Increased Machine Efficiency Using a Novel, Structure Wet Strength Resin

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Wet Strength Resins Background & Innovation

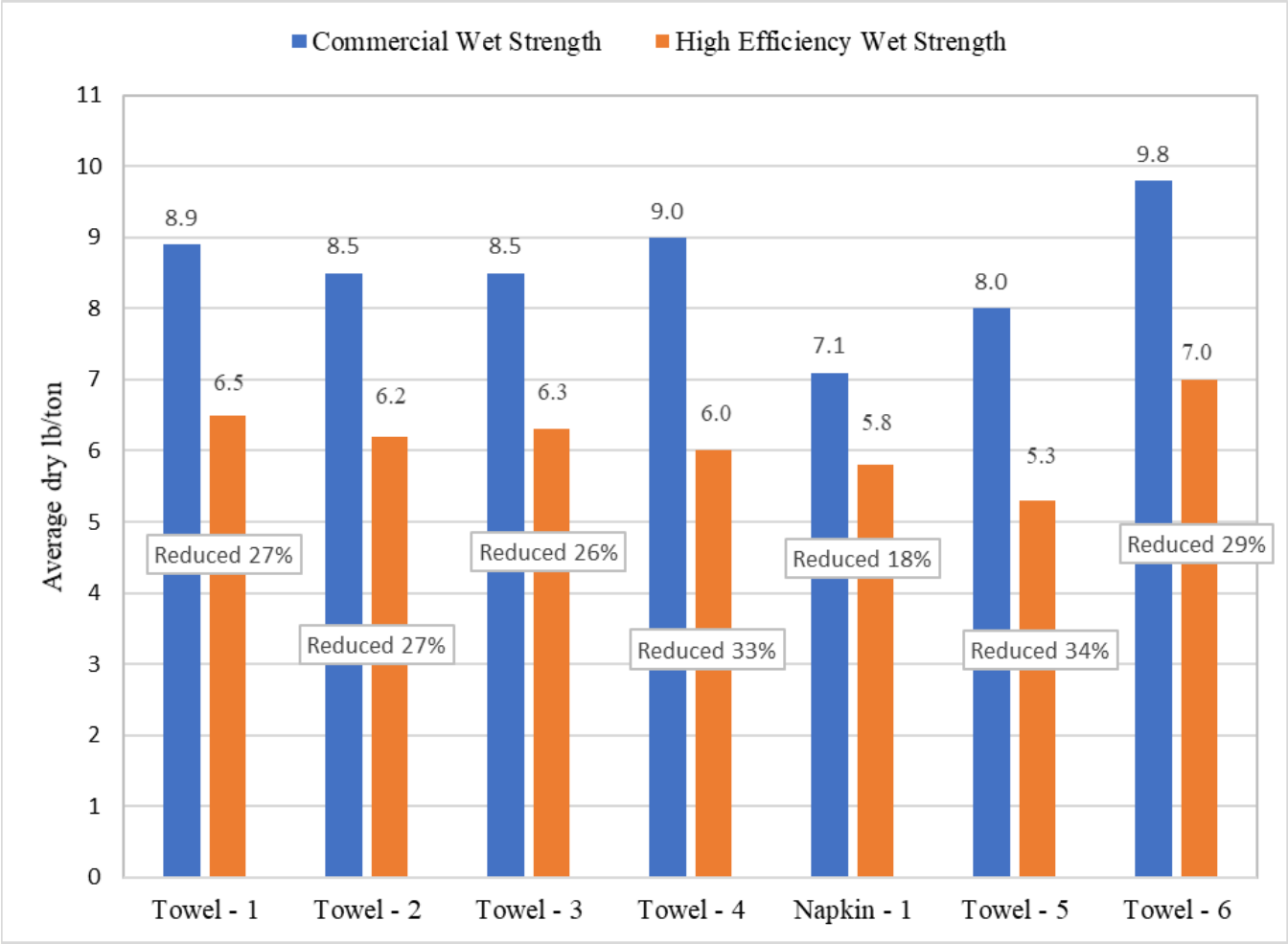
- PAE are the most widely used wet strength products
- Tissue & Towel, Board & Packaging, Specialty Grades
- Performance improvements - incremental for decades (tweaks)
- Step Change Innovation: Novel raw materials, unique manufacturing process
- Higher cationic charge, high molecular weight, high solids
- Higher maximum wet and dry tensile strength
- Patented technology

Development of a High-Performance Wet Strength Resin METRIX™ Armor

- Improved Operational Efficiency
  - New grade development and fiber substitution
  - Less product handling and worker exposure
  - Improved logistics and inventory management
  - Reduced VOC and AOX in-use

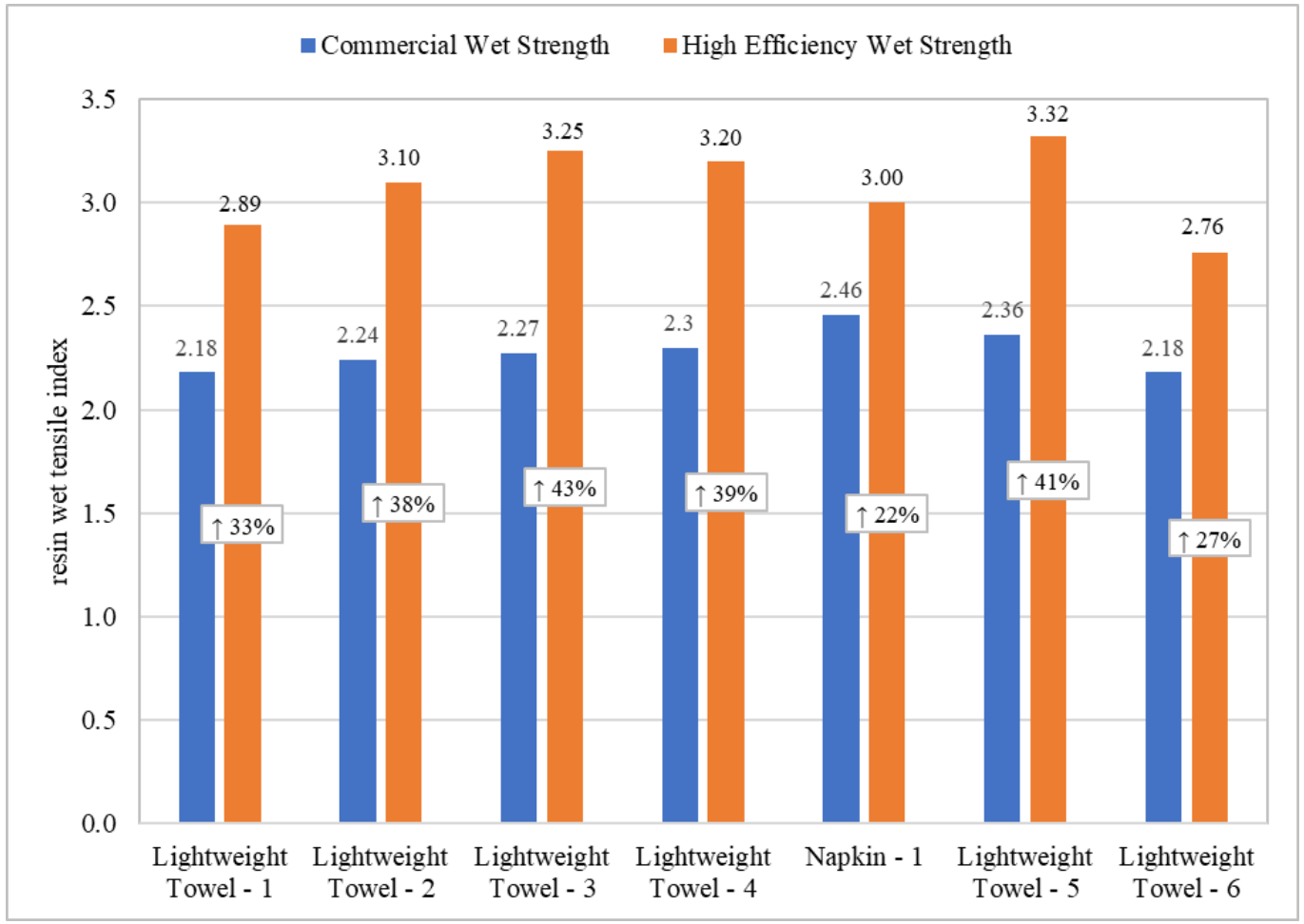
- Highest Wet Strength Performance
  - Increased polymer reactivity
  - Increased cationic charge
  - High molecular weight
  - High product concentration
  - Good storage stability

Trial - Dry Crepe Machine, Recycle Towel and Napkin
Average Wet Strength Resin Dosage, lb/ton dry



28% Average Reduction Across All Grades

Trial - Dry Crepe Machine, Recycle Towel and Napkin
Average CD Wet Tensile Index

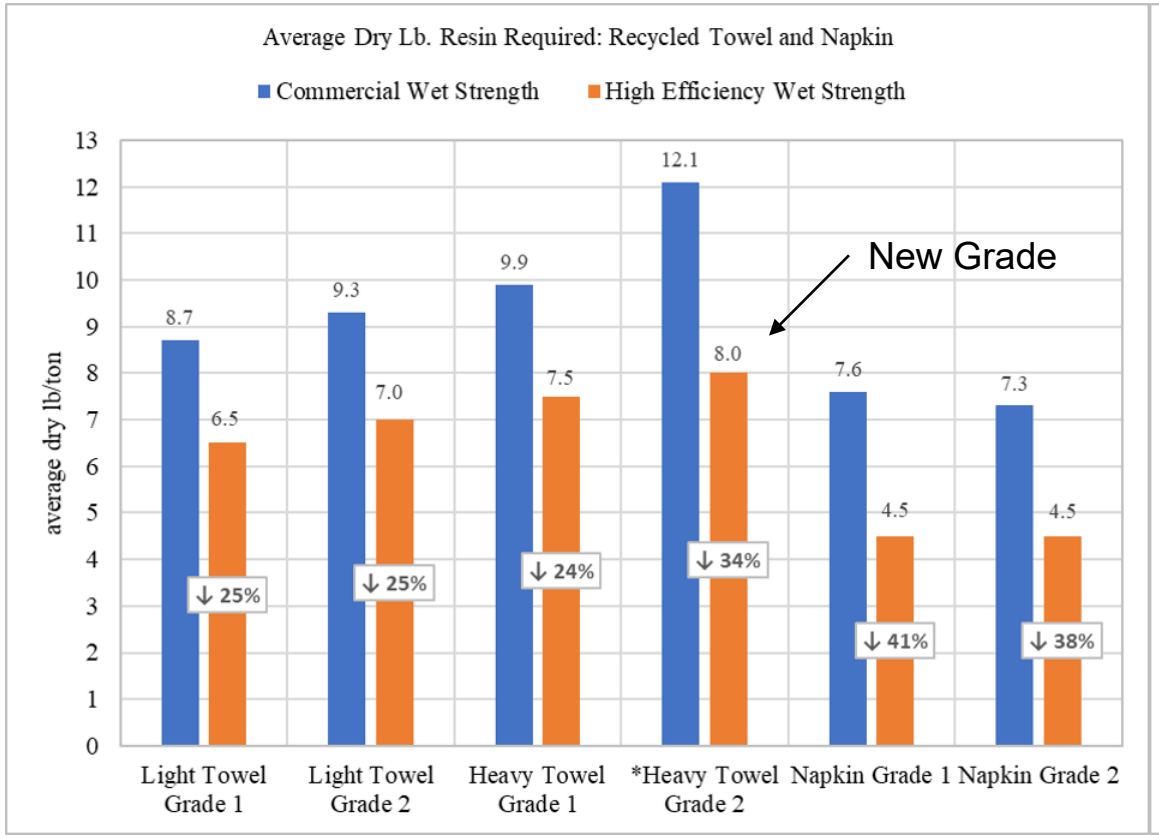


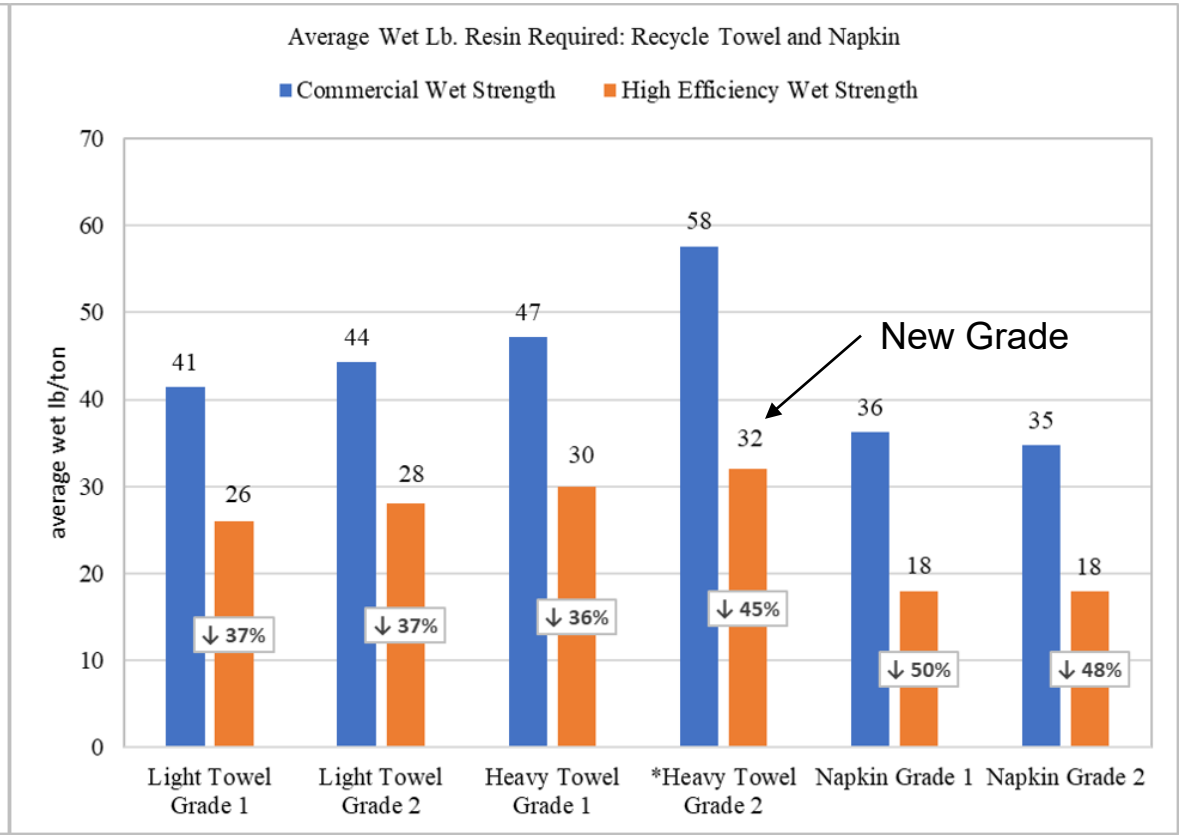
35% Average Increase Across All Grades

Extended Trial - Dry Crepe Machine, Recycle Towel and Napkin

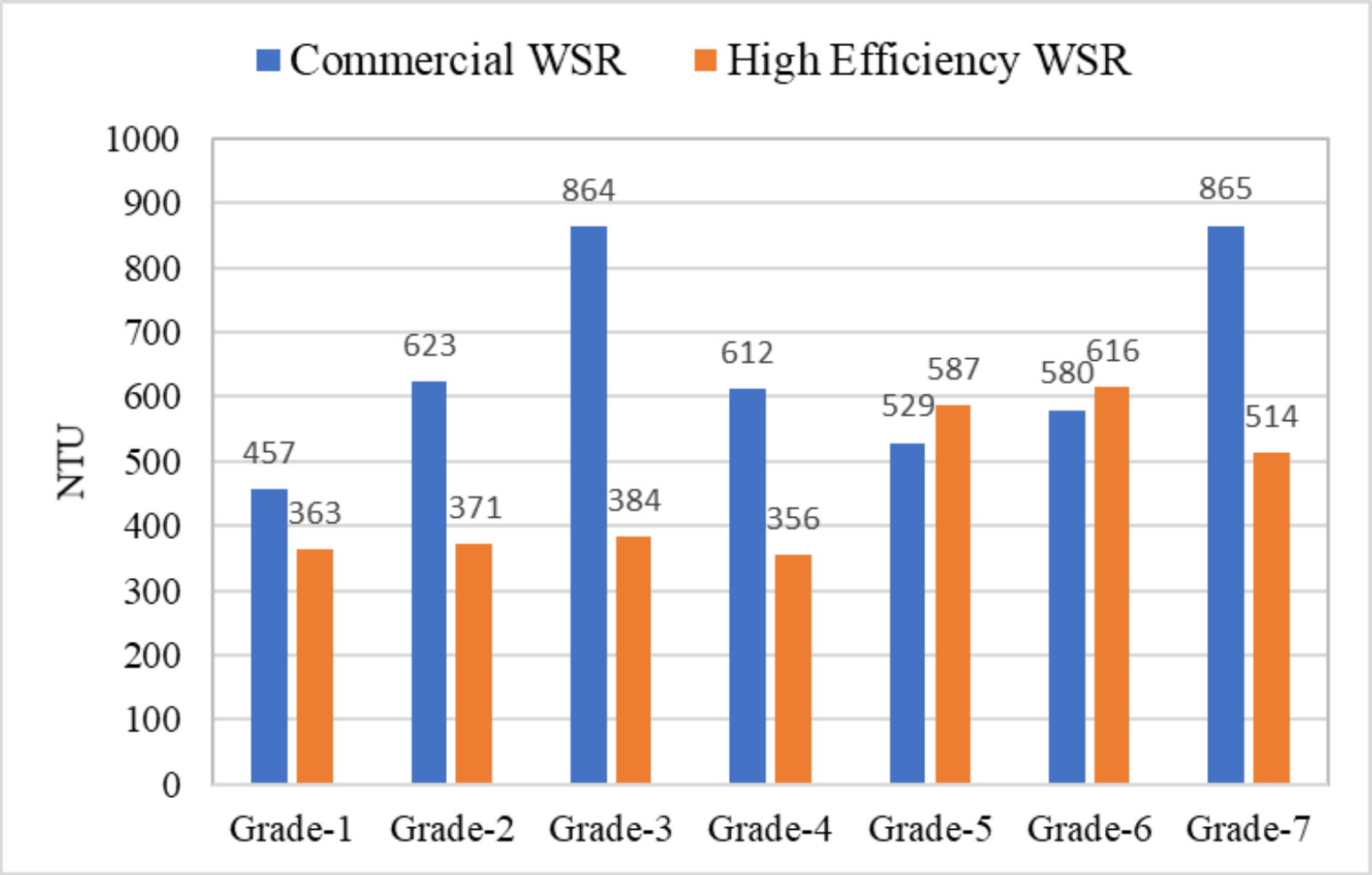
Dry Lb/ ton: 31% Average Reduction

Product Lb/ ton: 42% Average Reduction



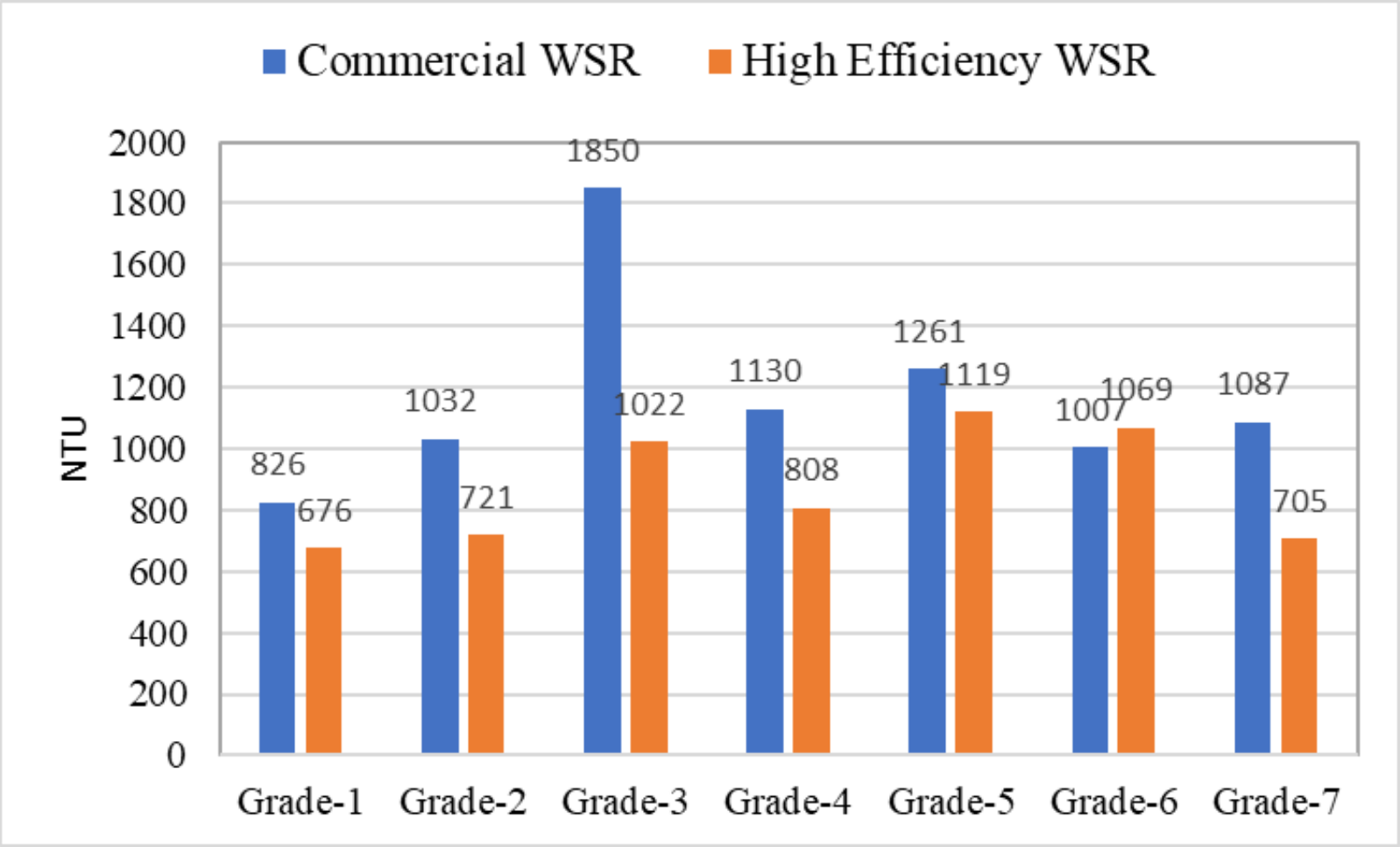


Trial - Recycle AFH Towel, Wet Crepe Machine
Headbox Filtered Turbidity



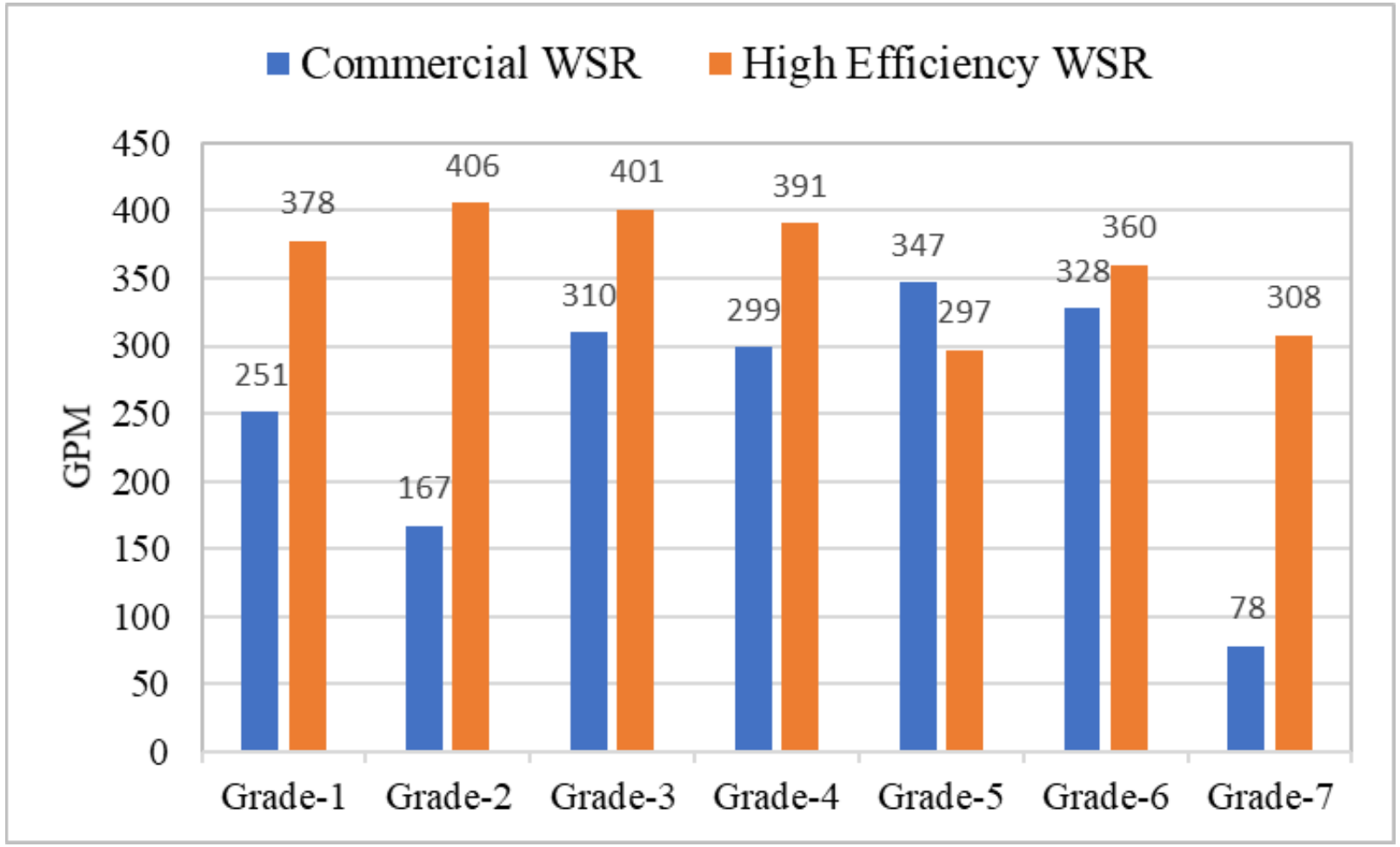
40% Decrease Across 5/7 Grades

Trial - Recycle AFH Towel, Wet Crepe Machine White Water Turbidity



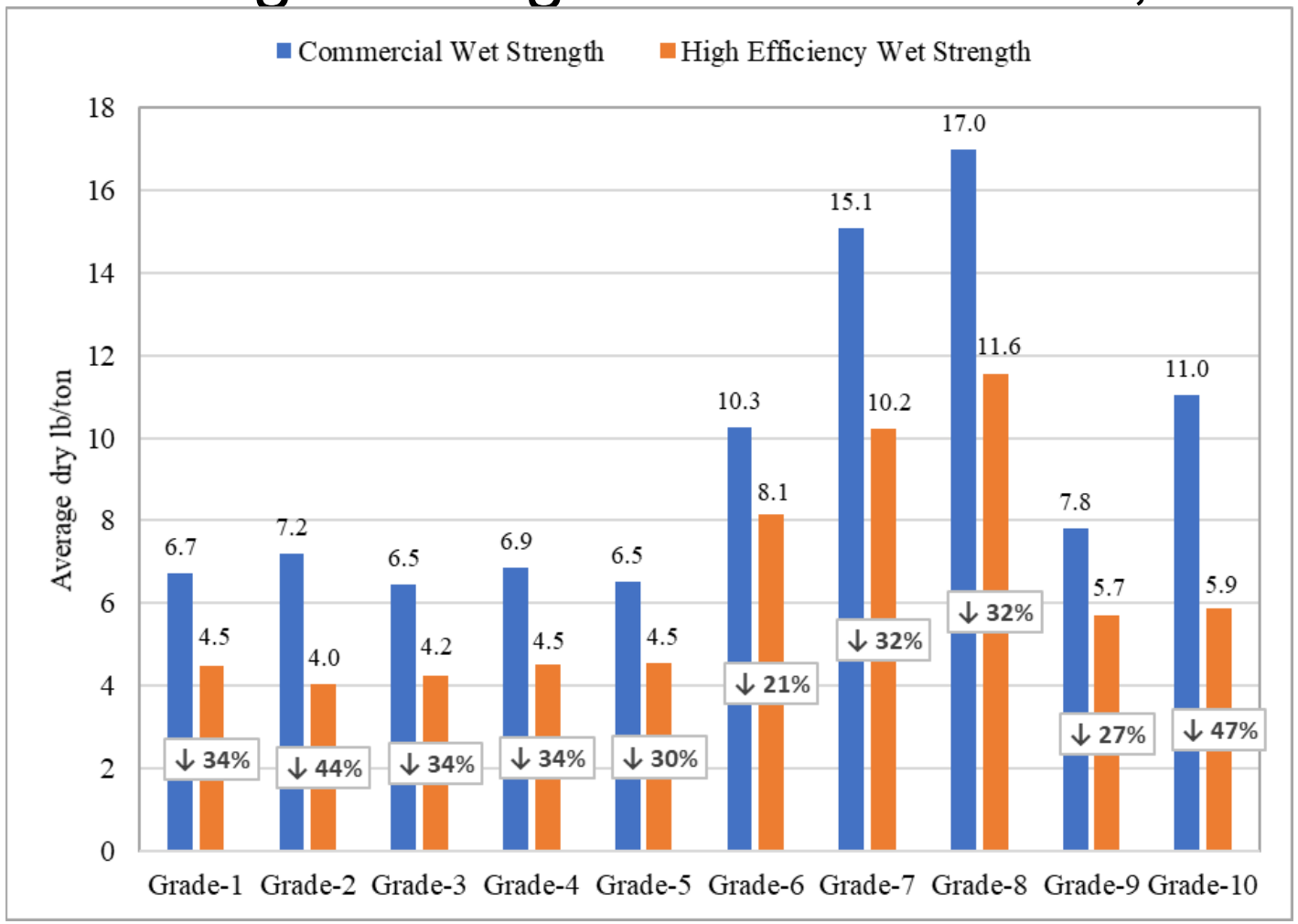
31% Decrease Across 5/7 Grades

Trial - Recycle AFH Towel, Wet Crepe Machine Broke Flow Rate, GPM



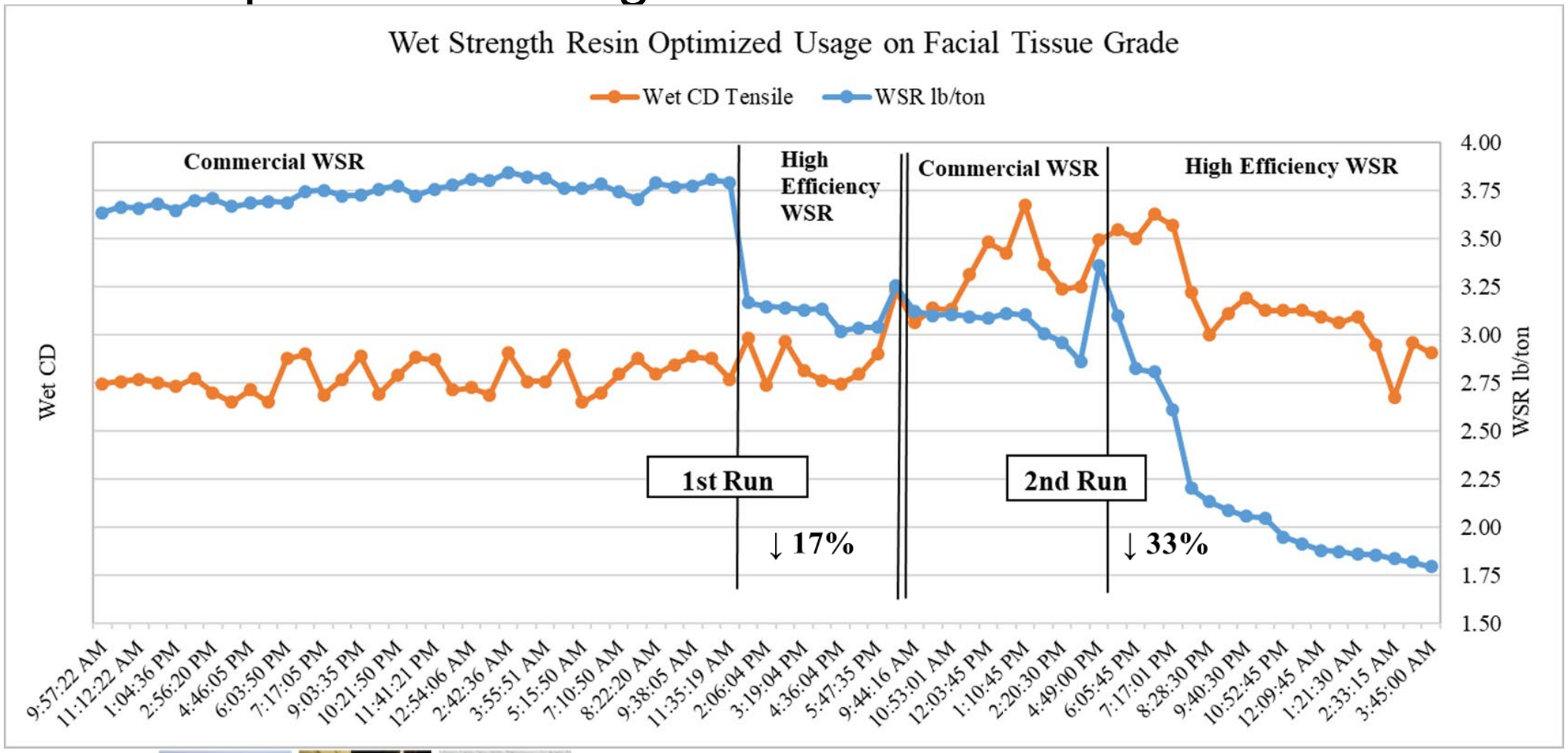
31% Increase Across 5/7 Grades

Trial Recycle AFG Towel, Wet Crepe Machine Average Dosage Rate Reduction, lb/ton dry

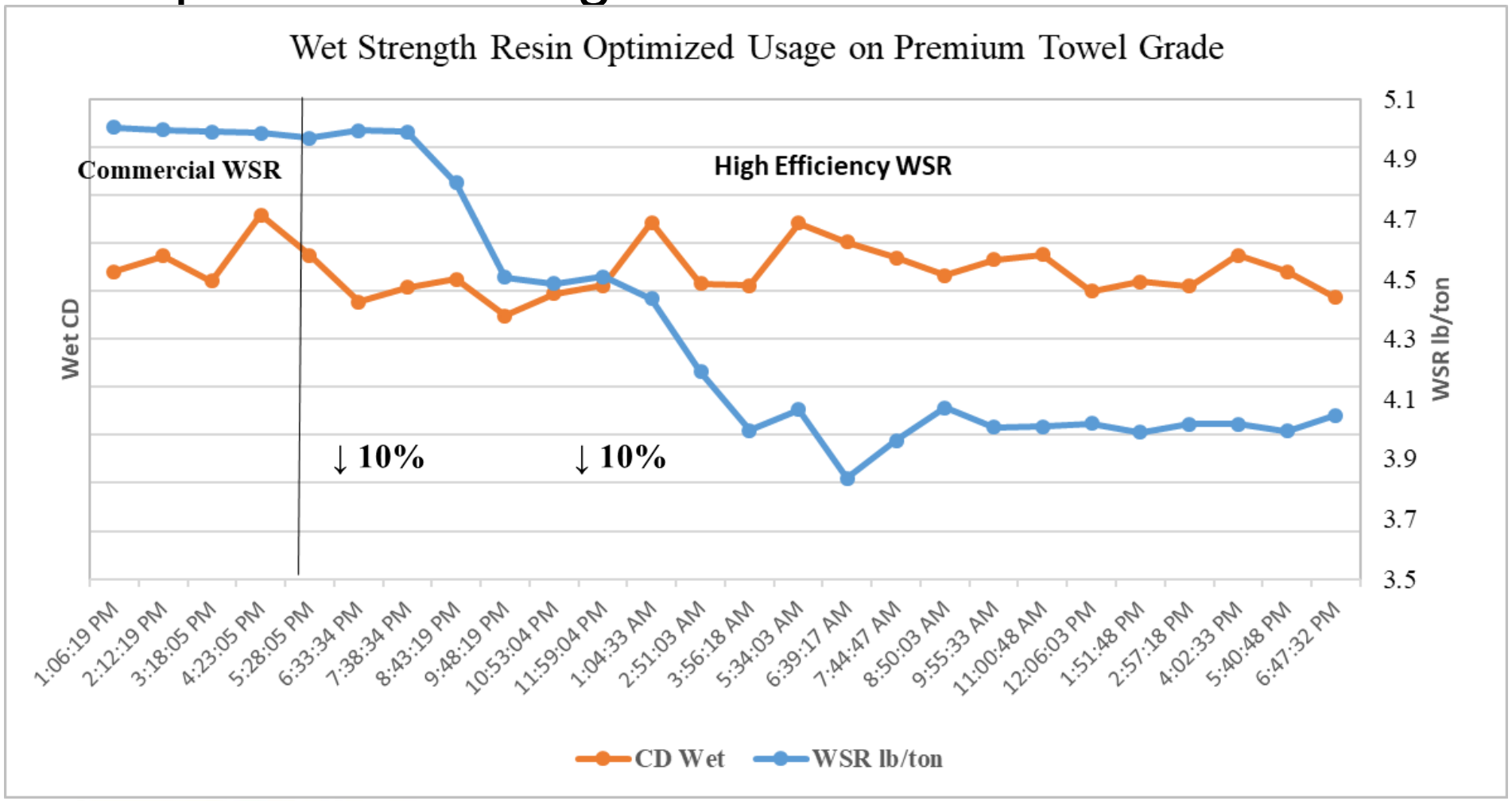


34% Average Reduction Across All Grades

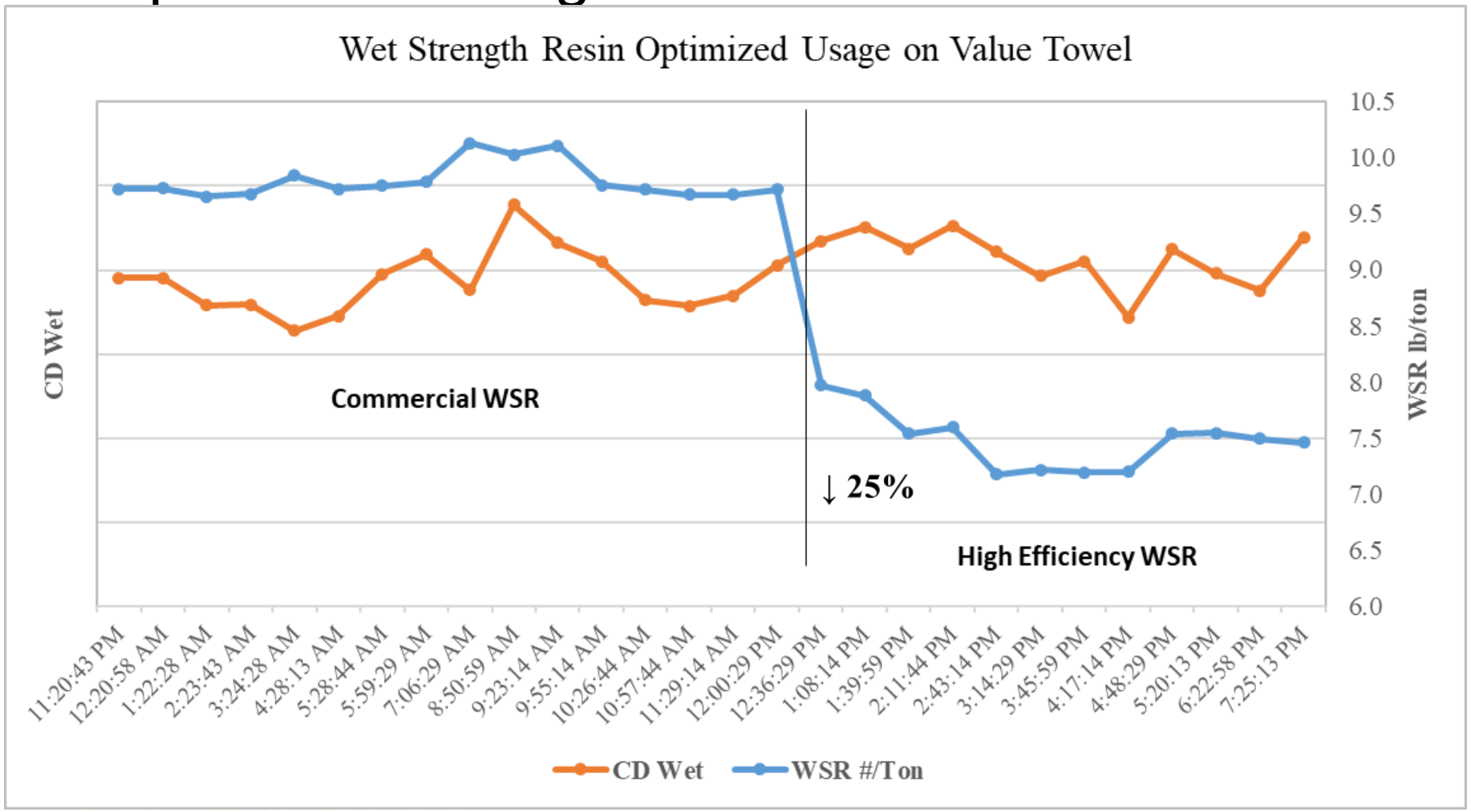
TAD Machine Trial – Facial Tissue Grade Optimized Dosage Rate and Wet CD Tensile



TAD Machine Trial – Premium Towel Grade Optimized Dosage Rate and Wet CD Tensile

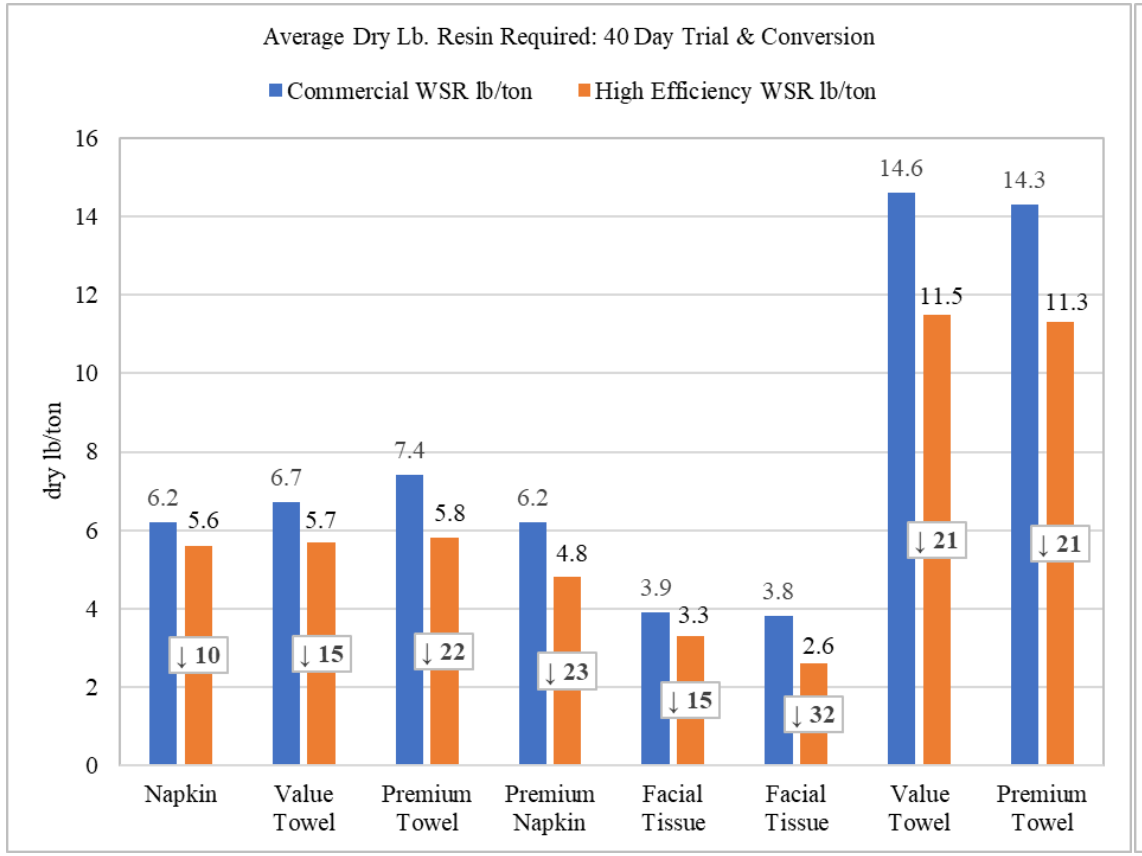


TAD Machine Trial – Value Towel Grade Optimized Dosage Rate and Wet CD Tensile

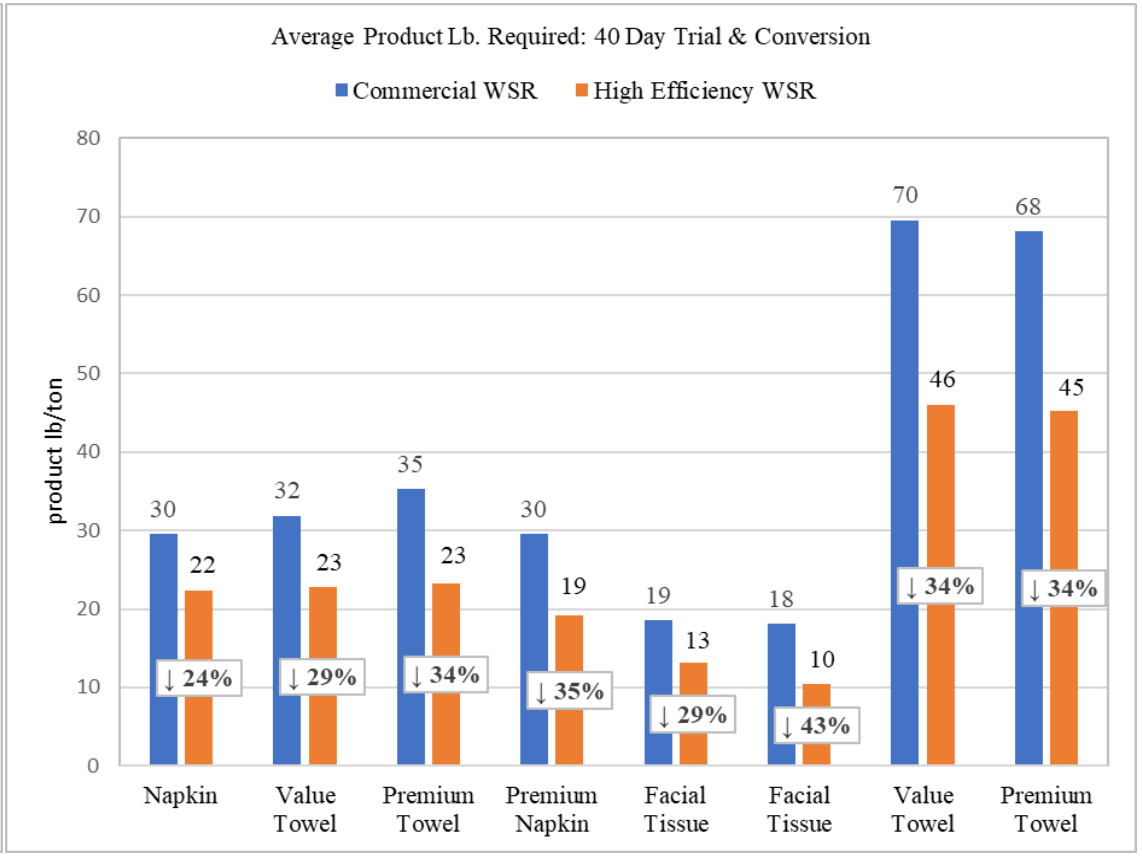


Extended Trial – TAD Machine

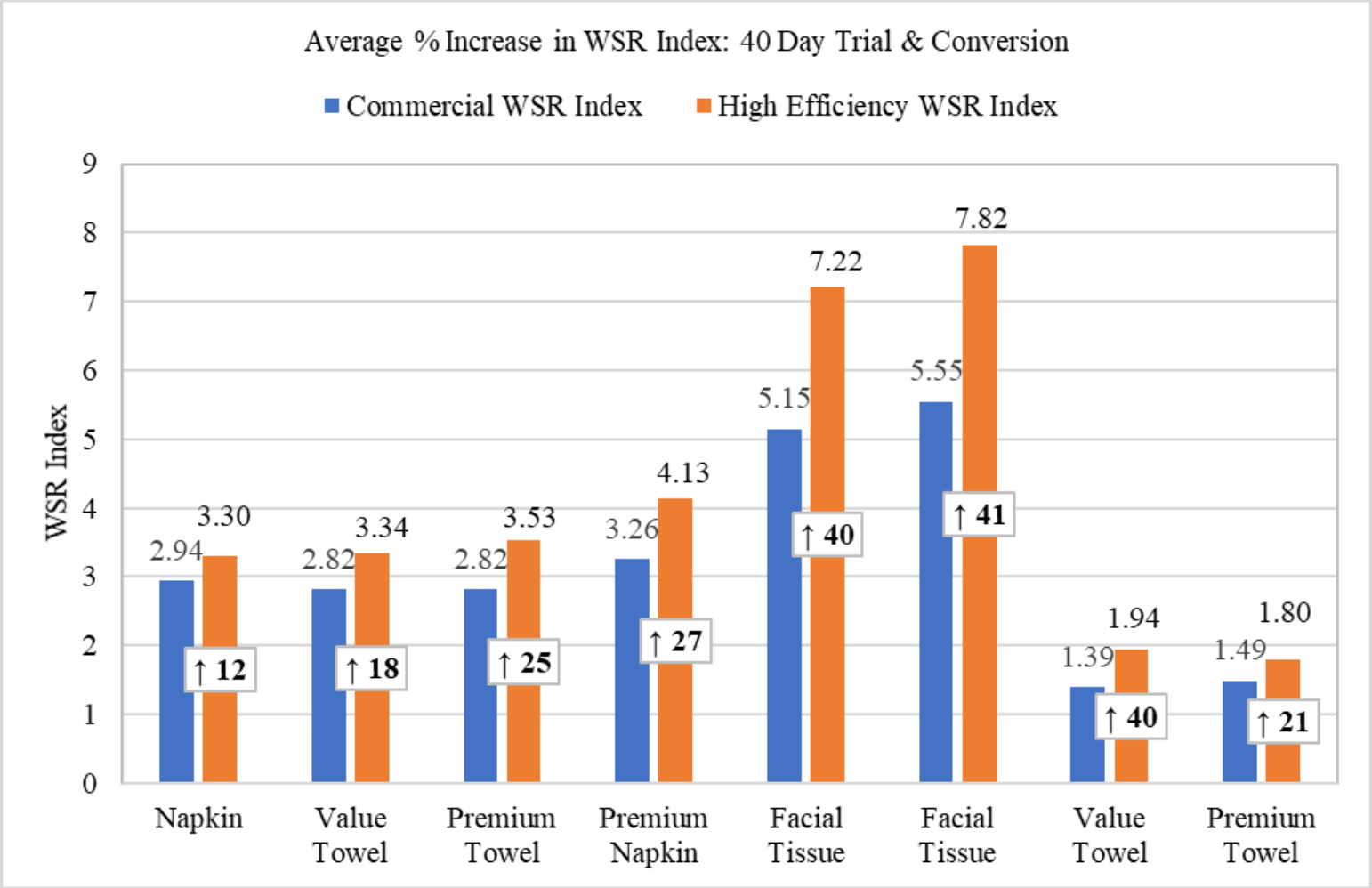
Dry Lb/ ton: 20% Average Reduction



Product Lb/ ton: 33% Average Reduction



Extended Trial – TAD Machine
Average % Increase in Wet Tensile Index



26% Average Increase Across All Grades

Synergistic Strength with High Efficiency Wet Strength and Dry Strength on TAD Machine

Grade	Commercial WSR lb/ton	DSR lb/ton	High Efficiency WSR lb/ton	DSR lb/ton	% Reduction DSR
Napkin	6.2	2.3	5.6	1.8	22
Value Towel	6.7	2.0	5.7	1.4	30
Premium Towel	7.4	4.8	5.8	4.5	6
Average	6.8	3.0	5.7	2.6	19

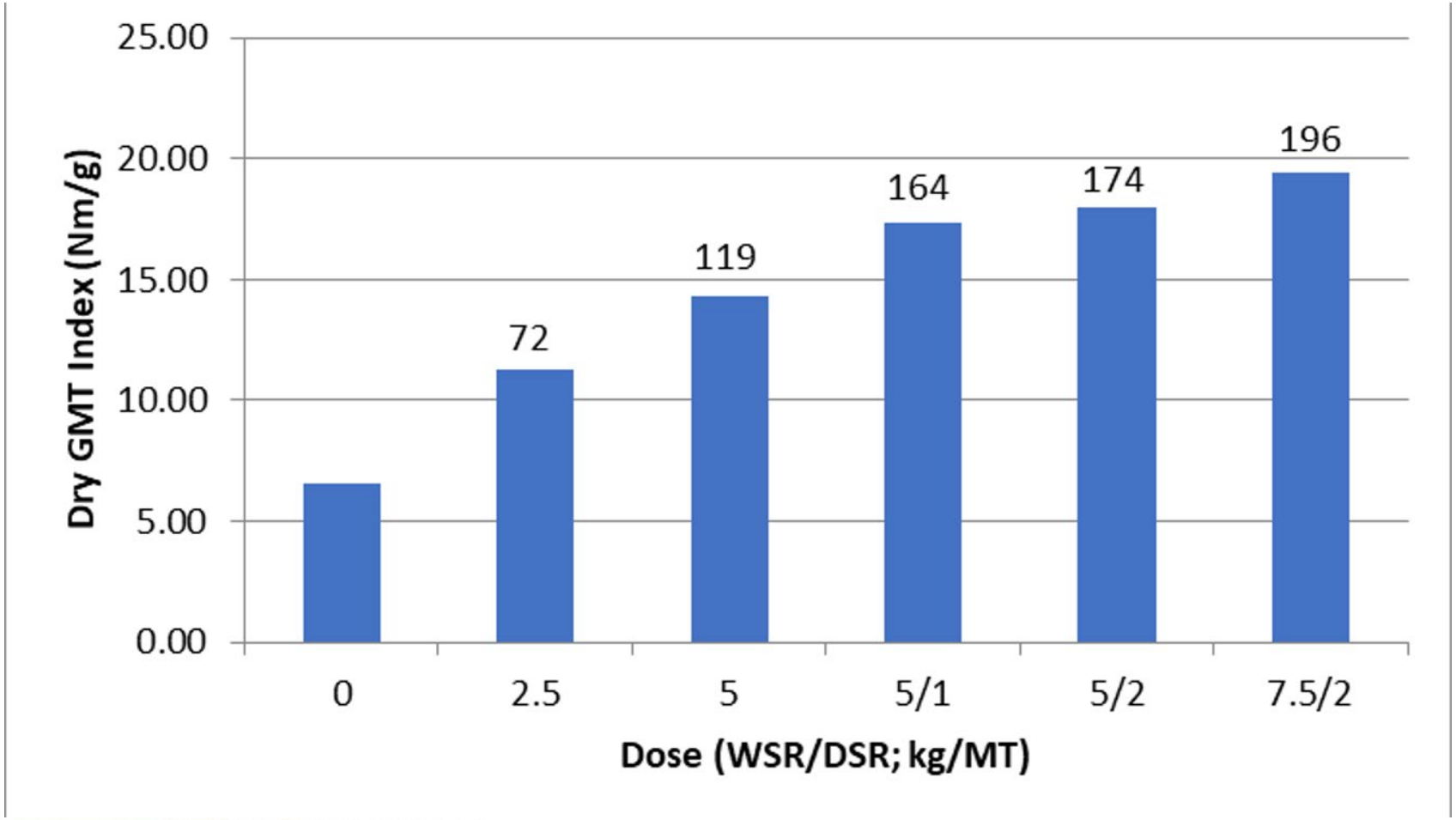
↓ 16%

Summary of Extended Trial and Conversion - TAD Machines

- Wet strength usage reduced 20% average
- Wet tensile index increased 28% average
- Dry strength usage reduced 6 – 30%
- Synergistic wet & dry boost in tensile strength
- Wet strength resin consumption reduced 800,000 lb/yr
- Reduced delivery cycles, improved inventory management
- 24% Reduction in annual strength chemistry spend

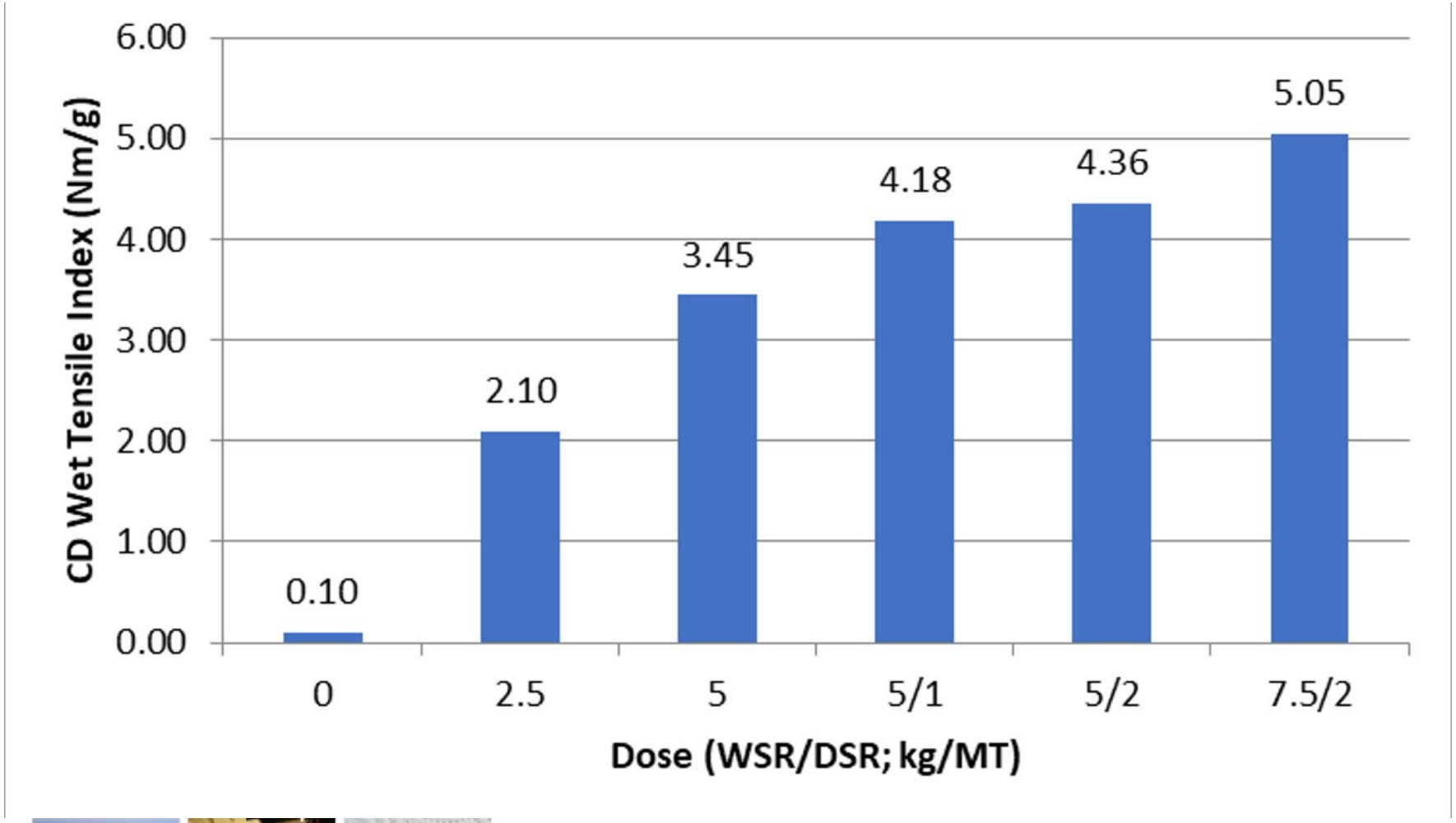
Pilot Evaluation in Kitchen Towel Grade on Hybrid TAD Machine

Dry GMT Index with Dual Polymer Program



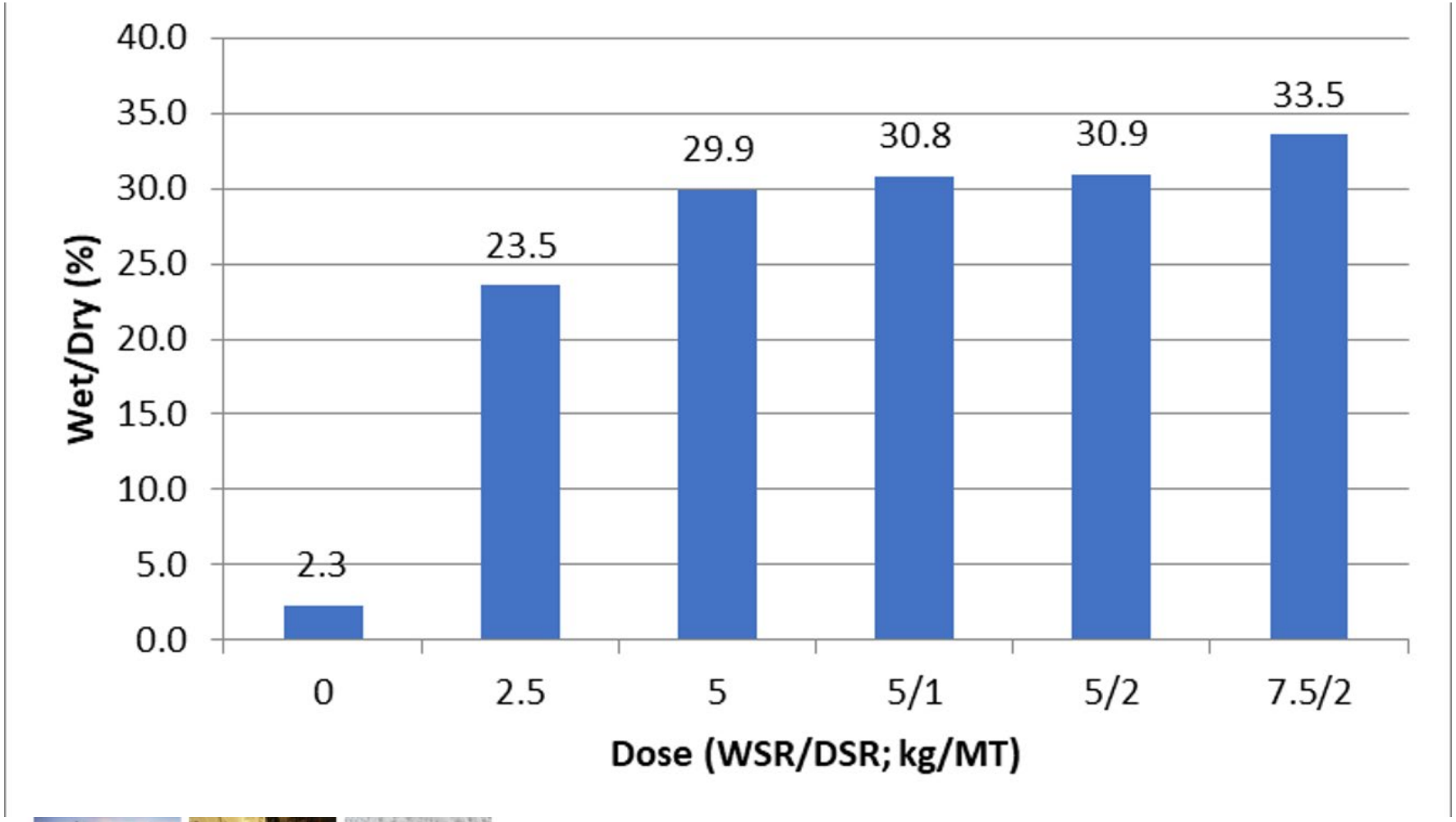
Pilot Evaluation in Kitchen Towel Grade on Hybrid TAD Machine

CD Wet Tensile with Dual Polymer System



Pilot Evaluation in Kitchen Towel Grade on Hybrid TAD Machine

CD Wet/Dry Tensile Ratio with Dual Polymer Program



Summary

- Improved overall product efficiency
- Resin dosage reductions of 15 – 40% in all furnishes
- Reduced VOC and AOX in-use
- Allows new grade development, fiber substitution
- Synergistic strength with dry strength
- Reduced delivery cycles, efficient inventory management
- Improved worker safety, reduced exposure

Thank you

PRESENTED BY

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