



# MORSTILLE<sup>®</sup> 18C DSTDP

## ANTIOXIDANT

### COMPOSITION

Morstille<sup>®</sup> 18C DSTDP is a thioester synergist that is particularly effective as a long-term heat aging stabilizer when used in conjunction with primary antioxidants. Morstille<sup>®</sup> 18C DSTDP is highly effective in polypropylene, ABS, and high density polyethylene. Morstille<sup>®</sup> 18C DSTDP is a nonvolatile stabilizer and offers low oral and dermal toxicity.

<b>PROPERTIES</b>	<b>TYPICAL VALUES</b>
Empirical Formula	C <sub>42</sub> H <sub>82</sub> O <sub>4</sub> S
Molecular Weight	682
Appearance	white pastilles
Acid Number	<1
Assay (%)	99
Molten Color (APHA)	20
Freezing Point (°C)	65
Physiological Behavior	Refer to safety data sheet
Packaging	44 lb. PE bag / 1,100 lb. skid 20 kg. PE bag / 500 kg. skid

### RECOMMENDATIONS FOR APPLICATION

1. Morstille<sup>®</sup> 18C DSTDP is especially recommended to protect polypropylene from oxidation in high temperature applications.
2. Morstille<sup>®</sup> 18C DSTDP is very effective in high density polyethylene and other polymers.
3. For applications requiring superior heat stability, a combination of a hindered phenolic antioxidant and Morstille<sup>®</sup> 18C DSTDP should be used. It has been found that a combination of three parts of Morstille<sup>®</sup> 18C DSTDP to one part of hindered phenolic antioxidant often provides optimum performance. Typical use levels are 0.15% of Morstille<sup>®</sup> 18C DSTDP and 0.05% of phenolic antioxidant. It is recommended that specific end use formulations be optimized with regard to thioester synergist ratio and use level.

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**INTRODUCTION**

The mechanism of oxidative polymer degradation is a radical chain process. The degradation process is initiated by the formation of a polymer free radical. This radical can be formed by the homolytic rupture of a chemical bond in the polymer. The initiation can be catalyzed by a variety of factors, such as ultraviolet radiation, ionizing radiation, heat and mechanical processing. Once the polymer radical has formed, it can react with oxygen to form a variety of oxygenated radical species. Initially, many of these species can propagate the decomposition process by yielding a radical which decomposes and by doing so can either cause oxidative chain scission or cross-linking.

The function of antioxidants is to inhibit the formation of the radical species. Hindered phenolic antioxidants are usually considered as chain terminators. Thioester synergists are believed to function in a variety of ways -- as hydroperoxide or peroxide decomposers and as a means of regenerating the primary antioxidant.

The term “synergist” is applied to Morstille® 18C DSTDP because when it is used in combination with a hindered phenolic antioxidant, the stability is much greater than the sum of the individual components.

**THERMAL STABILITY**

Morstille® 18C DSTDP has been processed at temperatures as high as 600°F without excessive color formation or loss of stabilizer. Morstille® 18C DSTDP is thermally stable and little decomposition occurs after heating at 550°F for extended periods of time.

The resistance of Morstille® 18C DSTDP to discoloration and volatilization is important as temperatures in this range are being encountered in modern plastic processing.

**CHEMICAL PROPERTIES**

Morstille® 18C DSTDP is a relatively inert plastic additive and does not react with most commonly used plastic additives.

**VOLATILITY**

Morstille® 18C DSTDP is a relatively nonvolatile stabilizer. At elevated processing temperatures, losses via volatilization will be relatively low for Morstille® 18C DSTDP.

ADDITIVE	WEIGHT LOSS @ 200°C
Morstille® 18C DSTDP	<1 %
2,6-ditertiarybutyl p-cresol	50 %

**COMPATIBILITY**

Compatibility of plastic additives implies good solubility, non-migration to the surface and permanence under conditions of use.

Generally hindered phenolic antioxidants are quite compatible in polypropylene at their normal use levels, e.g., 0.02 to 0.3%. Thioesters differ in this respect with Morstille® 18C DSTDP approaching the limits of compatibility at levels above 0.4%.

The test specimens were stored at room temperature and examined for exudation. The first signs of exudation were recorded and are listed in the following table:

<b><u>Compatibility of MORSTILLE® 18C DSTDP in Polypropylene</u></b>	
ADDITIVE LEVEL (%)*	DAYS TO EXUDATION
0.4	30
0.6	20
0.8	12
1.2	10
1.4	2

*\*All samples contained 0.1% of a hindered phenolic antioxidant and 1% carbon black.*