CRYOGENIC GRINDING

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INTRODUCTION

- Cryogenics – production by means of cold
- Cryogenic grinding is a method of powdering at sub-zero temperatures
- It employs a cryogenic process to embrittle and grind materials to achieve consistent particle size for a wide range of products.
- The cryogenic process also has a unique capability for recycling difficult-to-separate composite materials.
CRYOGENIC GRINDING PROCESS

• **SAMPLE PREPARATION**
• Cleaning of materials.
• Loading it in hopper through vacuum conveyor.
• Feeding in cryogenic screw.
• Chilling of materials with liquid nitrogen.
• Feeding of materials in pin mill.
• Grinding of materials in mill at low temperature and inert atmosphere.
• Extracting low temperature from grounded materials.
• Packing of materials in inert atmosphere.
PROPERTIES OF LIQUID NITROGEN
FOR WHICH MATERIALS IS COLD GRINDING ADVISABLE ??

• Samples with elastic behavior

• Samples with highly volatile constituents
DESCRIPTIONS OF PARTS OF GRINDING SYSTEM

• SCREW CONVEYOR
APPLICATIONS

- Grinding of heat sensitive or friable materials
- Powder coatings
- Plastics needing higher loadings of pigment and/or additives for compounding
- Recycling Rubber from Tires
- Adhesive coatings
- Specialty molding applications requiring smooth finishes
ADVANTAGES

- Efficient process
- Inertness
- Can grind smaller rubber particles down to below 200 micron
- Low capacity motors required
- Minimal loss of volatile components
- Regular particle size
- Reduced power consumption
- More uniform particle size distribution
DISADVANTAGES
<table>
<thead>
<tr>
<th>Disadvantages of Existing Grinding System</th>
<th>Advantages of cryogenic Grinding System</th>
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<tbody>
<tr>
<td>The heat is developed inside the grinding mill</td>
<td>Temperature below 0 0C inside the grinding mill</td>
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<tr>
<td>This heat, which developed during grinding, leads on the one hand to evaporation of the essential oils and on the other hand, heat-sensitive fats are melted. This is turn can lead to the grinding elements become grassy (oily) and clogged or even to machine blockages</td>
<td>Minimal loss of volatile components</td>
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<td>High energy consumption</td>
<td>Low energy consumption</td>
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<td>Existing grinding equipments more than two times recycle into the mill for required particle size.</td>
<td>Approx. 2 - 3 times higher grinding capacity</td>
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<td>Fire Risk</td>
<td>No Fire Risk</td>
</tr>
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<td>High capacity motors are required to grind the material</td>
<td>Low capacity motors are required to grind the material</td>
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<td>Air pollution due to evaporating essential oil into the atmosphere</td>
<td>No, evaporation of essential oil into the atmosphere</td>
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<td>No control on particle size</td>
<td>Particle size under control</td>
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CONCLUSION