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INSPECTION REPORT
FOR VERSO PAPER, MAINE, USA

HYMAC MODEL 100 HP-8F WET LAP LINE
CURRENT LOCATION: NIAGARA WISCONSIN

REPORT #12-520-1

MARCH 16, 2012

12-520-1

PROCESS CONDITIONS - WET LAPPING

		ORIGINAL	DESIRED
Production	-	100 ODSTPD	400 ODSTPD
Type of furnish	-	Groundwood	Blend 90% Softwood 10% Hardwood
Freeness (CSF)	-	unknown CSF	650-700
Inlet Consistency	-	4 - 5 % OD	3.5 – 4.5 % OD
Discharge Consistency	-	47% OD	45 ± 2 % OD
Temperature	-	unknown	≥ 130° F
pH	-	6.5 - 7.5	6.5 – 7.5
Ash	-	< 2% ODS	<2% ODS

GENERAL DESCRIPTION

TWIN WIRE PRESS

The **HYMAC** model **100 HP-8F TWIN WIRE PRESS** as inspected is a twin wire press design, originally set up to accomplish the continuous dewatering of groundwood pulp by entrainment and pressurization between two porous synthetic fabrics (belts). The press is of cantilever design, and will accommodate either endless or seamed fabrics. The belts are supported by perforated plastic dewatering plates in the initial, or forming section of the unit, and followed by free turning low pressure ("S") rollers, three sets of free turning press rollers, and a single set of driven press rolls. Frame construction is of painted carbon steel and incorporates both rectangular tube as well as heavy plate sidewalls in the press section. Rolls are carbon steel cores with rubber covers and bearing housings are painted carbon steel pillow block type. Wetted parts such as the head box, drain pans and discharge flanges, tensioning thrust shafts, shower bars and enclosures are of stainless steel (grade unknown, probably 304 or 316). Most fasteners are stainless as well.

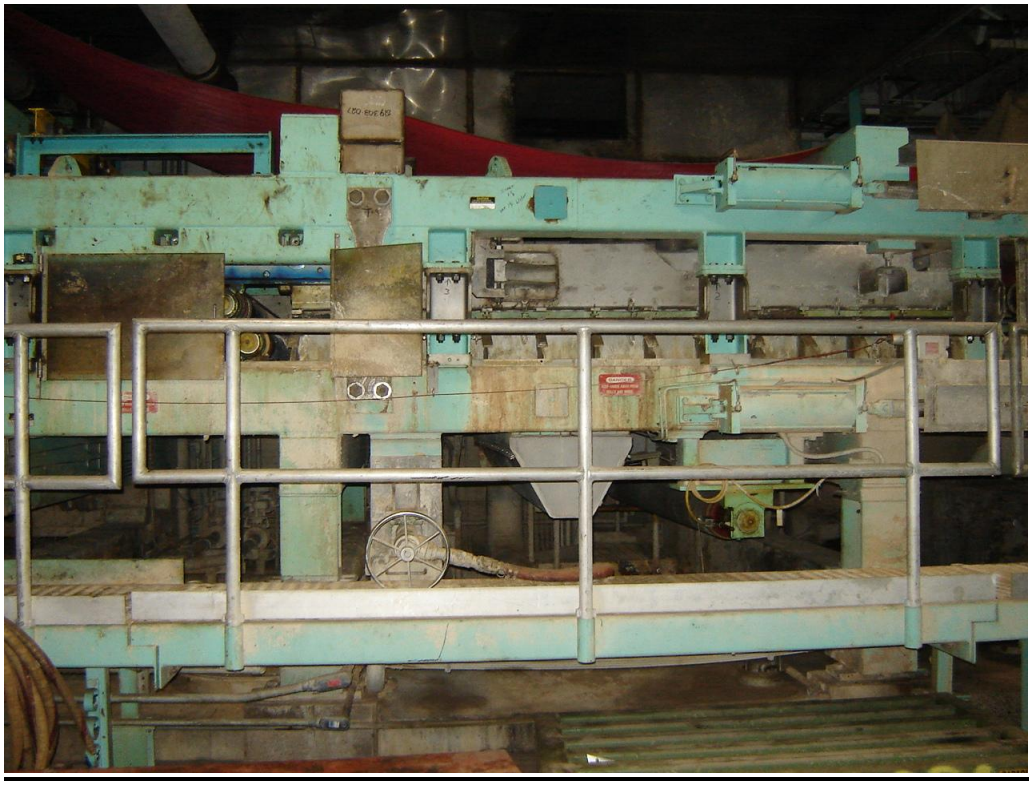
The press has two distinct dewatering zones or sections; the **Wedge Section** and the high pressure, or **Press Section**. The sections perform as follows:

The material to be dewatered enters the **Wedge Section** through a pressurized stainless steel head box which injects the suspension between the upper and lower belts. The belts are supported by dewatering plates in the initial (approximately 70%) of the wedge, with side sealing accomplished by seals mounted on either side of the machine, positioned between the upper and lower fabrics. This first section is commonly called the forming section. Dewatering plates give way to a series of "S" rolls at the end of the wedge section, allowing for some slight wrapping of the entrained suspension for increased pressure prior to entering the nip section. The rapid reduction of area as the material travels down the wedge results in a high rate of thickening, with the intended result of forming a stable sheet which then transfers into the **Press Section**, or high pressure section of the press.

After entering the **Press Section**, the material is passed through a series of individually controlled nip rolls of gradually increasing load. Pressure is applied pneumatically via Firestone air bags working in conjunction with lever arms. Pairs of nip rolls are arranged in an upward slope to aid in water removal from the top belt, and to avoid resuction of moisture into the sheet. Water is removed from the top belts utilizing a fixed doctor, or collection device which collects the pressate and directs it to either side of the belt where it drops down in to the collection pan. Discharge of the sheet occurs at the drive rolls, which are also pressurized. These rolls are driven through a single motor / dual output gearbox arrangement with a 125 HP variable speed AC drive.

After discharge the dewatered material is transferred over an open draw to the Cutter Layboy unit knife entry belt.


KUMAC



PULP PRESS

TECHNICAL SPECIFICATION AND GENERAL DESCRIPTION

TWIN WIRE PRESS

One (1) only **Hymac Model 100 HP-8F Twin Wire Press** for dewatering of a variety of industrial pulps and slurries. Cantilever frame design for use with endless or seamed belts. Unit is complete with:

PRESS ROLLS (6) - Carbon steel with hard rubber coverings. Each pair of nips is individually loaded via an air bag and lever arrangement. Gradually increasing pressures through the three nips will likely range from 200-800 PLI under typical operating conditions. Rolls mounted in carbon steel pillow block housings.

DRIVE ROLLS (2) - Carbon steel with rubber coatings; Nipped configuration, both driven through a single variable speed AC drive, with the upper and lower rolls speed matched through a dual output gearbox. Rolls mounted in carbon steel pillow block housings.

DRIVE UNIT - Variable speed AC drive motor connected to a dual output gearbox.

AUTOMATIC TENSIONING SYSTEMS (2) - Provide automatic belt tensioning pneumatically using Firestone air bags. Rollers are of rubber covered carbon steel tubing, with stainless steel thrust shaft assembly. The system incorporates a cross shaft arrangement to insure parallel alignment of the rolls. The top tension roll has been fitted with a fixed fan knock off shower and enclosure with hand wheel cleaning system.

AUTOMATIC TRACKING SYSTEMS (2) - Pneumatically actuated automatic tracking systems utilized for both the upper and lower belts. Each system consists of a rubber covered tracking roller mounted in pillow block housings, automatic servo-regulator unit with tracking finger, and a belt overtrack detector (limit switch) to automatically shut the unit down in the event of a failure in the tracking system.

BELT SHOWERING SYSTEMS (2) - Oscillating showers (AES) with stainless steel enclosures for both top and bottom belts. Hand wheel type cleaning system.

DEFLECTION ROLLS - For belt direction; carbon steel with rubber covers mounted in pillow block housings.

"S" ROLLS - For additional pressure and increased dewatering just prior to the nip rolls; carbon steel with rubber covers mounted in pillow block housings.

DEWATERING PLATES - For belt support and drainage in the wedge / forming section; perforated plastic plates both above and below the pulp sheet and fabric.

“FLOATING” WEDGE – The plastic dewatering plates area, or forming section of the wedge has been modified with a “floating” design, whereby the discharge end of the wedge is pneumatically loaded utilizing air bags pushing down on the top of the wedge, pivoting from the inlet end. This effect can be both controlled for overall amount of movement as well as eliminated through the use of adjustment bolts.

HEADBOX - Stainless steel, dual inlet, pressurized, with water addition points. Includes deckle attachments for sealing down the side of the wedge.

PRESSATE COLLECTION TRAYS - Stainless steel construction; for the collection of machine pressate.

WATER DOCTORS – Fixed type, stainless steel. For removal of water from the upper fabric just prior to each nip.

BEARING ASSEMBLIES - All bearings are believed to be spherical roller type with a multiple non-contact labyrinth style sealing system.

MACHINE FRAME - Fabricated of tubular and plate carbon steel with epoxy coatings. Designed to permit direct mounting of rollers and components, and of cantilever design to allow the use of endless belts.

CONTROLS – Removed prior to inspection.

FILTER BELTS - Upper and lower belts should be available with the equipment. Standard supply is nylon or polyester twill design by Albany, Asten, Huyck. or equal. It is recommended that the customer have a second set on hand prior to start-up.

GENERAL DESCRIPTION

CUTTER LAYBOY

The **HYMAC CUTTER LAYBOY** accepts the sheet discharged from the Twin Wire Press for cutting and stacking. After discharge from the press, the sheet is fed onto the knife entry belt (often called the low speed or sheet transfer belt) of the Cutter Layboy. The speed of the transfer belt of the CLB is matched to the press electronically. The transfer belt feeds the pulp sheet into the cutter knife, which is mounted on an independently driven roll. Speed of the knife roll is varied to determine cut sheet lengths. After cutting, the sheets transfer onto the vacuum assisted sheet discharge belt which carries them over the stacker unit and drops them onto a transfer conveyor mounted on a hydraulic scissors lift. Optic sensors lower the table gradually as the stack increases in height, until a pre-determined stack height is reached which triggers a set of fingers, or forks, to extend and catch the discharging sheets while the table drops to its fully lowered position and transfers the stack onto the customer's conveyor for removal to a scale, and storage or transport. The transfer table then rises back to its extended position and the fingers retract, dropping the sheets stacked in the interim onto the table and beginning the process over again.

CUTTER LAYBOY

TECHNICAL SPECIFICATION AND GENERAL DESCRIPTION

CUTTER LAYBOY UNIT

One (1) only **Hymac Cutter Layboy Unit** for wet sheet cutting and stacking. Unit is complete with:

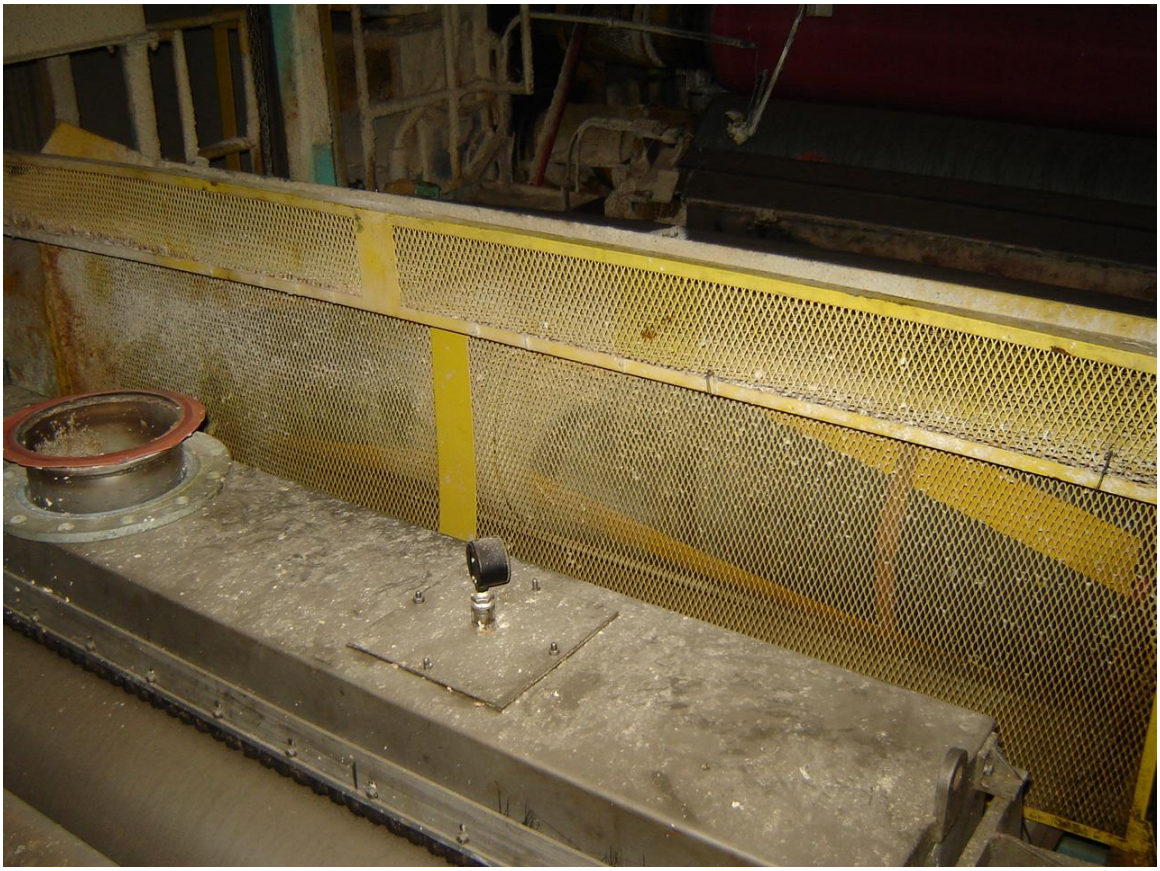
MACHINE FRAME - Fabricated of tubular and plate carbon steel. Designed to permit direct mounting of rollers and components. Coated with epoxy paint.

SHEET SPLIT AND TRIM – High pressure water system for side trim and center cut of the sheet, including high pressure pump, nozzles, and nozzle holders.

KNIFE ENTRY BELT (CONVEYOR) - Receives the sheet from the press unit and feeds it into the cutter knife. Driven by an independent motor and reducer, speed matched to the primary press through the drive control system. Belt is full width and will accept any size sheet or tail.

CUTTER (KNIFE) - Cuts the sheet to length. Configuration is a rotary fly knife working against a fixed anvil. Rotation speed is adjustable to customize sheet length, and then tied to primary press speed to maintain the cut length as line speed changes.

VACUUM PICK-UP SHEET DISCHARGE BELT - Receives cut sheets from the cutter and transports them to the stacking/transfer table. The vacuum system pulls the cut sheet up to a grooved belt and holds it there to transport it over the top of the stacking/transfer table, where it is dropped on to the bale or the forks if the bale is being discharged. Independently driven and matched to line speed. This belt was not installed at time of inspection, however I was told that a new spare had been sent to Maine.



STACKING/TRANSFER TABLE - The stacking/transfer table consists of a belt conveyor mounted on a scissor lift, in this installation the conveyor is set up to discharge the bales in machine direction. As sheets are discharged from the vacuum belt onto the table, optic sensors lower the table gradually while the stack increases in height. When a pre-determined stack height is reached, a limit switch triggers a set of fingers to extend actuated by a pair of pneumatic cylinders and catch the discharging sheets while the table drops to its fully lowered position and transfers the stack onto another conveyor for both accumulation and bale pick-up. This conveyor also incorporates a scale base at the pick-up point for weighing the bales. After discharge of the bales from the stacking conveyor, the transfer table then rises back to its raised position and the fingers retract, dropping the sheets stacked in the interim back onto the table and beginning the process over again. The conveyors have their own drives, and the scissors lift is actuated by a hydraulic unit.

FINGER TABLE - Pneumatically operated, fully automatic. The finger table holds incoming sheets while the stacking table is transferring its load.

CONTROLS - As with the press, the main control panel has been removed. However, a local operators station to control for manual control of the stacker and conveyor functions is still installed.

SUMMARY AND RECOMMENDATIONS

OVERALL CONDITION OF THE EQUIPMENT

The equipment as inspected is generally mechanically sound, with minimal surface corrosion. Interior corrosion of the frames is not known. Given the age of the line, this can probably be attributed at least in part to the rebuild of the equipment within the last 10 years, and the relatively little run time since then. A few modifications had been made to assist in the groundwood operation, and (it can be surmised) to facilitate ease of shipping. Foremost among these is the addition of a “floating” wedge. This was apparently added to increase the ability of the wedge section to handle variable sheet caliper and improve performance. The effectiveness of the groundwood oriented changes may be of limited use for your application, but will likely not adversely affect the function under the new operating conditions.

ITEMS FOR DISCUSSION / AREAS OF CONCERN

There are three main areas of concern regarding the movement and subsequent re-use of this equipment. They are:

1) The removal and shipping of the equipment.

2) Maintenance and repair or replacement of components to bring the equipment to good operating condition.

3) Modification required to meet the new operating parameters.

REMOVAL AND SHIPPING

Many of the ancillary items associated with the line had been removed at time of inspection, however the main equipment components were still in place. Removal was scheduled to begin shortly, and a discussion regarding method and procedure was held between Dave Dunlap and Don Boyd. There is very little headroom and no overhead crane to work with, so removal will have to be effected using a portable crane, forklifts, and equipment rollers. The general breakdown of the equipment will likely be approximately as follows, with variations made based on field decisions at the time of the work:

Removal of the equipment will be from the pick-up end of the conveyor and work toward the head box of the press. Parts should be both scribed and match marked, with a side elevation print correspondingly marked at the same time.

Cutter Layboy and Conveyor

- The conveyor should be able to be removed intact and shipped as a wide load
- Care should be taken not to damage the Toledo scale base under the end of the conveyor

- The cat walk should be removed from around the cutter layboy
- Drive and control components removed
- Vacuum system removed
- It would be a good idea to remove the fork actuation cylinders to avoid damage in transit
- At this point it might be possible to move the entire cutter layboy unit. If weight is a problem, removal of the knife roll is recommended

Press Section

- Remove the water trim and center cut components
- Disconnect and remove drive components
- Remove cat walks
- Disconnect all piping and showers, including tension roll knock off shower
- Remove drive rolls
- Remove press roll water doctors
- Remove press rolls
- Remove top high pressure frame from bottom
- Remove bottom high pressure frame from foundation

Wedge Section

- Remove tension rolls
- Disconnect upper discharge end wedge frame from upper head box end frame
- Separate upper frame from lower frame and remove both discharge and head box end upper frames
- Remove deckle seals
- Disconnect lower discharge end wedge frame from lower head box end frame
- Remove lower wedge frames from foundation
- Remove head box, try to salvage large sole plate

Note: Rollers that are not going to be recovered need to be handled with care and should not be set on the floor or shipped on their covers. They should be crated or blocked up so that the covers are not resting on a hard surface.

MAINTENANCE AND REPAIR

All components should be inspected at time of removal for signs of damage, and when found a note should made in a journal and the part tagged for further inspection. It is assumed at this time that the equipment will be transported to a facility for clean up and further inspection and repair or replacement of damaged components, as well as any modifications that may be required. Primary items of concern include but are not limited to:

- Roll covers, with particular emphasis on press and drive roll covers
- Roll journal condition and fit
- Proper functioning of the tension and tracking systems
- Dewatering plate condition
- Check head box body and nozzle for damage or bending
- Shower function
- Bearing condition
- Cutter roll and anvil knife condition
- Fork system operation
- Hydraulic power unit function
- Scissor lift and conveyor operation
- Frame and component corrosion, exterior and interior where possible

CURRENT CAPABILITY AND RECOMMENDED MODIFICATIONS

- Drive package. The current drive arrangement is too slow for the throughput desired. At a 2500 gsm sheet weight (typical for wet lap pulp), producing a full width 100” sheet requires about 130 fpm line speed. With a 15% safety factor, we would recommend sizing for 150 fpm, or about 22 rpm at the drive roll. We would typically use SEW Eurodrive or Falk gearboxes for this application, and have asked our SEW distributor for a selection to provide the torque and speed required for all of the gearboxes. Our recommended arrangement for the press application is a dual drive set-up with separate AC motors and gearboxes, linked together in a master / slave torque sharing relationship while in operation under pressure. The mill may have preferred suppliers for this type of equipment; our normal supply is Allen Bradley.

- Operator Controls. As I understand it, the original control package was upgraded to a fairly recent PLC touch screen type with DCS compatibility. If that is the case, it is likely capable or upgradable to handle the job.

- Head Box. The head box is a bit of a question mark. At 4% inlet consistency, the flow rate will be approximately four times the original application. However, we will also be running the line faster. This obviously changes the nozzle velocity to belt speed ratio as well as the head box pressure, however I believe that this could be an improvement as I suspect that one of the problems with production in the original application may have been related to this area. A closer inspection of the head box and nozzle after removal will be beneficial in predicting problems or possible changes in this area.

- Wedge Section. The plastic forming section of the wedge section should be OK as currently configured, although the "floating wedge" concept may prove to be less effective in this application than a fixed arrangement. In order to make a determination we need to know more about the air bag size and recommended operating pressure. This information should be available in the O&M manual.

  The "S" section is set up for eleven small diameter "S" rolls, although only 10 were installed at time of inspection. This area is somewhat crowded and will not permit much wrapping of the belt and I suspect was not very efficient. This is an important area of the press, and good operation here is necessary to set the sheet up to get the best performance in the press section. There are two options to improve performance in this part of the press:

  The first is to extend the wedge by adding another framework containing "S" rolls between the existing wedge section and the press section. This will be expensive, as it will not only entail building the frame, rollers, and housings, it must also incorporate a drain pan and discharge flange as well as be of cantilever design. In addition, I believe the added length will create the need for an extra roll on the top wire run to eliminate power ridging of the belt over the long unsupported span of the wedge. Also, this option requires additional engineering and expense for the foundation and fabrication of additional cat walk – not big items, but they still must be considered. This option is less expensive than adding a secondary press to the line, which would be ideal (and more effective), but costly.

  The second is to make the existing "S" section more effective. I would prefer to see larger diameter rolls in this area with more room between them, however building all new rolls may be unnecessary. The most economical solution would be to use three new larger diameter rolls and four of the existing small diameter rolls and spread them out a bit. This would allow for a better pressure profile through the section, improved water removal, and better efficiency through the zone. There is enough room to do this without frame modification, just some mounting plate work in the existing "S" section. We recommend this option.

- Press Section. I am not enthused about the fixed stainless water doctors as they can be pulled into the nip under certain conditions and cause a lot of damage. They are also not self adjusting, so if not properly adjusted to the belt surface they are ineffective. We would recommend that they be replaced with a rubber drape style which adjusts to variations in sheet profile and is designed to snap out of holders if necessary and can go through the nips without damage to fabrics or roll covers.

- Cutter Layboy. There are a couple areas of concern with the operation of the layboy. We will make the assumption that the cutter knife and anvil arrangement will do an adequate job of cross cutting the sheet. The first area is the vacuum belt transfer. It would be good to know if there is a limit to the basis weight which this unit will handle. In my opinion this should not be an issue, but the O&M manual should be reviewed to see if there is any information pertaining to this issue. The second area is the scissor lift and hydraulic package that actuates it. This is a critical area in that the lift must drop, discharge the bales, and rise again in a relatively short period of time due to the planned production rate. The higher production rate will fill the forks quickly, leading to a situation where they are either too heavy for the system or will trigger the high stack alarm and shut down the line. The table and hydraulic package should be checked to insure it is compatible with the new operating conditions, and if not will need to be upgraded or replaced.

- Conveyors. The existing conveyors and scale should work fine, however at the target throughput a two bale drop will occur approximately every 3.5 minutes and the system will hold from 10-15 minutes of production. This is likely not enough, so additional conveyor should be considered, along with any ancillary equipment such as a bale press, strapper, stacker, etc.

ITEMS REQUESTED FROM VERSO

- Floor plan of proposed installation. If we can get a floor plan of the proposed installation we will be able to overlay the line on it based on the information we have from the Niagara mill and create a preliminary foundation plan.

- O&M manual. If available, an O&M manual would be extremely helpful.

SUMMARY

As stated previously, this equipment line is in overall good mechanical condition, and after correcting deferred maintenance issues, fresh roll covers particularly on the nipped press rolls, and cosmetic refurbishing. should be in good functioning condition. This is of course provided no major repairs are indicated upon inspection after disassembly. The modifications recommended include the drive

system, changes to the “S” section, effective side barriers to keep water inside the frame of the wedge section, different style of water doctors at the nips, and potential modification or replacing of the stacking table and hydraulic unit. Additional equipment will likely center around a review of the material handling needs and procuring those items.

The target throughput of 400 ODSTPD will not be easy to obtain without additional equipment. In my opinion, an additional section of “S” rolls would not make a significantly larger impact than improvement of the existing section, and that is why we are not advising the addition of one. Normally, our primary recommendation would be to add an HDP, or heavy duty secondary press to the line. However, this would add significant cost to the project and is probably not a viable option. Therefore, the challenge will be to set the equipment up in the most efficient way possible in order to process the required amount of product and still make a sheet dry enough to cut and stack. This will entail processing almost 1700 GPM of pulp, and removal of a bit over 1500 GPM of pressate. While the collection trays appear to be adequate to handle the water, side shields as mentioned above should be part of the plan to contain the water removed from the top of the forming section and direct it inside the frame. In addition, it will be very important to have good control of both the consistency and flow of the pulp to the headbox, and warm, well agitated stock.

Properly set up and operated, the equipment should be up to the task. We are greatly looking forward to the opportunity to be of assistance to you to make this project a success. Please call with any questions or for further discussion.

Respectfully Submitted,
PRESS TECHNOLOGIES LLC

Don Boyd
President