Chemical Modification Improves Mechanical Stickies/Wax Removal

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Discussion Agenda

- What are the Cost of Stickies?
- ENESSCO S 1000 Technical Review
  - Mechanism & Benenfits
  - Reference Case Studies
- Mill Application
  - Trial Approach
  - Expected Benefits

What is the cost of Stickies/Wax?

- Lost Production due to Stickies Deposition
  - Including Matrix Deposits of Stickies, Wax, Pitch, Coatings, etc.
  - Deposits: Headbox, Forming Fabric, Press Felts, Dryer Section, Rolls, Converting, etc.
- Cost = Sheet Breaks, Downtime & Cleaning Chemicals

What is the cost of Stickies/Wax?

- Lost Production due to Poor Sheet Quality
  - White Grades: Light Spots, Holes, High Stickies/Dirt Counts
  - Brown Grades: High Wax/Stickies Counts, Wax Migration to Top Ply, < Strength
- Cost = Downgrades, Culls, + Process Adjustments (Grade Changes, DLK & Virgin Fiber Substitution, < Speeds)

What is the cost of Stickies/Wax?

- Fiber Loss
  - Stock Preparation Screening and Cleaning Reject Rate decisions made to promote "acceptable yield" economics.
    - Small Screen Slots to remove smaller particles
    - Reject Rates, Flow modifications, etc.
  - Inherent nature of Stickies/Wax is to be inter-wound with fiber
- Cost = Fiber, Disposal, Equipment + Impact on Production

What is the cost of Stickies/Wax?

- Lost Production due to Non-Optimized Production Processes
- What if:
  - No wax/stickies deposited: HB, forming fabrics, press felts, dryer fabrics, rolls?
  - Stickies/wax not available to negatively impact Sheet Parameters such as Strength, Appearance, Drainage, Sheet Consolidation, Slide Angle?
- Result: Increased 1st Quality Production

Achieving More "Virgin Like" Recycled Fiber

- Product:
  - 3rd Generation: ENESSCO S 1000 Chemical Modification
  - Synergistic, Patented Blend of Anionic Surfactants & Inorganic Salts
- Used to Maximize Stickies, Wax, Hydrophobic Contaminant Removal in Recycle Fiber Systems.

ENESSCO S 1000

- Product Fed to Recycle Fiber Repulper
- Dosage: 0.80 – 1.00 Dry LB/Pulper OCC Ton
- Application Methods
  - Dry-batch addition, Liquid-pump feed
- Equipment
  - Standard chemical gear pump for LQ bulk application

Treatment Philosophy

Competition	ENESSCO
▪ Mask stickies/wax problems by trying to render stickies to be non-tacky	▪ Eliminates stickies problems, while actually improving profitability
▪ Reduce stickies size	▪ Production & Quality Enhancer
▪ “Band-Aid Approach”	

Application Concept

- Product designed to More Efficiently Liberate Stickies/Wax/Ink from the Fiber Substrate
- Designed to Rigidify and keep contaminants in as **Large a Size as Possible** for Maximum Removal
- This mechanism avoids fiber/stickies bundles and avoids reducing contaminant size.
- Screening and Cleaning equipment can easily identify & reject contaminants, while accepting valuable fiber.

Application Concept

- Additional Mechanism attaches entrained air bubble to hydrophobic contaminants
  - This promotes maximum removal in lightweight removal equipment & water clarification.
  - Characteristic surface foam is seen in cleaner rejects, but entrained air is lower.
- Micro-Stickies are coated & pacified.

Contaminant Removal

PRIMARY MECHANISMS

1. Liberate Wax/Stickies from Fiber Substrate
2. Stabilize Wax/Stickies as Large Particles
3. Rigidify Wax/Stickies for Max. Removal

PRIMARY RESULTS

- 2-3 Fold Increase In Screening Rejects
- 2-6 Fold Increase In Lightweight Removal

(Lightweight Cleaners, Gyro-Cleans, DAF Clarification)

The Benefits of Greatly Reduced Wax & Stickies

System

- Yield Increase
  - Reduced Fiber Loss
- Higher Quality Pulp
  - Lower Stickies Count
  - Less Micro-Stickies
  - Substantially < Wax
- Higher Quality White-Water
  - Lower Chemical Use

Machine

- Production up 3-8%
  - Less Breaks,>Speed
  - Higher Strength, CD Sheet Uniformity
- Cleaner HB, Foils, Rolls, and Fabrics
- Chemical Reduction
  - Cleaning Chemicals
  - Control Chemicals
  - AntiSkid, Defoamer

Competitive Approaches

STOCK TREATMENT

- POLYMER
  - Detac
  - DiMDAC
  - P.E.I.
- Enzymes
- Talc
- Diatomatious Earth
- Dispersants & Surfactants

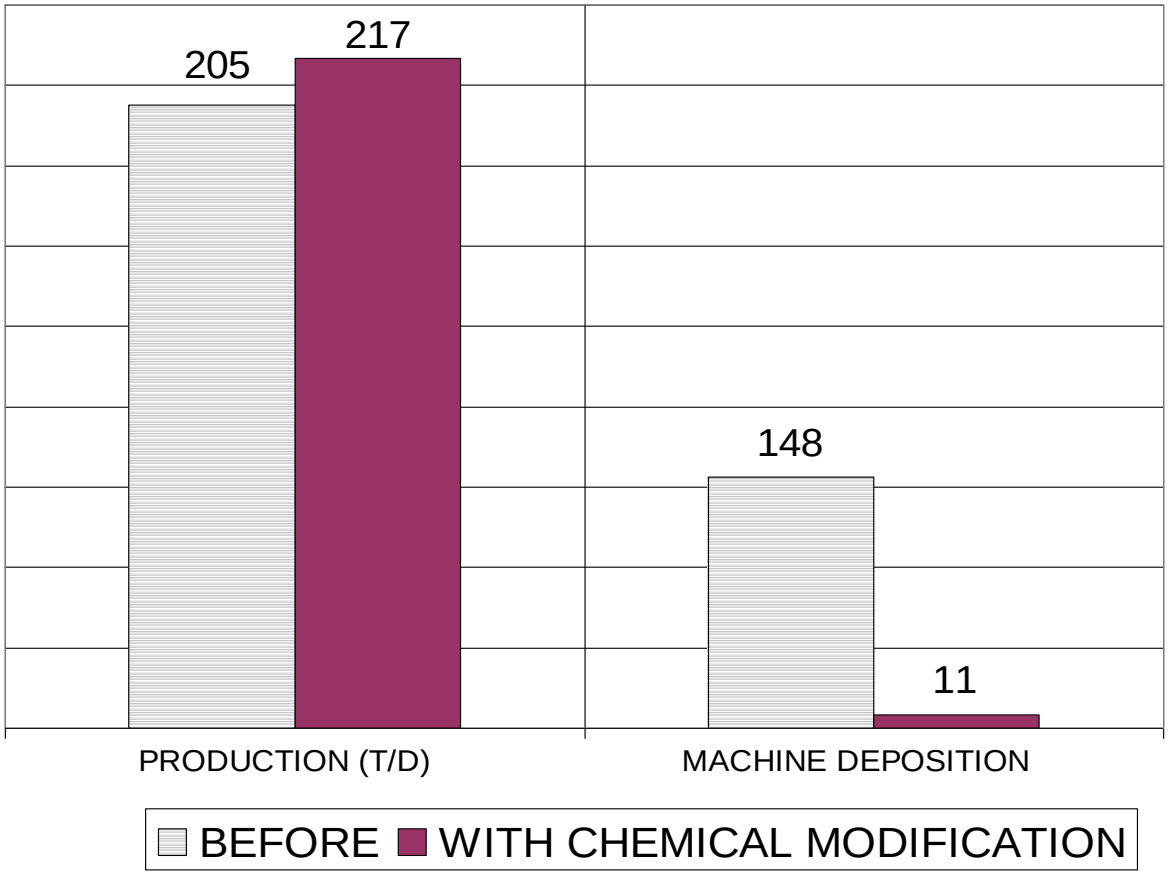
PAPER MACHINE

- Retention Aid
- Wire Passivation
- Felt Treatment
  - Solvent, Caustic, and/or Acid Wash
  - Blends with Disp. & Surfactants

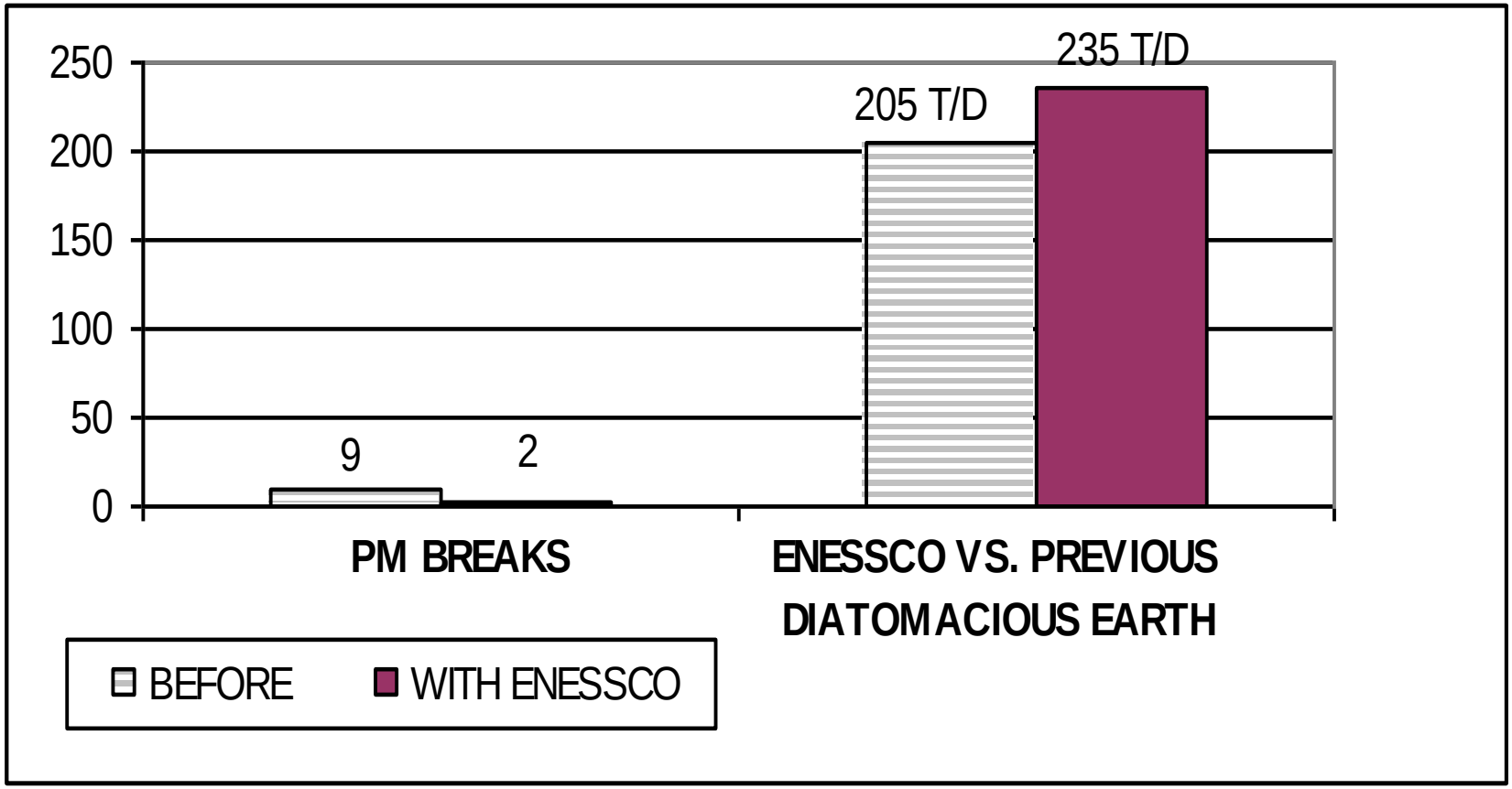
REFERENCE CASE STUDY #1: Midwest - Corrugating Medium

- Fourdrinear(2)- 18# to 40#, 100% OCC
- 100% Closed Water System
- ENESSCO Goals:
  - Reduce Cost of Chemical For Wax Control
  - Increase Quality Production
  - Reduce Downgraded/Culled Production
  - Reduce Stickies & Wax Deposition
  - Reduce Splices at the Rewinder

Initial Performance Of ENESSCO Program



Extended Production Benefits



Chemical Comparison

Chemical Use Before

- Defoamer
- Felt Wash
- Press Roll Treatment
- Starch
- Diatomaceous Earth

Chemical Use After Chemical Modification

- 60% Reduction
- 80% Reduction
- Eliminated
- 50% Reduction
- Enessco Cost Lower than Diatomaceous Earth

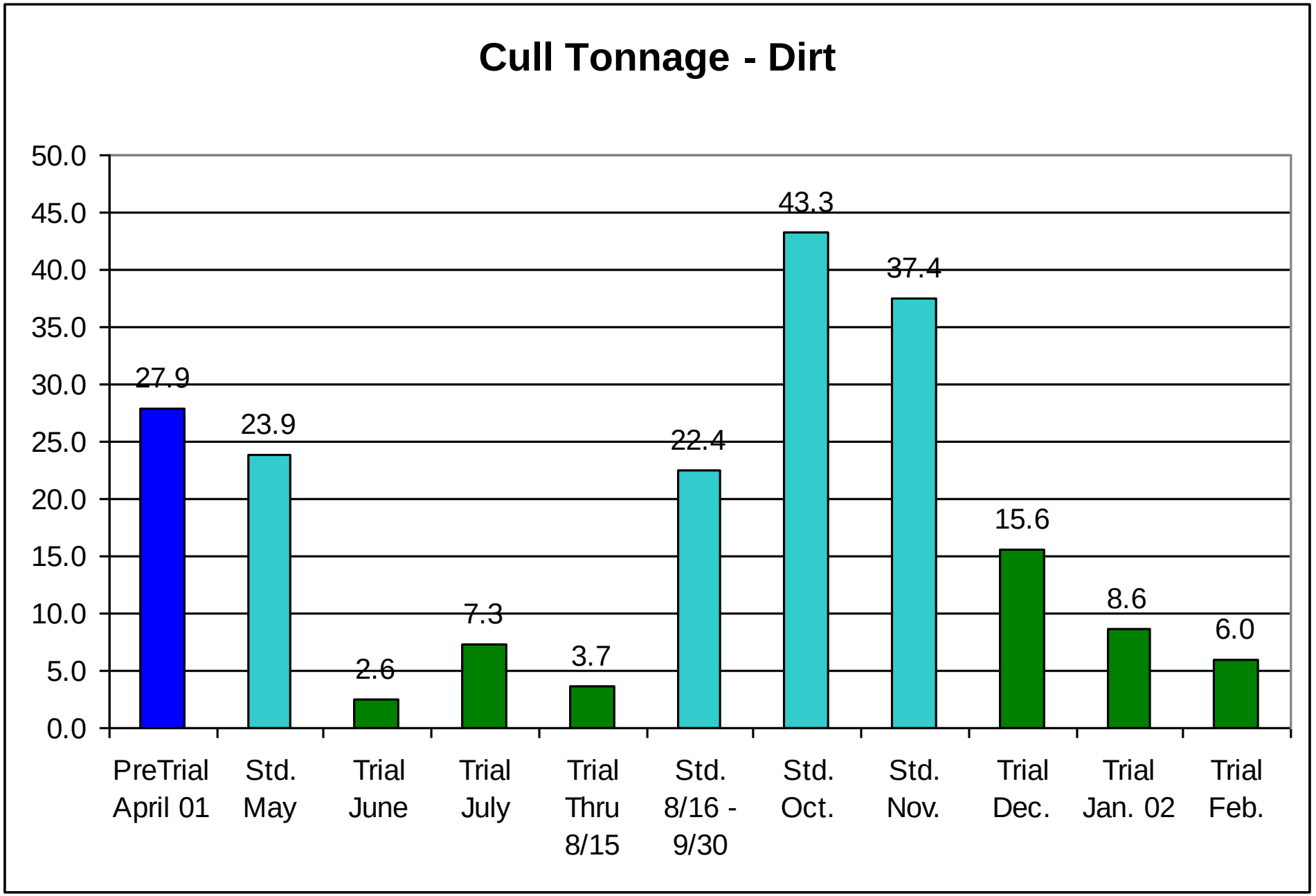
Cost Justification of ENESSCO Chemistry

- Machine Operation
  - **6%-8% Production Increase**
  - 90% Lower Culls
  - 70% Fewer Splices
  - 90+% Reduced Stickies Deposition
  - ➢ **Program Justification Easily**
- Operational Savings
  - Savings of $0.80/Treated Ton by replacing DE with Enessco S 1000
  - **Reduction of over $5.50/Ton of other Specialty Chemicals**

<u>EXCEEDS 3 to 1 ROI.</u>

REFERENCE CASE STUDY #2: Northeast - Linerboard

- Fourdrinear- 28# to 42# (100% OCC)
- Surface Water, Summer- Closed System
- ENESSCO Goals:
  - Reduce Stickies/Wax Downgrades & Culls
  - Maximize Production by improving Fabric Performance and Minimizing Dryer Deposition
  - Reduce Anti-Skid, < Slide Angle Variation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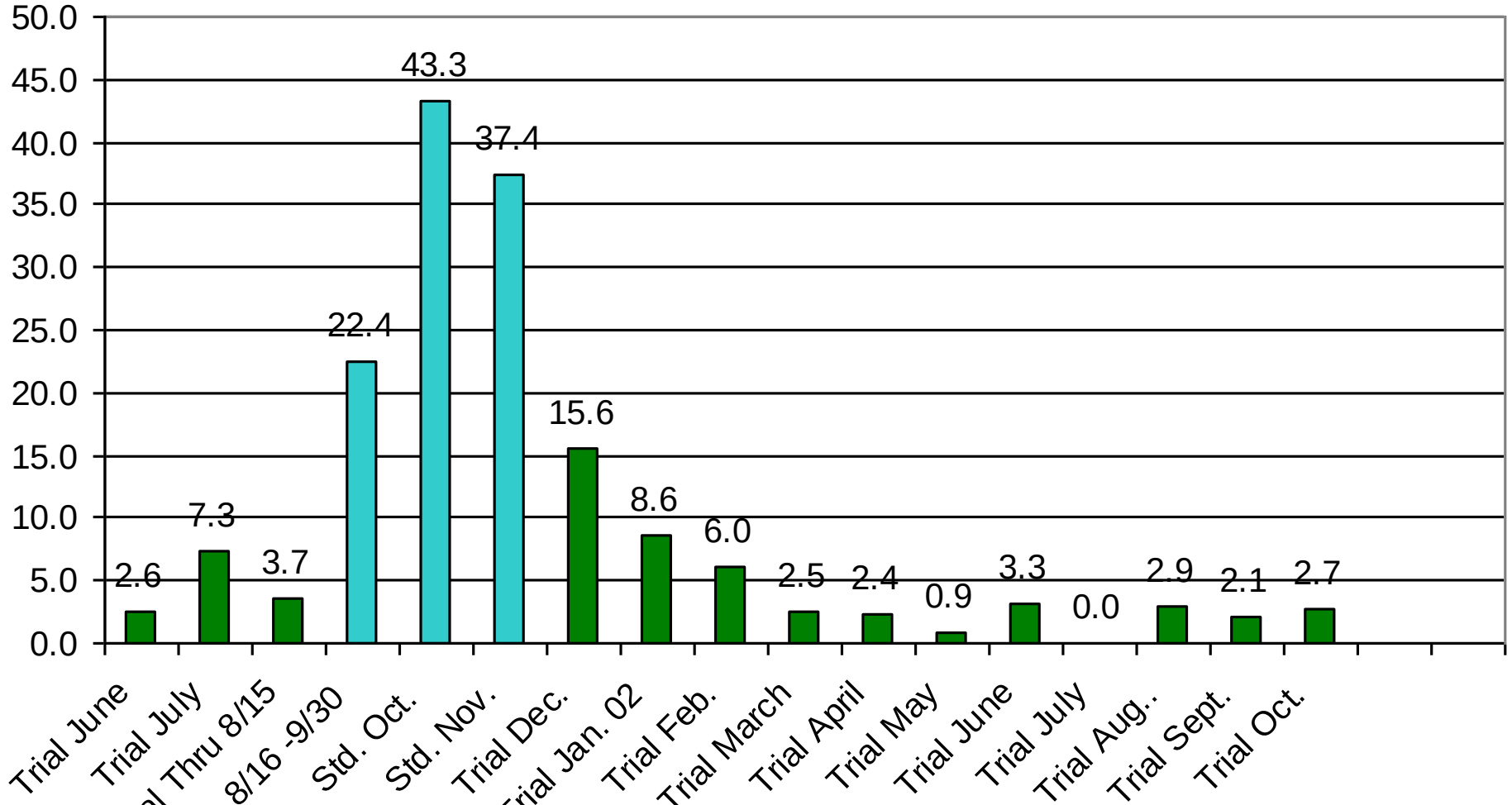
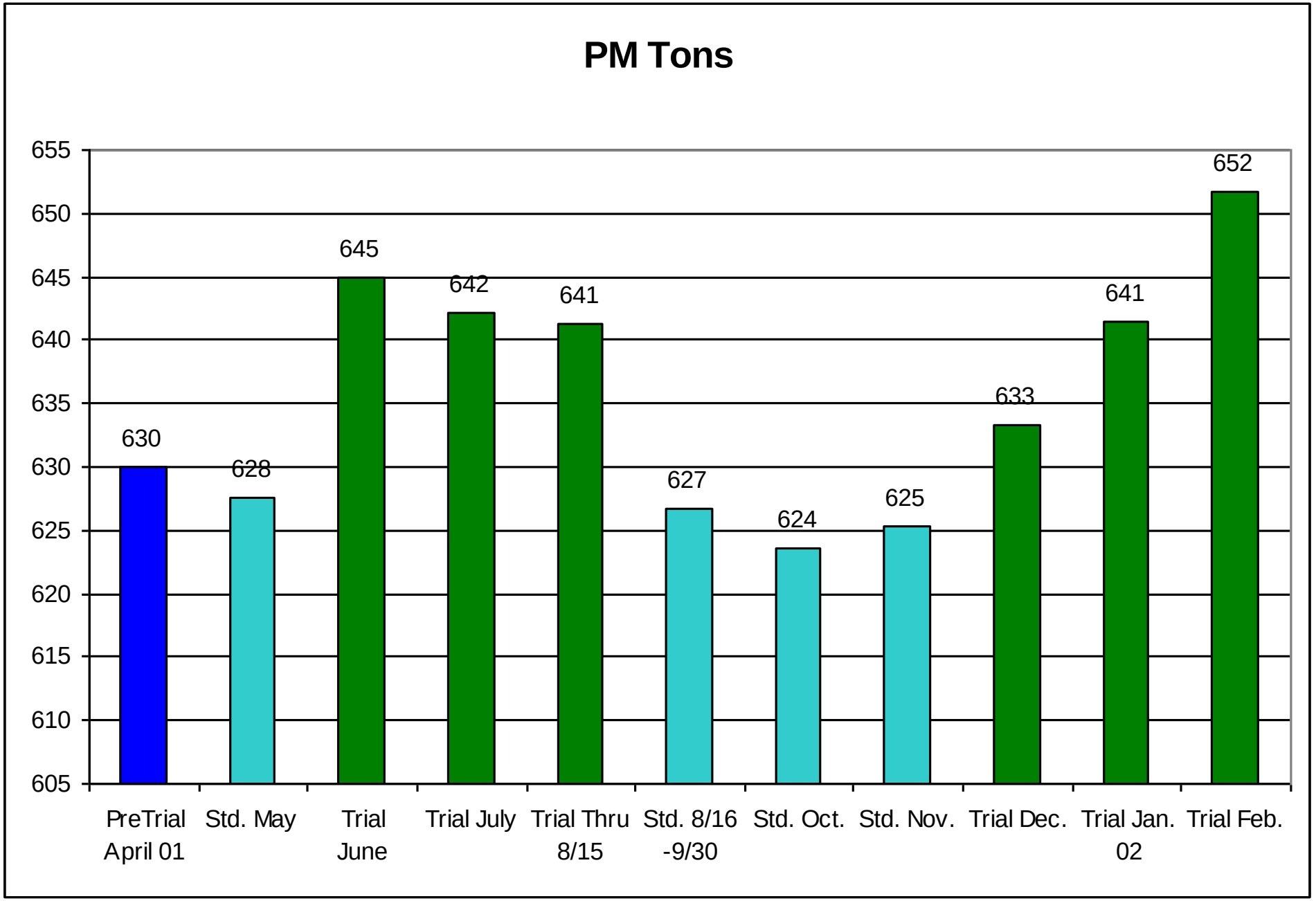
PreTrial April 01
Std. May
Trial June
Trial July
Trial Thru 8/15
Std. 8/16 - 9/30
Std. Oct.
Std. Nov.
Trial Dec.
Trial Jan. 02
Trial Feb.

Cull Tonnage - Dirt

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Std. May
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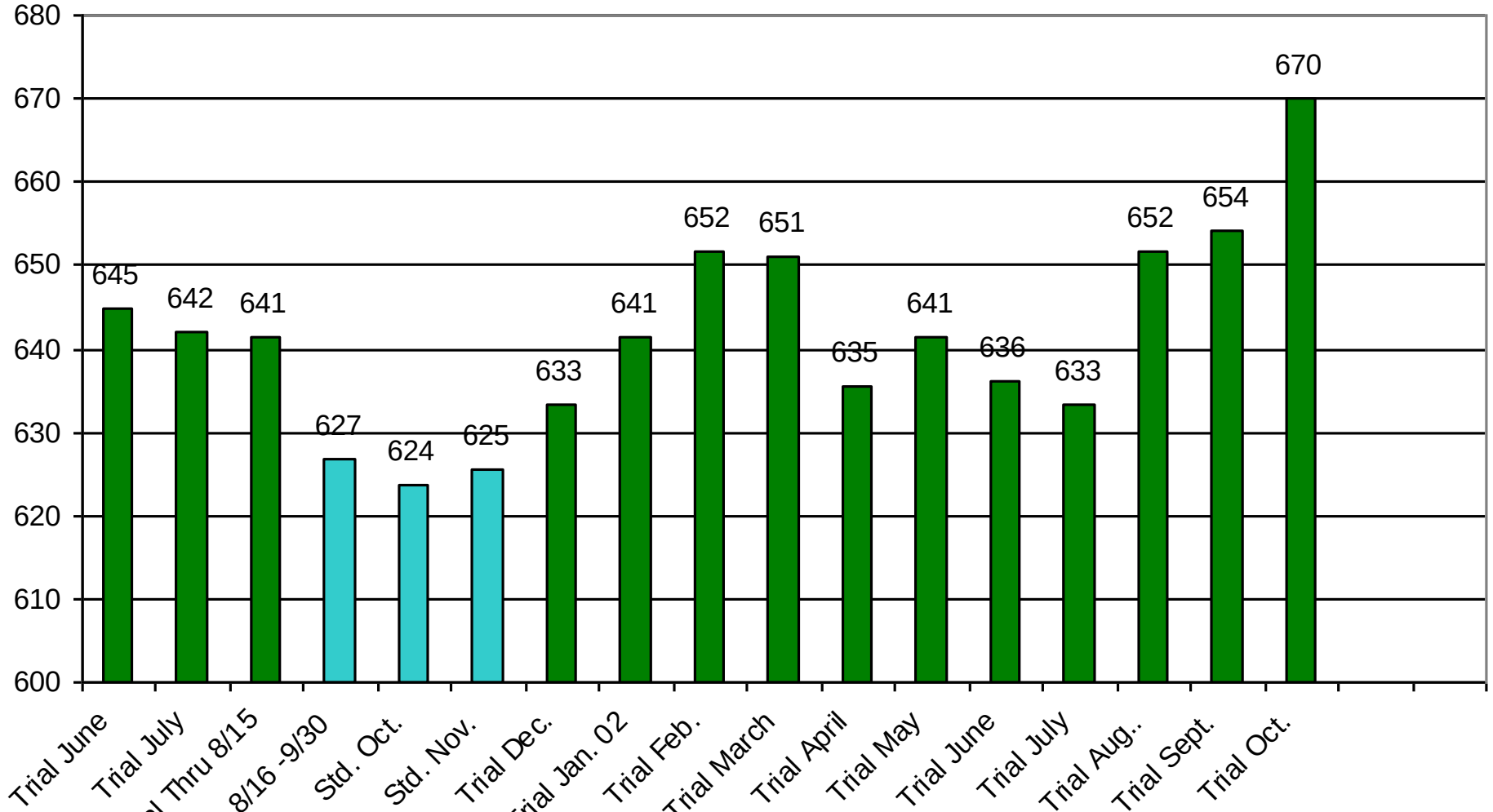
PM Tons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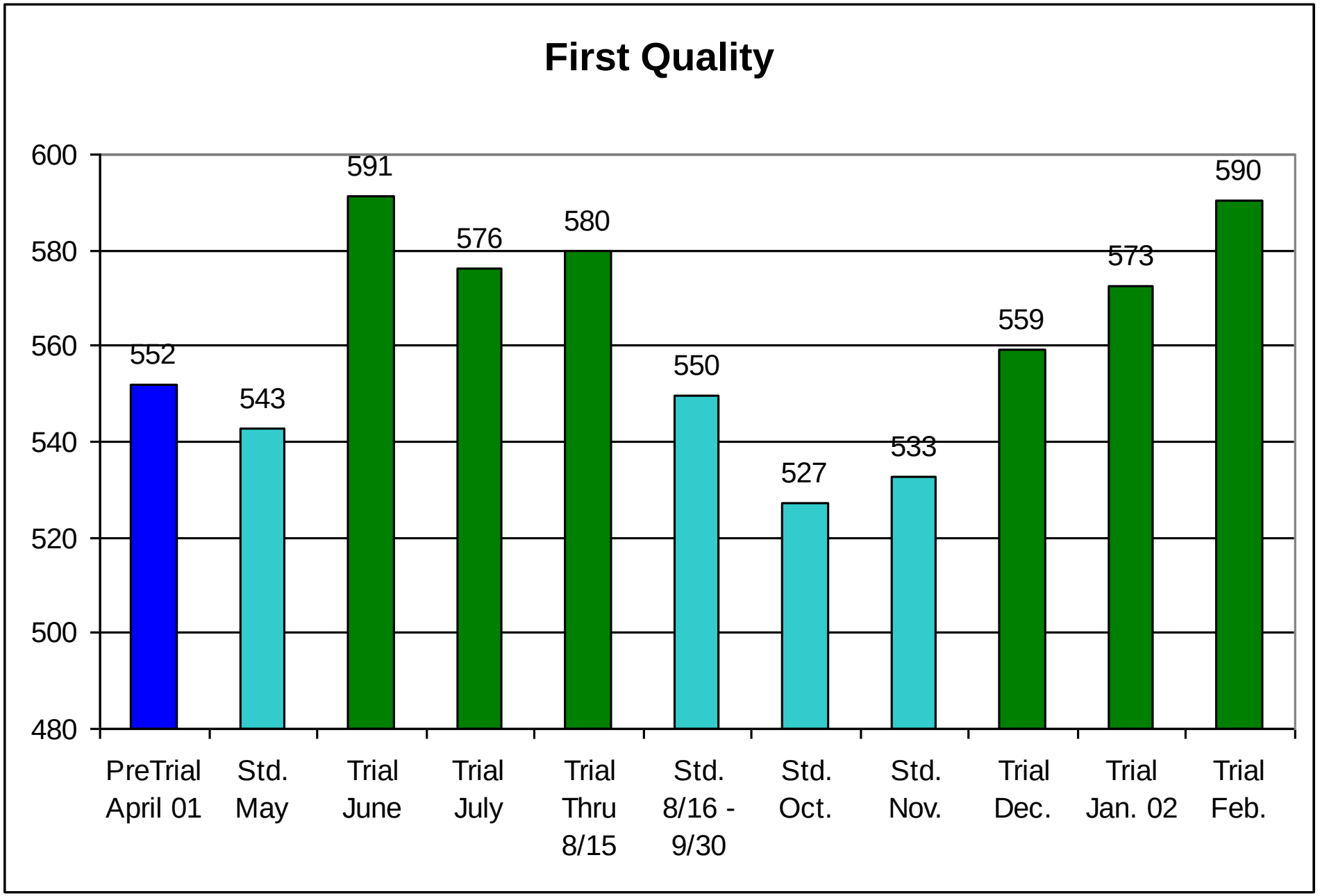
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Std. May
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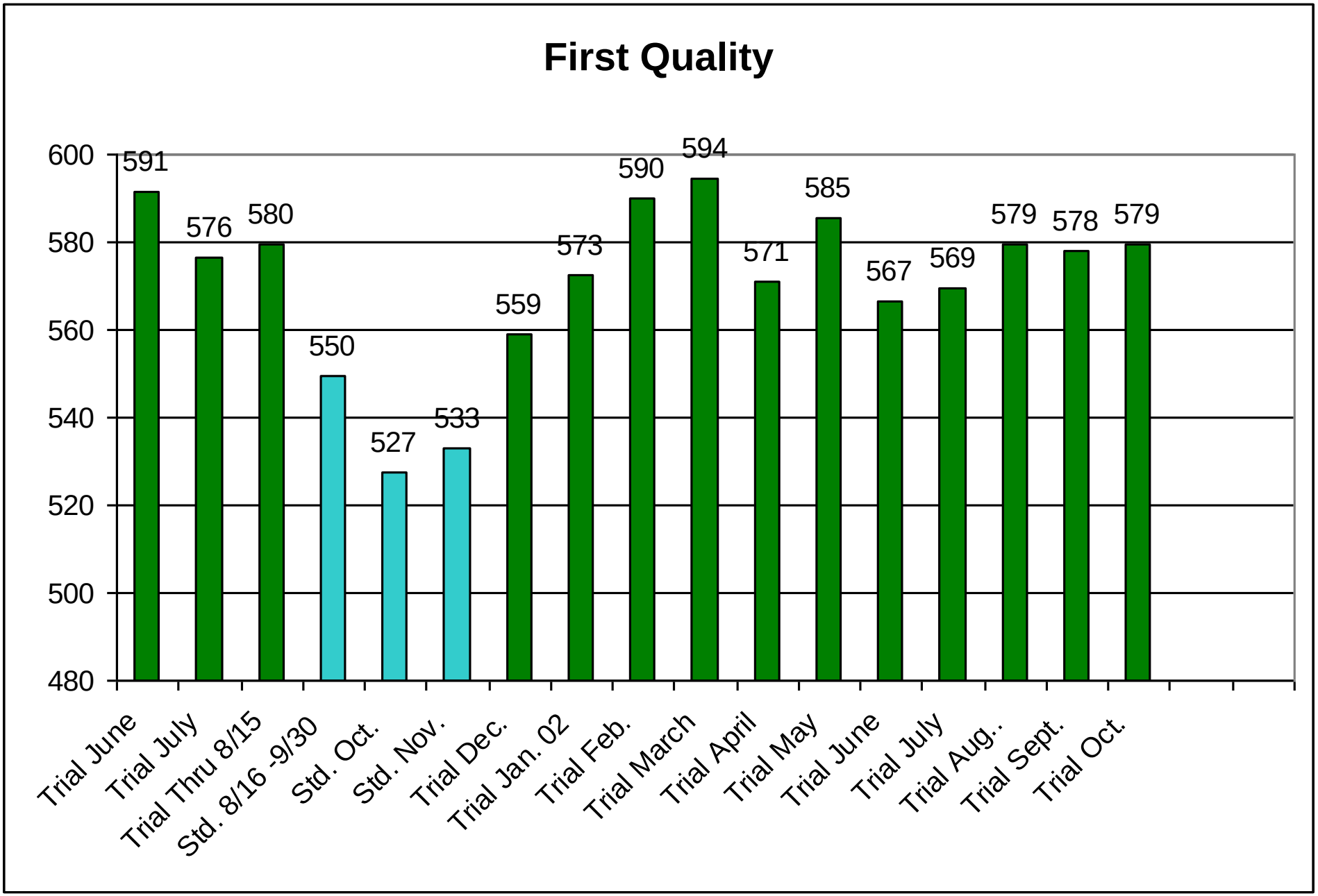
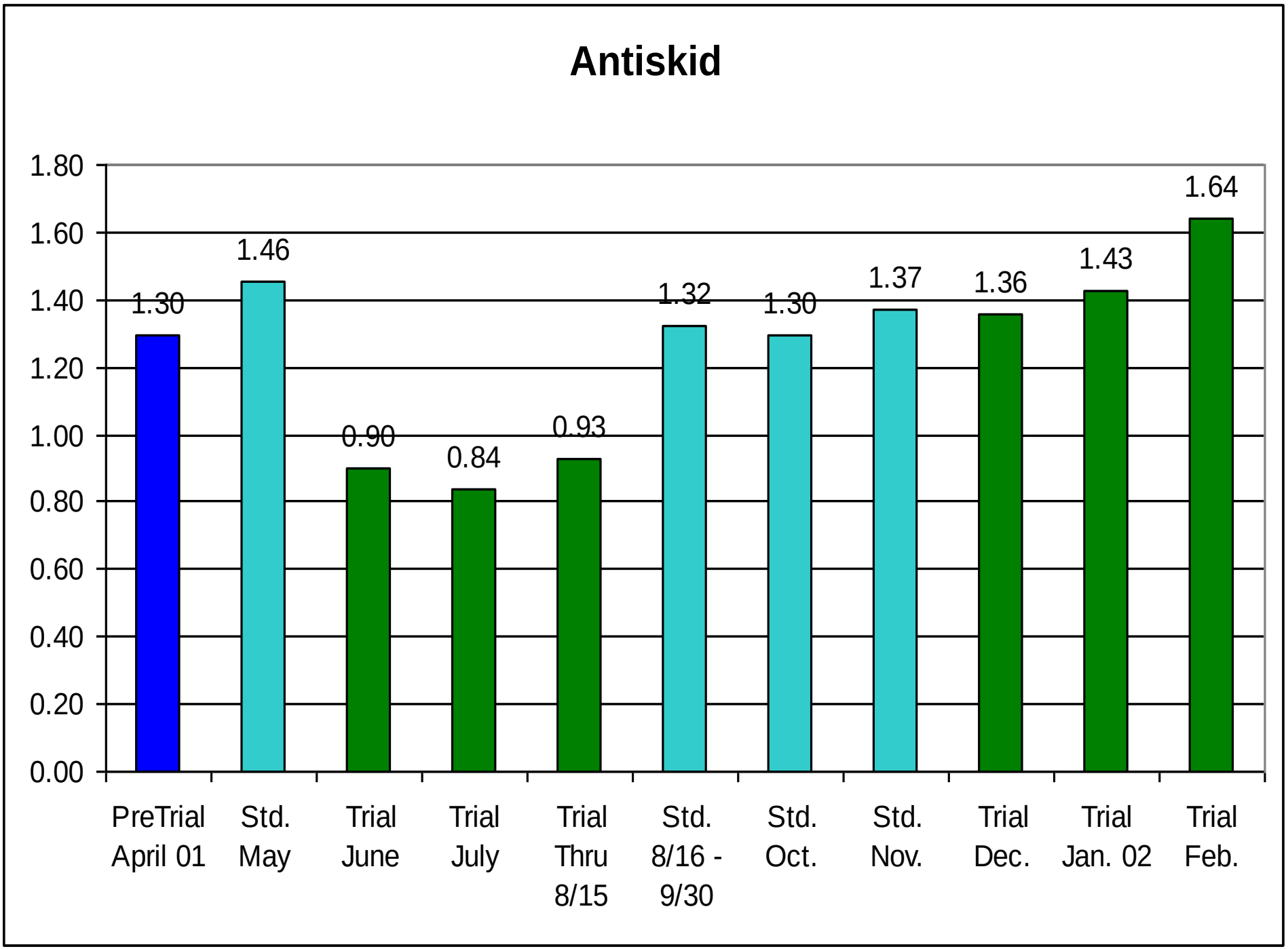
First Quality

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0.93
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PreTrial April 01
Std. May
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Trial Thru 8/15
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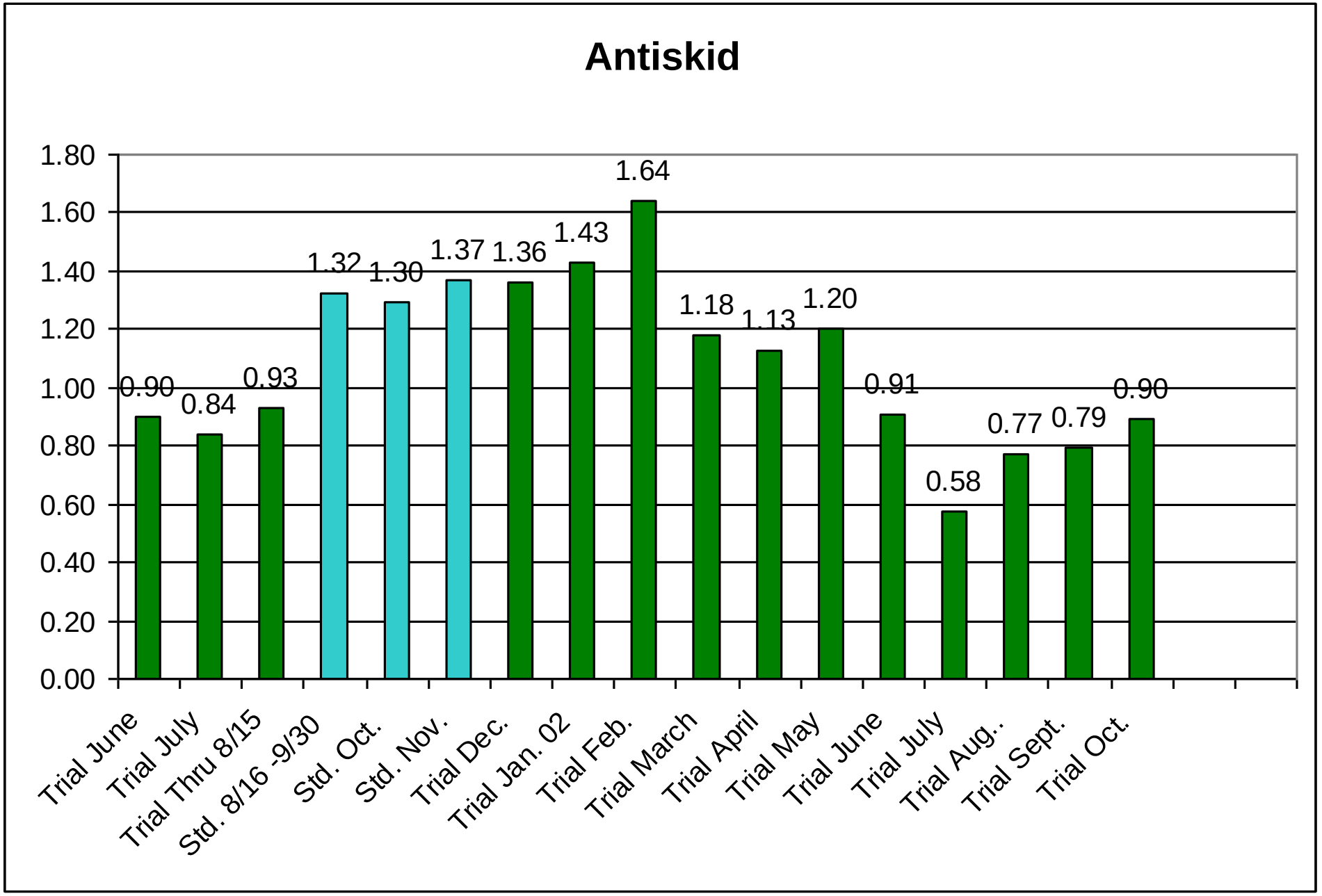
Antiskid
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Trial June
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Std. Oct.
Std. Nov.
Trial Dec.
Trial Jan. 02
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Trial July
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Trial Sept.
Trial Oct.

Cost Justification of ENESSCO Chemistry

- Machine Operation
  - **4% Production Increase**
  - **8% Increase: First Quality Production**
  - 80% Cull Reduction
  - Maintained Lowest Grade OCC usage
  - 2% Yield Gain
  - **Program Justification Easily**

- Operational Benefit
  - Improved Strength
  - More uniform sheet CD profile
  - Improved Press Section performance
  - Improved Dryer Section Performance
  - < Antiskid 40%

EXCEEDS 3 to 1 ROI.

ENESSCO Trial Approach

- System Survey to confirm Enessco S 1000 benefits can be realized.
  - Sample Final Stage Screening Operations
  - Sample Final Stage Lightweight Removal Equip.
  - Define Stickies/Wax Operational Issues.
- Based on Assessment of Mill Process:
  - Initiate Enessco at 0.80 – 1.0 Dry LB/Finish production Ton

Proposed Trial Approach

PHASE #1

- **1st 2-Week Period**
- **Monitor:**
  - Screening Efficiency
  - Lightweight Cleaners
  - Sheet Slide Angle Improvement
  - Document Improving Trends On Machine

PHASE #2

- **2nd 2-Week Period**
- **Monitor:**
  - Machine Speeds
  - Incremental Production
  - Reduction Downgrades & Culls; < Dirt Count
  - Sheet Strength
  - Other Chemical Use
  - Document ROI

Anticipated ENESSCO Benefits

PHASE #1

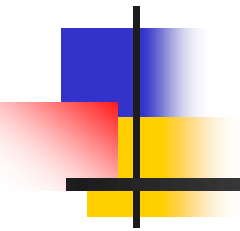
- **Benefits:**
  - Screening Rejects Removal Improved 2 x
  - Lightweight Cleaner Rejects Removal Improved 3-6 x
  - Sheet Slide Angle Improvement …….. 20-50% Improvement

PHASE #2

- **Benefits:**
  - Production
    - 85+% < Culled Rolls
    - 2-4% Increased T/D
  - Increased Strength
  - Chemical Savings
    - Antiskid(30+%), Defoamer(20%) Polymer, Strength, Felt Wash, Cleaning Chem.
  - Steam Savings

CLOSING

- ENESSCO Chemical Modification Technology Keeps Stickies & Wax Large For Superior Removal Efficiencies.
- The Value of "More Virgin Like" Recycled Fiber is extensive.
- Mill's Concentrate on Maximizing Profitability, Not Contaminants.



ANY QUESTIONS ???