Because production of most papermachines, particularly, board machines, are dryer section limited, the critical requirement is the consistency of the sheet entering the dryer section after the press section. Consequently, improved dewatering in the press section leads directly to a higher consistency sheet entering the dryer section and increased production. Improving the mechanical aspects of the pressing has been a goal of equipment manufactures for a very long time, and many improvements have been made, e.g. extend nip presses. Here we describe a chemical technology that enhances the water removal in the press section of the paper machine. In this paper we present data from actual machine applications since simulation of changes in press dewatering in the laboratory has proven difficult to quantify.

RESULTS AND DISCUSSION

The following data was obtained on a two-ply fourdrinier producing 26# corrugating medium using a 80% OCC/20% MW furnish. The press dewatering chemicals were sprayed on the top ply before the sheets went through the combining roll. Figure 1 is a schematic of the chemical application feed points. Two different chemistries with different composition were evaluated in this study.

ABSTRACT

Nalco has developed technology to enhance water removal in the press section of a paper machine. While high molecular weight flocculants are commonly used to enhance free drainage in many grades of paper, in board and packaging grades of paper it is often not possible to take advantage of this drainage rate improvement to increase machine speed.

This new press dewatering technology has minimal impact on free drainage but its impact on water removal in the press allows significant increases in machine speed and productivity. In this paper, we discuss reasons for the inability of board machines to take advantage of increased free drainage and then show data that clearly demonstrates the impact of this new technology on dewatering in the press section of a paper machine. Data from pilot machine runs as well as case histories from actual machine applications will be presented.

INTRODUCTION

It is well accepted that the cost of water removal on a paper machine increases as one moves from the forming section, through the press, and into the dryers. It would therefore be logical to remove as much water as possible before one gets to the dryer section.

Drainage aids are commonly used on many grades of paper. However, increasing the drainage rate (as measured by Canadian Standard Freeness, for example) does not always result in an increase in total water removal across the paper machine, especially in unfilled grades of paper. There are many reasons why the paper maker may not be able to take advantage of this increased drainage rate. Along with increasing drainage rate of a paper furnish, drainage aids often increase the retention of fines, fillers, and other additives. The water retention value of fines, for example, is significantly greater than that of long fiber making a sheet with higher fines content more difficult to dry. Increased fines content can also reduce the free pore volume, potentially making the sheet more difficult to dewater.

Figure 1 – Schematic of the Chemical Application.
The fact that this was a spray application implies that the data reported below was not the result of impacts on the wet end of the paper machine normally associated with dewatering chemicals. Sheet consistencies were obtained using gamma gauge measurements on the sheet entering and leaving the press section consisting of two roll presses. The impact that the application of this technology had on the second-press sheet solids is shown in Figure 2. As seen in this figure, both of the chemistries evaluated increased the 2nd press sheet solids. Note that the sheet solids increases with increasing chemical dosage, a good indication that spraying the chemical on the sheet is in fact resulting in higher sheet solids. Changing the chemical composition also appears to have an impact on sheet solids, indicating that chemical composition is another important variable.

The change in sheet solids from the couch to the second press, i.e. across the press section, is shown in Figure 3. Without any chemical treatment we saw a 21% increase in sheet solids. With chemical treatment we were able to obtain a 22%-23% solids increase. Although no speed increase was taken during this trial, this increase in press solids of 1 to 2 percentage points is expected to translate to a significant increase in production. Equivalently, the press solids increase could result in an energy consumption for drying of 4.0 to 7.5%, if desired.

One would expect that increasing the solids of the sheet out of the press would make the sheet easier to dry resulting in an immediate reduction in sheet moisture at the reel, and this was observed. The reel moisture change is transient because the DSC system automatically reduces the dryer steam demand. The average steam pressures measured under the different trial conditions are shown in Figure 4.

To summarize, the direct measure of consistency increases across the press section that are dependent on chemical dosage provide strong evidence that these chemical additives can provide a significant improvement in press performance. The application of the chemical after sheet formation and its immediate effect on sheet solids indicates that the chemicals’ effects are different from conventional additives typically used for drainage/dewatering in the wet end.

**CASE HISTORIES**

This technology has been successfully applied to a number of paper machines. Below is a compilation of some of these applications. It is interesting to note that not only has this chemistry been sprayed directly on the sheet, but we have also successfully applied this chemistry to thick stock and thin stock.

**Case History #1**

This machine produces corrugating medium on a fourdrinier from 100% OCC. The pressing technol-
ogy was fed to the thick stock at the outlet of the machine chest pump. The reduction in steam pressure from the application of this technology has allowed the mill to speed up the machine. Figure 5 is a table summarizing the impact of this technology on machine speed for various basis weights of paper. It is not surprising that the largest impact is seen on the heaviest grades of paper. Addition of this technology had no discernable impact on the wet line of the paper machine.

Case History #2
This machine produces linerboard and medium on a two-ply fourdrinier. The following data, shown in Figure 6 was taken from the initial evaluation of this technology on the paper machine. In this application the pressing aid was fed to the outlet of the machine chest pump.

Case History #3
This machine is a seven-ply cylinder machine producing gypsum linerboard from OCC. The pressing aid was sprayed at 3Kg/T between the inner plys. The sheet moisture coming out of the press was 52.5%. Upon turning on the pressing aid, the sheet moisture dropped to 50.9% in a matter of minutes. Upon turning off the pressing aid the moisture returned to 52.5%.

Case History #4
We evaluated the pressing technology on a European machine that produced 180gsm gypsum liner paper on a three-ply fourdrinier. In this case little impact was seen when we fed the technology to the outlet of the machine chest pump. When we moved the feed point to the thin stock loop (post screen) we were able to increase machine speed 20m/min (20 T/day) on a 180g sheet. Figure 7 is a schematic of the machine along with the feed points of the wet end additives.

The results from applying the pressing aid at the different feed points are shown in Figure 8. Note that there was no observed impact in retention. However when the chemistry was moved to feedpoint “C”, there was a significant increase in sheet dryness, which led to the machine speeding up. We currently do not have an explanation for the sensitivity of the chemistry to feed point.

CONCLUSIONS
We have developed chemical technology that has a significant impact on the press dewatering of a paper machine, but has little impact on wet end dewatering. This technology is being successfully used on single-ply and multi-ply fourdriniers as well as on multi-ply cylinder machines. Proper application of this technology is important for the paper machine to fully take advantage of the dewatering impact.

ACKNOWLEDGEMENT
The authors would like to thank Albany International for making the gamma-gauge consistency measurements reported.

<table>
<thead>
<tr>
<th>Basis Weight</th>
<th>Machine Speed Before Pressing Aid (Ft/Min)</th>
<th>Machine Speed After Pressing Aid (Ft/Min)</th>
<th>Estimated Production Increase (TPD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23#</td>
<td>1900</td>
<td>1925</td>
<td>4.9</td>
</tr>
<tr>
<td>26#</td>
<td>1860</td>
<td>1925</td>
<td>8.6</td>
</tr>
<tr>
<td>33#</td>
<td>1475</td>
<td>1730</td>
<td>64.9</td>
</tr>
</tbody>
</table>

Figure 4 – Impact of Pressing Aid Dosage on Steam Pressure.

Figure 5 – Impact of Pressing Aid on Machine Speed.
Figure 6 – Impact of Pressing Aid on Steam Demand and Machine Speed 33# Medium.

Figure 7 – Schematic of a Pressing Aid Feed Points on a Machine Producing Gypsum Linerboard.

<table>
<thead>
<tr>
<th>Pressing Aid Feed Point</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anionic PAM (kg/T)</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Coagulant (kg/T)</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pressing Aid (kg/T)</td>
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<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>First Pass Retention (%)</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Speed Increase (mpm)</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure 8 – Results of Pressing Aid at Various Feed Feed Points on a Machine Producing Gypsum Linerboard.

REFERENCES