

Honeywell Process Solutions



Future of the Plant Floor

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The Plant Floor of the Future

The pharmaceutical plant floor has already undergone a series of improvements as manufacturers work to transition their facilities to operate with a more flexible footprint. On top of this, the U.S. Food and Drug Administration (FDA) in 2003 helped encourage innovation in the industry by announcing the process analytical technology (PAT) initiative. The initiative is focused on the development and application of analytical devices for improved measurement and control, a key component in helping manufacturers improve process efficiency and product quality.

A Modular Footprint Saving

The pharmaceutical plant floor of the future is already under development and will be enabled by a central component, the modular footprint. A modular configuration affords manufacturers increased flexibility in the type of products they are able to process. Instead of being able to only produce a single product, manufacturers will be able to produce a variety of products from a single facility with faster changeovers and improved overall equipment effectiveness.

In a modular configuration operators will see a new plant floor emerge when compared to today's rigid environments. In a modular facility the sightline of large stainless steel tanks spread across the plant floor with elaborate CIP connections will all but be gone. In their place will be mobile equipment lined with smaller disposable plastic bags.

Modular = Mobile

Disposables offer more than just a mobility advantage over their larger stainless steel counterparts, which are often bolted to the ground. For instance, once a production run is complete the stainless steel equipment has to be clean and sterilized, in most cases, before another production cycle can be started. With plastic bags there is no cleaning needed as they are simply replaced after each use. Plus, plastic bags do not require maintenance – further improving operational efficiency.

A modular footprint also brings the benefits of mobility to the forefront. For a facility to scale up or down or change products, its equipment must be mobile. Across all processing steps the equipment needs to be movable for a manufacturer to see the greatest benefit from a modular configuration.

Another part of mobility is enabling the operator to move freely around the plant floor. In most settings today operators are already positioned on the plant floor using a remote control station to monitor equipment. However, the plant floor of the future is going to further mobilize operators with tablet PCs and hand-held devices.

Some pharmaceutical manufacturers have already made the switch to laptops, as they provide greater mobility and reliability. Case in point, remote control stations keep the operator tied to the station for extended periods of time. The fixed location of the stations limits the operator's ability to move around the plant floor efficiently to make equipment adjustments or take readings. Often this means the operator will have to make several trips between the equipment and the remote control station to complete a task.

This is not a desirable situation as it is time consuming and inefficient. In the modular plant of the future the key benefits are enabling operational efficiency, greater flexibility and product consistency. Mobile technology is going to serve a primary role in facilitating these benefits. Mobile stations also provide an extra layer of redundancy increasing a plant's overall reliability.

For instance, if a fixed control station was to lose its monitor or the keyboard stopped functioning, the operator's work tasks may become more difficult or he may have to stop production until the problem is fixed. With the portability and cost effectiveness of mobile computing devices, a backup can be readily put into service if the primary unit fails. This greatly reduces or eliminates the amount of downtime or process disruption a manufacturer might experience in this situation.

As operators become familiar with moving around the plant floor and monitoring equipment using mobile devices they will look to various form factors to help them with their jobs. For instance, an operator that needs to climb to the top of a piece of equipment to take a reading or add production material likely will not want to bring a laptop. In this case, smaller hand-held devices are a suitable option because of their compact design and integrated features.

Wireless Mesh Network

To harness the full potential of mobile technology, equipment and software manufacturers will need to move from a wired network to a wireless network. In most cases the plant of the future will be monitored using a highly available wireless mesh network instead of a single wireless network. With a mesh network, sensors, controllers and operators are able to work with each other, monitoring a variety of processes while ensuring that no gaps or dropouts in the network emerge.

A wireless network offers many benefits to pharmaceutical manufacturers as they seek to upgrade facilities or build new ones. In both cases a wireless network is more affordable to install than a wired network. The cost savings are achieved by eliminating the need to run wire from sensors to the distributed control system. In a modular plant with portable equipment wireless allows the equipment to be placed into production without costly hookups.

In many instances existing pharmaceutical manufacturers will find themselves turning to wireless technology instead of a wired network to more flexibly add capabilities to their existing facilities. For instance, the addition of a hard wired sensor includes not only the cost of the wiring but also expensive regulatory validation costs. However, with a wireless network the manufacturer can easily install or move a wireless sensor on the holding tank without making any structural changes.

Nano Technology

The future of wireless technology goes beyond connecting process equipment to control systems that deliver real-time data to an operator's mobile device. The future for wireless technology in the pharmaceutical plant floor of the future is vast. In the next 10 to 20 years pharmaceutical manufacturers may be using nano technology to measure such items as product temperature, pH levels and cell density.

These wireless sensors will be small enough that they will be able to act like a fluid and be added directly to the manufacturing process. The sensors will serve to provide manufacturers with a 3D model of the production process. To help conceptualize how this works think back to the movie *Twister*.

In the movie, tornado chasers release hundreds of sensors into a tornado. Once the sensors were picked up by the twister they immediately started sending back to the scientists. The data was then used to create a model of the tornado and provide environmental information such as wind speed. The same concept will be used in pharmaceutical manufacturing but with more advanced nano technology.

The Future of PAT

PAT is serving as a driving force behind the pharmaceutical plant floor of the future. It's enabling manufacturers to seek out new technologies to understand and optimize their production processes. The first step towards better understanding processes is to acquire the data from process equipment. Once the data is gathered it needs to be organized for analysis, compared against similar manufacturing runs, evaluated and then sent to an operator for review and appropriate action.

To accomplish this manufacturers are in the process of evaluating their existing technologies and considering new technologies to capture new kinds of process data. Already today manufacturers are turning towards innovative sensors to control the homogeneity of their product blends. By using uniformity sensors, pharmaceutical manufacturers are able to measure the mixing quality of their powder blends in real-time. This removes the need for operators to hold production while samples were taken and analyzed.

2020

In 10 years, the pharmaceutical plant floor is going to be dramatically different than the plant floor of today. The shift in pharmaceutical research and new products is moving away from huge blockbusters to products aimed at small patient groups and even individualized treatments will drive the need for new manufacturing strategies.

The facilities to support manufacturing in 2020 will be designed around a modular footprint, operated and monitored from a wireless network, leverage mobile technology, and using innovative sensor technology.

The future of the pharmaceutical industry is going to be bright as plants are retooled for the next era in biopharmaceutical manufacturing. Floor

More Information

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WP-10-06-ENG
July 2010
Printed in USA
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