SOP Document

1. PURPOSE
   To provide a procedure for operating the steam sanitizer
2. SCOPE
   This SOP applies to the steam sanitizer and applies to all types of mucilloid and can be performed by any qualified Making Technician.
3. OVERVIEW
   In this process, raw psyllium husk is:
   - First screened to remove small impurities, and
   - Sanitized by being exposed to superheated steam for approximately two seconds while being pneumatically conveyed.

   The material exiting the Sanitizer process is referred to as "sanitized husk."   All Metamucil products undergo the same sanitization process.
4. STEPS
   The process begins with the gravity feed of Raw Husk from the Raw Material Bin to the Raw Material Hopper. The Steam Inlet Temperature is measured at the Inlet HPRV (High Pressure Rotary Valve) before the husk is directed into the steam sanitization pipeline. In this pipeline, the husk is exposed to high-pressure steam (Steam Pressure - 2.7 bar) and superheated steam, effectively eliminating microbes. Exiting the steam sanitization layer, the Steam Outlet Temperature is measured at the outlet HPRV, and the husk is then transferred to the Steam Cyclone. In the Steam Cyclone, hot air is introduced, causing a pressure drop to 1 bar for a brief period of 2-3 seconds. Subsequently, the husk proceeds to the Steam Sep Cyclone, where the Steam Sep Line Temperature is measured. This step facilitates the separation of steam from the husk, with the steam moving upward and the husk descending to the bottom into the Drying Cyclone. During this movement, the Transfer Cool Air Temperature is measured as cooling air is introduced to the husk in the Drying Cyclone to remove excess water content. The cooling air is also measured at this stage. The husk exits the cyclone and is directed to the product screener, where any large pieces are removed. From there, it is pneumatically conveyed to the milling process. Prior to milling, the Loss On Drying (LOD) is measured.
5. APPLICATION TOOL DETAIL
   The application consists of the following:
   5.1 Prediction – Based on the parameters selected by the user the LOD is predicted.
   5.2 Recommendation – The users can input the desired range of LOD and the application will provide the stepwise recommendations to change the controllable parameters
   5.3 Sensitivity Analysis – It showcase the impact of change in input parameters to the LOD
6. DEFINITIONS
   6.1 Steam Inlet Temp (° C) – Steam temperature of inlet
   6.2 Steam Outlet Temp (° C) – Steam temperature of Outlet
   6.3 Steam Sep Line Temp(° C) – Steam Sep line temperature
   6.4 Cooling Air (° C) – Cooling Air temperature
   6.5 Transfer cool air Temp (° C) - Transfer Cool air temperature
   6.6 Air Velocity (m/s) – Speed to the air
   6.7 Steam Pressure (bar) – Pressure of the Steam
   6.8 Feed Rate (kg/hr) – Rate of feeding in kgs per hour
   6.9 Swell Volume (ml) – Swell Volume
   6.10   % Thru 70 Mesh - % of sample, by mass, that goes through a 70 mesh sieve

6.11   % Thru 100 Mesh - % of sample, by mass, that goes through a 100 mesh sieve

6.12   % On 30 Mesh - % of sample, by mass, that remains on a 30 mesh sieve

6.13   % Raw Husk LOD – Loss of Drying % of Raw Husk

6.14   Ambient Temperature (° C) – Current Temperature

6.15   Ambient Humidity (%) – Current Humidity

6.16   LOD (%)– Loss on Drying (% moisture content)

7. INPUT AND OUTPUT

7.1 Input Variable: - Steam Inlet Temp, Steam Outlet Temp, Steam Sep Line Temp, Cooling Air, Transfer cool air Temp, Swell Volume, % Thru 70 Mesh, % Thru 100 Mesh, % On 30 Mesh, % Raw Husk LOD, Ambient Temperature, Ambient Humidity, Air Velocity, Steam Pressure, Feed Rate

7.2 Output Variable: - LOD

8. RANGES

Parameter	Target Ranges	Ideal Range
LOD		
Steam Inlet Temp	147 - 153 C	
Steam Outlet Temp	136 - 145 C	
Steam Sep Line Temp	115 - 125 C	
Cooling Air	63 - 125 C	
Transfer cool air Temp	40 – 125 C	
Feed Rate	1000 – 2000 Kg/hr	
Steam Pressure		2.7 bar
Air Velocity		30 m/s

9. PARAMETER TYPE

Controllable Parameter: - Steam Inlet Temp, Steam Outlet Temp, Steam Sep Line Temp, Cooling Air, Transfer cool air Temp.

Raw Material Properties: - Swell Volume, % Thru 70 Mesh, % Thru 100 Mesh, % On 30 Mesh, % Raw Husk LOD

External Parameter: - Ambient Temperature, Ambient Humidity