

Former expansion at Waldorf Corporation

Warren T. Carlson and Robert C. Smith

When Waldorf replaced two existing vats for making top liners with Bristol pressure formers, it achieved increased production and quality improvements.

The Bristol Former™ emanated from research and development initiated by the St. Anne's Board Mill in the late 1960s. The objective was to produce a high-consistency former for use on cylinder molds. Development began with an analysis of the headbox used on the Inverform unit. Then, in conjunction with the Boxboard Research and Development Association of America (BRDA), the first commercial unit was manufactured by McGilpin and Pile, operating under the name of the BRDA/St. Anne's former. It is illustrated in Fig. 1.

The design and engineering of the former's curved lip was difficult, necessitating further research to determine whether it was really needed. At the same time, more detailed study was undertaken on the design of the explosion chamber, shown in Fig. 2.

The first former was installed successfully at St. Anne's in November 1976, serving as the back ply on a six-vat machine. In 1977 the complete machine, including the approach flow system, was converted in only two weeks. Thirty minutes after startup, a good quality board was being produced. In 1978, a sister machine was similarly converted. Both ran extremely well. In 1980, after St. Anne's was forced to close, all development was taken over by Black Clawson International at the Newport, Gwent, plant. The units now on the market are the result of the determination to make a top-quality former for worldwide distribution (1).

Bristol Former installation and operation

High performance, top quality, simple installation, ease of operation, flexibility, and low cost—these are just a few of the points to be considered when purchasing any new equipment. Attainment of only a few of these attributes would satisfy many mill managers, but with the installation of a Bristol Former, all of these expectations and more can be obtained in one package.

Although each unit is designed specifically for an individual mill's requirement, the formers can be grouped in four general categories (2):

1. Pedestal- or foot-mounted, as shown in Fig. 3
2. Column-mounted
3. Vat-mounted
4. K-frame, column-mounted, as shown in Fig. 4.

A fixed or variable throat is optional for each unit. In fact, two of the variable throat units are currently operating at speeds approaching 820 ft/min (250 m/min). Of particular interest is the K-frame unit, a complete, self-contained assembly incorporating the former, cylinder mold, and couch roll, which is the type of unit installed at Waldorf Corp., St. Paul, Minn.

Typical of a large number of North American mills, Waldorf was operating an older plant and equipment. It needed to improve board quality, increase production, and reduce operating costs on one eight-vat machine operating at speeds up to 410 ft/min (125 m/min), with an 11-ft (3.4 meter) deckle. The primary end product is clay-coated, lined chipboard for the packaging market. The top liner furnish consists of 50 lb/3000 ft² (80 g/m²) white/manilla waste. In 1986, when two vats were replaced with Bristol Formers, board quality was improved substantially. The six remaining vats were replaced with Bristol Formers in June 1989. Startup was successful in each case.

The formers were set according to standard methods. The safety stops were set at 0.010 in. (0.25 mm) and the lip opening at 0.030 in. (0.75 mm).

The mold cover used on the original 1986 startup was 6.3 (16.0 cm) mesh. It has since been determined that a mesh of 8 (20 cm) produces better results. For liner plies, mesh as large as 9.4 (24 cm) can be used. This parameter obviously depends on many variables. It is up to the individual mill to determine the correct solution to meet its needs. Waldorf chose an 8 (20 cm) mesh, which performs well in all positions.

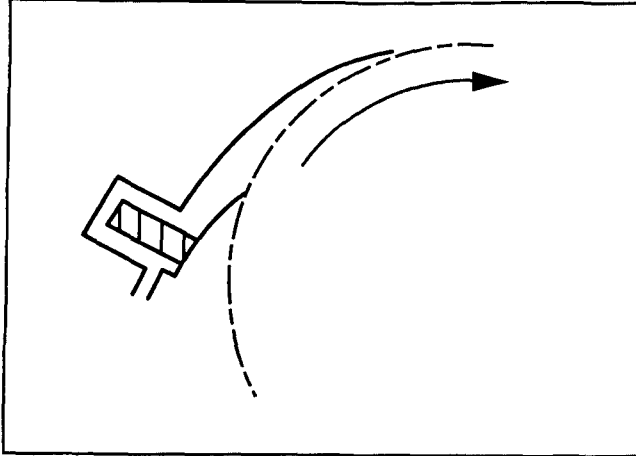
The best system by far employs made-to-measure, diagonally-seamed endless covers. They are pulled over the cylinder like a sock, tensioned up to 16 in.·lb (1.8 Nm), and soldered to the edge of the cylinder.

A coarse backing wire with a 2 (5 cm) mesh is recommended since it eliminates the possibility of the top cover being pulled down in between the spiral wires, causing excessive wear.

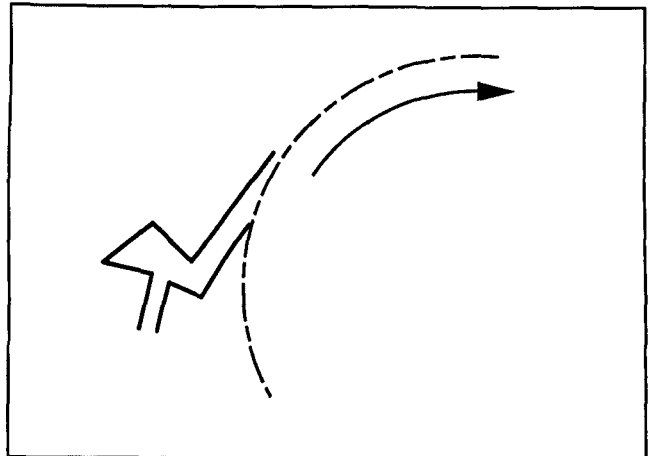
For a conventional vat, the normal established profile is $\pm 4.5\%$. As the number of vats is increased, this figure

Carlson is principal engineer with Waldorf Corp., 2250 Wabash Ave., St. Paul, Minn. 55164. Smith is regional sales manager for Black Clawson-Kennedy, Inc., 605 Clark St., Middletown, Ohio 45042.

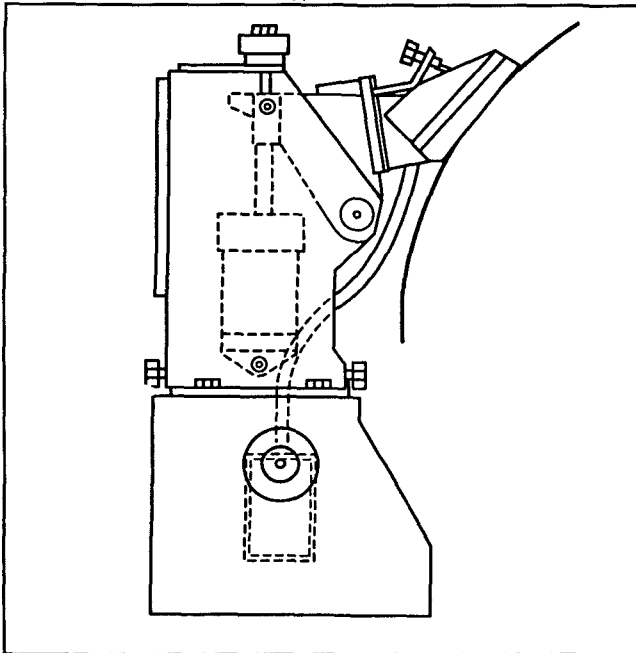
1. BRDA/St. Anne's former, the first commercial version



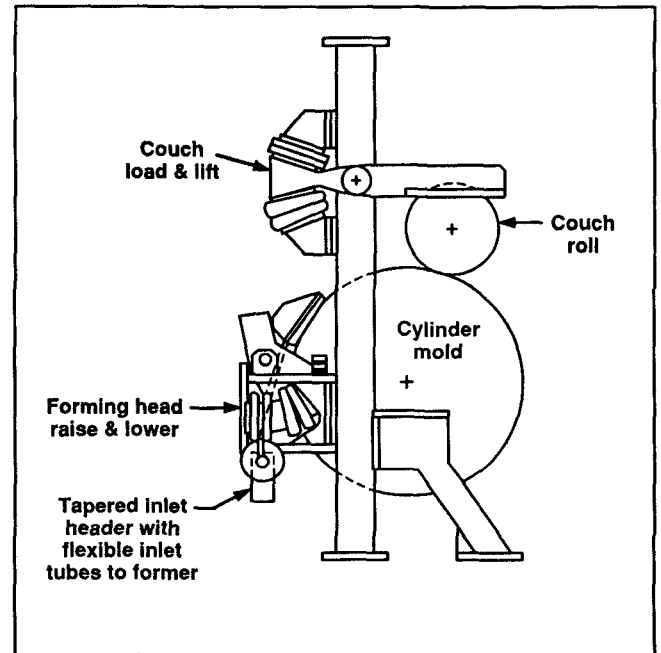
2. St. Anne's former



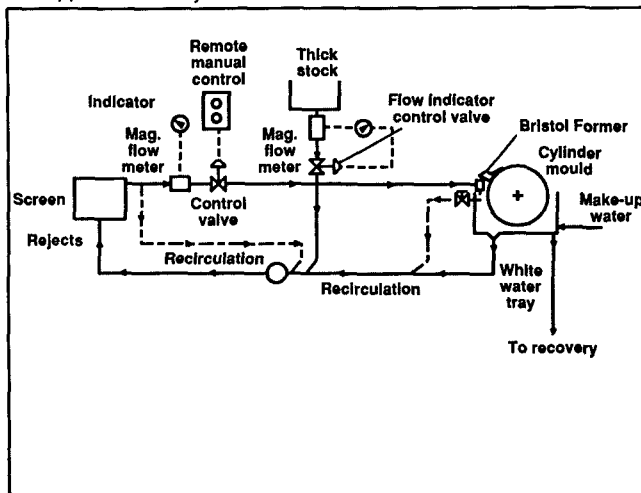
3. Pedestal- or foot-mounted type former



4. K-frame, column-mounted former



5. Approach flow system for Bristol former



reduces to $\pm 2.5\%$ for six vats. However, with the Bristol Former, a profile for a six-unit machine should be about $\pm 0.75\%$. To achieve this profile, conditions must be ideal. Of special note is the condition of the cylinder mold and its wire covers. The maximum runout should be 0.004 in. (0.1 mm). This is necessary because the gap between the former lip and cylinder mold surface can be as small as 0.012 in. (0.3 mm). This degree of accuracy makes no difference if the wire covers are not installed with the same precision.

Where cylinder molds are being used for former operation, a completely new approach is required for housekeeping and equipment care. No longer can production crews walk over the molds to change felts. We have seen a sheet of board on which the imprint of a size 10 boot was being faithfully reproduced every turn of the cylinder. Transportation of molds should be on special cradles which support them by the bearing housing.

As demand for board quality increases, so must care of the equipment. The Bristol Former is a rugged piece of equipment, but damage to the lip or its highly polished underside surface still can happen.

The Waldorf machine has a separate control loop and screen for each former. (Figure 5 is a diagram of a typical approach flow system.) The screens have slotted baskets with 0.011 in. (0.3 mm) openings to take out final impurities (staples, etc.) in the 100% recycled furnish. Without the screens, the mesh cover on the formers may become pit marked. This has occurred at Waldorf on one occasion when operators did not have a basket in one of the screens.

Profile is always a problem with old machines. Waldorf was no exception. Counterflow vats were developed primarily for high-ply-weight and low-speed operation, but when used conversely they do not always work as they should. This wide variation in profile leads to runnability problems, including cockling from overdrying and the need to eliminate calender blackening in high moisture and basis weight areas. After the introduction of two Bristol Formers, the Waldorf mill was well on its way to producing a well-profiled sheet.

Along with profile and runnability problems, the mill also looked at operating parameters such as startup, shutdown, and grade change times. With Bristol Formers, startup and shutdown times are drastically reduced. A conventional vat system takes approximately 20 min to reach stable operating conditions. A Bristol Former, if installed correctly, will take 1-2 min. All formers can be started together safely; therefore, the sheet leaving one forming section is stable after 1-2 min.

A similar situation occurs at shutdown. Shutting off the formers is practically instantaneous, whereas vats take up to 20 min to completely run out.

The Waldorf machine is dryer limited. After the Bristol Formers were installed, the cross-direction profile was reduced to 1.5-2.5%. The result was more efficient drying, which led to a 5% production increase.

Along with the production increase, overall sheet appearance and converting runnability have improved vastly. Due to the cost effectiveness of the quality improvements from the Bristol Formers, other changes to the machine are being considered. This is just one of many signs of a successful rebuild.

Today, Waldorf is making clay-coated, 18-26 point folding boxboard. The machine trims 130 in. (3300 mm) and has a speed range of 220-420 ft/min (67-128 m/min). After the first two Bristol Formers started up, it was determined only one was needed to apply the top liner because the Bristol Former greatly improved the profile and formation. Sheet splitting proved the top liner profile variation was 2-3%, where the overall machine variance was 10-12%.

Operator training

The major part of any startup is operator training. Initially, there may be some concern that the operators' past experience will be wasted and that they will not be able to cope with modern technology. This is not the case with a Bristol Former installation; only a new approach must be used. The ideal situation would be to have a fully

computerized machine on which all parameters stay constant. In practice, however, the variables are many, especially when using recycled raw material (3).

Waldorf has made a great effort to train everyone, from supervisors to machine personnel. This has proved so successful that the operators find they can now use their experience in a more rewarding way.

Conclusion

The installation of Bristol Formers at Waldorf has met or exceeded all expectations. Quality and production increases are leading Waldorf toward further improvements. □

Literature cited

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Received for review May 29, 1990.

Accepted June 16, 1990.

Presented at the TAPPI 1990 Papermakers Conference.