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The Aluminum Association

Aluminum Dust in Automotive Collision Repair

An increase in the use of aluminum in automotive industry applications necessarily correlates to an increase in the repair of aluminum structures in automotive body shops. Repair of these automotive aluminum structures has raised new questions related to the materials used. In particular, the management of aluminum dusts at automotive body shops is an area where awareness of the information below and action taken based on it can mitigate or eliminate potential issues arising from aluminum repair activities. Separately, the potential for corrosion due to the presence of aluminum dusts and/or dissimilar metals contact in the body shop environment have also been noted as a concern and these are addressed elsewhere.

Combustibility Hazards

Finely divided aluminum dusts can, in certain circumstances, present a combustibility hazard. Body panel repair activities generate dusts that due to their constituency, size range, and very small generation quantity do not typically represent a combustibility hazard. Below are factors for consideration when evaluating the potential for dust combustibility –

- Particle size below 420 microns increases the hazard (ie. sanding/polishing dust presents increased hazard as compared to grinding dust)
- With mixed size materials, increasing the average particle size decreases the hazard
- More heavily oxidized dusts (typically older) present less hazard than fresher dusts
- Atomizing the dust in the air greatly increases the hazard
- Increases in the temperature of the dust or the ambient air increase the hazard
- The hazard can be magnified if flammable body filler agent dusts are co-mingled with aluminum dusts

Testing of steel and aluminum dusts generated from automobile collision repair activities has confirmed that both present a combustibility hazard that must be managed. However, with both dusts over 30 hours of grinding/sanding was required to collect enough dust even for testing purposes.

Combustibility Management Practices

- Avoid the accumulation of aluminum dust in work areas and collection devices.
- The use of sanding/polishing tools with integral dust pickup points is recommended.

- Clean up dusts daily and remove them from the work area. Manual clean up should be conducted with natural fiber brushes and conductive scoops.
- Formation of dust clouds must be avoided and therefore compressed air cleanup is not recommended.
- The use of engineered dust collection devices is recommended with special considerations. The use of dust collection devices made for combustible dust environments is recommended. Standard commercial vacuums ("shop vacs" or similar) are not recommended and can increase the combustion hazard. Wet dust collection is a preferred method for the smaller quantities expected with automotive repair. Wet systems should be provided with pressure relief valving of the collection chamber to prevent accumulation of any gases. Empty collected dusts frequently to avoid accumulation inside dust collection hoppers.
- Do not mix dusts from steel and aluminum. If vacuums or other devices are used for the collection of dusts from different metals, the devices should be thoroughly cleaned/decontaminated prior to switching between uses with different metals.

Thermiting Hazards

Thermiting results from the tendency of aluminum to reduce iron oxide (rust) back to its iron base metal form while simultaneously oxidizing itself into the aluminum oxide form. This reaction is characterized by the release of heat, which depending on conditions, can be of a significant quantity. Conditions favorable to this reaction involve the presence of both aluminum and rust inside enclosed containers with little ability to disperse the reaction heat generated. A common scenario favoring thermiting is the collection of aluminum and iron particles/dusts which include rust in co-mingled management devices such as baghouses or vacuum collection systems.

Thermiting Management Practices

- Preferentially, aluminum dusts and iron/rusty dusts should be handled separately and/or managed in separate collection systems (see also above). If this is not feasible, care should be taken to monitor any enclosed co-mingled dust collection devices for the presence of temperature rise and/or any other temperature related effects and mitigate those effects.
- If temperature rise is observed, the co-mingled dusts can be inerted via the addition and mixture of sand or other inert material. Alternately, the dusts can be removed from their enclosures and allowed to passivate without dispersion in ambient air.

References

- Guidelines for Handling Aluminum Fines Generated During Various Aluminum Fabricating Operations (F-1), The Aluminum Association
- Standard #484 – Standard for Combustible Metals, National Fire Protection Association (NFPA)
- The Aluminum Association Combustible Dust Workgroup – 703-358-2976 or www.aluminum.org

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