## With Ball Mill

| | Cleaning | Roasting and Cooling | Winnowing | Melangeuring | Conching | Milling | Tempering | Molding | Packaging | Remarks/Assumptions/Calculations/Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Processing Weight (Kg) | 200kg | 250kg | 450kg | 119kg | 2800kg | 1400kg | 200kg | 140kg | Mostly Outsourced | From Case |
| Time Taken (Mins) | 15mins | 90mins | 60mins | 75mins | 600mins | 300mins | 60mins | 60mins | Mostly Outsourced | From Case |
| Service Time (Min/Kg) | 0.075min/kg | 0.36min/kg | 0.13min/kg | 0.65min/kg | 0.21min/kg | 0.21min/kg | 0.3min/kg | 0.42min/kg | Mostly Outsourced | From Case |
| Capacity (Pre-Loss) (Kg/Hr) | 800kg/hr | 167kg/hr | 450kg/hr | 92kg/hr | 280kg/hr | 280kg/hr | 200kg/hr | 140kg | Mostly Outsourced | From Case |
| Yield (%) | 96% | 100% | 74% | 100% | 100% | 100% | 100% | 100% | Mostly Outsourced | From Case |
| Capacity (Post-Loss) (Kg/Hr) | 768kg/hr | 167kg/hr | 333kg/hr | 92kg/hr | 280kg/hr | 280kg/hr | 200kg/hr | 140kg/hr | Mostly Outsourced | From Case |
| Bottleneck | | | | Bottleneck | | | | | | Step with the Lowest Capacity, According to the Theory of Constraints |
| System Capacity (Kg/Hr) | | | | 92kg/hr | | | | | | Capacity of the Bottleneck - Melangeuring |
| Maximum System Output (Kg/Mth) | | | | 68.448kg/mth | | | | | | Assume 24 hours and 31 days per mth |
| New Output Required Before Yield Loss at System Capacity (Kg/Hr) | 129kg/hr | 124kg/hr | 124kg/hr | 92kg/hr | 92kg/hr | 92kg/hr | 92kg/hr | 92kg/hr | 92kg/hr | Quantity each step needs to produce, accounting for yield loss |
| New Utilisation at Max Capacity | 17% | 74% | 37% | 100% | 33% | 33% | 46% | 66% | Assume Sufficient from Outsourcing | Current Output Required Divided by Capacity (Post Loss) |
| Minimum Working Hours (Hrs/Wk) | 28hrs/wk | 124hrs/wk | 62hrs/wk | 168hrs/wk | 55hrs/wk | 55hrs/wk | 77hrs/wk | 110hrs/wk | Assume Sufficient from Outsourcing | Based on New Utilisation at Max Capacity |
| Proposed Shift Hours (Shifts Per Day Per Week) | One Eight Hour Shift, Four Days a Week | 24 Hours a Day, Six Days a Week | Two Eight Hour Shifts, Four Days a Week | 24 Hours a Day, Seven Days a Week | One Eight Hour Shift, Seven Days a Week | One Eight Hour Shift, Seven Days a Week | Two Eight Hour Shifts, Five Days a Week | Two Eight Hour Shifts, Seven Days a Week | Assume Sufficient from Outsourcing | Number of Hours Each Week Based on Shift |
| New Inventory Build-Up (Assessed) | Yes | No | Yes | No | No | Yes | Yes | No | No | Assume Inventory Build-Up when Preceeding Step has Higher Capacity than Next Step; Ignore Rigidities by Time and Space |
| Current Output Required Before Yield Loss at System Capacity (Kg/Hr) | 76kg/hr | 73kg/hr | 73kg/hr | 54kg/hr | 54kg/hr | | 54kg/hr | 54kg/hr | 54kg/hr | From Base Case |
| Current Utilisation at Max Capacity | 10% | 44% | 22% | 59% | 100% | | 27% | 39% | Mostly Outsourced | From Base Case |
| Current Shift Hours (Shifts Per Day Per Week) | One Eight Hour Shift, Seven Days a Week | One Eight Hour Shift, Seven Days a Week | One Eight Hour Shift, Seven Days a Week | Two Eight Hour Shifts, Seven Days a Week | 24 Hours a Day, Seven Days a Week | | Two Eight Hour Shifts, Seven Days a Week | Two Eight Hour Shifts, Seven Days a Week | One Eight Hour Shift, Six Days a Week | From Base Case |
| Current Working Hours (Hrs/Wk) | 56hrs/wk | 56hrs/wk | 56hrs/wk | 112hrs/wk | 168hrs/wk | | 112hrs/wk | 112hrs/wk | 48hrs/wk | From Base Case |
| Current Worker Utilisation at Max Capacity | 33% | 33% | 33% | 67% | 100% | | 67% | 67% | 29% | From Base Case |
| Current Inventory Build-Up (Assessed) | Yes | No | Yes | Yes | No | | Yes | No | No | From Base Case |

## Without Ball Mill

| | Cleaning | Roasting and Cooling | Winnowing | Melangeuring | Conching | Tempering | Molding | Packaging | | Remarks/Assumptions/Calculations/Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Processing Weight (Kg) | 200kg | 250kg | 450kg | 119kg | 2800kg | 200kg | 140kg | Mostly Outsourced | | From Case |
| Time Taken (Mins) | 15mins | 90mins | 60mins | 75mins | 2880-4320mins | 60mins | 60mins | Mostly Outsourced | | From Case |
| Service Time (Min/Kg) | 0.075min/kg | 0.36min/kg | 0.13min/kg | 0.65min/kg | 1.03-1.54min/kg | 0.3min/kg | 0.42min/kg | Mostly Outsourced | | From Case |
| Capacity (Pre-Loss) (Kg/Hr) | 800kg/hr | 167kg/hr | 450kg/hr | 92kg/hr | 39-58kg/hr | 200kg/hr | 140kg | Mostly Outsourced | | From Case |
| Yield (%) | 96% | 100% | 74% | 100% | 100% | 100% | 100% | Mostly Outsourced | | From Case |
| Capacity (Post-Loss) (Kg/Hr) | 768kg/hr | 167kg/hr | 333kg/hr | 92kg/hr | 39-58kg/hr | 200kg/hr | 140kg/hr | Mostly Outsourced | | From Case |
| Bottleneck | | | | | Bottleneck | | | | | Step with the Lowest Capacity, According to the Theory of Constraints |
| System Capacity (Kg/Hr) | | | | | 54kg/hr | | | | | Actual Capacity is 39-58kg/hr , but Assume 54kg/hr since maximum output from case is stated as 40,000kg over 31 days, 24 hours a day |
| Maximum System Output (Kg/Mth) | | | | | 40,000kg/mth | | | | | From Case |
| Current Output Required Before Yield Loss at System Capacity (Kg/Hr) | 76kg/hr | 73kg/hr | 73kg/hr | 54kg/hr | 54kg/hr | 54kg/hr | 54kg/hr | 54kg/hr | | System Capacity of 54kg/hr, with Additional Output Required based on Percentage of Yield Loss in Steps 1 and 3 |
| Current Utilisation at Max Capacity | 10% | 44% | 22% | 59% | 100% | 27% | 39% | Mostly Outsourced | | Current Output Required Divided by Capacity (Post Loss) |
| Current Shift Hours (Shifts Per Day Per Week) | One Eight Hour Shift, Seven Days a Week | One Eight Hour Shift, Seven Days a Week | One Eight Hour Shift, Seven Days a Week | Two Eight Hour Shifts, Seven Days a Week | Three Eight Hour Shifts, Seven Days a Week | Two Eight Hour Shifts, Seven Days a Week | Two Eight Hour Shifts, Seven Days a Week | One Eight Hour Shift, Six Days a Week | | From Case |
| Current Working Hours (Hrs/Wk) | 56hrs/wk | 56hrs/wk | 56hrs/wk | 112hrs/wk | 168hrs/wk | 112hrs/wk | 112hrs/wk | 48hrs/wk | | Number of Hours Each Week Based on Shift |
| Current Worker Utilisation at Max Capacity | 33% | 33% | 33% | 67% | 100% | 67% | 67% | 29% | | Current Working Hours Divided by Maximum Number of Working Hours Per Week |
| Current Inventory Build-Up (Assessed) | Yes | No | Yes | Yes | No | Yes | No | No | | Assume Inventory Build-Up when Preceeding Step has Higher Capacity than Next Step; Ignore Rigidities by Time and Space |
| Remarks | | Each type of bean roasted separately, including cooling; currently understaffed | | | Two conches | | | | | |

## Base Case (Product Mix: 62% ONLY)

| | Cleaning | Roasting and Cooling | Winnowing | Melangeuring | Conching | Milling | Tempering | Moulding | Packaging | Remarks/Assumptions/Calculations/Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Processing Weight (Kg) | 200kg | 250kg | 450kg | 119kg | 2800kg | 1400kg | 200kg | 140kg | Mostly Outsourced | From Case |
| Time Taken (Mins) | 15mins | 90mins | 60mins | 75mins | 600mins | 300mins | 60mins | 20mins | Mostly Outsourced | From Case |
| Service Time (Min/Kg) | 0.075min/kg | 0.36min/kg | 0.13min/kg | 0.65min/kg | 0.21min/kg | 0.21min/kg | 0.3min/kg | 0.14min/kg | Mostly Outsourced | From Case |
| Capacity (Pre-Loss) (Kg/Hr) | 800kg/hr | 167kg/hr | 450kg/hr | 92kg/hr | 280kg/hr | 280kg/hr | 200kg/hr | 140kg | Mostly Outsourced | From Case |
| Yield (%) | 96% | 100% | 74% | 100% | 100% | 100% | 100% | 100% | Mostly Outsourced | From Case |
| Capacity (Post-Loss) (Kg/Hr) | 768kg/hr | 167kg/hr | 333kg/hr | 92kg/hr | 280kg/hr | 280kg/hr | 200kg/hr | 140kg/hr | Mostly Outsourced | From Case |
| Target Output (Kg/Hr) | 190kg/hr | 182kg/hr | 134kg/hr | 134kg/hr | 134kg/hr | 134kg/hr | 134kg/hr | 134kg/hr | 134kg/hr | Assuming 100,000kg Required over 31 days, 24 hours a day |
| Able to Produce Target Output Based on Capacity | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Assume Sufficient from Outsourcing | No if Capacity (Post-Loess) is Lower than Target Output |
| Need to Purchase Another Machine | No | Yes | No | Yes | No | No | No | No | Assume Sufficient from Outsourcing | Yes if Unable to Product Target Output Based on Capacity |
| New Capacity with Purchase of Additional Machine | | 334kg/hr | | 184kg/hr | | | | | Assume Sufficient from Outsourcing | Assuming Purchase of Additional Roasting and Cooling As Well As Melangeuring Machines |
| Utilisation Rate at Target Output | 25% | 54% | 40% | 73% | 48% | 48% | 67% | 96% | Assume Sufficient from Outsourcing | Target Output Divided by Capacity |
| Minimum Working Hours Per Week | 42hrs/wk | 92hrs/wk | 68hrs/wk | 122hrs/wk | 80hrs/wk | 80hrs/wk | 113hrs/wk | 161hrs/wk | Assume Sufficient from Outsourcing | Utilisation Rate Multiplied by 168 Hours Per Week |
| Proposed Shift Hours (Shifts Per Day Per Week) | One Eight Hour Shift, Six Days a Week | Two Eight Hour Shifts, Six Days a Week | Two Eight Hour Shifts, Four Days a Week | Three Eight Hour Shifts, Six Days a Week | Two Eight Hour Shifts, Six Days a Week | Two Eight Hour Shifts, Six Days a Week | Three Eight Hour Shifts, Five Days a Week | Three Eight Hour Shifts, Seven Days a Week | Assume Sufficient from Outsourcing | Minimum Number of Shifts to Meet Required Working Hours Per Week |
| New Inventory Build-Up (Assessed) | Yes | Yes | Yes | No | No | Yes | Yes | No | No | |