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Subject: 9th Status Report on XL-2 Projects at IP Androscoggin Mill, Jay, Maine
Progress as of August 15, 2002

Summary

This letter constitutes the 9th report on the XL-2 project being conducted at the Androscoggin Mill of International Paper Company in Jay, Maine. The report summarizes progress made as of August 15th, 2002. The objective of this project is to implement COD and color reduction projects at the Androscoggin mill in lieu of implementation of best management practice in the cluster rules.

Regarding the financial status of the XL-2 project, $370,000 of the available $780,000 has been spent for the IP XL-2 project while $410,000 of the original $780,000 remains to be spent on identified projects.

The COD in the mill effluent is presently about 26 kg/1000 kg AD pulp, which is the XL-2 goal for the final effluent to be reached by June 2004. If filtered COD is used as the evaluation method, the filtered COD is below the XL-2 goal. The data for color in the mill effluent has been updated to the 2nd quarter and shows that the color discharge is presently about 80 pound per U.S. ton of air dried unbleached pulp. The overall trend for color is clearly downwards over the last 5 years, but has been at the level of 80 pounds per air dried ton of unbleached pulp, which is midway between the XL-2 color limit (120 lb/ton) and XL-2 color goal of 50 lb/ton. Since the inception of the XL-2 project, both the color and the COD have shown less variability indicating a more stable system.

The status of various projects identified in the initial phases of the XL-2 program at IP-Jay is discussed in this progress report. Since the inception of the XL-2 project, the black liquor discharge from the screen rooms on both the softwood and hardwood kraft mill have been reduced significantly. Further, closure of the screen room and improving the effectiveness of the oxygen delignification system on the softwood side have been identified as potentially effective methods for further reducing the COD and color in the final mill effluent. Conductivity probes are being installed in selective sewers as a method for detecting and reducing black liquor spills. Seven of the nine conductivity meter probes have been installed and all nine will be installed by September 30, 2002. Design studies are underway to upgrade the oxygen delignification system.

Introduction

An XL-2 Project is being conducted at the IP paper mill in Jay, Maine[1]. Eight (8) previous reports have been written together with two topical reports summarizing the status of this project.[2]

Under the terms of the XL agreement, the IP mill is exempt from Best Management Practice (BMP) in the water pollution portion of the Cluster rules. In exchange for this exemption, IP has agreed to take a number of steps designed to improve the quality of the mill effluent for COD and color beyond the levels likely to be attained through implementation of the BMP requirements.

Financial Status

As of August 15th $370,000 of the available $780,000 has been spent for the IP XL-2 project. With cost estimates for remaining projects totaling $594,000, their full implementation would result in a shortfall of $184,000 (see Table 1). However, the Collaborative Team has not yet approved these remaining projects, and several will be discarded without implementation because they are now felt to have marginal impact on the color and COD levels in the final mill effluent. The next major project to be considered for funding is the steam mixer for the oxygen delignification system on the softwood side. The installed cost of the steam mixer is estimated at approximately $100,000. If approved, this still leaves about $310,000 for addressing technical solutions to reduce important black liquor point sources that go to the wastewater treatment system. The most important XL-2 technical projects relate to:

1. Closing the screen room in the softwood A mill (sluice filtrate),
2. Reducing the carry over of black liquor with flashed steam from the spent cooking liquor going to the digester flash tank, and
3. Improving the level of delignification in the softwood oxygen system.

Update on Effluent Discharge on COD and Color

COD in Mill Effluent. The data for the COD in the mill effluent is updated to July 2002 and displayed in Figure 1. It shows that the unfiltered COD is presently about 26 kg/1000 kg AD pulp, which is the XL-2 goal for the final effluent to be reached by June 2004. The filtered COD is at or below the XL-2 goal. The addition of cationic flocculent (polymer) since the beginning of June may explain part of the COD improvement during the summer. Overall the COD data show a slight downward trend since January 2000. This trend is also discernable in the COD concentration measured at the Bar Screen (see Figure 2), i.e. at the location just before

[1] International Paper XL Project: Effluent Improvements", Final Project Agreement, Androscoggin Mill, Jay, Maine (June 29,2000).

[2] Genco, J. M., and van Heiningen, A., "Topical Report on XL-2 Project at IP, Jay, Maine Results of Laboratory O_2 Delignification Experiments", August 12, 2002: "Second (2nd) Mill-Wide COD Balance to Identify Important COD Point Sources", December 21st, 2001 (7th report), "Status Report on XL-2 Projects at IP Androscoggin Mill, Jay, Maine; Progress as of September 30, 2001", October 25th, 2001 (Sixth 6th Report); "Effluent Reduction by Process Closure Short Course", Aug. 12, 2001: "Status Report on XL-2 Projects at IP Androscoggin Mill as of June 30, 2001", July 23, 2001 (5th report), "Status Report on XL-2 Projects at IP Androscoggin Mill", April 25, 2001 (4th report), "Comparative Analysis of XL-2 Projects", December, 28, 2000 (3rd report), "Mill-Wide COD Balance to Identify Important COD Point Sources", October 18, 2000 (2nd report), "First Summary Report for IP XL-2 Project, Initial Evaluation of COD Balance", August 9, 2000 (1st report).

the wastewater treatment plant. The data in Figures 1 and 2 reflect the changes in COD resulting from process changes and mill production. The recent COD data in Figure 1 also indicates that there is considerably less variability compared to COD data taken prior to the XL-2 program.

Color in Mill Effluent. The development of color in the mill effluent has been updated to the end June 2002 (2nd Quarter). These data are displayed in Figure 3. It shows that the color discharge is presently about 80 pound per U.S. ton of air dried unbleached pulp (lbs/adtubp). The overall trend is clearly downwards over the last 5 years, but has been at the level of 80 lbs/adtubp for the last three quarters, approximately midway between the XL-2 color limit (120 lb/adtubp) and XL-2 color goal of 50 lb/adtubp. It is interesting to note that quarterly fluctuations in the color discharge have become smaller over time, suggesting better control of the mill operations. Improving the oxygen delignification system on the softwood side should further reduce the color in the final effluent.

Recommendations resulting from University of Maine Oxygen Delignification Experiments

The results of the oxygen delignification experiments performed at the University of Maine simulating the IP system suggest that it should be possible to increase the degree of delignification, given by a change in kappa number, in the softwood mill to 35 to 40 % from the present 27%. Recommendations include:

1. **Raise Temperature in the System.** Raising the temperature in both the pressurized reactor and the atmospheric tower by at least 15 degrees Fahrenheit to about 190 °F, and preferably to 200 °F. This will require installation of a steam mixer and proper injection nozzles for reliable steam injection.

2. **Second Oxygen Mixer**. Adding a second oxygen mixer ahead of the high-pressure 15-minute oxygen reactor. A second mixer is desirable because it allows re-mixing of the pulp-oxygen mixture ahead of the reactor, and split addition of caustic and oxygen, which should improve the selectivity of oxygen delignification.

Installation of a second oxygen and caustic mixer just before the inlet of the pressurized tower was felt to be of lesser importance than raising the temperature of the pressurized reactor and atmospheric tower to achieve the increased delignification. Improved pulp viscosity and mixing may be required for the higher delignification achieved at the higher operating temperature. The addition of $MgSO_4$ may also be required at these conditions.

The reductions in COD and Color of the final mill effluent resulting from the increase in degree of delignification from 27 to 40% was estimated at 1.9 and 5 kg per air dried metric ton of pulp. Improving the oxygen delignification system appears to be particularly effective in reducing the color of the final effluent since 5 kg/ADMT is equivalent to approximately 10 lbs/ad ton of unbleached pulp.

Project Status

In both the softwood and hardwood pulp mills at IP-Jay, Maine, wood maceration is done in conventional Kamyr hydraulic digesters. Generic diagrams of a hydraulic digester are shown in Figures 4 and 5.

Down Flow Cooking Impacts. Outside the scope of the XL-2 project, the mill has recently implemented a modification to the softwood pulping system (A-Side) called Down Flow Cooking. The Down Flow Cooking project involves reducing the cooking temperature, carefully controlling the alkali concentration, and cooking the wood well into the wash zone or lower portion of the Kamyr Continuous digester. This project, in addition to giving a higher pulp yield, was expected to allow increased removal of black liquor from the continuous digester, given by an increase in the black liquor extraction ratio. Since the cooking temperature would be reduced, the temperature of the spent black liquor would also be reduced. The expected net effect of the changes brought about by implementation of the Down Flow Cooking process, would be that more wash liquor from the brown stock washing could be accommodated and less wash water from the brown stock washers would be used as sluice filtrate. Also, it was thought that since the temperature of the black liquor being extracted from the digester was reduced, less flash steam would be produced in the flash tanks, thus reducing the black liquor carry over from the flash tanks.

However, at the present time the volume of black liquor extracted per ton of pulp is slightly lower, and the spent liquor temperature is unchanged compared to the situation before the change over. Therefore, further work is needed to achieve the beneficial characteristics, increased black liquor extraction at a lower temperature, by the new method of operating the digester. This will be done by the mill and IP Technology in the coming weeks.

Sluice Filtrate. Filtrate from the Number 1 brown stock washer in the softwood (A-side) pulp mill is used to sluice the rejects collected from the last stage in the pulp screening process, that is, off the flat screen in the screen room. To reduce this continuous release of black liquor to the sewer, 113 GPM of the total flow of 180 GPM was replaced by white water, while the displaced 113 GPM filtrate flow was integrated into the brown stock washing operation. So far this partial replacement has not resulted in poor washing, although the situation might change when the pulp throughput is increased from its present low level to full production.

Flash Tank Demister. The objective of the flash tank demister project is that its installation will eliminate black liquor carry over with the flashed steam. The tie-ins necessary for the demister are in place. As part of the Down Flow Cooking project, the conductivity of the flash steam condensate has been measured both before and after implementation of the changeover. Although the conductivity level increased from about 800 to 1100 reciprocal micro-ohms (μ-ohms), these values are both quite low, and thus indicative of a relatively small amount of black liquor carry over. In addition, it was found that the conductivity level did not increase with increasing production, contrary to the hypothesis that black liquor carry over would increase strongly with increased flash steam flow rate. Therefore the sodium content of the flash steam condensate will be analyzed to determine whether black liquor carry over is still an issue. One possible explanation for the reduction of this particular black liquor release is recent maintenance repairs made to the flash tank.

Sewer Conductivity Probes. Seven of the nine conductivity meter probes have been installed. Not yet installed are the probe in the bleach plant acid sewer (requires special corrosion resistant metallurgy) and the oxygen filtrate sewer. The project will be completed by September 30, 2002, and include training personnel and incorporation into the PI control system of the mill.

Improved Mixing in the Oxygen System. A preliminary design study is underway by Neill & Gunter Engineering Company to investigate incorporation of a steam mixer, nozzles, and a second oxygen mixer into the softwood oxygen delignification system. This study will investigate the cost and feasibility of this project, which is a high priority for the Technical Team.

Next Collaborative Meeting

The next meeting of the Collaborative Team will be held at the International Paper Company mill in Jay, Maine on September 16th, 2002.

Sincerely yours,

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Table 1
Status of XL-2 Projects
As of August 9, 2002

Project / Engineer	Status	Completion Date	Estimated Cost*
Subtotal - Projects Completed			**$260**
Sewer Conductivity Cells (Funded) / Curt Treadwell/Erin Paine	• Cells installed except acid sewer and O2 system. • Developing PI/Prophecy data management system.	• 3rd Quarter (Data available in September)	$50
O_2 Chute Improvements (Vent Only) (Funded)	• Installation complete. • O_2 outage scheduled for August 20.	• August	$23
O_2 Chute Improvements – DSCE Only (Reposition chute Only) (DSCE Funded)	• Draft completed. Curt to review.	• TBD	$13
Flash Tank Demister – Tie Ins Only (Funded) / Curt Treadwell	• Hold (Evaluate downflow results)	• Hold	$19 (Estimated Cost = $180; Spend ytd = $19)
UMO Testing	• O2 Testing		$5
Subtotal – Money Spent - Projects Completed or Being Completed			**$370**
Flash Tank Demister (Funded) / Curt Treadwell	• Hold (Evaluate downflow results)	• Hold	$161 (Estimated Cost = $180; Spend ytd = $19)
O_2 & Steam Mixer (Not Funded)	• Need XL-2 input. Identified multiple mixers.	• TBD (Delivery time for mixer is 12~16 weeks)	$283 (Original was $240)
O_2 Consistency Transmitter (Not Funded)	• Obtained transmitter costs.	• Hold	TBD
O_2 Chute Improvements (Reposition chute Only) (DSCE Funded)	• Draft completed. Curt to review.	• TBD	$150 (DSCE Funding = $13)
TOTAL COSTS – All Projects			**$964**
XL-2 Commitment			**$780**
BALANCE - Money Available			**($184)**

" No Change" indicates project completion date has not changed from last XL-2 Technical meeting.

* Projects not completed have an estimated cost of +/- 25%.

Figure 1

International Paper, Androscoggin Mill
COD DischargesThrough July 31, 2002

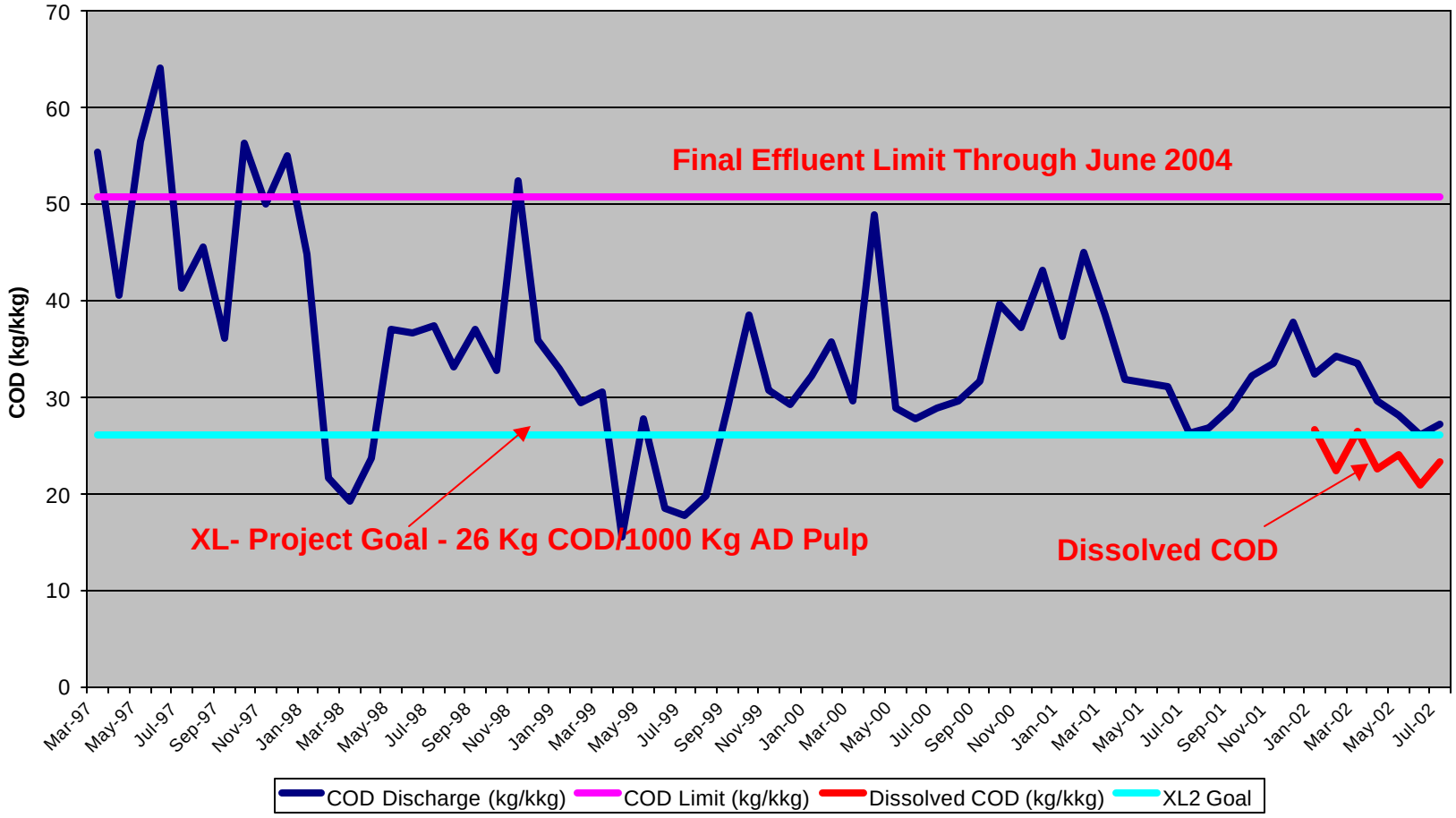

Figure 2

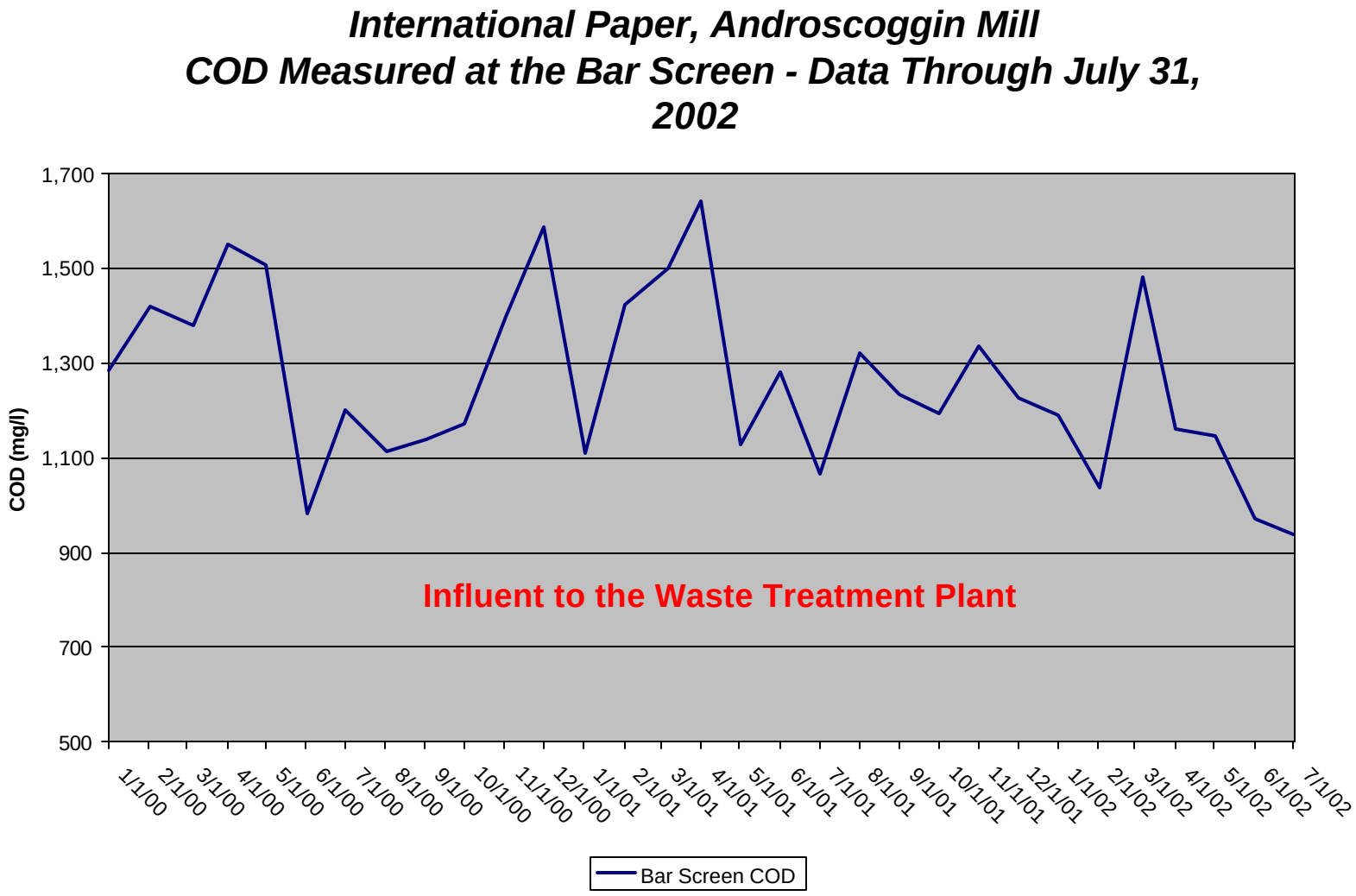

Figure 3

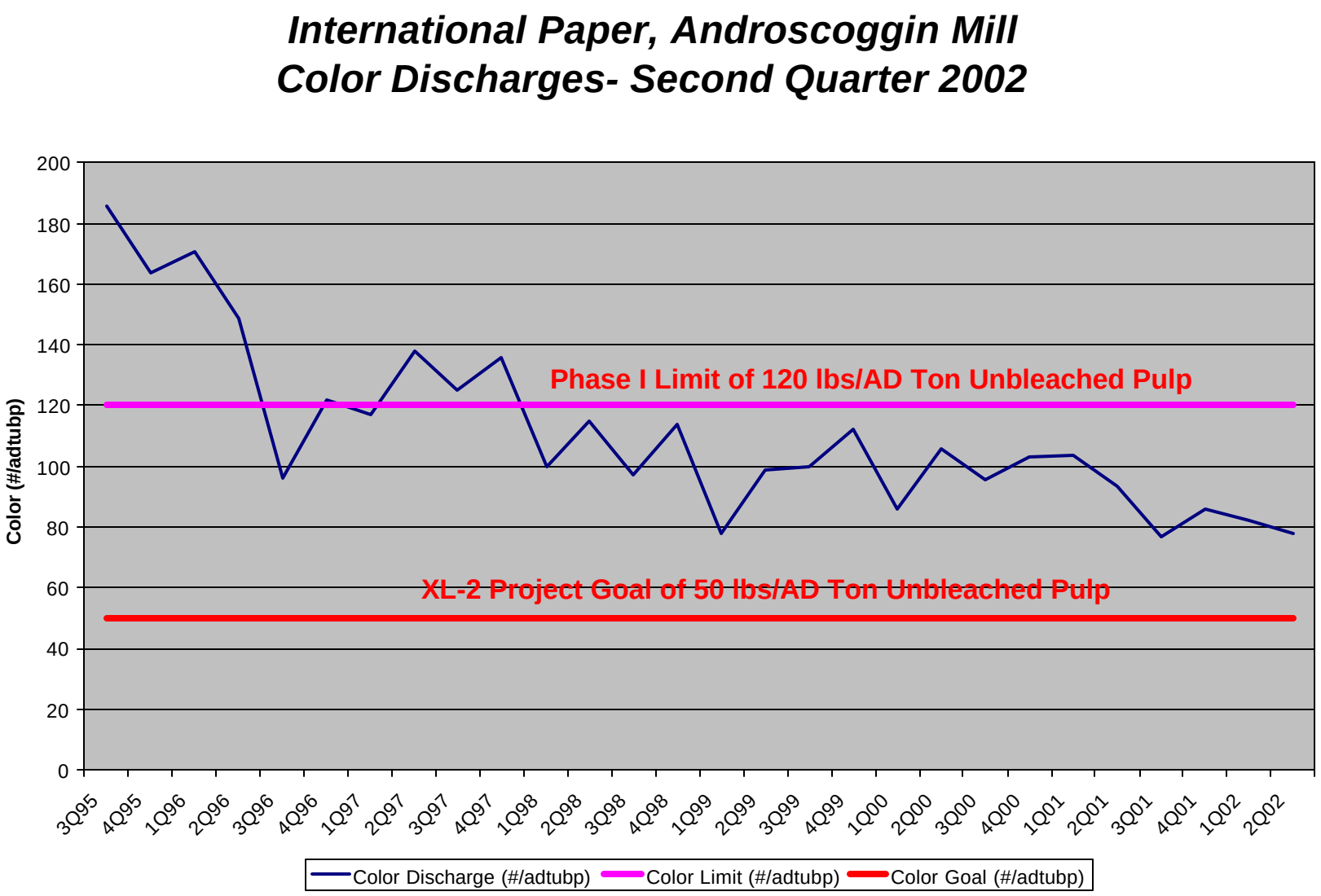

Figure 4

Current Softwood "A" Side Digester At IP Androscoggin Mill, Jay, Maine

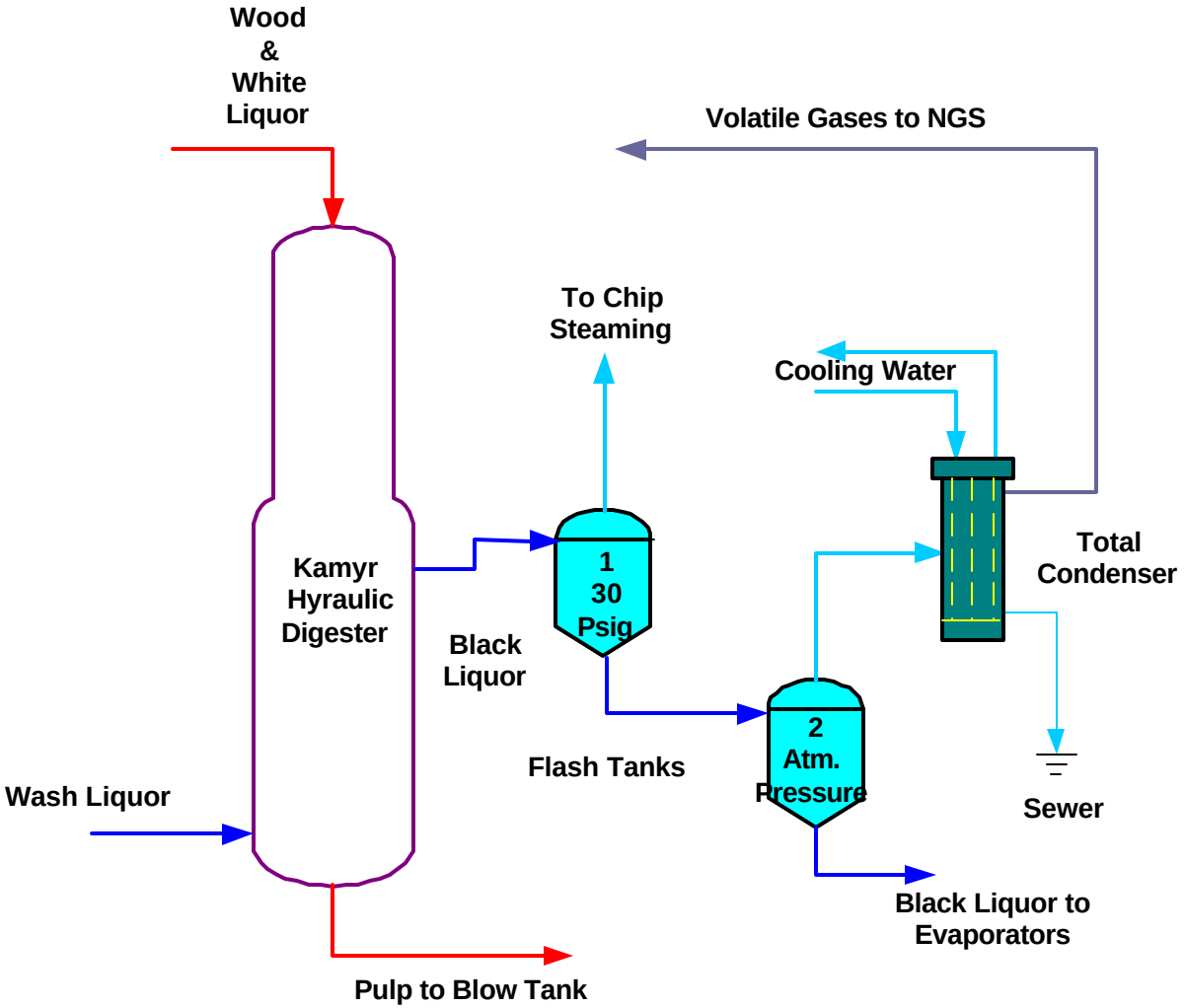

Figure 5

Conventional Kamyr Continuous Pulping System