Roller Alignment - Mechanics

Figure Courtesy of Oasis Alignment Services

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David Roisum, Ph.D.
Finishing Technologies, Inc.
Why is Alignment So Important?

Affects the Web:

• Flatness: Bagginess and apparent Bagginess
• Position: Path and Registration (e.g. Printing)
• Runnability (Web Breaks)
• Winding: Roll Quality
• Wrinkles
Two Views of Alignment

• **Mechanical**
  - Level
  - Square
  - Common Centerlines

• **Web Handling**
  - In-plane (bending)
    - Path control
    - Web breaks
    - Wrinkles
  - Out-of-plane (twisting)
    - Web damage/breaks at edges
    - Center wrinkle
  - Offset Centerlines
    - Guide runs off center
    - Web runs off center
Hand Tools - Types

Machinist Levels

Graduations are .0005” to .005” per foot

Trammels

Pi Tape

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Hand Tool - Limitations

• **Level**
  - At best good to 0.001”/foot
  - (Optics can be 20X tighter)

• **Square**
  - There is no squaring tool
  - Parallelism Problems
    - Doesn’t help square vertical spans (1-2 and 3-4)
    - Accumulation of error

• **Level and Square**
  - Large Tendency to Sloppiness
Hand Tool – Application

- **Step 1** – I *might* have an alignment related problem
  - Path Control
    - Printer Registration
    - Wound Roll Edge
  - Web Breaks
  - (Diagonal) Wrinkling

- **Step 2** – Verify working hypothesis that problem *might be* exacerbated by misalignment
  - Level by level
  - Parallel by Pi Tape

- **Step 3** – Align (Optics?)
Optical Tooling

Similar to surveying equipment, but > 10X more precise

Figures Courtesy of Oasis Alignment Services
Baseline Installation

• **Alignment means**
  - Establishing ‘offset centerline’ for alignments
  - Look for ‘monuments’ (small plugs) in floor

Figure Courtesy of Oasis Alignment Services
Centerline Survey

• Alignment means
  – Level,
  – Square, AND
  – Middle of Rollers on Same Centerline
Squaring With Optics

- Precision Square w.r.t. Baseline
- Uses a pair of TTS
- Precision right angles

Figure Courtesy of Oasis Alignment Services
Other High Tech Alignment Tools

Laser Shaft Alignment
The standard for motor to roller alignment

Laser Trackers

Coordinate Measuring Total Station

Gyro – Fast setup and position readout

Gyroscope

Figures Courtesy of Oasis Alignment Services 72.11
Alignment Details - Preparation

- $$$ for Downtime
- Machine Builder
  - Standards & Instructions
  - Alignability
- Maintenance
  - Remove Excess Rollers
  - Roller Maintenance
  - Dowel/Mark
- Align Crew
  - Plug Lines
  - Report with before & after readings

- Design for Service (alignability)
  - Individual rollers easily moved
  - Preserve Level
    - Shear ledge
    - Jack bolts
- Match Drilled Frames?


Alignment Challenges

• **Bearing Housings**
  - At an angle
  - Bolt bound designs (e.g., match drilled frames)
  - No shear ledge

• **Rollers - General**
  - Flimsy frames
  - Flimsy foundations
  - Loose mounting

• **Rollers – Specific**
  - Pivoting / translating
  - Skewable
  - Curved axis (bowed spreaders)
  - Segmented

• **Alignment**
  - No line of sight
  - Flimsy floors
  - Hand tools

• **Procedural**
  - Lack of guidance
    - Which rollers
    - How close
  - Not enough time

• **Special**
  - Foil
  - Close packed rollers
  - Narrow rollers (wheels)
Review Questions

• Why might we need to align?
• What are the instrument based definitions of alignment?
• What are the common measures of misalignment?
• What are the common realignment instruments?
Review Answers

• Why might we need to align?
  – Path, web breaks, wrinkling

• What are the instrument based definitions of alignment?
  – Level, square, common centerlines

• What are the common measures of misalignment?
  – Precision level, Pi tape or trammel

• What are the common realignment instruments?
  – Precision level, TTL
Questions?

Answers:
David Roisum, Ph.D.

http://www.webhandlingblog.com/
http://www.roisum.com
droisum@aol.com
920-725-7671 office
920-312-8466 cell