Guidelines for Handling Aluminum Fines Generated In Various Aluminum Operations

Third Edition

The Aluminum Association



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SCOPE

This guidance discusses the potential problems involved in various aspects of aluminum management operations which generate fine aluminum particles. It also discusses methods of fines collection and handling designed to reduce the risk of fire or explosion. The information is similar, in general, to that presented in National Fire Protection Association Standards or other referenced documents. However, it is not written to displace any aspect of these Standards, but rather to support and supplement them. In addition, it is not meant to cover aluminum powder and paste products. These are discussed in The Aluminum Association brochure No. TR-2 "Recommendations for Storage and Handling of Aluminum Powders and Paste."

INTRODUCTION

Fines and how they are generated

During aluminum management operations, fines may be incidentally generated by such activities as grinding, sawing, cutting, polishing, shredding, melting, casting, conveyance, sanding or scratch brushing and at least some of them can be fine enough to potentially create an explosion or flash fire. The term "dust" or "powder" is frequently used to describe such particles. It is difficult to be specific about dimensions, but if all the particles are larger than 420 microns, an explosion or flash fire is less likely. It is more likely, however, that a mixture of coarser and finer material will be generated, and if a fraction is 420 microns or finer, then the mixture has the potential for explosion or flash fire.

When conveying, fines can be generated and/or settle out of larger size material, concentrate, and create a potential fire, flash fire, or explosion at certain process points. Finer particles burn readily when their ignition point is reached, and tend to ignite the coarser particles as well. In the case of aluminum, an explosion or flash fire can result if ignition occurs while the particles are suspended in air as a dust cloud, since the burning extends from one particle to another with extreme speed. In addition, the potential for fire and explosion hazard increases as dust accumulation increases. Examples of potential sources of ignition are open flames, welding equipment and cutting torches, matches and cigarettes, faulty electrical equipment, molten metal, hot surfaces and static electrical discharges.

General Criteria for Aluminum Dust Explosions and Flash Fires

There are three primary hazards with respect to combustible dust. These hazards are fire, flash fire and explosions. Several conditions must be met before each of these can occur.

A) Required conditions of a dust fire:

1. The dust has to be combustible. This is the fuel.
2. Enough oxygen or other oxidizer must be available to support and sustain combustion of the dust. This is the oxygen source.
3. An ignition source contacting the dust must have enough energy to combust the particles.

B) Additional requirements for a flash fire:

1. The dust is lofted, or suspended in air creating a dust cloud.
2. Concentration of the suspended dust cloud is within the explosible range.