



Smart Manufacturing Infrastructure

Shining a new light on Industry 4.0

Our world is evolving more rapidly than ever before. Like many other industries, manufacturing is convinced that digitization will provide a major leap forward. A digitally integrated and intelligent value chain offers almost limitless possibilities. Benefits from Industry 4.0 include improving operations efficiency, productivity, product quality, inventory management, asset utilization, time to market, agility, workplace safety and environmental sustainability.

Foundational to Industry 4.0, a smart industry-graded infrastructure integrated with a plug-and-play service environment, for the secure collection and distribution of data, is lacking. Moreover, tracking people and valuable assets over a large industrial environment comprising of a diverse set of networks across multiple facilities is an even bigger challenge. The complexity and investments required for setup and implementation of such an infrastructure is still preventing many organizations from taking this leap forward. At Chemelot in Geleen, the Netherlands, partners PSPL, CGI and Sitech Services are collectively proving these barriers can be overcome.

Chemelot is more than just an industrial park. It is a unique chemical and materials community that ensures accelerated business growth through the open exchange of ideas. PSPL and CGI have been working at the Chemelot site with Sitech Services on the implementation of a Smart Manufacturing Infrastructure. A cost-efficient, reliable and fully secure wireless data network (by PSPL) to which a wide variety of Industry 4.0 devices can be connected rapidly, securely, safely and cost-efficiently (by CGI). The network integrates with a platform utilizing smart connectivity through wireless mesh network technology. Industry 4.0 devices can be utilized for cost-effective monitoring, optimizing industrial production, energy consumption and predictive maintenance purposes.

Sitech Asset Health Center is where the Smart Manufacturing Infrastructure initially originated, monitoring now more than 500 factory installations. Analyzing trends that provide information about the condition of factory installations. This enables Sitech Services to take action, even before something goes wrong. Central monitoring of the condition of an extensive range of installations is considered a first in the Western European process industry.

Cost efficient and sustainable infrastructure: building on the smart LED lighting system

The Smart Manufacturing Infrastructure utilizes a backbone that is currently already present in all production

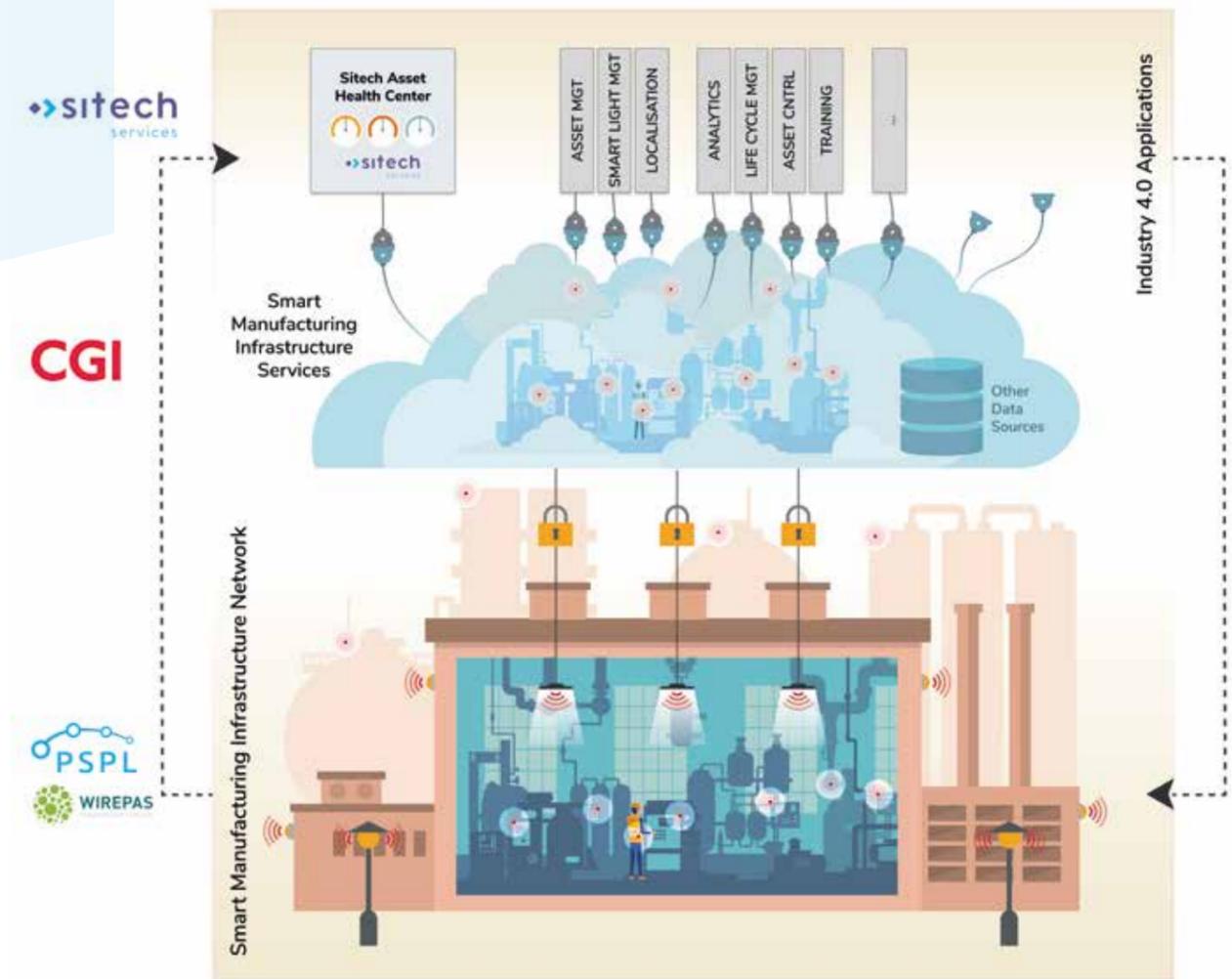
environments: light fixtures. Major replacement operations in precisely this area are due. From 1 January 2022, all fluorescent lighting will be banned, first in Europe and China and subsequently worldwide. Fluorescent lighting is too environmentally harmful due to the use of relatively high levels of mercury. Replacement of existing fixtures is necessary for the migration to LED lighting technology and offers a unique opportunity to integrate wireless connectivity. The simplest solution for creating the backbone for a fine-pitched mesh-type wireless network.

Only a very limited portion of this network's total capacity is needed for exchanging data between the lights and the control room. More than 95% of data transport capacity remains available for other services, without additional cost. As a result, there is plenty of room on the network for connecting a wide variety of industrial equipment, such as sensors, actuators or tracking tokens. These can be used to monitor process conditions with greater granularity, while analytical models can be used to predict process capability and product quality. This helps organizations to monitor the end-to-end manufacturing process, address bottlenecks, reduce waste and energy costs, and remove operator intervention. Together, these 'devices' offer those responsible for operations what they really need: real-time insight and control options, operational optimization at a significant lower cost. This is the idea behind Smart Manufacturing

Infrastructure from PSPL and CGI: combine LED lighting with smart communication paving the road to Industry 4.0.

Is cost hampering digitization in the industry?

Annually, CGI leaders around the world meet face-to-face with 1.500+ business and IT executives to gather their perspectives on the trends affecting their enterprises, including business and IT priorities, budgets and investment plans. In every boardroom, digitization and automation are high on the agenda. Frequently, the observation is made that further technology rollout and collaboration in the industrial environment in particular can add significant value for productivity, quality, (cost) efficiency, safety and sustainability. However, managers often point out the limited presence of devices such as sensors, which can deliver valuable data, and the high costs and high complexity of implementation. Indeed, the cost of adding one sensor can amount to tens of thousands of euros, and installation of the required cabling and power supply might not even be feasible. Today, on average 50% of the costs of additional process sensors are made up of sensors while the other 50% goes towards specific infrastructure for (wireless) connectivity. By replacing existing lighting, additional device connection costs are eliminated and sensors can be added without additional infrastructure costs.



An industrial wireless network can't possibly be reliable, can it?

How do you reliably supply power to all of the devices that complete the network? And why should wireless communication suddenly work now, even though past experiences have proven the opposite?

We know the objections – which are generally justified. Smart Manufacturing Infrastructure has been developed to remove these barriers.

Smart battery management

Smart LED lighting fixtures and built-in radios for wireless data traffic utilize the existing electricity power supply. In terms of stability and continuity, this is just as reliable as the existing installation. Smart battery management now also makes the power supply for non-wired equipment

highly reliable. Intelligence built in ensures battery-powered devices can receive and send data first-time-right in a minimum of time. Energy consumption is, therefore, also highly optimized enabling a new dimension in battery power sensors for industrial environments.

Robust radio technology in a dense mesh network

The radios used for the Smart Manufacturing Infrastructure are both 'long range' as well as suitable for high radio densities. They adjust transmission levels automatically. Each connection can be 'monitored' for its connection quality. End-to-end message and configuration parameter security is implemented over the full infrastructure.

Wirepas Mesh-protocol

The Smart Manufacturing Infrastructure uses the Wirepas Mesh protocol as a basis. This IoT protocol has been developed to provide connectivity for large-scale IoT networks with high density, flexibility and reliability. Ideally suited to solutions that require scalability, energy efficiency, density, reliability and flexibility. Wirepas works according to the 'minimum airtime / no collisions' principle, based on agreements on which device can communicate at what time. Messages are sent without a 'collision' and thus without retries allowing faster and better data transport. The resulting network is not only more reliable, but also more energy efficient.

Collaboration between Sitech Services, PSPL and CGI

Today, no single vendor can deliver all the capabilities needed to implement Industry 4.0 solutions effectively, as these are based on multiple technologies and devices that run on different networks. The critical success factor is close collaboration between relevant business partners, IT and OT.

Working together with Sitech Services on the Smart Manufacturing Infrastructure, PSPL provides professional and sustainable lighting solutions, with a strong base in the industry and a first industrial-scale smart lighting implementation at Chemelot. CGI is providing Smart Manufacturing Infrastructure Services and is one of the world's largest IT and business services companies at the forefront of digitization in a number of industries. As an experienced system and service integrator, CGI seamlessly and securely connects Operational and Information Technology (OT / IT). Innovation, service integration and connecting parties within ecosystems is part of CGI's nature.

Smart Manufacturing Infrastructure: plug and play

Often, automation projects don't make it beyond the decision phase. In these cases, the complexity of implementation is seen as a reason for not taking action. CGI is, therefore, committed to making the installation and implementation of new systems as easy and practical as possible. This also applies to Smart Manufacturing Infrastructure. Installation of the network seamlessly coincides with replacement of lighting fixtures. This is followed by the placement of sensors. At present, installation still requires a major investment, many times higher than the cost of the actual sensors. CGI is working towards a situation in which any installer authorized to work in the facility can execute this. With simple interventions and guidance on a tablet or smartphone suitable for hazardous environments, the sensor is added to the network, securely and functioning reliably, and continuously monitored from the (private) cloud environment. Plug and play installation and device management.



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