Barrier Materials Case Study
Non-PFAS Alternative

- CKS Packaging Overview
- Barrier Packaging Options
- CKS Non-PFAS Baritainers®
  - Manufacturing Process
  - Commercial Development
- Takeaways

CKS AT A GLANCE

- Company founded in 1985
- Privately owned by **C**harles **K. S**ewell and family
- Charles Sewell - first recipient of SPE's Lifetime Achievement Award (1984)
- Strategic investments in manufacturing plants, equipment, and technologies
- Serving multiple market segments with long-standing customer relationships
- 2.7 billion containers produced with over $750m annual sales
- Ethnically and Culturally Diverse workforce - over 3,100 employees
- 400+ blow mold machines deployed across 27 manufacturing sites
- Over 800 active stock and custom mold sets
- Community involvement and commitment to giving

CKS PACKAGING

North American Footprint

- Corporate Headquarters
- On-Site Facilities (4)
- Manufacturing Sites (27)

MARKETS SERVED

KEY MARKET SEGMENTS

SPECIALTY

FOOD

INDUSTRIAL

HOUSEHOLD

BEVERAGE & DAIRY

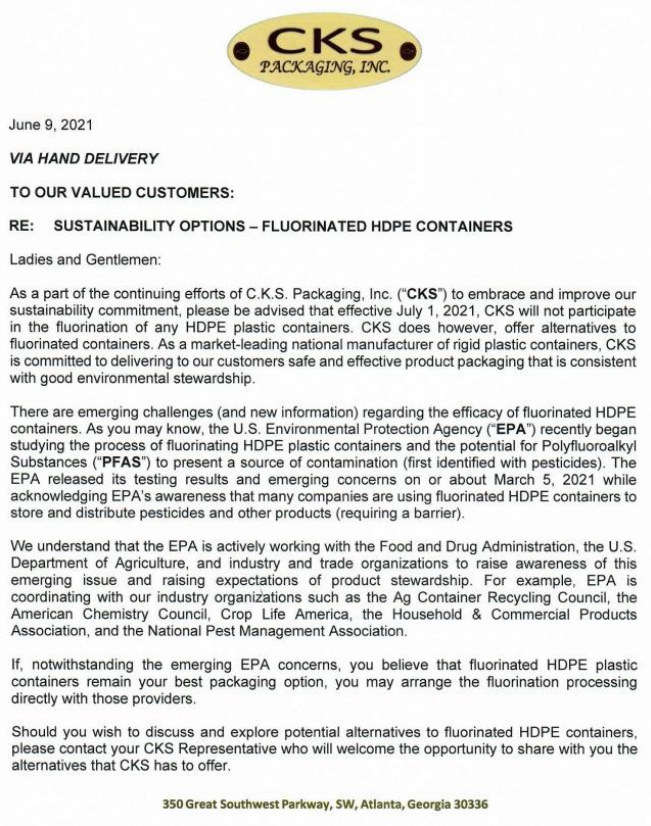
AUTOMOTIVE

AG CHEM

Barrier HDPE Options – Strategic Decision

CKS discontinues fluorinated plastics offerings

➢ Notice re: Sustainability Options – Fluorinated HDPE



CKS PACKAGING, INC.

June 9, 2021

VIA HAND DELIVERY

TO OUR VALUED CUSTOMERS:

RE: SUSTAINABILITY OPTIONS – FLUORINATED HDPE CONTAINERS

Ladies and Gentlemen:

As a part of the continuing efforts of C.K.S. Packaging, Inc. ("**CKS**") to embrace and improve our sustainability commitment, please be advised that effective July 1, 2021, CKS will not participate in the fluorination of any HDPE plastic containers. CKS does however, offer alternatives to fluorinated containers. As a market-leading national manufacturer of rigid plastic containers, CKS is committed to delivering to our customers safe and effective product packaging that is consistent with good environmental stewardship.

There are emerging challenges (and new information) regarding the efficacy of fluorinated HDPE containers. As you may know, the U.S. Environmental Protection Agency ("**EPA**") recently began studying the process of fluorinating HDPE plastic containers and the potential for Polyfluoroalkyl Substances ("**PFAS**") to present a source of contamination (first identified with pesticides). The EPA released its testing results and emerging concerns on or about March 5, 2021 while acknowledging EPA's awareness that many companies are using fluorinated HDPE containers to store and distribute pesticides and other products (requiring a barrier).

We understand that the EPA is actively working with the Food and Drug Administration, the U.S. Department of Agriculture, and industry and trade organizations to raise awareness of this emerging issue and raising expectations of product stewardship. For example, EPA is coordinating with our industry organizations such as the Ag Container Recycling Council, the American Chemistry Council, Crop Life America, the Household & Commercial Products Association, and the National Pest Management Association.

If, notwithstanding the emerging EPA concerns, you believe that fluorinated HDPE plastic containers remain your best packaging option, you may arrange the fluorination processing directly with those providers.

Should you wish to discuss and explore potential alternatives to fluorinated HDPE containers, please contact your CKS Representative who will welcome the opportunity to share with you the alternatives that CKS has to offer.

350 Great Southwest Parkway, SW, Atlanta, Georgia 30336

7/1/21: "CKS will not participate in the fluorination of any HDPE plastic containers"

"As a market-leading national manufacturer of rigid plastic containers, CKS is committed to delivering to our customers safe ands effective product packaging that is consistent with good environmental stewardship"

- Some customers chose to arrange fluorination processing directly with those providers
- Other customers reached out to explore alternatives

Barrier Packaging Options for Rigid Plastics

Barrier Packaging Technologies

- Multilayer Structures – EVOH, Nylon, Other
  - Effective O2/water vapor barriers (food and chemical)
  - Requires specialized equipment/coextrusion process – capital/maintenance/know how
  - Some recyclability issues, finished parts are typically more costly
- Fluorine treatment
  - Surface Treatment, effective chemical permeation barrier
  - Predominantly post-mold process - requires additional shipping/handling
  - Not an O2/vapor barrier
  - Concerns with PFAS/PFOA
- Barrier Additives
  - Effective chemical permeation barrier, also O2/Vapor
  - In-mold process – no additional logistics
  - Fully recyclable/cost effective option
  - Wide adoption in the market yet to be seen

Good option, high part price and CAPEX

Not an option for CKS

CKS chose this option

CKS Choice for Barrier HDPE

Kortrax® Technology

- Unique, patented barrier resin additive for HDPE, LDPE and PP resins
- Processed under defined conditions on adapted extrusion BM machinery
- Additive migrates/blends into discontinuous thin layers within the HDPE or PP matrix
- Resulting in “laminar or platelet morphology” which creates permeation barrier
- Barrier layers create a ‘tortuous path’ within the container (i.e., Baritainer®)
- This structure controls migration of aggressive materials (VOC’s) and slows vapor egress
- Material is inert, based on highly engineered & modified grades of polyamides

Non-PFAS Barrier Alternative

Baritainer® Features

- Enables compliance w/UN and DOT hazmat regulations, well within allowable limits
- Barrier is permanent => no shelf life issues
- Post-manufacturing treatment is not required
- FDA, EU and USP 661 compliant => Human Safe
- No impact on Recycle Stream => APR Letter of Recognition
- Compounded in the U.S.A.

No detectable PFAS/PFOS Compounds ***(confirmed in independent lab studies and by the EPA)***

Non-PFAS Alternative for Barrier Packaging

Manufacturing Process

Production Factors

- Proper equipment configuration and operator training/knowledge
- Material shipped in Moisture Proof Sealed Bags – may need drying if exposed to humidity
- High output HDPE screw recommended to ensure proper mixing (80-120mm)
- Polyamide designed for effective blending with HDPE and PP
- Adequate residence time for polyamide melt and blend
- No need to modify head-tooling – control swell with die temperatures
- BP Polymers has been instrumental with production line qualification

Non-PFAS Alternative for Barrier Packaging

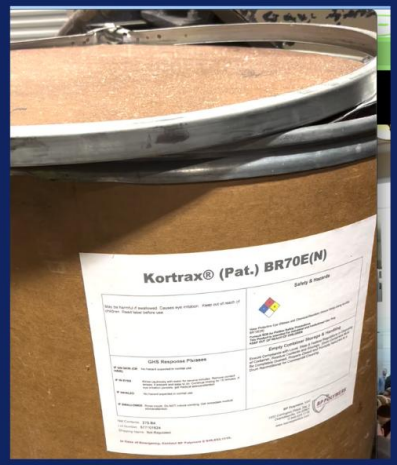
Blow Mold Process

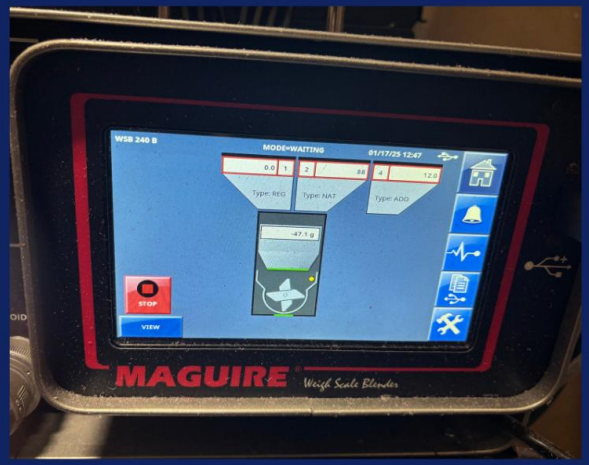
Manufacturing Process

- Blending is critical – gravimetric system provides best results and LDR tracking
- Presence of KORTRAX® is verified via UV tracer
- View Stripe for contents level identification is doable
- Process for system purge/cleaning similar as for color change
- Regrind containing KORTRAX® is separated and reprocessed
- If managed properly, do not need to pull/clean head and/or screw
- Purging compounds not necessary – purge with regular HDPE, back to previous heat profile

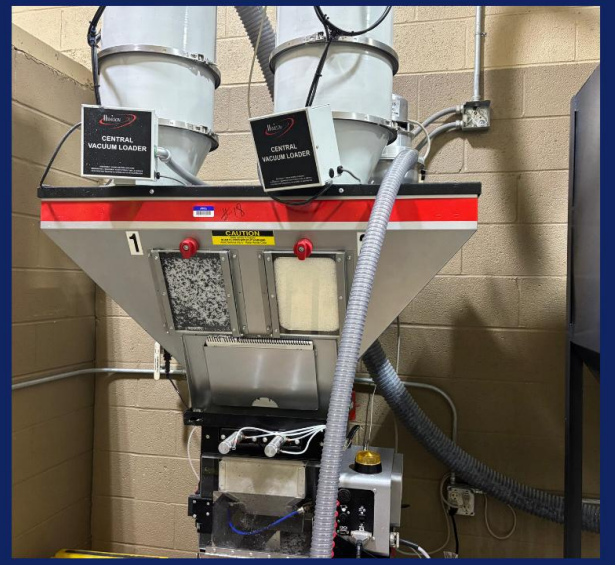
Non-PFAS Alternative for Barrier Packaging

Ease of Processing





Blending process of Kortrax® and resin utilizing a gravimetric blender.



Non-PFAS Alternative for Barrier Packaging

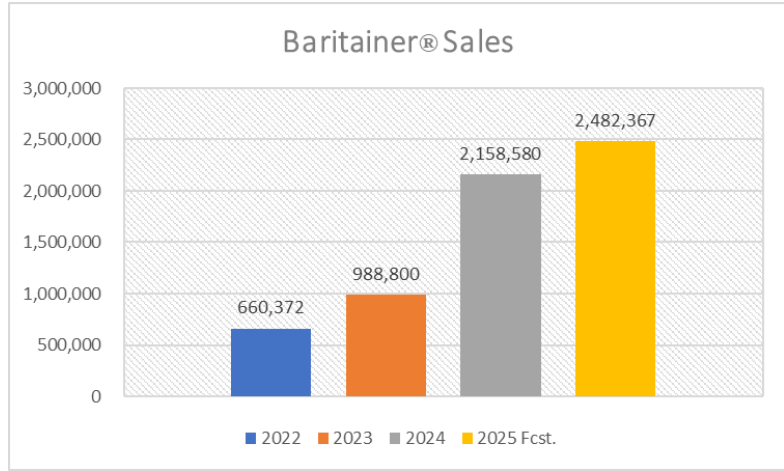
Ease of Processing

Non-PFAS Alternative for Barrier Packaging

CKS Commercial Development

- Customers requiring permeation barrier
  - ❖ Industrial cleaner, Ag Chem, Lawn Fertilizer, Auto Cleaner
- Compatibility testing per DOT 49CFR (critical - required/conducted by the producer)
- Current Pipeline – 8.4M Units
- Increased inquiries - PFAS/PFOA liability
- Shipping 6.3M units (2022-25)

Market Slow to Adapt



Non-PFAS Alternative for Barrier Packaging

Markets/Products

Markets Served

- Household/Industrial Chemical – Cleaners/Sanitizers/Solvents/Adhesives
- Ag Chem/Lawn Care – Pesticides/Herbicides/Fertilizers
- Automotive – Fuel Additive/Lubes/Cleaners/Polishes

Stock Designs – KORTRAX® Capable

- F-Style: 1 Gal. & 2.5 Gal.; 1 Gallon Round & Square
- Small Bottles: 8, 12, 16, 32, & 64 ounces
    - Cylinder/Carafe/Trigger Sprayer/F-Style

Four (4) Manufacturing Plants qualified

Latent Capacity ~50M units

Non-PFAS Alternative for Barrier Packaging

Takeaways

- Demand for non-PFAS barrier rigid plastic packaging is growing steadily
- Customer interest from multiple market segments (Liability concerns)
- Commercial process is technical with long sales cycle *(follow qualification protocol)*
- Processing is relatively easy with proper equipment and training
- Based on experience. this barrier technology performs as claimed

It works!

Safe/Sustainable/Economic PFAS-Free Alternative

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