Vibration instrumentation in paper machines – a unique environment
Installation considerations

- Installing the proper sensor
  - Wet section (hot, humid, corrosive)
  - Dryer section (heat, steam, ESD)

- Mounting the sensor
  - Deep groove vs. spherical bearings
  - High frequency analysis
  - Acceleration vs velocity

- Connectors and cabling
  - Materials and design
  - Shielding and routing

- Connection boxes
  - Switching
  - Location
Press and forming section

Environment: steam, water spray, corrosive chemicals

- **Sensor requirements**
  - Low noise for slow rolls
  - 316L stainless steel – chlorine resistant steel designed for paper industry
  - Hermetic sealing
  - Splashproof / waterproof connectors
  - Teflon® cabling

- **Sensor recommendations**
  - Industrial sensors: 787A, 797L, 799LF
  - Sealed connectors: R6QI (IP68), R6W (IP67)
  - J9T2A cables, shielded twisted pair
Dryer section

Environment: high temperatures, steam, ESD

- **Sensor requirements**
  - Long term reliability at high temperatures
  - Overload protection
  - ESD protection
  - Hermetic sealing
  - High temperature sealed connectors
  - Teflon® cabling rated to 200°C

- **Sensor recommendations**
  - Industrial sensors: 793-6, 797-6
  - Sealed connectors: R6QI (IP68), R6W (IP67)
  - J9T2A cables, shielded twisted pair
Dryer section
Requires high temperature performance

- Paper machine speeds are being increased to increase capacity. The dryer section temperatures are increased to meet faster speeds. Sensors chosen must meet these requirements!
  
- Temperature increases from 110 to 140°C are not uncommon
- Grease lubricated bearings are hotter than circulating oil lubricated bearings
- The top of the dryer hood is hotter than below
Dryer section

BOV trend

- High temperature sensor failures usually show a gradual decline in bias voltage
- Select sensors incorporating robust high temperature technology
Dryer section

BOV trend

- Bias voltage trending can be used to diagnose connection and cabling problems

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<thead>
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<th>Sensor bias voltages</th>
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<td>BOV trend</td>
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Vibration instrumentation in paper machines
Wilcoxon Sensing Technologies proprietary
Sensor shape considerations

- Use low profile sensors where roll access is required and on external gear machines. This will ease maintenance and reduce sensor damage.
Through-bolted accelerometers

- Captive bolt won’t fall into machine
- Captive bolt allows 360° cable orientation
- Low profile reduces sensor damage during maintenance and operation
- Exposed bolt removable with channel locks
Installation location considerations

- Spherical roller bearings: Mount axially

- Deep groove roller bearings: Mount radially near the load zone
Installation location considerations

• Tending side velocity measurements will detect drive side bearing faults

• 793V sensor is a convenient way to get velocity directly out of the sensor, mV/in/sec, without the need for external integration
Cable routing considerations

- Never allow cables to cross a felt line on the tending side of the machine.
- Route cables from front side (tending side) sensors through felt to the back side (drive side). This will ease felt removal.
- Route cables inside of felt for inner rolls/ outside of felt for outer rolls.
Intelligent Transmitters (iT), iT Alarm, iT communications module

- **Intelligent Transmitter**
  - Powers the IEPE dynamic sensor
  - Single integration of the signal
  - Converts the overall level to a 4-20 mA signal
  - Outputs a 4-20 mA proportional to acceleration, velocity or displacement
  - Output is RMS, peak, true peak or true peak to peak
  - Front panel BNC to monitor the raw AC signal or feed to an online system
  - DIN rail mountable

- **iT Alarm module**
  - 3 alarm relays
  - User programs settings
  - Local alarming
Intelligent Transmitters increase the value of your sensors

- Permanently mounted dynamic sensor is continuously monitored
- Overall value to true peak value can be sent as 4-20 mA signal
- Local control panel or plant-wide DCS can include vibration signal
- Raw AC signal is available for spectral analysis monitoring
Cable and connection considerations

- Use sealed connectors – not integral cables
- Use IP68 rated connectors
- Use appropriate materials Teflon® and Viton in dryer section
- Use 2 conductor shielded cable
- Bright cable colors are easier to identify
Cable shield grounding considerations

- Cable shield can be tied to the sensor case or the monitor - not both
- Prevent ground loops!
- Never ground both ends of a shield
Connection boxes

- Sensor turn-on time is important when using multiplexing and manual switch boxes
- Junction boxes should incorporate ferrite bead protection of BNC termination
- NEMA 4X rated boxes should be used for best wiring protection
- Termination boxes and switched output boxes maximize your permanent mount sensor utilization
High performance sensors tailored for your environment

- Low frequency, low noise sensors for clean measurements signals
- Dependable high temperature sensors for increased reliability in extreme environments
- Multiple output configurations to fit in any location
- Industry standard cable assemblies that last in extreme conditions
- High quality, long lasting connectors
- Proven performance
Wilcoxon Sensing Technologies

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