

Jake Zwart

Paper Uniformity Consulting Services

Typical Services

Measure and understand the source of pressure pulsations and vibrations that cause a non-uniform product. These problems often affect the paper machine at locations where the properties of the paper are determined. This would be at the headbox, forming section, press, and calender stack on a typical machine, but can include the coater, breaker stack and other areas of the machine.

Vibration related to machine reliability or speed increase issues are also measured and recommendations made.

Vibration measurement techniques range from spectral analysis, to transient analysis with the vibration measured as a function of time, speed, load or other parameter potentially affecting the vibration. Operating Deflection Shapes are used to determine the vibration shape of a structure at a specific frequency. Modal testing is available to determine the natural frequency characteristics of a structure.

For intermittent problems, long term monitoring of the vibration is available.

Focus on Uniformity

Basis weight, moisture and caliper uniformity are crucial to shipping a quality product. TAPIO analysis is recommended periodically to determine the basis weight and caliper uniformity.

Pressure pulsation or vibration at the headbox will disrupt the uniformity of the pulp mat laid down on the forming fabric causing basis weight variations. Basis weight variations decrease paper strength, and increase the likelihood of cockling in paper. To solve the problem, pressure pulsation levels and vibration levels are compared to specifications. High frequency components are tracked to the source using high frequency resolution with zoom analysis or synchronous time averaging.

Self-Excited Vibration (Press and Calender Stack Barring)

Higher frequency vibration in the press section and calender stack is typically a self-excited vibration. With the press section, vibration measurements are made to determine what the main self-excited feedback mechanism is to determine the best method of resolving the problem. With calender stacks, the vibration is measured to create a model of the calender stack. This model is used to determine the offset of the rolls that will minimize the vibration feedback mechanism.

Winder Vibration

Some shaftless winders experience roll throw outs. This can be a complex problem with detailed vibration and rotational speed measurements key to finding the source of the problem.

Other Services

Predicting the vibration of a paper machine after a machine speed increase can be critical to a successful start up at the new speed. Problems with machine life can be caused by excessive vibration. These and other vibration problems can be successfully resolved with the equipment and expertise available.

Background of Jake Zwart

- M.A.Sc. in Mechanical Engineering
- over 20 years of experience in research, development and consulting
- thorough understanding of process industries, in particular the paper making process
- focus on dynamic analysis from spectral analysis, transient analysis, rotating machinery analysis, to operating deflection shape and modal analysis
- solutions range from reducing excitation level to damping to moving natural frequencies away from the operating frequency

A partial list of problems worked on and solution procedures used, include:

- off-line measurement of basis weight and caliper variability on paper
- taking mill measurements to determine the source of paper variability and provide recommendations to fix the problem components
- perform operating deflection shape analysis and modal analysis to characterize the vibration of a paper machine headbox
- operating deflection shape analysis, synchronous time averaging, load analysis, and modal analysis of press sections
- transient vibration analysis on winders to solve a number of problems
- long term vibration monitoring of paper machine components
- analyzing the vibration of a soft nip calender
- build a finite element model of a headbox to stiffen the support structure and minimize the vibration
- modal test on a TMP refiner to characterize its modal (vibrational) properties
- modal test on a press section to determine the source of excessive vibration
- modal and operating tests in refineries
- modal test on automobiles and buses
- hand/arm vibration testing of hand tools
- flow induced vibration testing and analysis of cylinders in flowing water
- finite element modeling of calender rolls to determine the thermally induced distortion
- optimize the roll structure of the jumbo and the rolls from the winder
- thermal analysis of a super critical water oxidation reaction process
- leading edge research on calender barring, a type of self-excited vibration
- development of instrumentation used to increase productivity and quality in a paper mill

Papers and seminars on:

- paper machine uniformity related to paper properties
 - advanced vibration analysis techniques
 - winder roll throw outs
 - calender barring
 - the effect of thermal distortion on a calender roll
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