

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



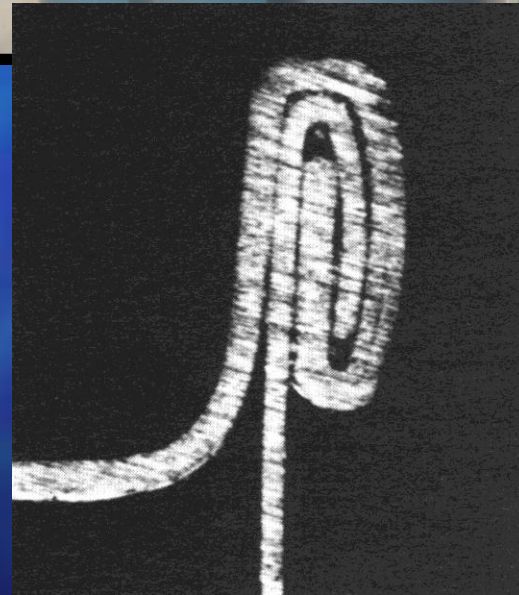
Can Manufacture

- 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

- 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

Can Sizes & Styles

- Four Available Sizes:

- 211x713 (66x218)
- 211x604 (66x178)
- 205x710 (58x203)
- 205x604 (58x168)



- Available in a single style for each can size.

Decoration

- Dry-Offset Print on Formed Cylinders
- Dry-Offset
 - Rotary printing presses which can apply multiple colors (up to 8 colors) for a label design to each cylinder running through the decorator.
 - Highly durable.
 - Dual decorators in each line provide for rapid changeovers between label designs.
- Wrap-labels
 - Can be considered as an option.

Formula/Container Compatibility

- Interior Lining - PET
 - Broad resistance to most solvents
 - Generally acceptable with most water-based product formulations
- pH
 - pH is a critical factor in corrosivity and also compatibility with PET lining
 - pH range of 6 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
 - Electrochemical testing
 - Test Packs / Can stability

Formula/Container Compatibility

- Electrochemical Testing
 - Accelerated methods, often used in combination.
 - Crevice cell, driven cell, cyclic polarization, electrochemical impedance spectroscopy.
 - Attempt to predict the mode and severity of corrosion, and on occasion lining degradation.
 - Screening tools, not a replacement for test packs.
 - Valuable as a quick indicator, to prevent significant time and effort on incompatibilities.

Formula/Container Compatibility

- Test Packs / Can Stability
 - Static storage of filled cans.
 - Cans stored at various controlled temperatures. (Room Temperature, 100°F or 120°F).
 - Opened and evaluated at specific intervals.
 - Best measure of formula/container compatibility – but time consuming.

Regulatory – United States

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

Regulatory – United States

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

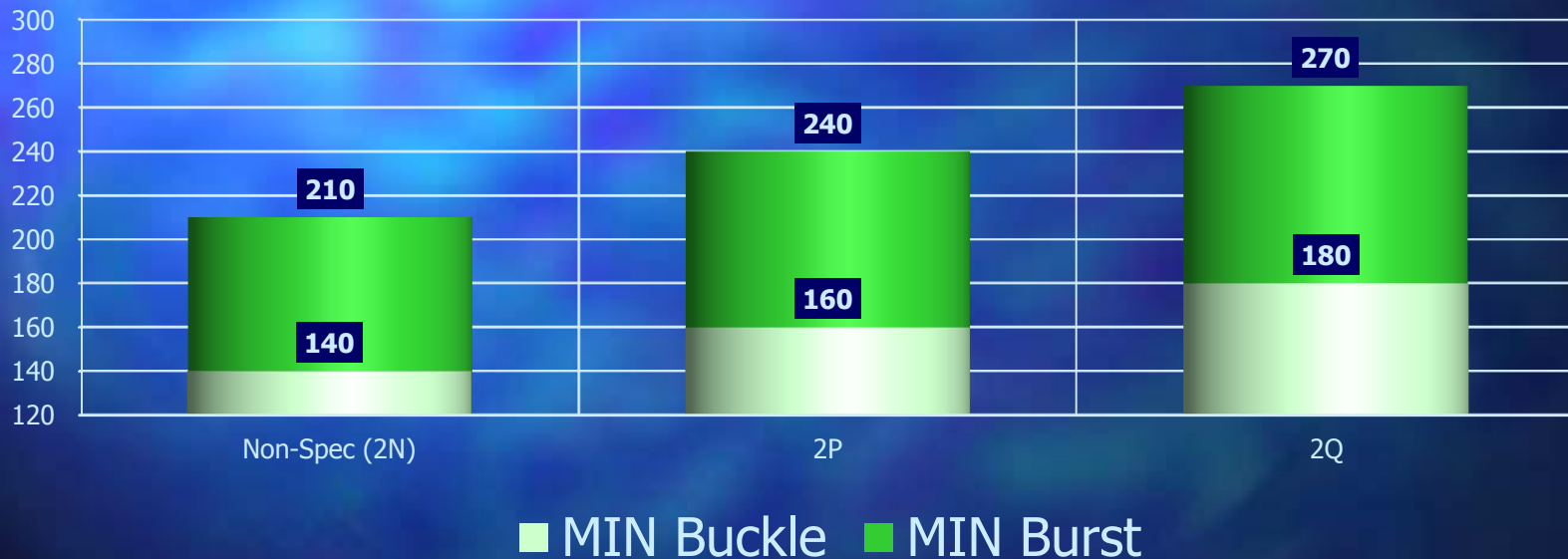
Regulatory – United States

- USDOT Classifications
 - 3 main groups, based on internal pressure of a filled can at 130°F.
 - Non-specification (2N)
 - DOT-2P (DOT markings required on every can)
 - DOT-2Q (DOT markings required on every can)
 - Burst pressure minimums are 1.5x the buckle pressure minimum for all standard classifications.
 - Customer/Filler must determine which classification is needed for each individual product.

Regulatory – United States

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

USDOT Buckle/Burst Pressure Requirements @ 130°F



Regulatory – United States

- Table 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 Benefits

- Less energy, material consumption, and waste in our process
- The production of steel for our cans emits 4.5 times less CO₂ than the production of aluminum
- Polymer-coated steel eliminates the need for solvent-based linings and coatings; reducing VOC emissions, energy usage, and hazardous wastes
- Standard cans withstand a minimum 15 Bar/218psig without buckle and 18.6 Bar/270psig without burst

Sustainability Benefits

- Printing technology does not use water or alcohol, reducing hazardous wastes
- Semi-precious metals (such as copper and tin) are not used in the manufacturing process
- Cans are 100% recyclable
- DSC cans are 10% to 15% lighter than comparable 3-piece tinplate aerosols
 - On average, about 12 grams lighter per can
 - Over 1 million cans, this equates to more than: **13 tons of steel**

Food/Health Safety

- PET lining is approved for direct food contact in both the USA and Europe (FDA/EU)
- Additional benefits:
 - Heavy Metals Compliant
 - CONEG
 - 94/62/EC
 - No BADGE, BFDGE or NOGE
 - No Bisphenol-A (BPA)
 - REACH SVHC Compliant
 - Conflict Minerals Compliant (Dodd-Frank Reform Act)

Thank You!

- Questions?
 - Contact Kevin Richards at
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