

# **Phos-Chek® Fire Retardants For Use in Preventing & Controlling Fires in Wildland Fuels**

## **Frequently Asked Questions**

### **ICL PERFORMANCE PRODUCT'S COMMITMENT TO SAFETY**

ICL Performance Products, LP is a strong advocate of the American Chemical Society's Responsible Care initiative. We strive to design, develop, manufacture and market our products in a manner that meets societal needs while posing no undue risk to human health or the environment during all stages of the product's life cycle. In addition, we continuously work with customers to ensure that these principles are followed during the product's use and ultimate disposal.

These principles are of particular importance when dealing with wildland fire retardants that, during their expected use, come into contact with people, wildlife and the environment. ICL encourages the practice of good industrial hygiene during handling of the Phos-Chek Fire Retardant concentrates and solutions and good common-sense practices in their end-use in fire prevention, management and control. The Material Safety Data Sheet (MSDS) should always be consulted as the primary source of health and safety information. This document provides additional guidance on the handling and use of Phos-Chek wildland fire retardants.

### **WHAT IS IN THE PHOS-CHEK WILDLAND FIRE RETARDANTS?**

The Phos-Chek brand wildland fire retardant concentrates are supplied for use on wildland fuels in two general forms, i.e., dry powders and liquids concentrates. The active fire retarding component in both retardant concentrate types is either ammonium phosphate or ammonium polyphosphate. In addition to the fire retarding component(s), the Phos-Chek retardants contain relatively small quantities (5 to 15%) of performance additives including one or more of the following: a gum thickener, a flow conditioner, a color pigment and corrosion inhibitors. Also, both types of retardant concentrates are mixed with water to form relatively dilute (10 to 15%) solutions prior to use in fire prevention, prescribed burning or suppression.

The dry powder concentrates utilize one or a combination of the following as their active fire retardant salt; monoammonium phosphate and diammonium phosphate. These free flowing dry-powders are mixed and dissolved in water prior to their use. The resultant solutions are easily pumped liquids varying in color (red, fugitive orange/red or uncolored/clear) and/or viscosity.

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The liquid concentrate type retardants utilize water solutions of ammonium polyphosphates as the active fire-retarding component. These concentrated liquid retardants are supplied to the user as low viscosity liquids that are easily diluted to use concentration prior to application for their intended use. The Phos-Chek® liquid concentrates result in low viscosity, red colored, gum-thickened solutions following dilution.

There are grades of Phos-Chek wildland fire retardant that can be supplied for application from fire hose, fire trucks, helicopters equipped with either buckets or fixed tanks and from fixed-wing aircraft. These retardants are, for the most part, compositionally similar to each other. They vary primarily in the ratio of the components that alter the solution characteristics dependent on the mode of application, e.g., higher or lower viscosity, presence, absence or type of color, etc.

### **HOW DO PHOS-CHEK WILDLAND FIRE RETARDANTS WORK?**

The retardant solution is applied on threatened vegetation in the form of a chemical firebreak in front of an approaching fire. This solution coats the fuel and then, as the fire gets closer and the water contained in the retardant solution evaporates, the fire retardant component reacts with the cellulose present in the woody material, grass, needles and other matter which normally provide fuel for the fire. (The water contained in the fire retardant solution functions only as a carrier for the fire retardant, evaporating before arrival of the fire and, consequently, contributing little in terms of fire retardancy.) As heating continues, the fire retarded material decomposes giving off water vapor that cools the fire and leaves behind a black, graphite-like, non-flammable carbon coating which both insulates and restricts air flow to any residual fuels. When this occurs, the intensity of the fuel-starved fire decreases and control is much easier to achieve.

Any fire retardant residue that is not consumed in the fire will continue to be effective in preventing ignition and flame spread until removed from the fuel by wind, flexing or rainfall. The amount of rainfall necessary will vary with intensity and frequency. Reapplication should be considered after more than 1/8<sup>th</sup> inch of rainfall and/or violent winds.

### **ARE PHOS-CHEK® RETARDANTS HAZARDOUS?**

Prior to mixing with water, Phos-Chek retardant powders are generally classified as hazardous under criteria established by the United States Occupational Safety and Health Administration (OSHA) because of their potential to form dust during manufacture and when handled in windy conditions. The Phos-Chek dry-powder concentrates contain a mixture of powdered and granular components. That portion of

the product that is present in powder form is subject to being picked up and entrained in the air when windy conditions exist. Most dusts are considered to be respiratory irritants. This is due to the fact that excessive amounts of dust can deposit in and inhibit flow through the respiratory tract and this is a potential "hazard" according to most regulatory criteria. Hazard classifications may, however, differ in other world areas and

3

the MSDS applicable to your country or jurisdiction should be consulted. The dry-powder retardant mixing systems recommended and used are designed to minimize the generation of dust, however, under even severe use conditions. The potential respiratory effect of generated dust is the only identified hazard associated with the dry powder Phos-Chek retardants. Once the dry-powder concentrate is dissolved in water to prepare the fire retardant solution, it no longer has the capacity to generate dust and is no longer considered hazardous according to these criteria.

Acute (single exposure) toxicity test data have been obtained on the dry-powder concentrates and on their solutions by an independent laboratory using protocols established by the United States Department of Agriculture's Forest Service (USFS). These data show that the retardants are not toxic by ingestion or dermal application and are not significantly irritating to the eyes or skin.

Liquid concentrate type retardants are supplied as liquids and, consequently, do not have the potential to generate dust. Fire retardant solutions prepared from dry-powder and liquid type concentrates are essentially identical. Therefore, the acute toxicity data for solutions from the two concentrate types are essentially the same.

The fire retardant salts used in both the dry-powder and liquid types of Phos-Chek retardant are used in large volumes throughout the world as agricultural fertilizers.

### **ARE HAZARDOUS COMPONENTS PRESENT IN PHOS-CHEK RETARDANTS?**

The potential hazards posed by the components in the Phos-Chek fire retardants are disclosed on the MSDS, even those considered trade secret, if the ingredient is considered hazardous under applicable regulatory criteria. Under most world-area regulatory criteria, hazardous components present in a mixture at levels below 1% (0.1% for carcinogens) are not considered to contribute to the hazards of the overall formulation.

As stated previously, the Phos-Chek retardants consist primarily of ammonium phosphate or ammonium polyphosphate. These salts function as the active fire retardant component in the composition. . The ammonium phosphates and ammonium polyphosphates are used in agricultural fertilizers as sources of both nitrogen and

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phosphorus and are considered safe. The industrial grade phosphates used in the dry-powder Phos-Chek retardants are considerably more pure than the fertilizer grade phosphates. As stated previously, the Phos-Chek liquid concentrate type retardants utilize a fertilizer grade of ammonium polyphosphate that differs from the industrial grade phosphates in degree of purity and water solubility.

Ammonium phosphates are classified by the US Food and Drug Administration (FDA) as Generally Recognized As Safe (GRAS) when used in small quantities as direct human and animal feed additives.

4

In addition to the fire retardant salts, relatively small quantities of performance additives are included in the various fire retardant formulations. For example, a natural gum thickener is incorporated in many of the Phos-Chek retardant formulations. It is extracted from cultivated guar beans or xanthan. Both of these thickener types hold the retardant cloud together during free fall from the aerial application vehicle (or from a fire-hose) to the fuel so that it lands in the target area and then clings to the fuel where it will be effective. These thickeners are used, also, as components in food products such as ice cream. Both, also, are dry-powders prior to mixing in the retardant and are, therefore, considered hazardous under some regulatory criteria because of their potential respiratory irritation properties (see discussion below on respiratory sensitization). Both are considered to be GRAS by the FDA.

A small amount of flow conditioner is also included in the dry-powder formulations as a performance additive. This component provides free flowing characteristics to retardant powders so that they can be easily transferred and mixed to form retardant solutions. The flow conditioner present in the Phos-Chek retardants is a calcium phosphate. It is often used for the same purpose in common table salt and as an edible calcium supplement. It has no significant hazards and is affirmed as GRAS by the FDA.

It is important that the fire retardant solution be visible when applied aially so that a continuous firebreak can be prepared. Wildland fire retardant solutions generally contain color pigments that provide a bright red color visible to the applying pilot, air observers and ground crews. Colored Phos-Chek retardants contain either permanent or fugitive color pigments. Permanent pigments remain visible for long times (years) whereas the fugitive pigments fade and disappear after a relative short (weeks) exposure to natural sunlight. The permanent color pigment in the Phos-Chek retardants is red iron oxide, i.e., finely ground, water insoluble iron rust. The fugitive pigments used in the Phos-Chek products are very small particles composed of a light-sensitive dye in a biodegradable resin matrix. Neither type of pigment is considered hazardous although the visual aesthetics of the permanent color pigment is often considered undesirable near population centers and in scenic areas. Uncolored retardants, obviously, do not contain a color component.

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Wildland fire retardant solutions also contain inhibitors to protect handling, mixing and delivery hardware from corrosion. Very small quantities of several different additives are used to protect the various types of metal with which the solutions come in contact. These additives may be considered hazardous in bulk or when used in large concentrations because of their potential to cause eye, skin, and respiratory irritation. However, all are present in the Phos-Chek retardants in quantities too low (less than 5% in the concentrates) to be considered as hazardous ingredients or to lead to classification of the overall formulation as hazardous. None of the components, including the corrosion inhibitors, used in the Phos-Chek retardants contain known carcinogens or toxic materials such as arsenic, cyanides or heavy metals. Further, no known adverse long term or chronic health effects have been attributed to any of the Phos-Chek retardant ingredients.

5

### **DO THE PHOS-CHEK RETARDANT SOLUTIONS BIODEGRADE?**

When a material can be consumed, or degraded, by bacteria it is considered biodegradable. Inorganic compounds, such as the fire retardant salts, cannot be digested by bacteria but do provide nourishment for plant life. It needs to be remembered that 85 - 95% of the Phos-Chek retardant solution is water. Of the 5 to 15% of other components present in the solution, most provide nourishment for plant life rather than bacteria, i.e., they are not biodegradable but are consumed by vegetation. The gum thickener and other organic compounds are, however, biodegradable or will breakdown via other means in the environment.

### **WHAT HEALTH, SAFETY & ENVIRONMENTAL TESTING HAS BEEN DONE ON THE PHOS-CHEK RETARDANTS?**

ICL manufactures and offers for sale only products that are considered safe when used responsibly. In order to assure this, prior to offering any new product for sale, a safety and environmental assessment is conducted on all of its components and on the combination thereof. At that time, test data is generated to answer any questions raised during the assessment. The MSDS is the primary means of communicating the results of that assessment, including a presentation of all known health, safety and environmental data.

In addition, the composition of all qualified Phos-Chek wildland fire retardants is revealed to the United States Department of Agriculture's Forest Service (USFS) prior to commercial use. The USFS reviews the composition and conducts performance, health, safety, and environmental testing under government auspices by an independent laboratory using protocols established for that purpose. Testing includes acute oral ingestion, dermal application and eye and skin irritation. This testing is

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conducted on both the retardant concentrate, as handled and mixed at using locations, and the retardant solutions as applied in wildland fire fighting. Successful completion of these tests is a prerequisite for commercial use. The results of the health and safety testing of the Phos-Chek retardants are summarized in the respective Material Safety Data Sheets.

### **HAVE THE PHOS-CHEK RETARDANTS BEEN REVIEWED FOR SAFETY BY ANY REGULATORY AGENCIES?**

Phos-Chek retardants contain only ingredients that comply with the provision of the various chemical control laws such as the United States' TSCA, Europe's Dangerous Substances Directive 67/548, Australia's Industrial Chemical (Notification and Assessment) Act, etc.

All of ICL's wildland fire retardant products have been evaluated and qualified by the United States Department of Agriculture's Forest Service as described in the preceding paragraphs. Also, some States and local watershed districts evaluate wildland fire retardants for potential effects on water quality. The Phos-Chek retardants have been approved in all instances where testing was conducted.

6

ICL will disclose, to appropriate regulatory agencies, the complete composition of the Phos-Chek wildland fire retardants in order to facilitate health, safety, environmental and performance studies. Compositional information is, however, considered business confidential and must be maintained in a manner consistent with the protection of ICL's proprietary technology.

### **ARE MATERIAL SAFETY DATA SHEETS AVAILABLE?**

Material Safety Data Sheets are available, on request, in the format required by all countries in which the Phos-Chek retardants are available. It is ICL's practice to provide an MSDS for all commercial products available to anyone who requests one. They can be obtained directly from ICL, from the Phos-Chek website or from an authorized distributor.

### **WHAT IS SARA SECTION 313 AND WHY ARE AMMONIUM SALTS REPORTABLE?**

Under the Superfund Amendments and Reauthorization Act (SARA), U. S. manufacturers and users are required to annually report emissions of certain chemicals. The U.S. Environmental Protection Agency (EPA), the administrator of SARA, reviewed the use of ammonium salts under this law in 1995. They concluded, at that time, that

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there were no known significant human health affects emanating from the use of aqueous ammonium salt solutions, however, the small amount of free (un-ionized) ammonia present in water solutions of any inorganic ammonium salt may be harmful to aquatic organisms. In view of this, the EPA requires that environmental releases of free ammonia, for other than its intended purpose, be reported annually. Using EPA guidance as to the amount of free ammonia expected, about 2% of the Phos-Chek dry-powder retardants, which are released to the environment through spills, airborne dust, or landfills (for other than their intended purpose) are reportable under this law. Ammonium salts and Phos-Chek retardants that are applied in the manner for which they are intended, such as in an applied fertilizer or fire retardant solution, are not reportable.

### **WHY IS THERE AN ALLERGIC RESPIRATORY WARNING ON THE PHOS-CHEK RETARDANT MSDS?**

A guar gum manufacturer found that some individuals with a history of respiratory allergies might be aggravated by exposure to guar gum dust. While the results of the study conducted by the manufacturer were not conclusive, we feel it appropriate to convey that warning to our workers and to customers who may come in contact with dust generated by the dry-powder Phos-Chek retardants. Once Phos-Chek retardant powders are dissolved in water, there is no exposure to guar gum dust. Thus the warning is no longer applicable.

7

### **CAN PHOS-CHEK RETARDANT BE APPLIED AS FERTILIZER?**

The components in Phos-Chek retardants are safe for land application when applied in the recommended manner as a fire retardant. Even though the products provide a source of nitrogen and phosphorus, their uncontrolled application for other than their intended purpose is not recommended.

### **ARE PHOS-CHEK RETARDANT RESIDUES DANGEROUS TO ANIMALS?**

There are no known adverse effects to domestic or farm animals that consume small amounts of foliage covered with Phos-Chek retardant. Reaction of animals, however, can vary among species. A veterinarian should be contacted if your animals consume a significant amount of fire retardant coated vegetation.

Various Phos-Chek retardants have been tested both by ICL and by U.S. government agencies for possible acute toxicity effects on small terrestrial wildlife (birds, rodents, earthworms). Reports emanating from these studies indicate that the Phos-Chek retardants pose a comparatively low order of acute toxicity.

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## **WILL PHOS-CHEK RETARDANT HARM PLANTS OR FOLIAGE?**

Like fertilizer, retardants that are not removed from vegetation, may dehydrate the plant and cause the foliage to turn brown and the plant to wither. After rain, however, most plants will return to normal and growth may be enhanced due to the added nutrients.

## **WILL PHOS-CHEK RETARDANT HARM FISH OR OTHER WATER DWELLING ORGANISMS?**

ICL has tested the Phos-Chek retardants for toxicity to fish and water dwelling invertebrates. The results, presented in the MSDS, indicate a relatively low order of acute toxicity to these organisms. This indicates that runoff from the application of Phos-Chek retardants is unlikely to pose a serious threat to aquatic life.

None of the Phos-Chek retardants contain additives that are considered harmful or have been shown to degrade in the presence of natural sunlight, releasing components into water sources. The Phos-Chek retardants, like all wildland fire retardants, contain ammonia that is toxic to aquatic life. Care is recommended, and is exercised to as great an extent as possible, by the using agencies, to minimize application into streams, ponds, and other bodies of water. Some ammonia introduction may occur, however, since bodies of water may be hidden from the applicator by vegetative cover or smoke.

It should be recognized, also, that fish are quite sensitive to even minor changes in water temperature (such as may result from a fire) and to runoff of decomposition products from burning vegetation and other debris resulting from the denuded burned area. Thus, mortality of aquatic life is common in areas where large wildland fires have occurred, even when retardants have not been used.

8

## **HOW ARE PHOS-CHEK RETARDANT SOLUTIONS REMOVED?**

Wildland fire retardants are generally quite water-soluble and can be removed from smooth surfaces with little effort prior to drying. Undissolved components may, however, penetrate into porous or rough surfaces and become difficult to remove. When allowed to dry, contained thickeners may form films that tend to hold the dried retardant rather tightly to that on which it lands. This is desirable when it lands on wildland fuels. It is less desirable, however, when trying to remove it from other areas. Retardant residues should be removed as soon as possible. After drying, some scrubbing or power washing of structures and equipment may be required. Care should be taken when using power washing equipment to prevent increased penetration of the dry powder components into porous or on rough surfaces. A mild surfactant, including those that contain enzymes, may assist or improve the ease of removal.

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## **ARE THERE OTHER POTENTIAL HAZARDS?**

Solutions in general can increase slipperiness of many surfaces. Retardant solutions are not exceptions and care should be taken when working in and around spilled or applied retardant. Gum thickened retardant solutions may be even slipperier than solutions in general. Spills should be cleaned up as soon as possible to avoid possible falls. Care needs to be taken as well, by personnel working in areas treated with wildland fire retardants.