Freeze Drying Generics: Cost Advantages and Considerations

The FDA defines a generic drug as “a drug product that is comparable to a brand listed drug product in dosage form, strength, route of administration, quality and performance characteristics and intended use.” Generics are considered identical in dose, strength, route of administration, safety, efficacy, and intended use.

For a variety of reasons set out below, generic drugs are usually sold for significantly lower prices than their branded equivalents. Consequently generics have an appeal that is applicable to public and private healthcare systems in both developing and mature economies. The breadth of this appeal has resulted in massive growth in the generic sector.

The Market for Generic Drugs

The global generics market was estimated at about $225 billion in 2011. By 2016, the value of the total global generics sector is expected to have risen to $358 billion, representing more than 18% of all pharmaceuticals.

Cost Advantages

The cost advantage of generic products is derived from a number of sources:

- The generic manufacturer does not bear the costs of developing the active ingredients, obtaining regulatory approval, proving efficacy and safety and clinical trials. The absence of patent protection means that the generics market is extremely competitive.
- The active ingredients have already established a track record of patient benefit and engendering the confidence of those who make therapeutic decisions.

Against this backdrop, the imperative for successful generic production is ruthless management of production costs within a large scale manufacturing process that achieves robust, replicable and dependable results. The competition for market share amongst generic manufacturers means that there is no place for inefficient process within the profit margins expected in this sector of activity. The generic manufacturer must ask three key questions:

- Is my process the most efficient that it can be in terms of economies of scale, process optimization, reduction in process time and all the other factors that influence price per unit, in a cost scrutinizing environment?
- Does that process minimize batch loss, inconsistency and other factors that might lead to supply interruption?
- Is that production process founded upon a documented process whose development will pass regulatory scrutiny in as large a proportion of the market place as possible?

Benefits of Lyophilization

Many generic products pass through a lyophilization gateway, largely to provide product stability or to produce a production or dispensing formulation. Lyophilization (freeze drying) is sometimes a slow and expensive process and in this environment cost optimization is very relevant.

The purpose of lyophilization is to increase a product's shelf life and allow easier. The latter often avoids the complications of cold chain supply management, facilitates transportation of the products and increases patient compliance.

Many different pharmaceuticals are freeze dried. Lipophilic small molecules benefit from freeze drying because it creates an increased surface area of the dispersed drug in the porous cake. This can accelerate dissolution significantly and improve bioavailability. When used as an intermediate process step, freeze drying can also facilitate further handling during processing. Additionally, many biological compounds, such as larger peptides, proteins and antibodies, offer acceptable stability only as freeze-dried formulations.

Inefficiencies in Lyophilization

Over the years, lyophilization processes have been developed by trial and error, in a qualitative way. Sometimes the same process is applied to a series of products irrespective of any difference in their characteristics; at other times, the same cycle may be transferred from one freeze-drying system to another, without understanding how this may affect the performance of the cycle.

Bypassing the quantitative characterization of a freeze drying step within a process can have significant repercussions at three levels: financial, operational and regulatory.

- Serious issues with product activity, shelf stability and batch consistency and repeatability can go undetected until late in development. This can cause batch failure or expensive recalls.
- Long, overly conservative cycles are an expensive drain on energy and manpower resources. An optimal freeze-drying cycle ensures that energy consumption is kept to the lowest, as the cycle is the shortest possible and unnecessarily low temperatures are avoided. Also, ensuring operational efficiency increases batch turnaround time and therefore overall throughput.
- Quality control and regulatory requirements can cause further setbacks, when specification about the product and the suitability of the process are not readily available and justifiable. Finally, a good insight in the process step ensures that unexpected events can be mitigated or assessed and resolved rapidly.

This becomes all the more significant when dealing with generic drugs; as prices are lower, any opportunity to minimize cost of production to attain a maximal profit margin is essential.

To this end, a number of aspects must be looked at when optimizing lyophilization.

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