

**STUDY ON IDENTIFYING THE EFFECTS OF DRYER
PARAMETERS ON THE QUALITY OF SPRAY DRIED MILK
POWDER**

BY



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ABSTRACT

Spray drying is a process widely used to produce milk powders. In dried milk powder, it results with the good quality, low water activity, easier transport and storage, with good solubility properties. The quality of spray dried milk is quite dependent on the dryer plant operating parameters. Thus, an understanding these parameters which affect the dried milk powder quality is required for the process optimization in order to obtain dried milk powder with better sensory and nutritional characteristics and better process yield. In this context, the study was conducted in a two-stage spray drying plant at the newly established Milk Powder Plant in Pelwatta Dairy Industry with the aiming to study the deviations of dryer plant operating parameters from their standard design parameters and identify dryer plant operating parameters on the final quality of dried milk powder and find out the Fluidized Bed Dryer Efficiency. In the present study factors such as raw milk quality, Dryer Plant Operating Parameters, their deviations, problematic points and their effect on the final powder quality were studied.

In the experiment, Steam Pressure of Thermal Vapor Recompression (TVR) vs Time, Outlet Temperature of Direct Steam Injection (DSI) vs Time, Outlet Temperature of Pre-Heat Exchanger vs Time, Flash Vessels Temperature vs Time, Temperatures in Vapor Separators vs Time, First Calendria Jacket Temperature vs Time and Cooling Water Inlet Temperature vs Time in the Evaporation Section and Hot Air Inlet & Hot Air Outlet Temperatures vs Time and Dryer Chamber Vacuum vs Time in the Spray Dryer Section and Hot Air Inlet Temperature vs Time, Cool Air Inlet Temperature vs Time and Vacuum Pressure vs Time in the Fluidized Bed Dryer were observed to identify the problematic deviations among the parameters in comparison with their

recommended ranges. Then Final Powder Quality Viz In-solubility Index, Percentage of Moisture, and Bulk Density were also found out.

According to the experimental results, raw milk qualities didn't vary much. Dryer plant operating parameters in the evaporation section behaved under their recommended limits. As per the experimental results in the spray drying section, operating parameters of spray dryer also behaved under allowable limits. But, considerable problematic points were observed in the Fluid Bed Dryer section which led to the Average Moisture removal efficiency of Fluidized Bed Dryer was 12.87%. This showed that fluidized bed dryer was not working properly. Experiment conducted in the FBD revealed that moisture was not removed properly at the FBD heating section. The final outlet powder moisture should be 3.0-3.5% as per the plant recommended design. Therefore, solubility of milk powder was severely affected while reducing the agglomeration of powder particles due to this improper moisture removal. Poor temperature gradient and powder temperature variation were another problem in the fluidized bed dryer. Final experimental results clearly showed that moisture was added at cooling section rather than removing of moisture. This proved that, Fluidized Bed Dryer Dehumidifier was not working properly.

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