Falk PLI is a privately held company located in IN, AL, and PA.

Our Mission: To help our clients solve problems and create value through innovative technology and institutional expertise.

Technology Overview
- Laser Tracker
- Laser Scanner

Real Life Challenges with AHSS
**Scope:** Dynamic Study

**Problem:**
Uncharacteristic movement of pinion stand

**Solution:**
Maintenance vs. Capital Expense
Simulate Mill Conditions

Legend
- = Within Tolerance
- = Close to Tolerance
- = Out of Tolerance
## Laser Technologies

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Laser Trackers

- 3D Measurements to 0.001 in
- Static and Dynamic measurement capabilities
- 10K observations per second
- Can watch a piece of equipment move (assists in adjustment)
- Better understanding of foundation stability
Mill upgrades for AHSS

- Hot Mill “Super Coilers”
- Side Trimmers
- Welder Installation
- Furnace Rolls
- Leveler installation
Super Coiler Project
Super Coiler Project

Notes:
1. This report is of a survey on the coiler completed by Falk PLI.
2. Alignment baseline was established from existing monuments for the theoretical centerline of mill.
3. Elevation was established relative to gravitational level.
4. All measurements are operator side relative to the drive.
5. All units are in inches, unless otherwise noted.
Side Trimmer Alignment

AS-FOUND

BOTTOM KNIVES AT KNIFE FACE

VIEW FROM DELIVERY SIDE

OPERATOR SIDE

DRIVE SIDE

PLAN VIEW

Center Line of Strip

CENTER OF KNIVES ARE

Operator Side Knife is 0.099" Higher than Drive Side Knife

NOTES
1) This drawing represents data acquired by Falk PLI on 11/9/2016.
2) Alignment is relative to existing monumentation onsite. Centerline was established by splitting the edge guide rolls.
Side Trimmer Dynamic

- Leveler #1 (North) Held for Baseline 0.000"
- Leveler #2 (South) Held for Baseline 0.000"
- Location of Leveler Measurement (typ.)
- Knife Measurements are with Plate Engaged for Top Knives Only*
- Backing Plate
- Road/East/Operator Side
- Location of Dynamic Measurement
- River/West/Drive Side
- 48.028" 52.016" 48.346" 52.313" 52.292" 52.016" 48.008" 52.016" 48.319"
- 0.070" 0.052"
- 58°
Side Trimmer Alignment

Road Side  
104.308"

River Side  
104.340"

Top Knives  
Top-Down View

Skew Across Face = 0.021"

Road Side  
96.376"

River Side  
96.389"

Bottom Knives  
Top-Down View

Skew Across Face = 0.008"

Road Side  
48.348"

River Side  
48.355"

View in Direction of Travel

Skew Across Face = 0.006"

Road Side  
48.028"

River Side  
48.034"

View in Direction of Travel

Skew Across Face = 0.006"
## Typical Processor Rejects

### Slitting
- Edge Damage
- Handling Damage
- Oscillated Winding
- ID Damage (Egg)
- Belled Edges
- Center Buckle

### Blanking
- Bent Edge
- Wavy Edge
- Die / leveler marks
- Out of square
- Staggered Blanks
- Up-dings
Leveler Cassette Alignment

As-Found Survey Results

Cassette 1
- Skew (in/ft): Alignment = 0.010
- Elevation = 0.016
- Skew (in/ft): Alignment = 0.013
- Elevation = 0.015

Cassette 2
- Skew (in/ft): Alignment = 0.011
- Elevation = 0.010
- Skew (in/ft): Alignment = 0.011
- Elevation = 0.016

Notes:
- Skew (in/ft): Alignment = 0.003
- Elevation = 0.003

1/20/2012

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DRAW NO. 02aa4344-01
Slitter Exit End Study
Slitter Exit End Study

NOTE: ALL ALIGNMENT DIMENSIONS ARE PARALLEL AND PERPENDICULAR TO OVERARM

STRIP TRAVEL

EXIT END WITH WEIGHT

OVERARM

UPPER PINCH ROLL

LOWER PINCH ROLL

STRAIGHTNER ROLL TABLE

SHEAR

RECOILER

Arrows indicate operator side compared to drive side

SURVEYED BY:

AS-FOUNDED SURVEY

CONTACT:

CFW NO. 08AA011072-2
Slitter Exit End Study

Coil 1
Horz. Dev. = -0.016"
Vert. Dev. = -0.025"

Coil 2
Horz. Dev. = -0.021"
Vert. Dev. = -0.016"

Coil 3
Horz. Dev. = -0.031"
Vert. Dev. = -0.001"

Time: 21s

Strip Travel (positive)

Horizontal Deviation

Vertical Deviation
Dynamic Measurements
Simulate Material Comparison

- Simulate the machine performance differences in comparing light gauge and heavy gauge material (material type unknown) in edge trimming operation
- Dynamic monitoring of arbors and knives in operating state
- Conclusion: Heavier gauge materials cause additional forces on the cutting surface resulting in unpredictable behaviors in the knives themselves.
- Hypothesis: Higher strength materials will behave in the same manner and will only exaggerate the condition.

- Stay tuned ....
Slitter Material Comparison

Top-Down View
- Arbor
- Knife

Heavy Gauge

Light Gauge

Strip Travel

Deviation Perpendicular to Strip Travel

Light Gauge
- Orange
- Heavy Gauge
- Blue

Deviation Parallel to Strip Travel

Light Gauge
- Orange
- Heavy Gauge
- Blue

Profile View
- Arbor
- Knife

Heavy Gauge

Light Gauge

Deviation in Elevation

Light Gauge
- Orange
- Heavy Gauge
- Blue
Considerations

• Do your maintenance practices incorporate equipment alignment?

• Do you have baselines for equipment performance?
  – KPI’s for alignment and elevation?
  – Are you validating on an annual basis?

• Do you have skilled maintenance practices that enable you to interpret the measurements and make necessary shimming adjustments?

• Do you have an established “centerline” for the equipment?

• Do you have reference drawings and manufacturer tolerances?

• How do you get “capital grade performance” on a maintenance budget?
Industrial Project Methodology

Construction Layout
- Verify control
- Layout and installation of Owner specified control points
- Provide reports / drawings

Bolt As-built
- Establish centerline for equipment installation
- Provide reports / drawings

Equipment Installation
- Measure installed features before / after concrete set
- Verify equipment specifications
- Dynamic monitoring
- Reports

Ongoing Operations & Maintenance
- Define best practices for annual outages
- Emergency call-out

Process Improvement
- Verify alignment relative to plan
- Dynamic Monitoring
- Quality / productivity basis
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Laser Scanners

- 3D Measurements to 0.080 in
- 1 million shots per second
- Generates a “point cloud” that is used as the basis of 3D Modeling
Pre-Project Planning
Pre-Project Planning

NOTES:

1. This TrueView represents the existing conditions found of the 120° Hot Strip Finish Mill at Constellium in Muscle Shoals, as measured by Falk PLI, June 30th and 8th, 2015.

2. Data extraction and modeling from this point cloud are available upon request.

3. TrueView files are intended for planning and rough dimensioning only. Measurements for higher accuracy, design, and fabrication are available upon request.
Pre-Project Planning