

Using a Phenom™ Personal Electron Microscope Spurs Innovation in Paper Development at Boise, Inc.

Speeds Lab Results, Improves Quality, and Increases Collaboration



“Phenom brought our lab everything Boise needed. Ease of operation, high-quality results, and affordability... now we get results quickly with everything in-house.”

—Bob Brunea,
research scientist,
Boise, Inc.

Boise Inc. manufactures packaging products, coated and uncoated papers, newsprint, and market pulp.

2008 Sales: \$2.4 Billion

www.boiseinc.com

Overview

Boise Inc., headquartered in Boise, Idaho, manufactures packaging products and papers including corrugated containers, containerboard, label and release and flexible packaging papers, imaging papers for the office and home, printing and converting papers, newsprint, and market pulp.

The Boise Technology Development Center at the Wallula, WA paper mill is responsible for technology and new product development, as well as process development and troubleshooting. A primary function of the Wallula lab is to investigate and develop various paper qualities. The lab examines and optimizes properties of paper such as:

- Form, structure, and morphology
- Chemical constitution, coatings, and ink absorbency
- Visual appearance of the paper surface
- Strength and resistance to tearing and stretching

Challenge

Before acquiring the FEI® Phenom, the Wallula lab did not have an electron microscope in-house. “One of the challenges we faced was using contract laboratories. We ran into what I think are typical issues. There is a long turnaround time, from sample submission, to getting information back. It is rather expensive. Quite often the information is of poor quality because the contract lab’s analyst did not understand what you are looking for,” says Bob Brunea, research scientist, Boise, Inc. “At the same time when we look at the available technology for scanning electron microscopy out there, we find the standard SEM unit cost is higher than our pain level in dealing with contract laboratories. Plus, you have to spend a pretty significant amount of time and cost to develop specialists to operate the high-end SEMs,” says Brunea.

Why FEI

A SEM with the resolution, ease of use, and low cost of Phenom was not available until 2008. Phenom offered attractive new features, according to Brunea. “It is small, compact, and incredibly easy to use,” he says. “Phenom is very valuable in helping to characterize a material, then relate the characteristics of that material to a particular function or characteristic that you’re trying to develop in a new paper grade.”



PHENOM

The Solution

First, Boise put the Phenom to work in the development of specialty papers, specifically, coated stock. The Phenom is used not only to look at the paper, but the paper's coatings, which are made primarily of inorganic pigments. These pigments can either be naturally derived, from materials such as clays or limestone, or synthetically manufactured. All pigments have different sizes, shapes, morphologies, and characteristics.

For example, to develop a glossy magazine paper, a layer of pigment plus binder is applied. The pigment particles have a high aspect ratio – i.e., they are shaped like tiny dinner plates. After application and processing, they orient parallel to the surface, lying flat on the sheet. With billions of particles on a coated sheet, each particle acts as a tiny mirror. Light impinges on the surface of the sheet and bounces off, making the paper surface appear glossy.

To produce various levels of quality of specular reflection (gloss) in paper, the Phenom helps researchers characterize the appropriate pigment to use. With Phenom, lab personnel look for pigments with particles that have the appropriate aspect ratio, dimension, size, and other qualities that would help optimize the paper for the properties desired.

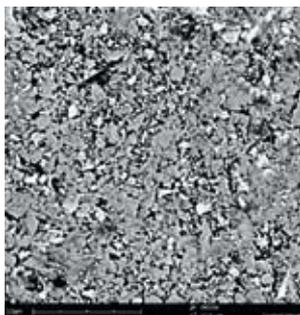
The Result

“Phenom speeds up the pace of development, improves the quality of the information, and we operate the SEM ourselves without training special operators,” says Brunea. “Phenom brought our lab everything Boise needed. Ease of operation, high-quality results, and affordability—plus now we get results quickly with everything in-house,” Brunea says.

Ease of use is also having another positive effect. “Rather than having a single specialist operating the equipment, many people can operate the Phenom. They're getting information back that is invaluable. We know it will spur innovation,” Brunea concluded.



Coated-1 View of paper coating layer and overall coating structure; magnified 2,080X by Phenom.



Coated-2 Magnified paper coating layer, individual coating particles; magnified 6,180X by Phenom.



Uncoated-1 Fiber structure of uncoated copy paper; magnified 480X by Phenom.



Uncoated-2 An individual paper fiber; magnified 2,500X by Phenom.

SEM images provided by the Boise Technology Development Center

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