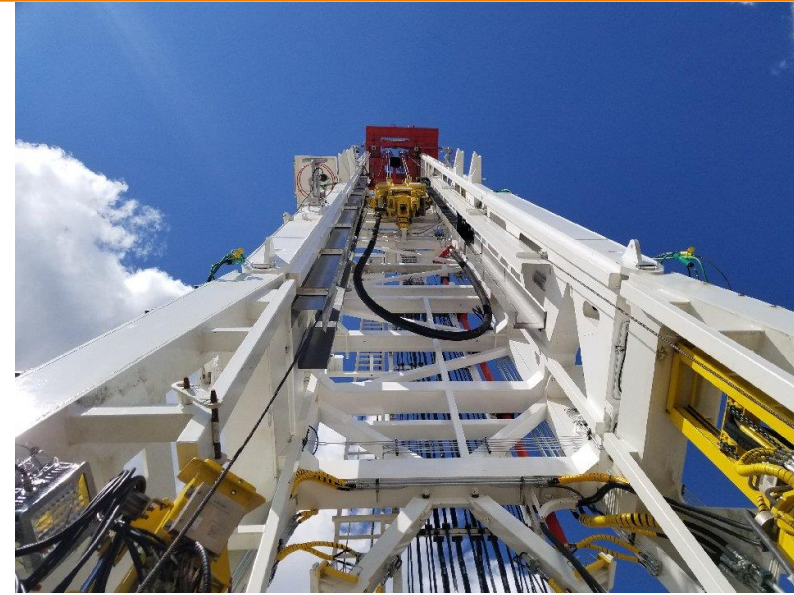


- Stand Alone - Can be managed onsite to provide failures and e-stops. No icom needed
- Offline - Integrated icom module and managed local alerts and schedules and can compare measured data with data on igus servers to calculate service life (encrypted and anonymous)

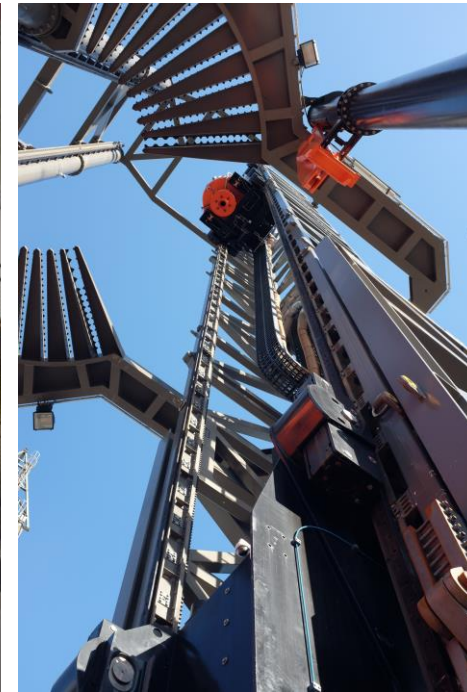
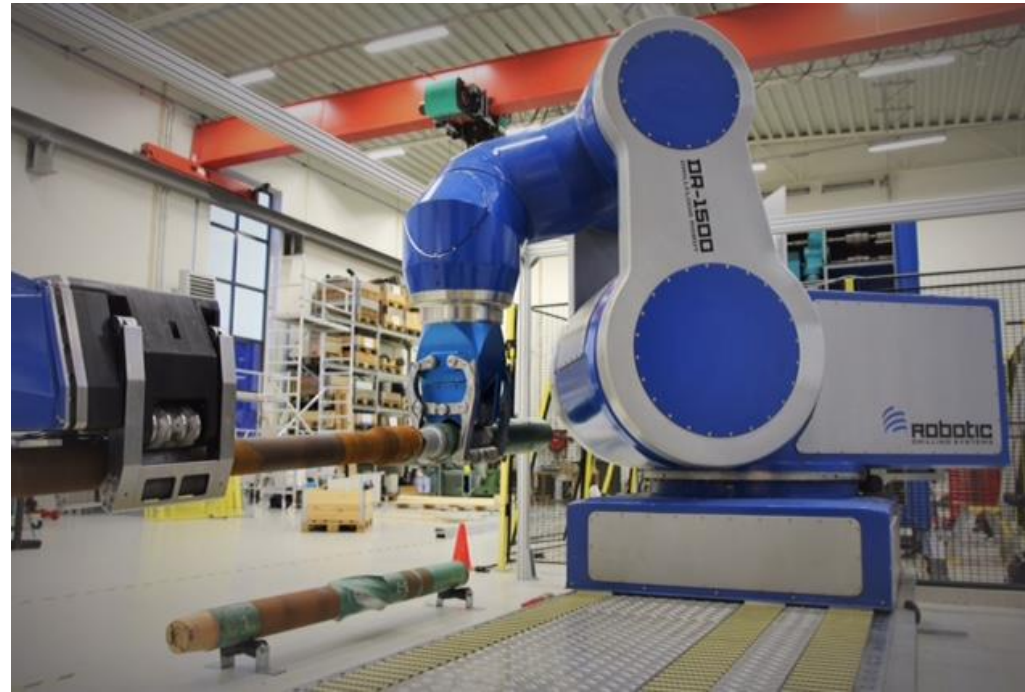
- Integrated – Local integration on customers visualization software and able to determine predictive failures and service life
- Online – Planned service work and replacement parts. All data is encrypted and anonymous and processed to give best servicing schedule available based on data stream

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Applications



Overview

- igus Tribopolymers specifically designed and resistant for O&G applications
- Proven application history that has been tested
- Why is Industry 4.0 important?
 - Small problems stay small
 - Ability to predict maintenance
 - Remote monitoring
 - Pre-Order spare parts
 - Identify areas where operation is damaging equipment and allows for process improvement
- igus has multiple options for monitoring
 - Standalone
 - Offline
 - Integrated
 - Online



**Thank you and we welcome your questions
and comments!**



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