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IN-SITU™ ROLL BALANCING

at International Paper Company • PM#3 Roanoke Rapids, NC

During the period from September 8, 2000 through July 19, 2001, Bretech Engineering Ltd successfully conducted in-place balancing of paper machine dryer cylinders.

Unbalance in dryer cylinders will produce high structural vibrations throughout the dryer section. Forces due to unbalance increase dramatically with machine speed.

$$F = (me\omega^2)$$

force

speed

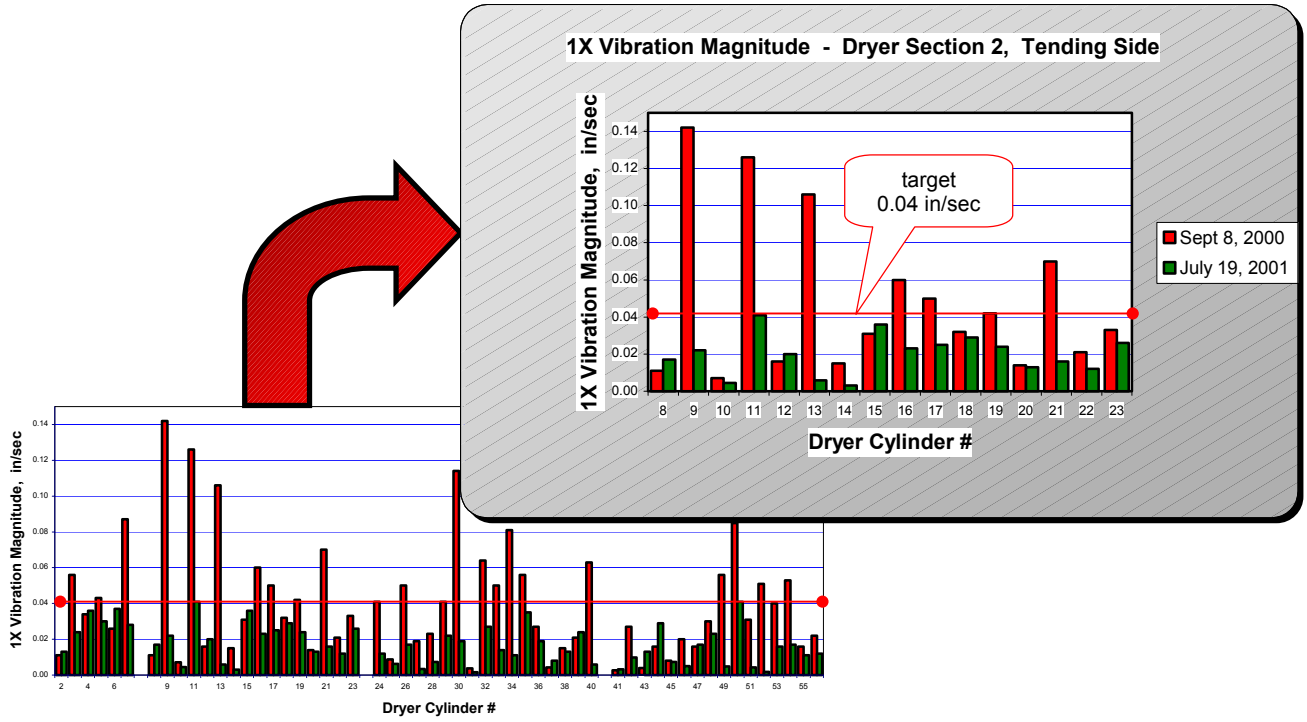
Correcting dryer unbalance will;

- ✓ **improve paper machine reliability / availability**
- ✓ **improve paper machine speed capacity**

Correcting dryer unbalance presents significant technical challenges, due to slow turning speeds, and phase influence of nearby dryers. Traditional correction methods include extended shutdowns, resulting in lost production costs.

IN-SITU™ was developed using regular maintenance shutdowns as the opportunity for incremental corrections. This method considers the dynamics of the entire dryer section and the influence of all machine components (adjacent dryers, felt rolls, dryer frame, etc). Typically, one roll per section is balanced during each correction, with trim weight corrections conducted if required during subsequent corrections.

PM#3 at Roanoke Rapids required **1 baseline assessment + 5 corrections** to reduce vibrations caused by dryer unbalance to below 0.04 in/sec.



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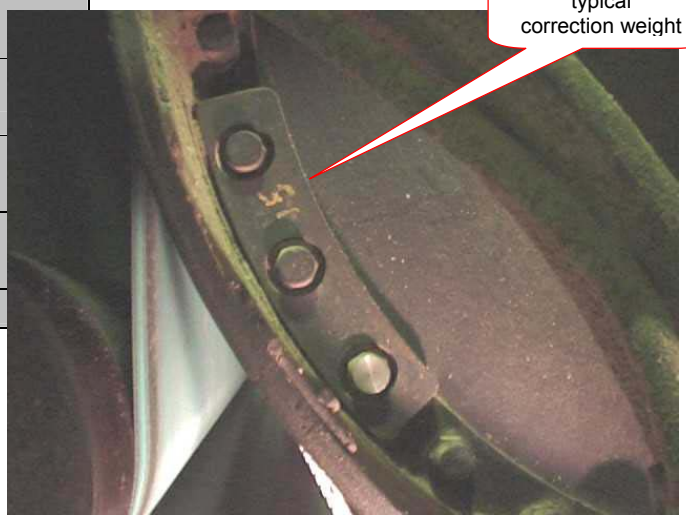
SITE VISIT	FEES + EXPENSES
Baseline Assessment ✓ September 2000	
Correction #1 ✓ October 2000	
Correction #2 ✓ January 2001	
Correction #3 ✓ March 2001	
Correction #4 ✓ May 2001	
Correction #5 ✓ July 2001	
TOTAL	$ ≈95 000.



KEY BENEFIT
- ✓ Machine Speed Increase • + 50 FPM
- ✓ + increased machine speed potential

KEY BENEFIT
- ✓ vibration index reduction • 58%
- ✓ 1X amplitude from 0.040 to 0.017 in/sec

KEY BENEFIT
- ✓ felt roll problems identified
- ✓ critical speeds identified

KEY BENEFIT
- ✓ improved reliability
- ✓ fewer breakdowns • fewer sheet breaks

Bretech gratefully acknowledges teamwork and assistance provided by International Paper Company representatives, in particular **Mr. Jack Barber**, **Mr. James Brewer**, and **Mr. Roy Bell**.

Please direct any ***IN-SITU*™ ROLL BALANCING** inquiries or requests for additional information to;
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BRETECH
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INNOVATION
RESULTS