



## Ready Reckoner- Application Overview

Use of Termirepel<sup>®</sup>™ in Wire and Cable based Applications

## C Tech Corporation

Product Specialization Group

Generic Requirements

**Termirepel<sup>®</sup>™**, non toxic, non hazardous and environmentally friendly anti termite master batches

A brief overview on the use of Termirepel<sup>®</sup>™ in Wire and Cable based Applications

## TECHNICAL NOTE

### **TERMIREPEL®™ FOR WIRE AND CABLE APPLICATIONS**

Termirepel®™ is a non-toxic, non-hazardous, environmentally safe additive specially developed for use as a master batch in polymeric applications as well as in coating applications.

Termirepel®™ does not kill but keeps the pests away by making use of the sensory mechanisms. It is a product of Green Technology and is applicable for a variety of uses in a multitude of sectors.

It is a broad spectrum aversive adept at repelling all species of termites as well as about 600 species of pests including termites, caterpillars, red and black ants, aphids, leafhoppers, beetles, mites, leaf borers and many more.

Wires and cables are especially susceptible to damage from termites. Termites not only attach natural materials like wood but even polymers and other synthetic materials. Buried cable networks especially are the most affected by subterranean termites.

#### **❖ LOSSES DUE TO TERMITE ATTACK IN WIRE AND CABLE PROJECTS**

Termites are one of the major causes of polymer damage. Electric wiring, plug switches and switchboards are all damaged by termites. The insects make mud tunnels from the nest to the surrounding structures. Termites have been known to damage utility poles, concrete electrical vaults, traffic



control switch boxes, the seals on high-pressure water lines, foam and fiberglass insulation, wooden bridges, railroad ties, wharves, pilings under buildings, lime brick mortar, caulk, felt paper, roofing material, lead, copper, books, paintings, furniture and plastic pool liners.

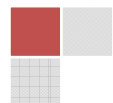
Underground and above ground wires as well are susceptible to termite damage. Subterranean termites and other insects are known to feed on wires and cables which may be laid underground for transmission of



information and communication purposes. This can lead to short circuits due to the exposed wires. Termites secrete Formic acid which damages the wires and cables. Studies have indicated that other insects also damage wires and cables made from copper, iron and aluminum. This damage needs to be addressed.

Gas pipelines especially used in the city gas distribution systems are prone to attacks by aggressive subterranean termites and also other insects, as they are made of polymeric material. These pipelines are important as they are used to transport natural gas over long distances and thus can be dangerous in case of a gas leak. Hence this problem needs to be addressed

The current termiticides used are toxic and do not effectively solve the termite problem. Also their toxic and harmful nature prevents their use in a variety of applications. They also cannot be extruded along with wires and cables as they aren't compatible with polymer processing procedures and temperatures



## ❖ SALIENT FEATURES

- Non-toxic
- Non- hazardous
- Environmentally safe
- Acts as an aversive
- Large life span of 5-40 years
- Thermally stable at temperatures as high as 1400 °C
- Does not leach into Groundwater and soil
- Does not volatize
- No harmful fumes
- Available as a LDPE and EVA masterbatch
- Can be customized according to customer requirement
- Inert in the polymer matrix
- Does not degrade in soil
- Chemically Stable
- Hazardous polymerization not likely to occur
- Not harmful if accidentally inhaled or ingested
- Safe to add in pipes used for drinking water

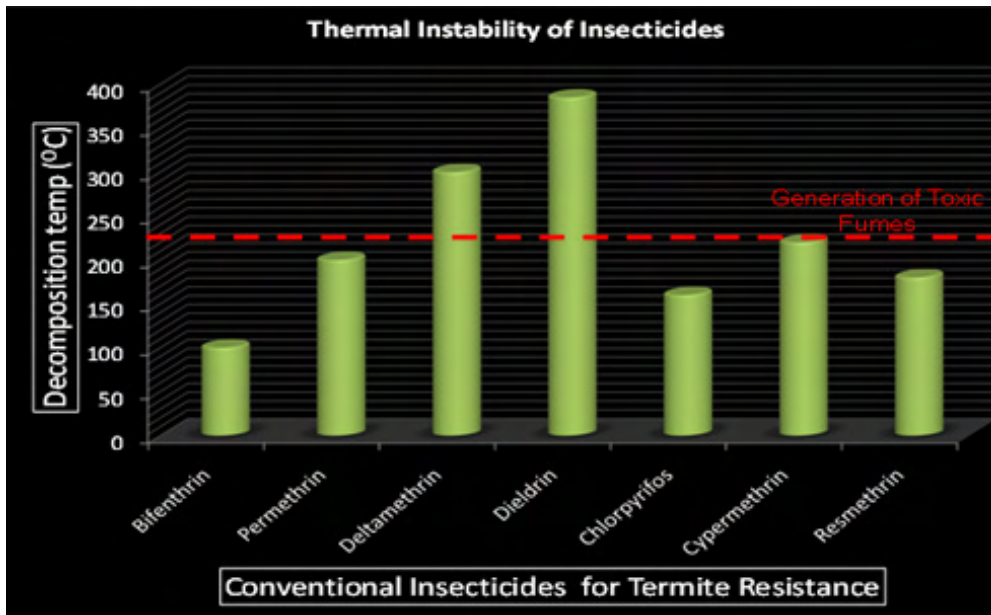
## ❖ THERMAL STABILITY

Most of the termiticides and pesticides used volatize at high temperatures releasing harmful fumes. As temperature increases, vapor hazards increase. The vapors from many pesticides increase three to four times for each 10 C increase in temperature.



Termirepel®™ is designed to withstand the high temperature of polymer processing. Termirepel®™ is stable up to 1400 C and hence is safe to use in severe temperature conditions.

Thus Termirepel®™ can safely be used even in high temperature applications with complete stability.



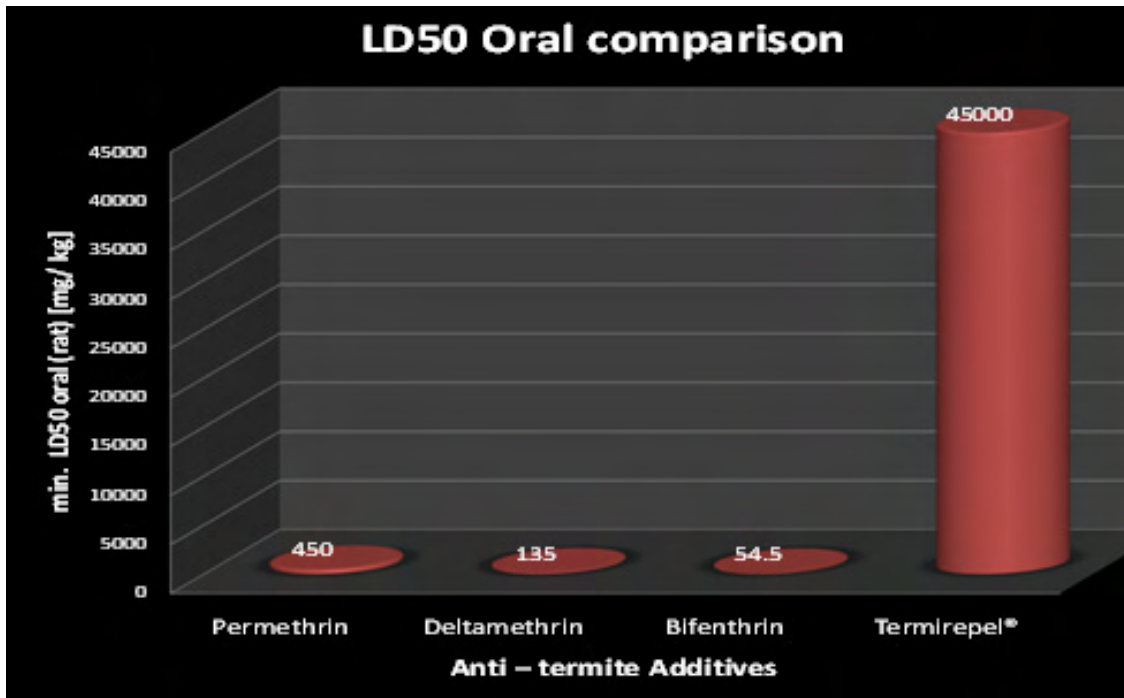
Thermal instability of commonly used insecticides

### ❖ NON-TOXICITY

The Lethal Dose and Lethal Concentration are used to determine the toxicity of most chemicals. The testing is mostly done with termites and mice. The LD50 is a method to measure the toxicity of a material. It is the amount of a chemical substance per 100 grams or per kilogram of the weight of the test animals that would cause the death of half (50%) of the test species.



Lower the LD50 value, higher is the toxicity as lesser quantity of the substance is enough to cause toxic effects. Termirepel®™ has a very high LD50 value thus showing its non toxic nature.



The non-toxicity of Termirepel®™ when compared with harmful termiticides

❖ CRITICAL PARAMETERS

Sr. No.	Property	Test	Limits prescribed
1	Effectiveness	Anti-termite testing for evaluating the bioefficacy of the finished sample comprising of Termirepel®™	Weight loss < 2% Average gnawing factor < 0.02
2.	Non toxicity	Oral LD50 tests for	Acute Oral LD50 ( rat) >



		evaluating the toxicity of the masterbatch	8000mg/kg
3.	Long life span	Accelerated ageing tests followed by anti-termite bioefficacy test to check the termite repellence of the aged cables	Weight loss < 3% Average gnawing factor < 0.025 ( Here initial weight would be the weight of the aged cable sample)
4	Compatibility	<p>Tests to ensure the mechanical properties of the finished sample are not affected</p> <p>For wet core cable:</p> <ul style="list-style-type: none"> <li>- Proof test for minimum strain level</li> <li>- Peak Stripability force to remove primary coating of the fiber</li> <li>- Dynamic Tensile Strength</li> <li>- Dynamic Fatigue</li> <li>- Static Fatigue</li> <li>- Fiber Macro bend</li> </ul>	<p>1%</p> <p><math>1.3 \leq F \leq 8.9 \text{ N}</math></p> <p>Un-aged: <math>\geq 550 \text{ KPSI}</math> (3.80 Gpa) Aged: <math>\geq 440 \text{ KPSI}</math> (3.00 Gpa)</p> <p><math>\geq 20</math></p> <p><math>\geq 20</math></p> <p>Fiber is coiled with 100 turns on <math>30 \pm 1.0 \text{ mm}</math> radius mandrel:</p> <ul style="list-style-type: none"> <li>- <math>\leq 0.05 \text{ dB}</math> at 1550nm</li> <li>- <math>\leq 0.5 \text{ dB}</math> at 1625nm</li> </ul> <p>Fiber is coiled with 1 turn around <math>32 \pm 0.5 \text{ mm}</math> diameter mandrel:</p> <ul style="list-style-type: none"> <li>- <math>\leq 0.5 \text{ dB}</math> at 1550nm</li> <li>- <math>\leq 1.0 \text{ dB}</math> at 1625nm</li> </ul>



		<ul style="list-style-type: none"> <li>- Fiber Curl</li>   <li>For Dry core cable:</li> <li>- Tensile strength Test</li> <li>- Abrasion Test</li> <li>- Crush Test (Compressive Test)</li> <li>- Impact Test</li> <li>- Repeated Bending</li> <li>- Torsion Test</li> <li>- Kink Test</li> <li>- Cable Bend Test</li>   <li>- Temperature Cycling (Type Test)</li> <li>- Cable aging Test (Type Test)</li> <li>- Water Penetration Test (Type Test)</li> <li>- Test of Figure of 8 (Eight) on the cable (Type Test)</li>   <li>- Flexural Rigidity Test on the optical fiber cable (Type Test)</li> <li>- Static Bend test (Type Test)</li>   <li>- Cable Jacket Yield Strength And Ultimate Elongation</li> </ul>	<p>≥ 4 meters radius of curvature</p> <p>Strain &lt; 0.25%, change in attenuation &lt; 0.05 dB</p> <p>No perforation &amp; loss of eligibility of the marking on the sheath.</p> <p>Change in attenuation ≤ 0.05 dB</p> <p>Change in attenuation ≤ 0.05 dB</p> <p>Change in attenuation ≤ 0.05 dB</p> <p>Change in attenuation ≤ 0.05 dB</p> <p>Change in attenuation ≤ 0.05 dB</p> <p>Change in attenuation ≤ 0.05 dB, sheath will not show any cracks visible to the naked eye</p> <p>Change in attenuation ≤ 0.05 dB</p> <p>Increase in attenuation ≤ 0.05 dB</p> <p>Seepage of water shall not be more than 1 meter</p> <p>It shall be possible to make figure of 8 of minimum 1000 meters of the cable uncoiled from the cable reel without any difficulty. No visible damage shall occur.</p> <p>Change in attenuation ≤ 0.05 dB, sheath will not show any cracks visible to the naked eye</p> <p>Change in attenuation ≤ 0.05 dB, sheath will not show any cracks visible to the naked eye</p> <p>Un-aged: Minimum elongation 400%</p> <p>Aged: minimum elongation 375%</p>
--	--	--	---





❖ **APPLICATIONS:**

Termirepel®™ can be customized for use in the following ways

➤ **Fibre Optic Cables**

Termirepel®™ can be added to fibre optic cables to protect them against termite damage. It is useful in the transmission sector as well as the railway signaling sector.



➤ **Gas Pipelines**

Sensitive gas pipelines if damaged by termites can leak out the gas causing fire hazards. Termirepel®™ added to the gas pipes prevents termites from damaging them.

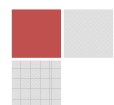


➤ **Signaling Cables**

Railway signaling is one of the most important applications in which Termirepel®™ can be used. Outdoor railway signaling cables are suitable for control purpose in power & switching stations. Metallic armoring or fibre reinforced plastics, usually used are expensive and limit cable flexibility. Termirepel®™ is both effective at preventing the damage due to termites and also not affected by the problems that affect metallic armoring and fibre reinforced cables.

➤ **Utility Poles**

Termites also damage electric poles. They eat through the bottom of the poles and can also hollow out the entire interior of the pole. This can cause the poles to fall and cause accidents. There have been many instances of



termites damaging communication lines and compromising high-voltage cables. Termirepel®™ added utility poles protect them from termite attack.

➤ **Underground Telephone Lines**

Termites and other insects also chew through plastic, rubber and lead to get to paper insulation in the telephone cable, destroying the pressure seal on the cable and exposing it to water damage. This hinders communication. Termirepel®™ added telephone lines can be protected from this damage.



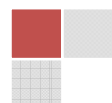
➤ **Power Lines**

In New Orleans, USA there have been instances of termites having eaten into power lines - carrying 15,000 or 24,000 volts chewing through plastic, rubber and lead to get to paper insulation wrapped around copper wiring. Water eventually floods the cable and causes an explosion. At more than half of the sites where blowouts occur, Formosan termites have been found in adjacent manholes or their mud trails running along the cables. This damage to the power cables and the subsequent loss can be prevented by using power cables to which Termirepel®™ has been added to protect against the termites.



❖ **SAFETY AND VERSATILITY**

- Termirepel®™ is thermally stable and does not degrade on exposure to heat and light. It is soil stable and does not leach out to pollute the soil or air.



- It is completely inert in the polymer matrix apart from performing its main function of acting as an aversive.
- It is compatible with a number of polymeric bases depending on the end application
- Termirepel®™ is RoHS and REACH compliant and FIFRA exempted.



[www.ctechcorporation.com](http://www.ctechcorporation.com)

