Detailed chemical analysis of dirt specks in celgar off-grade pulp

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Abstract: Off-grade in Celgar NBSK pulp has been an intermittent problem since 1998. In order to fully understand the cause of the problem, more than 170 dirt specks in Celgar off-grade pulp were collected over a 4 month period starting in 2005. Each individual sample was characterized using preliminary chemical testing. More detailed analytical methods were used on selected samples. This work was able to positively identify slime (biofilm) as the cause of off-grade in more than 70% of the samples examined. Prior to this work, it was not possible to clearly distinguish between slime and pitch during pulp grading at the mill, and off-grade from slime was frequently classified as pitch.

A simple routine test was implemented to allow graders to clearly distinguish between pitch and slime.

Nitrogen isotope analysis was used to show the source of slime (biofilm) in individual dirt specks. This is the first time that this has been reported in the pulp and paper industry.

Additional analytical methods used include SEM/EDS, FTIR-microscope and glycoside composition analysis.

INTRODUCTION

Zellstoff Celgar is a modern pulp mill producing approximately 460,000 admt/year of northern bleached softwood Kraft (NBSK) pulp. The mill is located in the West Kootenay region of British Columbia, and as such utilizes a wide variety of softwood species to make up its furnish basket. To compete in the market, a final pulp with a high level of brightness and cleanliness is essential.

When the mill was modernized in 1993, production increased from roughly 650 admt/day to its current level of 1400 admt/day and a significant improvement in the closure of the mill water system was implemented. Over the course of several years it became apparent that this closure was leading to increased levels of biological growth in the pulp machine area and an increase in off-grade in the final pulp. This type of problem is commonly seen in paper machine environments, but rarely in pulp mills. It was believed that this growth would slough off at times and contribute to off-grade problems in the final pulp. Since the biological growth on the pulp machine was usually a combination of pitch, talc and slime, it was difficult to know which component should be the focus of control efforts. Significant process modifications were made to reduce visible growth of biological deposits, but off-grade continued to be an intermittent problem.

The main purpose of this work was to provide an accurate representation of the types of dirt present in off-grade pulp at Zellstoff Celgar. To do this, it was necessary to collect and characterize a large number of dirt specks over a significant time interval and to collect multiple samples of each type of dirt that occurred. More than 170 samples were collected and individually examined over a four month period of time.

The initial screening procedures used only a small part of each sample to provide a significant number of very similar samples for more detailed testing. Detailed characterization generally required destructive testing and was carried out on the major dirt types identified in the initial screening.

Over the previous nine years, a number of different analytical methods and techniques were employed at the Celgar mill by a number of consultants. In the present work, additional analytical methods were evaluated in order to fully understand the problem.

The following analytical methods were used on individual dirt specks:

- Chemical spot tests using a microscope for preliminary identification.
- Scanning electron microscope/energy dispersive X-ray spectroscopy (SEM/EDS).
- Fourier transform infrared spectroscopy (FTIR)-microscope.
- Glycoside composition analysis (sugar composition of polysaccharides).
- Natural isotope analysis ($\Delta^{15}N$) by elemental analysis- isotope ratio mass spectrometry (EA-IRMS).
- Carbohydrate content, soluble and insoluble.

METHODS AND MATERIALS

Pulp samples containing dirt specks were col-

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