Building Leadership Excellence

Operational Excellence Success Story

Papermaking Success Stories-Optimized Refiner Plate Designs

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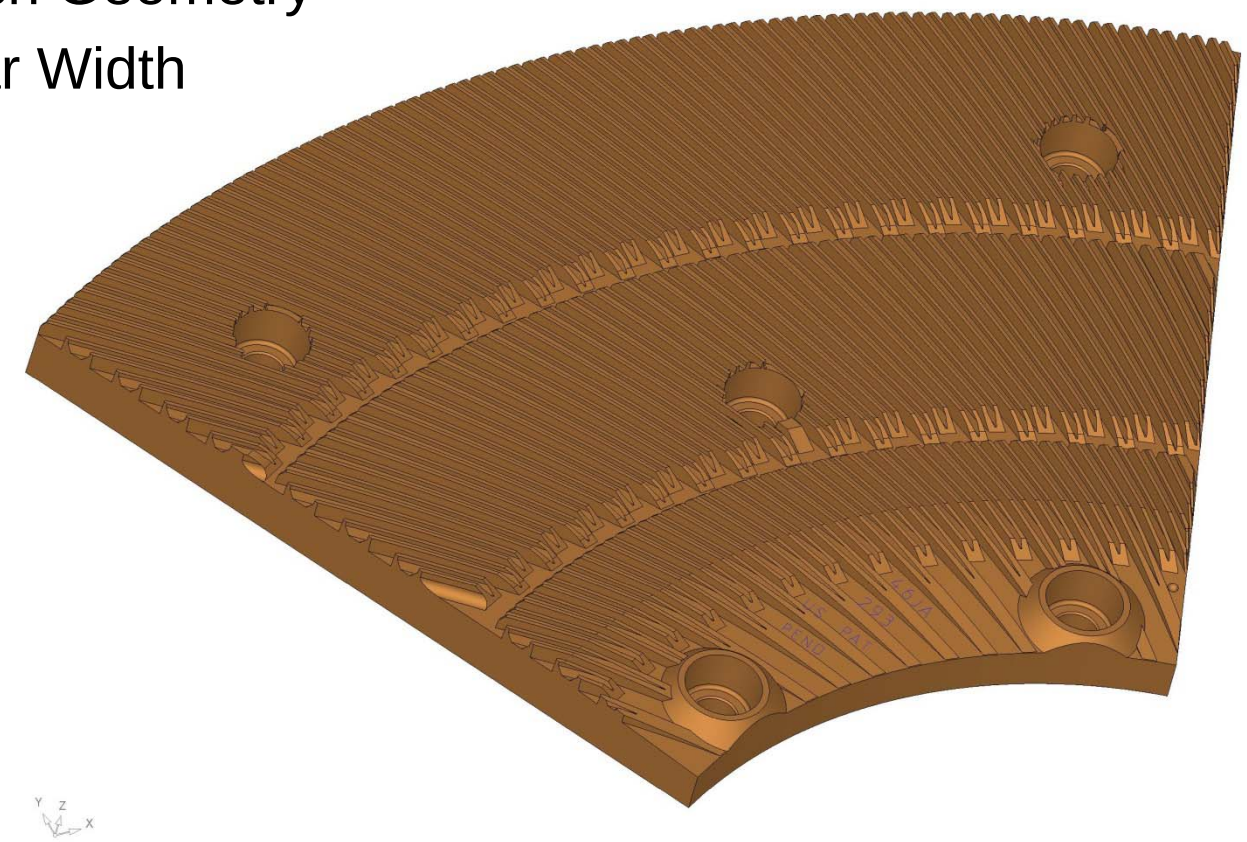
May 1-4
PaperCon 2011
Northern Kentucky Convention Center

RETHINK PAPER:
Lean and Green

Andritz Lemaxx Spiral® 200 Series Refiner Plate Designs

- Optimized and Constant Crossing Angle
- Variable Pitch Geometry
- Constant Bar Width

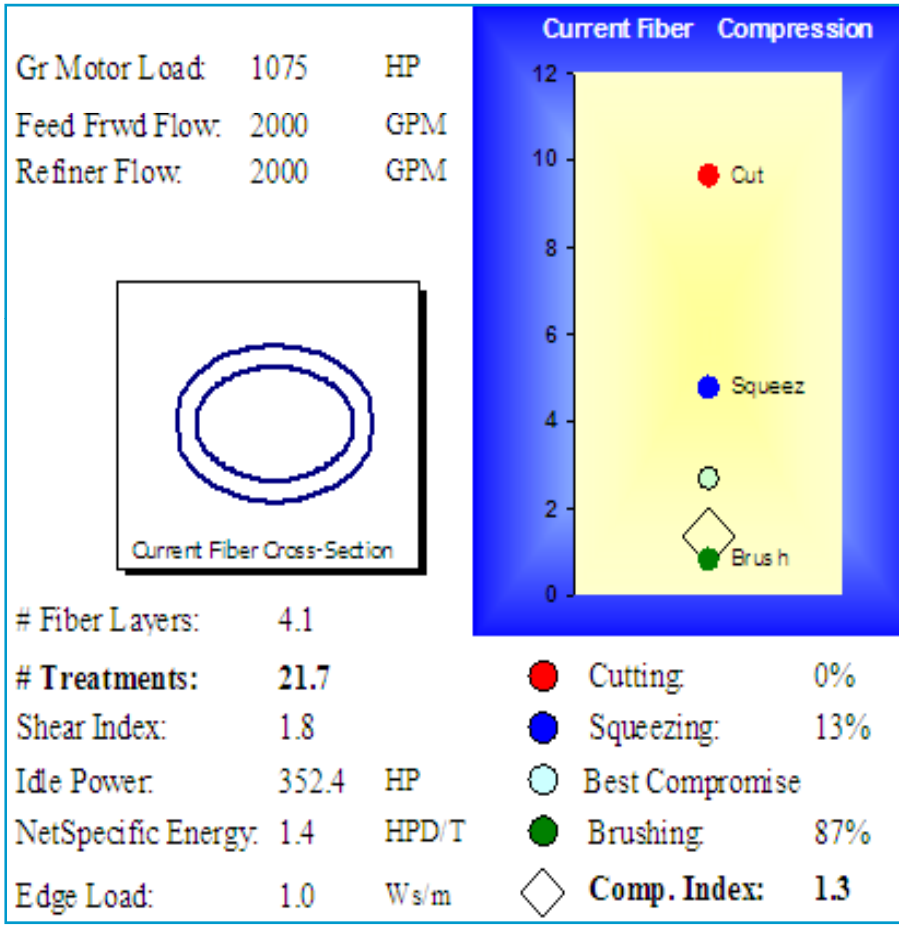


Mill 1 – Midwest USA Packaging Grades from OCC

- Overview
  - Two 46” Disc Refiners in Parallel – 509 BDST/D each
  - Fiber Quality Acceptable
  - Low Plate Life (28 days)
- Goal
  - Maintain Fiber Quality
  - Maintain Throughput
  - Maintain Refiner Energy Level
  - Increase Plate Life

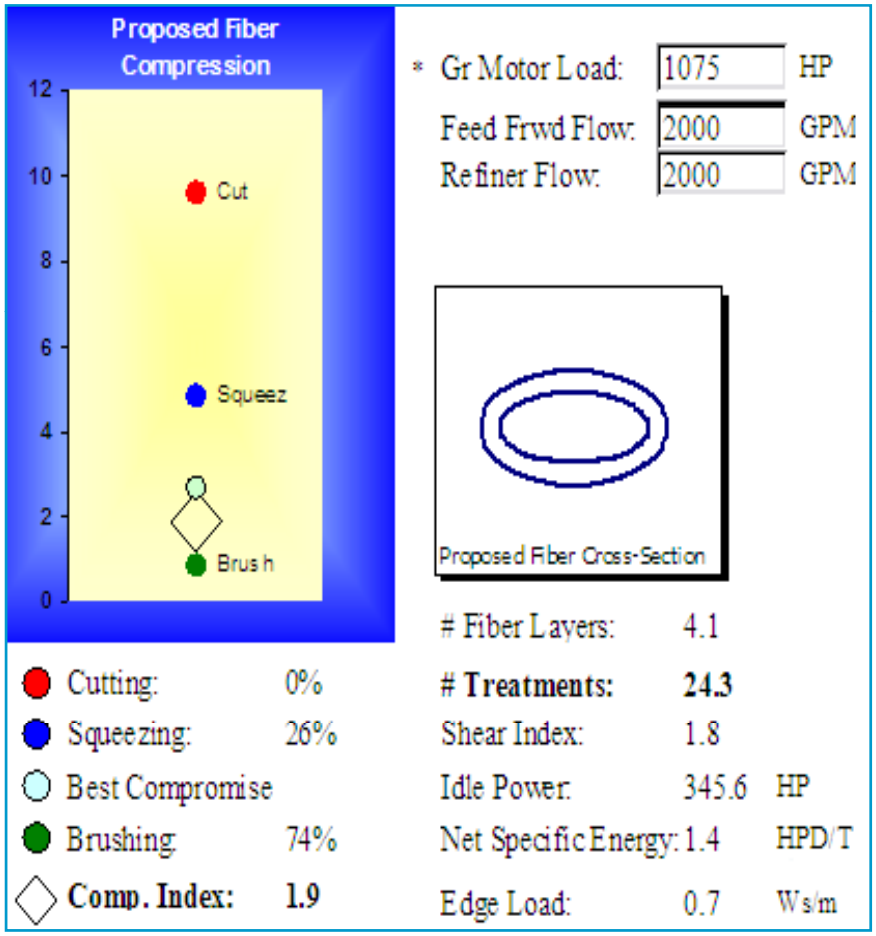
Mill 1 – Review Of Current System

- Low Intensity Refining
- Compression Index at Brushing Limit
- Good Fiber Development
- Higher Energy Requirement



Mill 1 – Optimized Refining

- Maintain Low Refining Intensity
- Higher Compression Index
- Higher # of Treatments
- Better Refining Efficiency for Lower Energy Levels
- 200 Series Variable Pitch Allows Use of X2 Abrasion Resistant Alloy



Mill 1 - Results

- Plate Increase 185% = 28 days to 80 days
- Energy Decrease 7% = 75 horsepower per refiner
- Fiber Quality = Equal

Mill 1 – Total Cost of Ownership Results

- Energy Savings = $US45,000/year
- Plate Life Savings = $US137,000/year

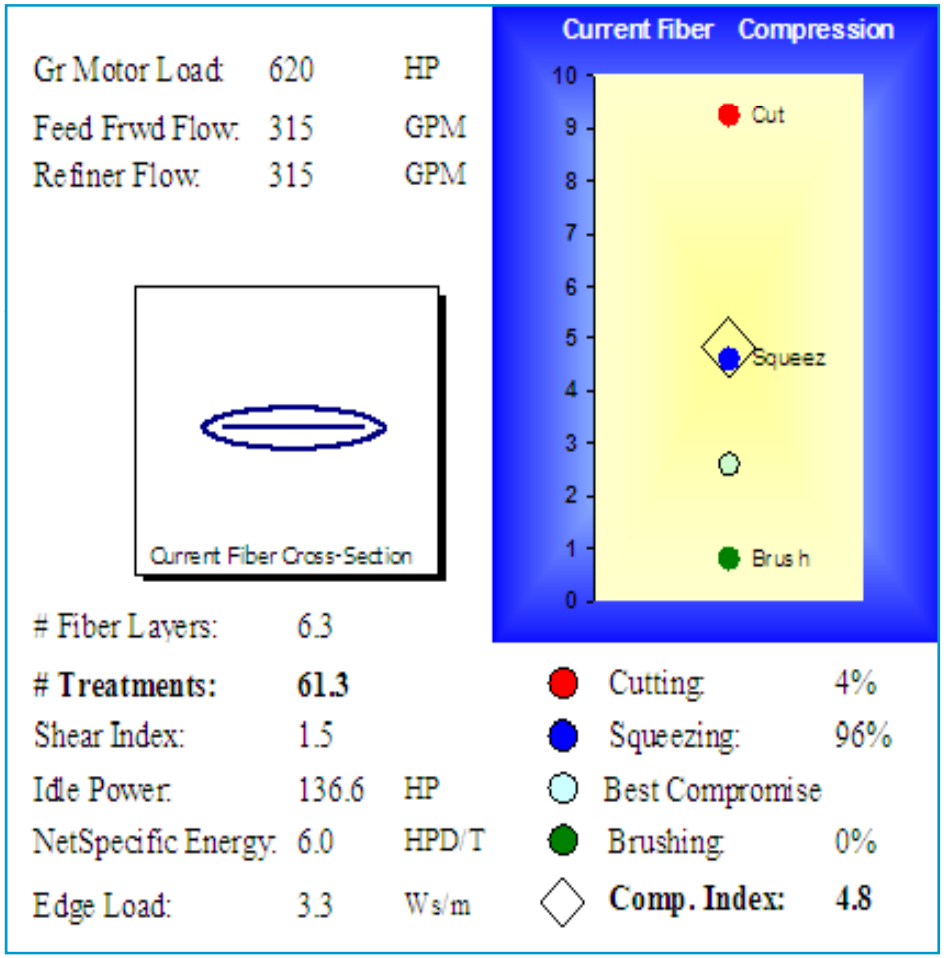
- TCO Reduction = $US182,000/year

Mill 2 – Canadian Printing and Writing - Softwood

- Overview
  - One JC03 Conical Refiner – 80 BDST/D
  - Fiber Quality Acceptable
  - Filling Life Acceptable
- Goal
  - Maintain Fiber Quality
  - Maintain Throughput
  - Decrease Refiner Energy Level

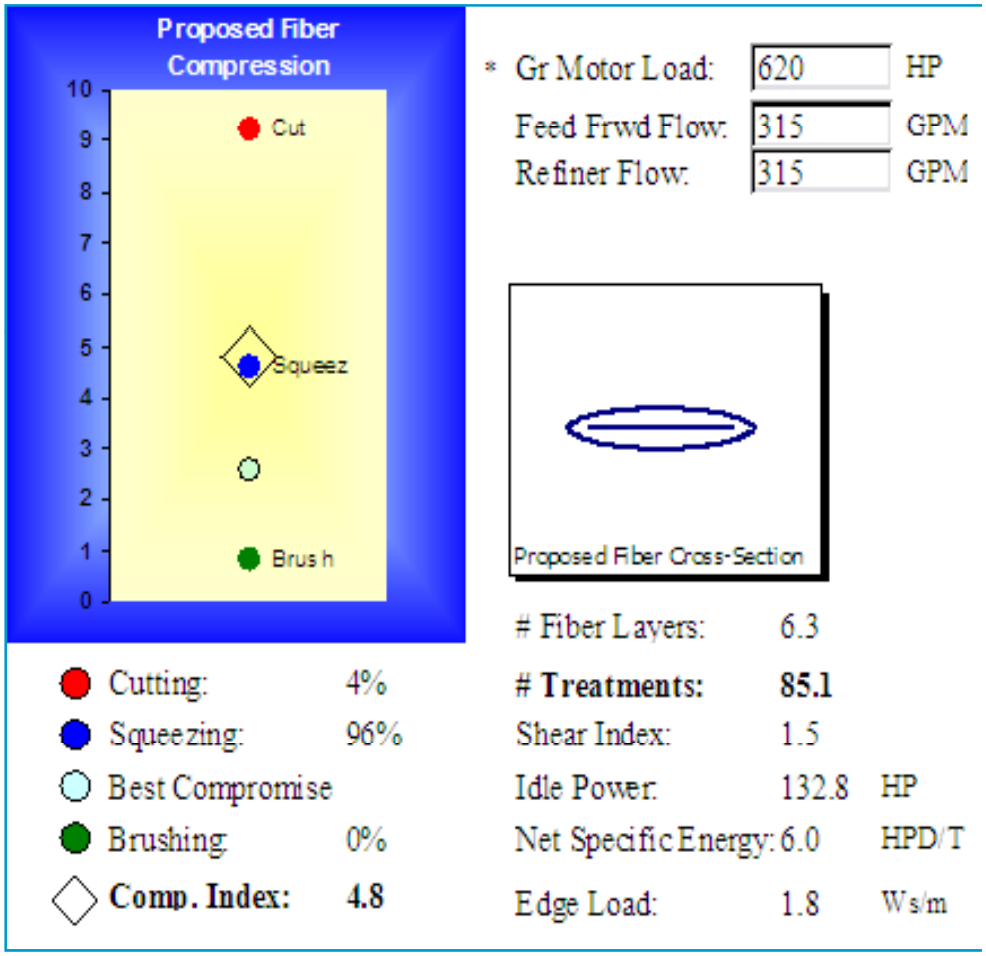
Mill 2 – Review Of Current System

- Compression Index at Squeezing Limit
- High # of Treatments
- Good Ranges for Development of Bleached Softwood Kraft with Minimum Fiber Damage



Mill 2 – Optimized Refining

- Maintain Compression Index
- Increase # of Treatments by 39%
- Better Refining Efficiency for Lower Energy Levels



Mill 2 - Results

- Energy Decrease 10% (6.0 down to 5.4 net hp-day/bdst/d
- Fiber Quality = Equal
- Filling Life = Equal

Mill 2 – Total Cost of Ownership Results

- Energy Savings = $US18,600/year
- Paid for Segmented Conversion Cost Middle of Second Year

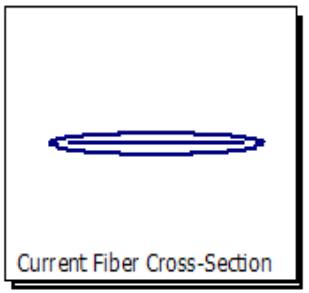
Mill 3 – Southern USA Linerboard Mill Virgin Kraft

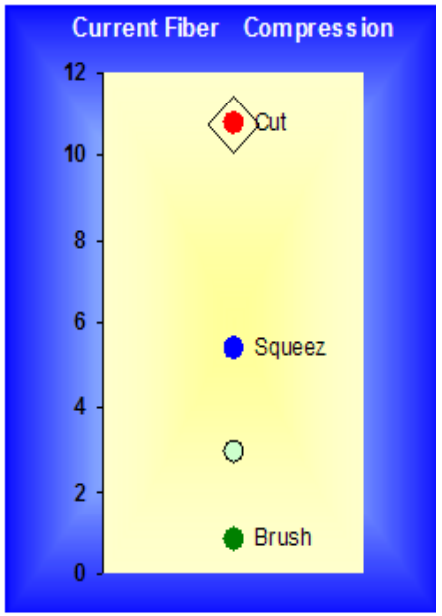
- Overview
  - Two 42” Disk Refiners in Series
  - Fiber Quality Acceptable Most of the Time
  - Occasionally Lack Sufficient Refining Energy Resulting in Slower Machine Speeds (Approximately 5% of Machine Time)
  - Plate Life Acceptable
- Goal
  - Maintain Fiber Quality
  - Maintain Throughput
  - Decrease Refiner Energy Level Requirement to Meet Fiber Properties
  - Maintain Plate Life

Mill 3 – Review Of Current System

- Compression Index at Cutting Limit
- Low # of Treatments
- Non-Optimized Fiber Development for Drainage Loss

Gr Motor Load:	1985	HP
Feed Frwd Flow:	1426	GPM
Refiner Flow:	1426	GPM



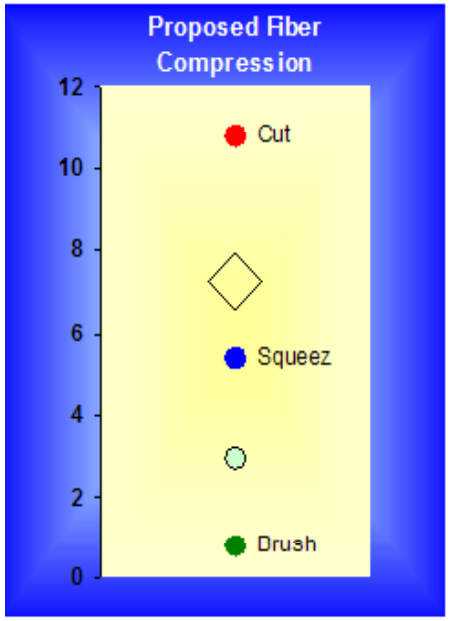


# Fiber Layers:	6.1	
# Treatments:	**18.6**	
Shear Index:	1.9	
Idle Power:	329.5	HP
NetSpecific Energy:	3.2	HPD/T
Edge Load:	4.6	Ws/m

Cutting:	98%	
Squeezing:	2%	
Best Compromise		
Brushing:	0%	
Comp. Index:	**10.7**	

Mill 3 – Optimized Refining

- Lowered Compression Index by 32%
- Increase # of Treatments by 20%
- Better Refining Efficiency for Lower Energy Levels
- Ability to Meet Fiber Property Requirements at Higher Drainage Rates



* Gr Motor Load:	1985	HP
Feed Frwd Flow:	1426	GPM
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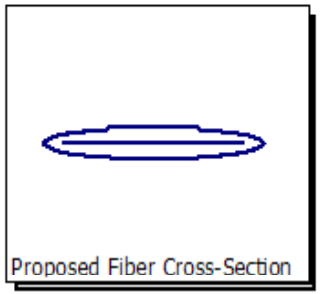

Cutting:	34%	# Fiber Layers:	6.1	
Squeezing:	66%	**# Treatments:**	**22.3**	
Best Compromise		Shear Index:	1.9	
Brushing:	0%	Idle Power:	331.8	HP
Comp. Index:	**7.2**	Net Specific Energy:	3.2	HPD/T
		Edge Load:	4.2	Ws/m

Mill 2 - Results

- Able to Meet Fiber Property Requirements Without Loss of Machine Speed
- Fiber Quality = Equal
- Filling Life = Equal

Mill 3 – Total Cost of Ownership Results

- Increased Machine Production (0.8%) = $US464,000/year
- Increased Plate Cost = $US24,000/year

- TCO Reduction = $US440,000/year

Summary

- Magnus Model Enables Detailed Overview of System Eliminating Multiple Trials
- Lemaxx Spiral® 200 Series Can Provide TCO Reductions in Many Applications