Applying Inertial Roll Alignment in the Vacuum Metalizing Industry

Chelsea Fiegel
Sales & Application Engineer
Overview

• Significance of Roll Alignment
• Traditional Optical Methods of Alignment
• Alignment in Vacuum Metalizing Industry
• PARALIGN: Solution to Roll Parallelism
• Results of real-life PARALIGN service performed on VM
• Concluding Ideas of PARALIGN technology for Roll Alignment
Roll Misalignment
Roll Alignment

Symptoms: Tracking, Stretching, Wrinkling, Uneven Coating

Effect on Production:
- Line Speed
- Quality
- Output Volume

Overall Cost:
- Scrap
- Unplanned Outages
- Maintenance $
Why is it necessary?

Reduces risk of:
- Excessive wastes
- Telescoping during winding
- Delamination
- Premature roller and bearing wear
- Registration offsets

Essential starting point and good investment
- Perform alignment check to determine cause of unwanted misalignment issues, or
- Rule out the possibility of misalignment, and engage in further maintenance
- Track alignment of machine over time
Traditional Optical Alignment

Methods
- Telescopic transits
- Theodolites
- Machinist level
- Plumb bob
- Pi-tape

Limitations
- Line of sight
- Atmospheric conditions
- Inaccessibility of rolls
- Dependent on skill of the user
- Time consuming nature
PARALIGN

• Designed and developed by PRUFTECHNIK, the PARALIGN was created to counteract the limitations of optical alignment and provide a means of measuring parallelism of rolls through inertial technology

• Houses 3 ring-laser gyroscopes
  • Measure x, y, z
  • Extremely high sensitivity and stability
  • Same gyroscopes used in military aircraft and aerospace technology
Patented Sweep Mode

- Points are recorded as the PARALIGN is swept across the roll surface
- At least 20° is needed
- 80 points per measurement
- 30 seconds per measurement
- 2 measurements per roll
Comparing Axes
Results

• Each axis is equated to an angle.

• Axis angle $x$ Roll length = Vertical and Horizontal Offset

• Axis angle is compared to a Reference Roll (zero)

• Offsets shown instantly
V-blocks vs. Flat surface

- Roll-straddling devices typically use V-Blocks
- PARALIGN has Flat Feet
- V-Blocks are not needed. A Filter range is determined by the Yaw gyroscope.
- The Software removes any readings outside of the filter range. Measurement not limited by diameter.
- Consistent precision is achieved on rolls of all sizes, from Yankee Dryers to small lay-on idlers.
Irregular shaped rolls

- Crowned Mode
  - Points taken over roll face
  - At least 150°

- Used on:
  - Crowned
  - Tapered
  - Worn
  - Winder

- Benefit: Finds true axis of rotation regardless of surface qualities.
Service Procedure

- Initial plate set-up (one time, one hour)
- Calibration (5 minutes)
- Link roll (start measurement)
- Measuring rolls (20 minutes)
- Link roll (end measurement window)
- Results (displayed instantly)
- Adjustments
- Recheck adjusted rolls
- After service, remove the plate
Vacuum Metalizing Industry

- Process of coating a nonmetallic material with a metallic substance generally to enhance value, appearance, and range of application.
- Sigma Technologies specializes in using thin films and surface functionalization to manufacture insulating fabrics and heat reflective films.
  - Aluminum
  - Copper
  - Silver
  - Multi-layer optical filters
- Save energy and prevent excessive heat transfer in architectural settings
Scope of PARALIGN Service @ Sigma

- PARALIGN technicians measured parallelism of 33 rolls in vacuum metalizer
- Roll lengths ranged from 114” to 134” (bearing-to-bearing)
- Target tolerance: 0.025”
- On-site mechanics: 2
- Aided in adjustments: 8 rolls
- Rechecked corrected rolls
- Completed standard service procedure prior to leaving jobsite
- Time needed: 5 hours
VM Results

Initial position of rolls to the right of the Process Drum
Final position of rolls to the *right* of the Process Drum
VM Results

Initial position of the rolls to the *left* of the Process Drum
VM Results

Final position of the rolls to the *left* of the Process Drum
Problem Solved

• Sigma operators initially observed unfavorable web behavior: tracking
• After corrections were made, absolute improvements were noticed:
  • Less wastes
  • Less downtime
  • Faster production speed
Other Industries

- Tissue
- Aluminum
- Printing
- Extruded Film
- Tire
- Carbon Fiber/Fiberglass
- Lamination
- Carpet
- Textiles
- Paper
Advantages of PARALIGN

• Rapid set-up & measurements
• Line-of-sight not a requirement
• Location, elevation and proximity are not factors
• Results are not dependent on user or atmospheric conditions
thanks for listening!

www.pruftechnik.com