# Two-Piece Laminated Steel Aerosol Can Technology

Southern Aerosol Technical Association

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# Overview

- Manufacturing Process
- Key Factors in Selection

# Can Manufacture - Overview

- Incoming Material
- Bottom End Manufacture
- Can Manufacture

# Incoming Material
(Bodies and Bottom)

- Polymer laminated tin-free steel (TFS) (Electrolytically Chromium Coated Steel - ECCS)
  - PET (polyethylene terephthalate) on each side
    - White-pigmented exterior
    - Clear interior
- No need to apply additional lining or basecoatings
- Similar coil weights to tinplated steel used in 3PC aerosols (up to 10MT)

# Bottom End Manufacture

- Bottom end only
- Coil-fed directly into press, no sheet cutting
- Ends are punched to concave shape
- Cut-edge is curled
- End compound is applied and cured; serves as a gasket in the doubleseam and helps to ensure a hermetic seal
- In-line vision system to 100% inspect/reject various non-conformances (compound skips/voids, scratches, dents)

# Can Manufacture

- Coil-to-can draw/re-draw (DRD) process

# Can Manufacture

- 1st Stage
  - Cupping Press
- Forms the initial shallow/wide cups

# Can Manufacture

- 2nd Press Progression
  - Through a series of dies, the shallow cup is re-drawn into a narrower, taller cylinder
  - Imparts minimal ironing/thinning to the can wall (DOT-2Q thickness maintained)
- 1st Trimmer
  - Cleans bottom edge

# Can Manufacture

- Lithography – Dual Decorators
  - In-line decoration "in the round"
    - Up to 8-colors
  - Dry-offset process
    - No process colors
  - Varnish
- Curing Oven
  - Cures the inks and varnish

# Can Manufacture

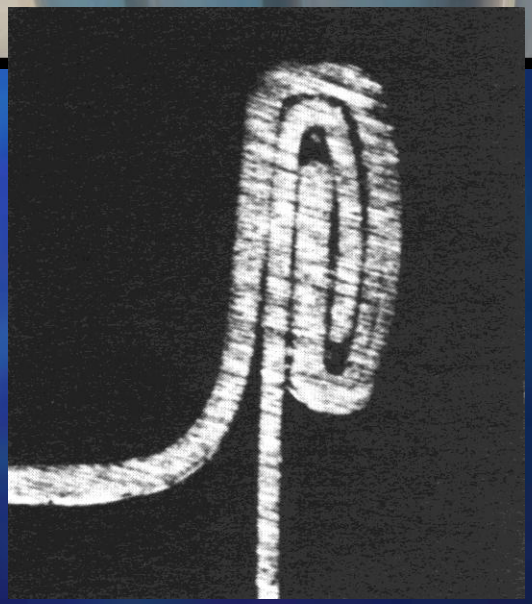
- 3rd Press Progression
  - Forms the shoulder contour of the can
  - Forms a "hat", used to make the 1-inch curl opening
- 2nd Trimmer
  - Final trim to raw edge, to ensure squareness and dimensional control

# Can Manufacture

- 1st Combination Machine
  - Forms the standard 1” aerosol opening
  - Trims the top and roll-forms the curl
    - In-line vision system to 100% inspect and reject curl non-conformances (cracked curls)
  - Conforms to CSPA dimensional standards

# Can Manufacture

- 2nd Combination Machine
  - Necks the cylinder bottom
  - Forms the flange
  - Dual vision systems to detect/reject non-conformances with internal lining and flange
  - Attaches the bottom end with a doubleseam
  - Improved seam integrity due to lack of weld and consolidated material specs



# Can Manufacture

- Air Tester/Leak Inspection
  - Cans are fed through an in-line rotary air tester
    - Each can is placed into a pocket that is pressurized and equipped to detect leakage
    - Cans identified as leakers are rejected
- Mixed Label Detector
  - In-line vision system to detect and reject cans from previous labels
- Palletizer

# Key Factors in Selection

- Can Size & Style
- Decoration
- Formula/Container Compatibility
- Regulatory

# Can Size & Style

- Currently 211 diameter only
- Two height options
  - 211 x 604 (18 fluid ounces capacity)
  - 211 x 713 (22.5 fluid ounces capacity)
- Future sizes to be determined

# Can Size & Style

- Aerosol Can Sizes
  - For Three-piece cans
    - Expresses can diameter (body) X can height (over doubleseams)
    - 3 digit number
      - 1st digit = Whole number of inches
      - 2nd & 3rd digit = 16th's of an inch
    - Example: 211x604
      - Diameter = 2 – 11/16 inches
      - Height over doubleseams = 6 – 4/16 inches
  - Two-piece cans
    - Do not have a top doubleseam
    - Stated sizes reflect conformity to overall dimensions

# Decoration

- Lithography or Wrap-label?
- Lithography
  - Multi-color printing options
  - Highly durable
  - Defined container/product inventory
  - Dual-decorators on each line
    - Ability to provide smaller minimum orders, exact order quantities, shorter lead-times
- Wrap-label
  - Allows for reduced can inventory
  - Burden of decoration placed on the filler
  - Less durable

# Formula/Container Compatibility

- Interior Lining - PET
  - Broad resistance to most solvents
  - Generally acceptable with most water-based formulas
- pH
    - pH is a critical factor in corrosivity and also compatibility with PET lining
    - pH range of 4 to 10 most appropriate

# Formula/Container Compatibility

- Corrosion Prevention
  - PET lining will protect the container from more corrosive fills
    - Very low metal exposure (<10 mA – WACO)
  - Fewer crevices
    - No top doubleseam, no sideseam weld
  - PET lining is less robust versus highly acidic or highly alkaline formulas
  - Corrosion inhibitors remain “cheap” insurance

# Formula/Container Compatibility

- Lab Testing
  - To evaluate potential for product and container degradation
    - Compatibility Database
    - Electrochemical testing
    - Testpacks / Can stability

# Formula/Container Compatibility

- Compatibility Database
  - Records of previous testing, experience
  - Which chemicals have history of success or failure?
    - Known incompatibilities
      - Sodium hypochlorite
      - Sodium hydroxide
      - Hydrogen Peroxide
    - Anticipated compatibilities
      - Most solvents
      - Waterbased formulas with near-neutral pH
  - MSDS can be of some use
  - pH guidance – 4 to 10

# Formula/Container Compatibility

- Electrochemical Testing
  - Attempt to predict the mode and severity of corrosion, and on occasion lining degradation
  - Screening tools, not a replacement for testpacks
  - Valuable as a quick indicator, to prevent significant time and effort on incompatibilities

# Formula/Container Compatibility

- Testpacks / Can Stability
  - Static storage of filled cans
  - Cans stored at various controlled temperatures
  - Opened and evaluated at specific intervals
  - Best measure of formula/container compatibility – but time consuming

# Regulatory

- USDOT is the regulatory body for aerosols
- Primary function = safe shipment
- Code of Federal Regulations (CFR)
  - CFR 49, § 100 to 185

# Regulatory

- Three key sections pertaining to aerosols
  - §173.306 “Limited Quantities of Compressed Gases”
  - §178.33 “Specification 2P”
  - §178.33a “Specification 2Q”

# Regulatory

- USDOT Classifications
  - 3 main groups, based on internal pressure of a filled can at 130°F
    - Non-specification (2N)
    - DOT-2P
    - DOT-2Q
  - Customer/Filler must determine which is needed

# Regulatory

- Current material specifications consolidated on DOT-2Q
- However, cans are NOT "DOT-2Q" unless specified, as certain requirements must be satisfied
  - Pressure
  - **Marking**
  - Test frequency / documentation

# Regulatory

- Overview: Non-spec, 2P, & 2Q

| | Non-Spec | DOT 2P | DOT 2Q |
|---|---|---|---|
| Internal Pressure-MAX | 140 psig. | 160 psig. | 180 psig. |
| Buckle Strength-MIN | 140 psig. | 160 psig. | 180 psig. |
| Burst Strength-MIN | 210 psig. | 240 psig. | 270 psig. |
| Wall Thickness-MIN | N/A | .007” | .008” |
| Req’d Can Marking | N/A | DOT 2P | DOT 2Q |
| Testing (Can Manuf) | N/A | 1/25,000 | 1/25,000 |

# Sustainability

- Cans are 10 to 15% lighter than comparable 3-piece tinplate cans
  - On average, about 12 grams lighter per can
    - Over 1 million cans, this equates to more than:
      - **13 tons of steel**
- No solvent-based coatings
  - Significant reduction in carbon emissions

# Sustainability

- The production of aluminum yields 6 to 8 times more CO2 emissions
- Greater than 50% recycled steel content
- Fully recyclable again
- No tin or copper used in material or process
- VOC-free polymer coating / 100% solids

# Food/Health Safety

- PET lining is approved for direct food contact in both the USA and Europe (FDA/EU)
- No BADGE, BFDGE, or NOGE
  - Bisphenol-A DiGlycidyl Ether
  - Bisphenol-F DiGlycidyl Ether
  - Novolac glycidyl ethers
- No Bishphenol-A (BPA)

# Thank You!

- Questions?