1987

Metal Fire Extinguishment

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(Manuscript received October 1985, accepted January 1987)

ABSTRACT

Four sets of experiments were conducted in order to find the most efficient extinguishing agent for use on fires of metal dusts such as aluminum and magnesium. Parameters considered included time before application of agent, ratio of applied agent to metal dust, time to extinguishment, and active versus inert chemical composition of agents. A 30% active, 70% inert mixture of zinc stearate and sand was found to be an effective and economical extinguishing agent for metal dust fires.

INTRODUCTION

METALS SUCH AS ALUMINUM, magnesium, zirconium, which were finding limited use until the 1950s, are now being used extensively in aircraft, paint, and explosives industries. These metals in their finely divided form are vulnerable to fire because of the large surface area offered by their particulate. They are also responsible for causing dust explosions when ignited, resulting in severe damage. Severe fire hazards may also occur when large quantities of these metals are exposed to intense heat or when they are in the molten state. Most of them are highly reactive and burn with immense heat, raising surface temperatures beyond 1200°C. The reactivity of these metals is so high that aluminum, magnesium, and zirconium continue to burn even in the presence of nitrogen, forming their nitrides. Though conventional fire extinguishing agents such as water and foams are capable of extinguishing very small fires, they are virtually ineffective against large fires. Most of these metals, when hot (sodium and potassium react even with cold water), react with water, producing hydrogen which, when mixed with atmospheric oxygen, may result in serious explosion hazards. Dry chemical powders based on bicarbonates are also ineffective against metal fires because these metals react with carbon

Reference: T. P. Sharma, B. B. Lal, and J. Singh, "Metal Fire Extinguishment," *Fire Technology*, Vol. 23, May 1987, pp.

Key Words: Aluminum, magnesium, metal dust, preapplication time, metal powder heap, extinguishing agent.