SPECIALTY ADDITIVES FOR PLASTICS
Introduction

Together with our manufacturing partners, we are focusing on the next generation of High Performance Additives designed to substantially increase the shelf life of consumables (fruit, vegetables, meats, etc.), add environmental value to packaging and sustainable protection to wire & cable products.

Some of our products are unique, exclusive and patented, and all of our products are at the forefront of technological advances which make plastics safer, even more useful, and simply better!
Specialty Additives

1. FrescoPlus ™
2. PreservePlus ™
3. Anti-Microbial/Anti-Fungal (S)
4. Anti-Microbial/Anti-Fungal (O)
5. Oxo-Photobiodegradable
6. Photobiodegradable-(T)
7. UV Blocker
8. Anti-Drag/Anti-Scratch/ Print Plus
9. Anti-Corrosive
10. Anti-Static
11. Barrier
12. Anti-Fog
13. Ant Repellent
14. Rodent Repellent
FrescoPlus™ Additive

**Introduction:**

- Fruits, Vegetables, Cut Flowers & Meat are spoiled due to:
  - i. Ethylene generation. Ethylene acts as an auto-catalyst during ripening
  - i. Microbial attacks of bacteria, virus & fungi
  - ii. Unhygienic transport & storage conditions

*FrescoPlus™ Additive is an ideal solution to enhance shelf life of fruits, vegetables, cut flowers & meat by up to 100%.*
Unique Features:

1. Based on silver coated micro, inorganic particles
2. Increases the shelf and transit life of packed fruits, vegetables, cut flowers & meat by reducing ethylene concentration
3. Remains unconsumed while constantly working as a catalyst, hence gives long-term effect.
4. Effective at low addition levels
5. RoHS compliant
6. End Product certified by SGS for efficacy & food safety
7. Human safe, Eco-friendly
8. Compatible with respective polymers
9. Patented in many countries
10. Economical

Areas of Applications:

Plastic/Polymer Industry:
- Used as Master Batch in Packaging Products like Cling films, Liners, Containers, Bags etc..
- These products are used for packing fruits, vegetables, meat & cut flowers for local & export markets.
Life Extender Packaging Products

FrescoPlus™ Bags
FrescoPlus™ ZIP Bags
FrescoPlus™ Cling Film

FrescoPlus™ Containers

FrescoPlus™ and PreservePlus™ are Trademarks of Millan & Associates, LLC
In House testing of FrescoPlus™ Container

Lady’s Finger after 6 days of storage at ambient conditions

Plain Container

FrescoPlus™ Container

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In House testing of FrescoPlus™ Bags

Strawberry after 5 days of storage at ambient conditions

Control

FrescoPlus™ Bag

FrescoPlus™ and PreservePlus™ are Trademarks of Millan & Associates, LLC
In House testing of FrescoPlus™ Bags

Control

FrescoPlus™ Bag

Lemon after 13 days of storage at ambient conditions

FrescoPlus™ and PreservePlus™ are Trademarks of Millan & Associates, LLC
## COMPARATIVE DATA OF FrescoPlus™ BAGS

<table>
<thead>
<tr>
<th>FOOD PRODUCT</th>
<th>PLW (%) At Room Temperature</th>
<th>STORAGE DAYS At Room Temperature In FrescoPlus™ bags</th>
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<tbody>
<tr>
<td></td>
<td>Control bag</td>
<td>FrescoPlus™ bag</td>
</tr>
<tr>
<td>Strawberry (Sweet Charley)</td>
<td>10.04</td>
<td>6.19</td>
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<tr>
<td>Green grapes (Thompson seedless)</td>
<td>12.05</td>
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<tr>
<td>Black grapes (Sharad seedless)</td>
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<td>2.26</td>
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<td>Pomegranate (Bhagawa)</td>
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<td>Guava (Sardar)</td>
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<td>Lime (Kagzi)</td>
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<td>Bottle gourd</td>
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<td>Fenugreek</td>
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<td>Spinach</td>
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<td>Coriander leaves</td>
<td>40.85</td>
<td>9.45</td>
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<tr>
<td>Curry leaves</td>
<td>39.24</td>
<td>23.40</td>
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</tbody>
</table>
PreservePlus™ Additive

Introduction:

- Fruits, Vegetables, Cut Flowers & Meat are spoiled due to:
  i. Ethylene generation. Ethylene acts as an auto-catalyst during ripening
  ii. Microbial attacks of bacteria, virus & fungi
  iii. Unhygienic transport & storage conditions

PreservePlus™ Additive is a cost-effective solution to enhance shelf life of fruits, vegetables, cut flowers & meat by up to 40%
Unique Features:

1. Based on micro particles of modified zeolite
2. Increases the shelf & transit life of packed fruits, vegetables, cut flowers & meat by reducing ethylene concentration by adsorption, hence has limited life
3. RoHS compliant
4. Human safe, Eco-friendly
5. Compatible with respective polymers
6. Cost Effective

Areas of Applications:

Plastic/Polymer Industry:

- Used as Master Batch in Packaging Products like Cling films, Liners, Containers, Bags etc..
- These products are used for packing fruits, vegetables, meat & cut flowers for local & export markets.
In House testing of FrescoPlus™ & PreservePlus™ Bags

PreservePlus™ Bag

Control Bag

FrescoPlus™ Bag

Alphanso Mangoes after 17 days of storage at ambient conditions

FrescoPlus™ and PreservePlus™ are Trademarks of Millan & Associates, LLC
Anti-Microbial/Anti-Fungal Additive

Introduction:

- Pathogenic bacteria, protozoa and fungi - Cause of many infectious diseases
- Microbes - present in nearly everything that we handle daily, even in the air that we breathe!
- Effective dealing with harmful microbes to prevent infection & disease is a challenge

Anti-Microbial/Anti-Fungal Additive is an ideal solution to provide anti-microbial properties to the surface of polymers.
Unique Features:

1. Enriched with metallic silver particles & other additives in polyethylene wax
2. Imparts excellent bacterial and fungal-controlling properties on the surface of polymers
3. Remains unconsumed
4. Effective at low addition levels
5. RoHS compliant
6. End product certified by MICROCHEM LABORATORIES for efficacy
7. Human safe, Eco-friendly
8. Compatible with respective polymers
9. Economical

Areas of Applications:

Plastic/Polymer Industry:
- Used as Master Batch in inner liners of household appliances (refrigerators, microwaves, washing machines, air conditioners etc.), in toilet seats, car interiors & molded furniture, toothbrushes (body and bristles) etc..
Anti-Microbial/Anti-Fungal (O) Additive

Introduction:

- Micro-organisms live in all parts of the biosphere to fulfill vital roles in all ecosystems.
- In spite of their vitality - microbes like pathogenic bacteria, protozoa & fungi are the cause of many infectious diseases.
- Dealing effectively with harmful microbes to prevent infection & disease is a challenge.

Anti-Microbial/Anti-Fungal (O) Additive is a cost-effective solution to provide anti-microbial properties to the surface of polymers.
Unique Features:

1. Based on organic micro particles & other additives in polyethylene wax/or as powder.
2. Imparts excellent bacterial & fungal-controlling properties on surface of polymers
3. Effective at low addition levels (but less effective than AntiMicrobial-AntiFungal Additive)
4. Gives long-term effect
5. RoHS compliant
6. Human safe, Biodegradable, Eco-friendly
7. Compatible with respective polymers
8. Cost-effective

Areas of Applications:

Plastic/Polymer Industry:
- **Wax-based product** - used as Master Batch in inner liners of household appliances (refrigerators, microwaves, washing machines, air conditioners etc.), in toilet seats, car interiors & molded furniture, toothbrushes (body & bristles) etc..

- **Powder-based product** - finds wide applicability in pharmaceutical industries in topical formulations & in paint industry in various exterior-interior paint formulations.
Oxo-Photobiodegradable Additive

Introduction:

- Managing plastic waste is a big challenge.
- Most polymers do not degenerate for decades after land filling or by throwing as garbage.

Oxo-Photobiodegradable Additive is an ideal solution to facilitate bio-degradation of plastics in the presence of UV/Sunlight & Oxygen
**Unique Features:**

1. Based on mixture of transition metal salts & nano-titanium dioxide
2. Facilitates bio-degradation of plastics in the presence of UV/Sunlight & Oxygen
3. Plastic disposal becomes easy and safe
4. RoHS compliant
5. End product certified by CIPET (Central Institute of Plastic Engineering & Technology) for efficacy & by SGS for food safety
6. Effective at low addition levels
7. Ecologically safe
8. Compatible with respective polymers
9. Economical

**Areas of Applications:**

**Plastic/Polymer Industry:**
- Used as Master Batch in plastic materials during molding, extrusion or in blow molded components.
Photobiodegradable-(T) Additive

Introduction:

- Managing plastic waste is a big challenge.
- Most polymers do not degenerate after land filling or by throwing as garbage.

Photobiodegradable -(T) Additive is an ideal solution to facilitate bio-degradation of plastics in the presence of UV/Sunlight
Unique Features:

1. Based on nano particles of titanium dioxide
2. Facilitates bio-degradation of plastics in the presence of UV/Sunlight
3. Plastic disposal becomes easy and safe
4. RoHS compliant
5. Effective at low addition levels
6. Ecologically safe
7. Compatible with respective polymers
8. Economical

Areas of Applications:

Plastic/Polymer Industry:
- Used as Master Batch in plastic materials during molding, extrusion or in blow molded components.
Introduction:

- Plastics - used extensively in various ranges of products due to their relatively low cost, ease of manufacture, versatility & imperviousness to water.
- Degradation of plastic is not desirable in applications where the polymers are extensively exposed to UV/sunlight.
- To avoid plastic degradation, UV Stabilizers based on Benzophenone and HALS are used.
- UV Stabilizers based on both these compounds are consumables. Hence their usage is as high as 6000 ppm.

**UV Blocker Additive is an ideal solution to retard UV degradation of plastics.**
Unique Features:

1. Based on surface modified nano-titanium dioxide
2. Blockage of UV between 200 – 400 nm range
3. Retards UV degradation of plastics
4. Life-long effectivity (Non consumable)
5. Effective at a lower concentration of 1000 ppm
6. Same addition level in all climatic conditions
7. RoHS compliant
8. Ecologically safe
9. Compatible with respective polymers
10. Economical
Areas of Applications:

Plastic/Polymer Industry:

- Used as Master Batch in plastic materials during molding, extrusion or in blow molded components.
- It can be used in Green house films, mulching films, protective films, molded furniture, molded luggage, canal lining films, molded auto components, etc..

Dosage:

<table>
<thead>
<tr>
<th>Additive in LLDPE, PBT, PS or other polymers</th>
<th>Concentration in final product (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV Blocker Additive</td>
<td>100</td>
</tr>
</tbody>
</table>
Introduction:

- Polymers face resistance from moulds or dies while molding or extrusion operations
- Solution - slipping agents based on oils, silicon or waxes are added for lubrication
- Drawback - They tend to migrate on the surface of polymers causing dusting, reduced printability, blocking etc..

Anti-Drag/Anti-Scratch/Print Plus Additive is an ideal solution to improve the processibility of polymers.
Unique Features:

1. Based on treated silica nano-spheres
2. Does not contain wax or silicone oil
3. Reduces drag during extrusion & molding
4. Improves scratch resistance
5. Improves printability & seal-ability
6. RoHS compliant
7. Effective at low addition levels
8. Ecologically safe
9. Compatible with respective polymers
10. Economical

Areas of Applications:

Plastic/Polymer Industry:

- Used as Master Batch in blowing, molding or extrusion operations.
Anti-Corrosive Additive

Introduction:

- All ferrous & non-ferrous metals are prone to atmospheric corrosion in presence of oxygen and moisture.
- The oxidation needs acidic pH.

*Anti-Corrosive Additive is an ideal solution to prevent surface corrosion of packaged components.*
Unique Features:

1. Based on weak acid salts of aliphatic amines incorporated in wax
2. Prevents surface corrosion of packed components
3. RoHS compliant
4. Human safe, Ecologically safe
5. Compatible with respective polymers
6. Economical

Areas of Applications:

Plastic/Polymer Industry:

- Used as Master Batch in films used for packing/protecting of auto or other mild steel components.
Anti-Static Additive

Introduction:

- During processing, polymers can accumulate static charge on their surface due to shear-generating production equipment.
- This can hinder production operations & degrade final intended use of the polymer.
- It can also pose serious fire hazard in solvent-based applications.

**Anti-Static Additive is an ideal solution to eliminate static charge accumulation on surfaces.**
Unique Features:

1. Based on poly-functional hydrophilic polymer
2. Makes the surfaces hydrophilic which permanently stops accumulation of static charge on the surface
3. Avoids dust accumulation on film surfaces
4. Easy film roll unwinding
5. Reduces fire hazard
6. Not extractable by water contact
7. RoHS compliant
8. Human safe
9. Compatible with respective polymers
10. Economical

Areas of Applications:

Plastic/Polymer Industry:

- Used as Master Batch in films
- It is used for improving surface hydrophilicity of polyolefin films which stops accumulation of static charge on the surface & reduces fire hazard
Barrier Additive

Introduction:

- Plastics are widely used for packaging due to attributes like flexibility, clarity, low-cost, shelf appeal, ease of transport, storage & use
- All forms of plastics are permeable which may hinder their storage performance for food materials, corrosive components etc.. They may also affect printability of polymers.
- Hence, it is important to have barrier property to the movement of gas/liquid molecules through the plastic matrix comprising the package.

Barrier Additive is an ideal solution to decrease permeability of polymers for any material (like gases-$O_2$, Water, Fatty acids or Bases) by a factor of approximately 100 for 10 micron thickness.
**Unique Features:**

1. Based on surface modified inorganic platelets with very high aspect ratio.
2. Drastically reduces permeability of all diffusing molecules like oxygen, water, oils, fatty acid etc..
3. Helps to maintain printability & seal-ability of the plastic
4. RoHS compliant
5. Food safe, Ecologically safe
6. Compatible with respective polymers
7. Economical

**Areas of Applications:**

**Plastic/Polymer Industry:** As master batch –

- In films for reduced permeability of packaging materials for decreased diffusion of free fatty acids in vegetable oils, improved printability of plastics & retention of print matters
- For packaging of fried & baked foods like biscuits, wafers etc.. This prevents spoilage of foods due to oxidative or hydrolytic rancidity & sogging
- For packaging of bread. It retains the softness of bread.
- For packaging of fruits & vegetables. This prevents spoilage due to oxygen degeneration
- To improve overall barrier properties of plastic materials
In-House test of Barrier Property (LDPE films exposed to Hexane)

Diffusibility at 24°C to 30°C.

- For Control Film - 0.482 gms /cm² /day.
- For (1%) Barrier Film - 0.391 gms /cm² /day.

Bulging indicates prevention of diffusion of hexane vapors.
Areas of Applications:

Plastic/Polymer Industry:
• Used as Master Batch in domestic/industrial cables, drip irrigation pipes, automobile cables etc..

Dosage:

<table>
<thead>
<tr>
<th>Additive in LLDPE, PBT, PS or other polymers</th>
<th>Concentration in final product (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rodent Repellent Additive</td>
<td>500-1000</td>
</tr>
</tbody>
</table>
Contact Us

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