Investigation of green lime mud at Harmac mill

By K. Taylor and D. Bossons

Abstract: Over the past several years, the Harmac pulp mill has experienced operating periods of very poor lime mud quality and upset operation of the recaust and lime kiln areas. These upsets coincided with the occurrence of green lime mud. This study investigates the chemistry of non-process elements (NPEs) in the recaust/lime kiln cycle, evaluates the effect of secondary sludge burning in the recovery boiler, identifies a possible cause of green lime mud, and makes recommendations to reduce lime mud filter plugging and maximize sludge burning.

HARMAC LIME MUD was typically very white in colour until 2001. Since then, lime mud colour has varied from nearly white to dark green. Recaust upsets such as plugging of pressure and rotary lime mud filters seemed to occur when the lime mud was dark green in colour. These incidents of poor lime mud quality were serious enough to reduce mill output due to insufficient white liquor production. There was a concern that these process upsets were caused by non-process elements (NPEs) introduced during the burning of secondary treatment sludge in the recovery boiler, which also began in 2001. As a result, sludge burning was discontinued in June 2004. However, a serious recaust upset with green lime mud occurred from July to October 2004, casting doubt on sludge burning as the cause of the problem. A strong economic incentive exists to burn sludge in the recovery cycle at Harmac, since it reduces operating costs by approximately $2 million a year.

The Harmac pulp mill, located on the east coast of Vancouver Island, is operated by Pope & Talbot. The mill was built in three distinct phases between 1950 and 1963, and has undergone considerable modernization over the past 20 years. The mill currently operates with a capacity of 1,120 air-dried tonnes (adt/d) of fully bleached market kraft pulp. The recaust was modernized in the mid-80s and combined into a single line. Harmac disposes of the waste secondary sludge from its effluent-treatment process through three means: dewatering and burning in the power boiler, dewatering and sending to landfill, or direct mixing with the weak black liquor and burning in the recovery boilers.

Incineration of secondary sludge in the recovery boiler has been of interest to the pulp industry for some time [1]. Economics are favourable, but the sludge is known to contain mill-specific NPEs that can affect mill operation [2].

Extensive literature searches and discussion with industry experts did not explain the occurrence of green lime mud. Extensive reviews of the effect of non-process elements in kraft pulp mills are available [3-6]. However, none of them was able to shed light on the problems occurring at Harmac.

Because of the favourable economic incentive of sludge burning, and the negative impact of recaust upsets, a research project was initiated to address the following objectives:

1. Identify the cause of green lime mud at Harmac;
2. Understand the role of NPEs in the Harmac process cycle;
3. Evaluate the effect of sludge burning on the Harmac process cycle; and
4. Make recommendations to reduce lime mud filter plugging and maximize sludge burning.

METHODS, MATERIALS

Metal concentrations were measured by Econotech Services Ltd., Delta, BC. After digestion, samples were analyzed by inductively coupled plasma (ICP) spectroscopy. Total metals content was measured in liquid samples.

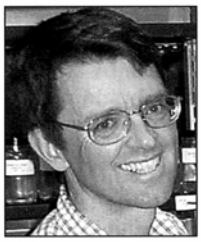
Step-scan X-ray powder-diffraction data (XRD) using the quantitative Rietveld method were collected on a standard Siemens (Bruker) D5000 Bragg-Brentano diffractometer. These measurements were performed at UBC Department of Earth and Ocean Sciences by M. Raudsepp and E. Pani.

Visible light spectroscopy of liquid samples was performed with a Carey 5 UV/VIS/NIR spectrometer while diffuse reflectance measurements of solids were made with a Carey 1 UV/VIS/NIR spectrometer.

Brightness of lime mud was measured with a Technibrite Micro TB-1C (Technidyne Corporation, USA).

Kaolin clay was obtained from Feldspar Corp. (Florida) as EPK Kaolin and contained 97 wt% kaolinite. Surface area was 24 m^2/g and average particle size 1.4 microns. Synthetic green liquor contained 1.1M sodium carbonate (ACS grade) and 0.5M sodium sulphide (ACS grade).

Samples for the sludge-burning trial were collected in acid-washed polyethylene sample containers to eliminate possible metal contamination. Samples were collected for four days with normal mill operation then for seven days burning sludge at 120 US gal/min. One set of samples was collected seven days after termination of sludge burning.



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