

- Data acquisition

Regarding data acquisition, Artificial Intelligence allows the collection and organization of information from various sources, such as measurement sensors for temperature, humidity, pressure, vibrations or dimensions. Data sets are stored in the Cloud, facilitating rapid and permanent access to them, both by systems and human resources.

- Data analysis

After data acquisition, analysis takes place, which leads to the efficient operation of systems. Their performance can be studied and corrected whenever necessary, in a timely manner. Thus, data sets can be deepened through analysis and comparison, informing even the human resources in case of need for optimization.

- Intelligent factory automation

After following the first two steps of data collection and interpretation, intelligent factory automation takes place, with reference to parameter control. Thus, through Artificial Intelligence, together with IIoT (Industrial Internet of Things), priority processes can be modified. For example, in the case of a significant increase in demand for a product, robots and digital production systems can be set to modify their manufacturing process, leading to timely market needs satisfaction with minimum effort.

3. Advantages of a smart factory



Fig. 2. The advantages of a smart factory

The implementation of a smart factory leads to high-level connectivity and operational efficiency, bringing with it a series of benefits (see Figure 2), such as:

- Increased productivity

Thanks to advanced technologies, autonomous machines can communicate with each other, making it possible to generate real-time data about production processes, which, once analyzed, contributes to a productivity improvement.

- High quality

By intelligently automating factories, the risk of potential errors is reduced. By monitoring processes and their performance, output is increased and resources are streamlined, ensuring high-quality production. [4]

- Flexibility

Considering that we live in a dynamic era, where changes can occur at any time, smart factories have the ability to adapt to any real-time demands by effectively measuring key production performance indicators. [3]

- Workplace safety

Intelligent factory automation allows human resources to be free from potential risks that can cause accidents. Thus, operators have the ability to focus on value-added tasks, and combine their creativity with the accuracy and speed offered by modern techniques.

- Reduced energy consumption

The efficiency of new production systems ensures reduced energy waste, carbon footprint and waste, thus optimizing energy management and increasing product accessibility. [4]

- Significant cost reductions

Smart factories have the capacity to prevent and quickly resolve potential maintenance issues, leading to reduced equipment repair costs and avoidance of interruptions, maintaining a balance between production and investment. Additionally, 3D simulation programs can mirror the physical world in a virtual world that can include robots, products, and people, all within specific industrial engineering processes. [6]

4. Disadvantages of smart factories

Smart factories can have certain disadvantages, such as:

- High costs

Implementing advanced technologies in the manufacturing process requires a significant investment in intelligent machinery, sensors, and the systems involved, many small and medium-sized enterprises not having the capacity to afford such an investment.

- Dependence on technology

Given that factories are intelligently automated, any small error or lack of synchronization can drastically affect the production system if preventive measures are not taken in this case.

- Security and confidentiality risks

Factories are becoming increasingly dependent on their relationship with the Internet, exposing them to cyberattacks that can lead to the loss or leakage of data that threatens the security of production processes. The data collected may be used to monitor employees or information related to the processes used within the factory.

- Job automation

The role of smart factories is to solve existing and future problems through intelligent automation, which involves an increase in productivity, sustainability, and economic performance, with minimal human assistance. For this reason, there may be a decrease in the workforce, leading to social disruptions.

5. Conclusions

Following the above, we can acknowledge the significant influence of smart factories on industrial engineering due to the latest technologies of Engineering 4.0, such as Artificial Intelligence, IIoT (Industrial Internet of Things), Cloud computing, or HMI (Human Machine Interface). Evolving from the automation stage, implemented about five decades ago, smart factories bring a new vision to the

