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Handling and Storage of Thermal Spray Materials

Handling of Thermal Spray Materials

Materials used in the thermal spray process can be used efficiently and stored effectively provided the simple guidelines in this document are adhered to.

Material Shelf Life

Always practice a "first in – first out" philosophy for all materials.

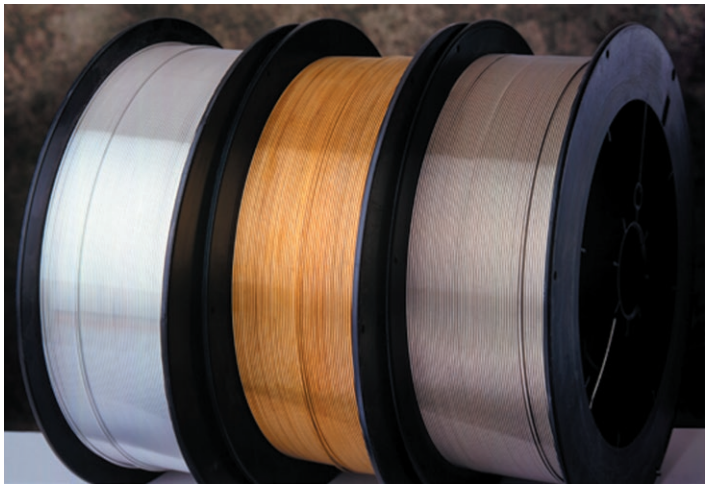
- **Powders:** The shelf life for powders is unlimited under normal, dry storage conditions at ambient temperatures (20 to 25 °C / 68 to 77 °F).
- **Wires:** Many wires have an unlimited shelf life with the exception of powder-filled composite wires. These products have a shelf life of 1 to 5 years, depending on the wire type and storage conditions. It is recommended that a spray test and analysis be performed with the wire to ensure there is no unexpected voids or oxidation in the coating.
- **Sealers and Masking Compounds:** Sealers and masking compounds generally have a shelf life of 6 to 18 months from the date of shipment, depending on the sealer product. Please check the product datasheet for the correct shelf life.
- **Masking Tapes:** Masking tapes have a maximum shelf life of 6 months.

Powder Storage

- All Thermal Spray powders will benefit from being stored in a clean, dry and well organized store-room. For most powders, the environment should be relatively low in humidity and at a typical working temperature of approximately 20 to 25 °C (68 to 77 °F).
- Certain powders are hygroscopic in nature and will adsorb water from the atmosphere. These powders (typically abradables such as Metco 601NS and ceramics such as Metco 105SFP) should be stored at a temperature of approximately 40 °C (104 °F). They should also be stored in such a way that the moisture vapor can exit from the container. This will usually mean breaking the seal on the lid and leaving it slightly open in a way that does not allow contamination to enter.
- This technique can also be employed when the normal ambient humidity levels are high.
- If powder feeding becomes a problem with any powder due to “clumping” of the product, then it may be necessary to employ a specific drying technique. In this case, the powder should be spread out in a clean tray to maximize the surface area and optimize drying. Dry the powder for a minimum of one hour or until flowability is restored. Material dried in this way should be sprayed as soon as possible after transfer to the feeder to prevent moisture ingress. Consideration should also be given to the use of heated hoppers.

Wire Storage

- Ensure that identification tags remain on partially used wire as it is easy to lose lot traceability if they become detached.
- Wires should be stored in a clean and dry environment sealed in the original packaging.
- Store wires for as short a time as possible before using.
- Some wires, particularly galvanically active materials such as aluminum, zinc and copper, will oxidize at an acceler-



ated rate if kept in a warm, humid atmosphere. Most of these types of materials will be slightly lubricated not only to improve wire feeding, but also to reduce this corrosion effect. Care must be taken not to remove the lubricant film during storage.

- Powder-filled composite wires may be prone to moisture pickup and must be stored in a dry environment.
  - Avoid temperature fluctuations of greater than 5 °C (9 °F).
  - Maintain storage at a humidity level of ≤ 60 % at 15 to 25 ° (59 to 77 °F) or ≤ 50 % at 25 to 35 °C (77 to 95 °F).
  - Do not store for more than 5 years. Older wire should be redried.
  - If slightly affected by moisture, the wire may be redried at a temperature of 150 °C (300 °F) for 6 hours. Longer drying times of up to 12 hours at temperatures up to 200 °C (390 °F) can be employed if necessary. Redry no more than 6 times.
  - Wires exposed to severe water contamination, exposed to the atmosphere for long periods and/or exhibit oxidation or corrosion cannot be redried and should be scrapped.

Thermal Spray Powder Manufacturing

Powders supplied for the thermal spray process can be made via a wide range of manufacturing routes. Generally, the procedure used is that which is best suited to the spraying process being employed. This also applies to the particle size distribution of material that is finally delivered. The most common manufacturing techniques, and/or combinations thereof, are as follows:-

- Cladding (mechanical or chemical)
- Atomization (gas or water)
- Blending
- Sintering
- Agglomeration (spray drying, casting, fusing)
- Crushing
- Densification

In order to ensure that the optimum coating quality is obtained, it is important to consider how powders are handled prior to spraying.

Powder Handling

During transport and storage, materials can segregate. This means that the powder distribution within the container can vary depending on the particle size range and density of the constituent products. For most materials, it is possible for the larger and therefore heavier size fraction to settle towards the bottom of the container. For blended materials such as Metco 601NS and Metco 81VF-NS, the lower density phase can separate out towards the top of the container.
In all cases, this means that best practice is to gently tumble the powder before spraying. This ensures uniform product distribution and uniform coating results.

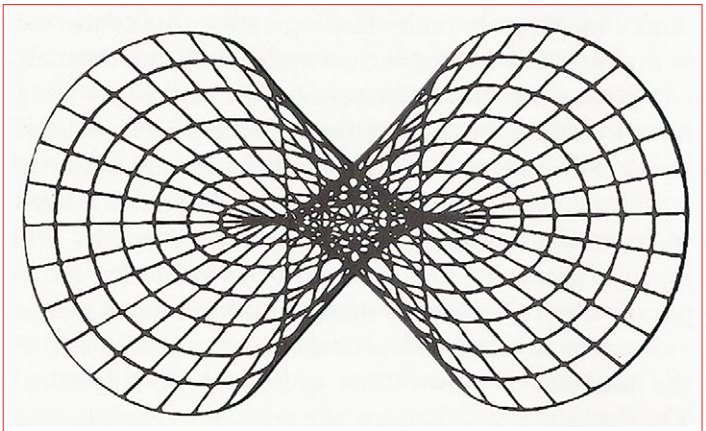


Diagram showing how to gently mix a powder container using a manual "Figure-Eight" motion.

For most materials, the powder can be satisfactorily mixed via a gentle manual “figure eight” tumbling action of the container. This can be carried out as the user transports the powder from the storage area to the powder feeder. A more controlled process can be achieved using a mechanical 3D-360° rotary mixer or a V-style blender.

Care must be taken not to over-agitate the powder. This is especially true for clad materials such as Metco 450NS. In this case, the fine aluminum particles attached to the outside of the nickel core can become detached during the tumbling process. If this occurs, an uneven distribution of powder in the flame can lead to a non-uniform coating quality. In all cases, the mixing period and force must be defined to suit the material being used.

Powder Feeding

Once the powder has been loaded into the feeder, controlled agitation will still normally be required to continue the process of controlling the material distribution. This is usually achieved either with a stirrer device (as used in Oerlikon Metco's volumetric feeders such as the Single / Twin type feeders) or an air vibrator (as employed in Oerlikon Metco's fluidized bed feeders such as the 9MP series). Again, control of agitation parameters is of key importance.

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