# DRY CHEMICAL EXTINGUISHING AGENTS CORROSIVE AND CONTAMINATING EFFECTS

## INTRODUCTION

Due to its unique and efficient means of extinguishment, dry chemical agents are used in situations where prompt extinguishment is desired. They are primarily used on hazards involving flammable liquids. Dry chemicals generally do not provide much protection against reignition. For more information on design, installation and maintenance of dry chemical systems see NFPA 17 and PRC.13.1.1.1.

Under some conditions, dry chemical extinguishing agents can be corrosive or contaminating; the effects vary with the type of agent used. Restricted usage is necessary.

## POSITION

Do not use dry chemical extinguishers or extinguishing systems in the following or similar corrosion-sensitive occupancies:

- Computer rooms or computer testing areas.
- Electronic equipment manufacturing areas.
- Cleanrooms.
- Precision equipment in laboratories or manufacturing areas.
- High temperature furnaces with silica refractory (possibly associated with internal quench tanks).
- Food processing areas (except for small cafeteria or restaurant cooking appliance systems).

In these occupancies use water for Class A hazards, carbon dioxide for Class B hazards and a nonconductive gaseous agent for Class C hazards.

## DISCUSSION

Sodium bicarbonate and potassium bicarbonate (both used in B:C classified applications) and diammonium phosphate (used in A:B:C classified applications) have a pH in the basic range and, in the presence of moisture, can severely corrode aluminum and magnesium. Monammonium phosphate (used in A:B:C classified applications) and potassium chloride (used in B:C classified applications) are acidic and can severely corrode steel in the presence of moisture. It may be difficult to determine which agent was used in a particular extinguishing system without consulting the manufacturer.

Di- and mono-ammonium phosphates are the principal ingredients of the multipurpose (A:B:C) type dry chemical. When heated by a fire, these materials adhere to solid surfaces and form either a glazed or intumescent coating, which may prevent proper electrical contact. This coating may be difficult to remove after a fire. This agent is somewhat abrasive and can damage precision machinery and cause wear to motor windings.

The sodium and potassium compounds, under certain temperature conditions and exposure time, will react with silica brick used as a refractory in high-temperature furnaces. The reaction produces sodium or potassium silicate, a glass-like material which drips off the furnace lining and may damage mechanical equipment, such chain drives.

Dry chemical agents are not toxic, but will contaminate any open food upon which they settle.

All the agents are electrically nonconductive when dry and, consequently, can interrupt the use of equipment with open contacts.

## Loss Example

A fire occurred in a partitioned room at a wave solder machine used for soldering electronic components. Personnel used twenty 10 lb A:B:C dry chemical extinguishers to control the fire, but it was finally extinguished by the public fire department using a small diameter hose line with a spray nozzle.

Fire damage was limited to the wave solder machine and immediate area. However, the air conditioning system picked up the agent and distributed it throughout adjoining computer assembly and test areas, causing immediate contamination and corrosion problems.

With delicate electronic components in this computer assembly area (which could be classified as a cleanroom), all residue needed to be completely removed from the building components, benches, stock and other equipment. Vacuuming was the first step followed by wash-down of walls, benches and other building structures with a “phosphate-free” detergent. In some locations, four washes and rinses were needed to achieve the desired degree of cleanliness.

Corrosion was also taking place on the electronic parts. These were vacuumed, followed by solvent or detergent cleaning. Since a wide variety of parts and assemblies were involved and some were sensitive to certain cleaning materials, each piece had to be individually analyzed to determine the best cleaner. A slightly alkaline aqueous detergent solution was used for removing adhered power, especially where it had mixed with hydrocarbon oil. The alkaline detergent also aided in dissolving the silicone encapsulate on the powder particles. Many parts were vacuum baked for accelerated drying.

The corrosion created by the powder (particularly on very fine memory bank wire) and the expense involved in the necessary cleanup more than doubled the final loss. Only prompt and efficient action by the owner prevented the final result from being any worse than it was. Subsequent testing and accelerated corrosion studies showed that the extinguishing powder (mostly monammonium phosphate) could cause surface etching and discoloration on copper and aluminum panels, with only slight discoloration on stainless steel.