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Cartridge Brass ~ C26000

Purpose: To explain the use of the copper alloy C26000 and its application in brass cartridges.

I. Introduction: The copper alloy C26000, known by its common name Cartridge Brass, has many applications due to its wide array of properties. The application highlighted in our presentation is for ammunition cartridges, and how the properties of the alloy are manipulated for this application.

II. Alloy: Introduction
   A. Products
      1. Clips & Fasteners
      2. Decorative Hardware
      3. Radiator Cores/Tanks
      4. Hinges
      5. Various Plumbing Components
      6. Ammunition Cartridge Cases
   B. Naming System
      1. "C"
         a. Identifies it as a Copper alloy by the UNS system
      2. "260"
         a. Identifies the alloy as a Copper-Zinc by the CDA system

III. Mechanical and Chemical Properties
   A. Percent Composition and Alloying Elements
      1. Copper (Cu)
         a. Approximately 70-80%
         b. Added to soften the alloy, 70% is nominal
      2. Silicon (Si): Optional
         a. Up to 0.53%
         b. Added to control processing characteristics
      3. Iron (Fe): Optional
         a. Up to 0.17%
         b. Added to control processing characteristics
      4. Chromium (Cr): Optional
         a. Up to 0.19%
         b. Added to improve corrosion resistance and add a shinier surface
      5. Zinc (Zn)
         a. Approximately 20-35%
         b. Increases tensile strength, yield strength, hardness, and corrosion resistance. Ammunition cases demand for a high corrosion resistance, which is a property the

alloy receives from Zinc. More than 35% Zinc will increase tensile strength, but lower yield strength and hardness. Zinc will also hurt the ductility of the alloy.

B. Mechanical Properties
    1. Density: 8.53 g/cm^3
    2. Hardness: Rockwell B 77
    3. Important Properties for Ammunition Cases, and Why
        a. 70/30 Cartridge brass is used for ammunition cartridges for its wide array of properties. This alloy is very easily cold-worked, due to its ductility and softness. The metal can also be heat treated to control hardness that comes from cold working. Due to the corrosion resistance added by Zinc in the alloy, the finished cartridges can last for years with little to no evidence of the passing time.

IV. Manufacture
A. Initial Cold-Working Steps
    1. Disks pressed from sheets
    2. Disks drawn through dies, under extreme pressure
    3. Usually drawn in 3-5 stages
        a. 1st: Initial Cup
        b. 2nd: 1st draw
        c. 3rd: 2nd draw
        d. 4th: Initial Cutting
        e. 5th: Pre-Pressing
        f. 6th: Head pressing (to form neck)
        g. 7th: Necking and Perforation
        h. 8th: Turning of rim and neck
        i. 9th: Primer end flattened
        j. 10th: Primer "Pocket" punched out
    4. Drawing/Cold working results in reduced ductility and increased hardness
B. Softening Heat Treatments
    1. Annealing
        a. Used to reduce work hardening. Annealing is usually done multiple times throughout the drawing process, usually by being first heated to 1,100°F, then quenched in a water bath.
    2. Neck Annealing
        a. Many manufacturers soften the neck of the case to allow for easier reloading.
C. Creation of Ammunition
    1. Finishing steps to establish final shape/length
    2. Brass either shipped out or finished in plant

V. Alternative Materials
A. Steel
    1. Steel is usually only used within foreign militaries, such as Russia and China and sometimes for recreational use. These cases have advantages for military use due to their low weight, allowing a soldier to carry more. These cases are also far cheaper,

but also less reliable, and not able to be reloaded due to their inability to be easily reformed.

B. Aluminum
    1. Some manufacturers offer Aluminum cases as an alternative to brass, mostly offered by CCI ammunition manufacturers. Reloading these cases is highly discouraged because of the fatigue the Aluminum receives during firing and resizing.

VI. Conclusion
    A. Because of the ability for cartridge brass to be cold worked, the ability to be reused, the ability to survive all sorts of stress, as well as adverse conditions we feel that this currently the superior alloy for this application.