Digital Twin Energy Management for German Industrial Parks (Industry 4.0)

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1- New Energy Game for German Factories: Leverage Virtual Models to Manage Electricity

Did you know? German factories today are the application of a technological know-how like “digital double” to manage electricity – that is the “digital twin” in Industry 4.0 technology. Briefly speaking, it is to construct an electronic mannequin identical to the factory unit in the computer, and demonstrate in real time the amount of electrical energy being consumed by each computing unit, the amount of electrical energy generated by photovoltaic panels, and even the power consumption of air conditioning can certainly be seen.
This technology transforms the factory’s “site energy” (known as Standort Energie by using the Germans) into an intelligent machine that is able to govern itself, which has the capability to hold cash and lower carbon emissions.

2- Four stages of electrical energy management in German factories: from “manual meter reading” to “AI housekeeper”

1. **Ten years ago: the technology of guide meter reading**
   At that time, the production department deployed humans to enter meter numbers every month, and saving electrical energy relied solely on experience, and they didn’t have reasoning where the most electrical energy was consumed.
2. **Post-2010: Solar panels penetrate factories**
   More and more factories are fitting photo voltaic panels and are beginning to tap smooth energy, but retaining photo voltaic strength is still a matter of concern.
3. **In recent years: Sensors are ubiquitous**
   The actual factory is full of wise sensors, like putting “smart bracelets” on the machinery to reveal power consumption at any given time, but there is also too much facts and it is a pain to analyze.
4. **Now: Digital twins as “energy housekeepers”**
   Now the factory has constructed a technological “virtual factory” within the computer, with the capability to predict how much electric power will be used tomorrow in advance, automatically tune the machine’s operation, and even decide when the battery need to be maintained – like having an on line strength specialist on call 24 hours a day.

3- How does the digital twin manage electricity? Learn the three primary functions

1. **Real-time monitoring: See power consumption like watching a TV show**
   The virtual mannequin will show real-time: what electrical energy the solar panel generated today, how many times the battery was charged, which computer at a time “stole electricity”, and even the office air conditioner will be set to an alarm when it’s too low.
2. **Smart forecast: Electricity consumption forecast more precise than climate forecast**
   The system will decide how awful quantities of electrical power will be used each hour tomorrow solely on the basis of past records and manufacturing timetables. For example, if you are given that 1,000 vehicles will be made tomorrow morning, you will instruct the photo voltaic panels to generate additional electrical power and the batteries to save additional electrical power in advance.
3. **Automatic tuning: It knows ahead of you that there is no electricity**
   In case of a power failure, the machine will automatically switch to the emergency power supply,

similar to a home backup flashlight. Large power consuming machines typically will be scheduled quietly to run in the dead of the night when electrical power is less expensive to enable the manufacturing facility to save money.

4- Chinese technological expertise helps German factories: These electricity storage devices are critical

The German factory's digital twin device cannot do without dependable power storing devices, such as China's HighJoule company products:

- **Energy storage cupboards such as Lego**
  Their energy storage modules can be freely combined and rearranged like Lego, from powering a base station to powering an entire industrial park, and deployed wherever needed.
- **"Power Bank" which can be used both indoors and outdoors**
  – **Indoor electricity storage cupboard (**HJ-Z24-40I**)**: Installed in the manufacturing unit workshop, it is used to store photo voltaic electricity and, in seconds, become a standby power source when power cuts out.
  – **Outdoor power storage cupboard (**HJ-Z24-40O**)**: Not afraid of rain and wind, and can be installed after photo voltaic panels to store electricity instantly.
- **Container-type "mobile strength station"**
  The HJ-SG-R01 power storage container is a monolithic cellular energy supplier. It may be towed at any place where there is substantial electricity consumption. It is particularly ideal for ad hoc increase of production lines or electricity blackout emergencies.

5- Real money-saving instances of German factories: facts speaks

1. **Electricity payments of car plants have been greatly reduced**
   After the implementation of digital twins, Mercedes-Benz Bremen manufacturing plant lowered its annual electrical energy consignment by 15% – equivalent to one hundred families' annual electrical energy use.
2. **Energy-saving miracle of sports activities shoe factory**
   Adidas' "speed factory" saves energy with the assistance of 30% per pair of shoes produced by means of rational scheduling, the same as eliminating 3,000 piles of carbon dioxide emissions to the ground.
3. **Green transformation of conversation base stations**
   Germany's O_2 company replaced all of the base station's diesel mills with "solar electricity + electricity storage." Not only did it never have a energy blackout, but it also turned into an environmental protection demonstration project.

6- Want to improve? Five steps are correct

1. Provide the manufacturing plant with an "energy checkup"
2. Install intelligent "neural network"
3. Build a virtual "digital factory"
4. Allow AI to test to "regulate electricity"
5. Ongoing optimization and upgrading

7- What will the future factory be like? These visions are most likely to become a reality

- **Sell electrical power with blockchain as buying vegetables**: Factories can purchase and sell surplus solar electrical power like on shopping platforms, with open and cheap prices.
- **Wear VR glasses to refurbish equipment**: Workers wear VR glasses to see which desktop of the virtual mannequin should be repaired, 10 times quicker than normal inspections.
- **Quantum computer calculates electricity power bill**: Supercomputers someday may be used to calculate how to use electricity most economically, and calculate the optimal configuration for a month in seconds.

8- Why are German factories in a hurry to use it?

Put simply, digital twins are like having a universal housekeeper for the factory: it can calculate how much electrical power is being used and how much electrical power consignment is stored, plan photo voltaic electricity and strength storage machinery to run efficiently, and spot equipment screw ups beforehand. For those factories who would like to be leaders in the fourth industrial revolution, this machine is a two-kill product of “saving cash + environmental protection”. If you additionally like to make your manufacturing unit smart, now is the first-rate time to start!

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