A LIMITED EDITION MULTIPART SERIES

The ABCs of cannabinoid manufacturing

In the world of manufacturing, things move quickly. The manufacturer's goal is to manufacture their product with the target quality in the proper quantity with as little waste possible. Many manufacturing outlets will do their quality control before a process starts and after the process ends, but *what about while something is being created?*

Welcome to The *ABCs* of cannabinoid manufacturing

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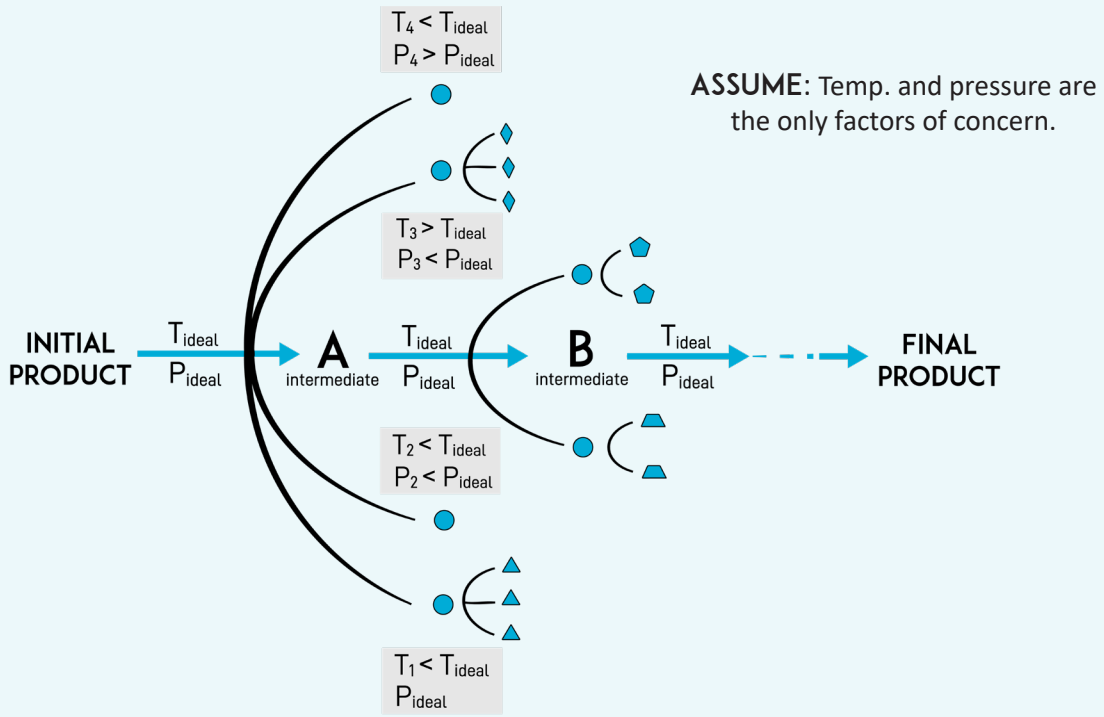
Quality Control Issues in Manufacturing

Many industries based on manufacturing, such as Pharmaceutical, Big Agriculture and Petrochemical, have realized that with every additional step in the manufacturing of a product, there is additional opportunities for things to go wrong. Many chemical reactions have a certain window of acceptable conditions. The wrong conditions can lead to lower yields or unwanted side reactions. A final product that takes several manufacturing steps has numerous opportunities for these unwanted results to occur. If this happens early in the process, it could lead into a plethora of extraneous side products or zero yield of the product(s) of interest. (See Figure 1).

FIGURE 1



In many batch processes, if something goes wrong in the middle and not discovered until the end, it could mean millions of dollars of waste if the output needs to be disposed of.

Many manufacturers have implemented or are looking to deploy analytical techniques to assess not only the incoming and outgoing goods, but also throughout the processes that transform the raw materials into the final goods.

A first step towards understanding a process is to "thief" samples during the process and measure various characteristics of interest (i.e. cannabinoid concentrations, solvent concentration, water content, etc.) in a lab. However, there are numerous pitfalls associated with this method.

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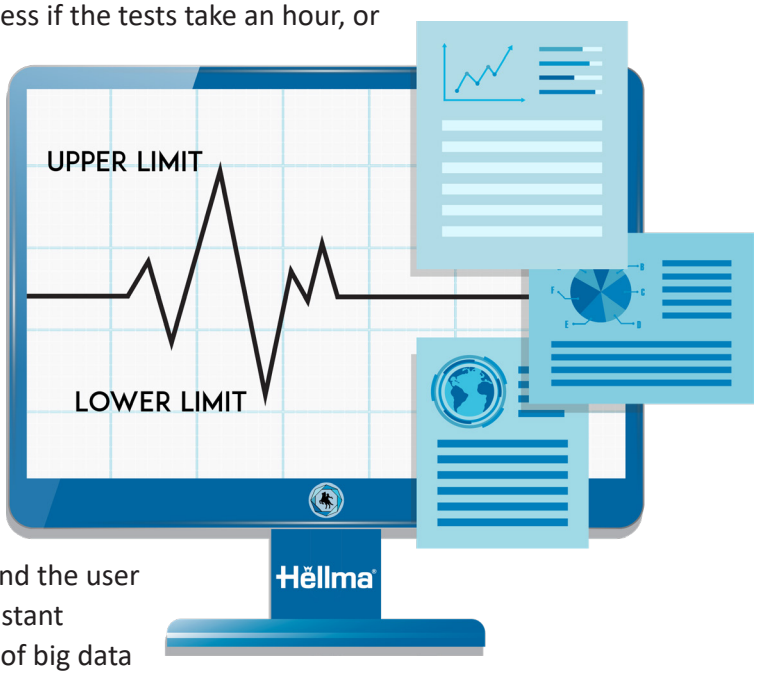
The first pitfall is that someone is going to have to physically retrieve a sample from the process and transport it to the lab, during which the sample has ample opportunity to be contaminated. Results may take hours to days to weeks. What happens to the process if the tests take an hour, or twenty-four, to give the users a result they can act on?



The idea of true process control is to actively monitor your processes. Many basic process tanks will monitor simple things, such as temperatures and pressures of all the lines and tank, to help ensure safe working conditions. However, many industries, have moved to putting in more complex technologies so that they can monitor the actual chemical processes that are occurring in their tank.

Spectroscopy allows monitoring of the chemical species within the process, and it can be apparent very quickly if an unwanted side-reaction is occurring and the user can react to correct the process. Beyond the value of instant insight, advanced process sensors also give the benefit of big data aggregation, where additional efficiencies and optimization can be gained over time as well.

The ultimate goal is to create a control system that is constantly monitoring the entire system, so that it can proactively, and automatically, change a parameter if something starts to go wrong. This automated learning would allow for a fully autonomous system that is efficient and safe.

This series of articles will focus on the benefits of using Spectroscopy as an analytical technique to monitor the processes in the various areas of Cannabis manufacturing, including the extraction, manufacturing, growers/breeding, and the dispensaries.

An expanded version of this article installment is available upon request.

Hellma USA, Inc has been serving the U.S. markets in spectroscopic accessories for over 50 years. They specialize in quartz manufacturing for the lab and probes for the process. Dr. Carrier has Ph.D. from University of Wisconsin – Madison in Physical Chemistry specializing in Spectroscopic techniques to monitor chemical reactions.