

MTC

3BUS 002 254 R0201

in reducing off-quality production and unscheduled downtime.

Roll Management is an integral part of Smart Advisor, an automatic health advisory system designed to help papermakers maintain the health of their paper machine and process. The overall benefits of this system include substantial cost savings and improved productivity through extended equipment life, reduced unscheduled downtime and less off-quality product. Additional management tools available with this system include Quality, Bearing, Felt and Sheet Break Management.

## Description

Roll Management is a modular, integral component of Smart Advisor. The system uses accelerometers mounted in various machine sections (i.e., press, size/coating, calendering, etc.) for monitoring. Impending failures are detected before off-quality results, enabling the mill to use scheduled downtime rather than unplanned downtime to resolve problems.

The following are the types of rolls monitored by Roll Management and the common problems detected:

### Suction Rolls

- Vacuum strip wear
- Roll misalignment
- Drive shaft failures
- Shell cracks
- Shell barring
- Bearing defects

### Poly or Rubber Covered Rolls

- Misalignment
- Cover separation
- Drive shaft failures
- Shell cracks
- Cover wear
- Roll barring
- Bearing defects
- Shell barring

### Steel, Granite or Micro-rock Rolls

- Roll barring
- Misalignment
- Drive shaft failures
- Bearing defects

## Executive Summary

Roll Management is a valuable tool that assists papermakers in selecting the best rolls and covers for their machine. This system monitors roll performance, identifies impending defects, alerts operators and provides automatic expert advice for problem resolution before off-quality production or catastrophic failure occurs.

On-line measurements of vibration and speed are used to isolate individual rolls for monitoring twenty-four hours per day. By trending the vibration of each roll, Roll Management determines the specific roll with a problem and identifies its specific defect without requiring extensive data analysis. The system detects various conditions including misalignment, barring, cover wear, cover separation, chemical buildup, vacuum strip wear, drive shaft defects and shell cracking.

Additionally, engineers and analysts use the system to help determine which rolls and covers perform best on their machine and the effectiveness of roll grinding procedures. This valuable information aids

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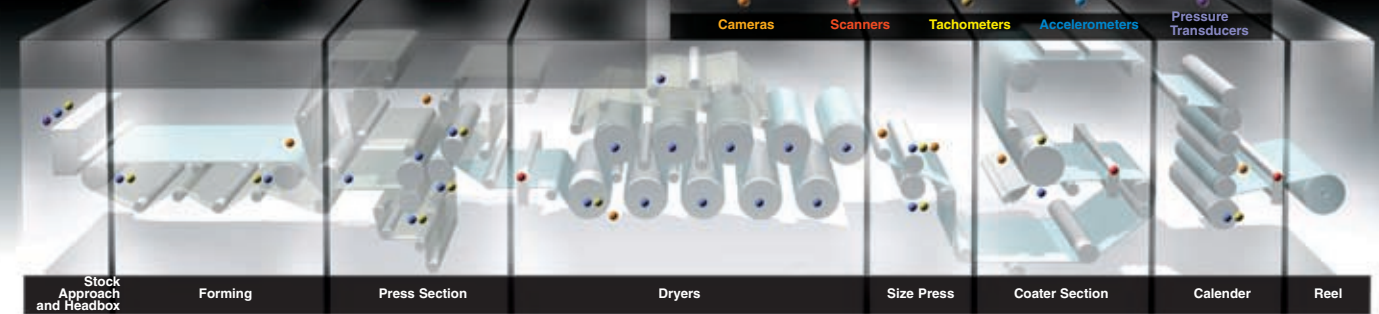
**Smart Advisor**



## System Architecture

Accelerometers mounted on rolls on both the front and back of the machine monitor press vibration. In order to isolate roll vibration from overall press energy, and thereby clearly locate defects, the system performs Time Synchronous Averaging of the accelerometer signals. Roll tachometers provide the necessary timing information.

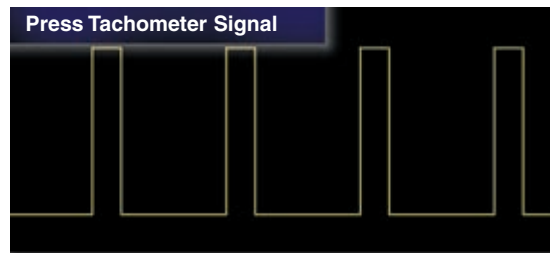
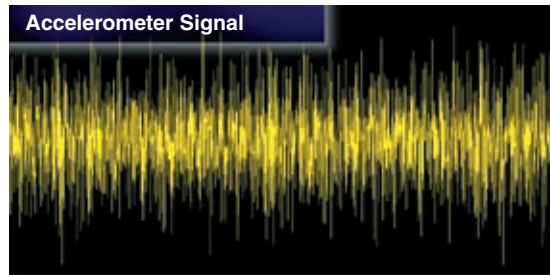
Tachometer signals are sent to the Tachometer Interface, which are then transmitted with the accelerometer signals to the Distributed Transducer Processors, where Roll Management analyses are automatically performed. The valuable information retrieved is then transferred to the server for storage, access over the mill network, and display via the operator station.



## Features

### Automatic Analyses Performed 24 Hours per Day

Accelerometer and tachometer signals are collected continuously by the Distributed Transducer Processors. These processors calculate a spectral plot showing the frequencies of vibration caused by a specific machine component. Different types of conditions or faults occur at specific dynamic frequencies and can be identified by their excess energy generation. Time Synchronous Averaging is then performed against the various tachometer signals along the paper machine.

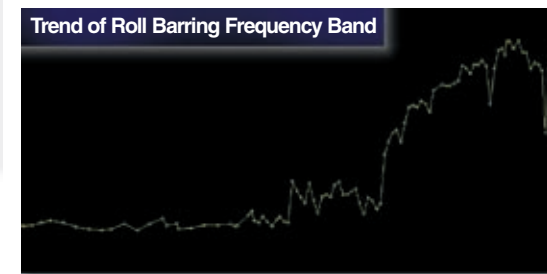
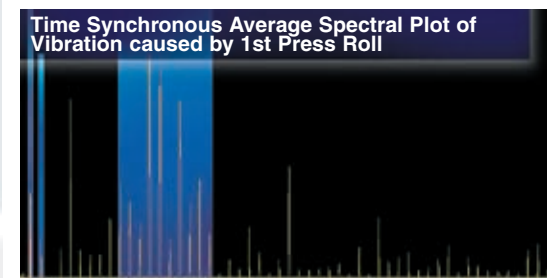


### Time Synchronous Averaging

Time Synchronous Averaging isolates the roll signature from vibrations coming from other machine components. This technique uses tachometers to generate a single pulse for each rotation of a roll. Defects that are not synchronous to that roll will be filtered out during the averaging process.

### Spectral Analysis with Frequency Banding

Within the spectral plot derived from Time Synchronous Averaging, bands are used to detect different impending problems such as misalignment, barring, cover wear, etc. As a defect progresses, the energy in the band rises until it crosses the predetermined threshold set by the mill. When this occurs, the system automatically alarms.



## Automatic Expert Advice

Once a threshold is crossed, the system will automatically alarm. When this happens, the System Overview Display identifies the machine section where a problem exists. This indicates immediate operator attention is required.

After corrective action has been taken, the operator logs his or her action(s) and requests a new analysis. Once the system verifies resolution of the problem, the operator closes the alarm, selects or types in the action(s) that resolved the problem, and communicates the event and response information to chosen personnel via E-mail. All actions and analyses are stored in the database and automatically placed in a note icon on the Active Alarm Display Fault History section at the time of alarm closure.

Conventional systems require an experienced analyst to interpret significant amounts of statistical data to identify and solve machine and process problems. Smart Advisor saves valuable time for mill personnel by making problem detection and resolution automatic and simple.

## Database Tracks Roll and Roll Cover Performance

Notes are entered into the system database when roll and roll covers are changed. Roll Management captures performance problems over the life of the component, enabling mill personnel to evaluate the roll and/or roll cover's effectiveness over its lifetime.