NEWSPRINT FROM THE PERSPECTIVE OF A PRESS MANUFACTURER

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THIS SUMMARY OF THE INTERACTION OF NEWSPRINT WITH THE PRESS HARDWARE AND THE VARIATIONS IN THAT HARDWARE FOCUSES ON BRIDGING THE INFORMATION GAP. IT GIVES TECHNICAL PERSONNEL INFORMATION TO RESOLVE ON-PRESS PAPER ISSUES AND PLAN FUTURE PRODUCTION REQUIREMENTS.

PAPER SUPPLIERS SERVE A VERY WIDE RANGE OF CUSTOMERS with a variety of printing hardware. Nothing is obsolete until it is out of service. Customers obviously make their own demands on the paper supplier. This discussion will attempt to provide perspective to the paper requirements by explaining the requirements and performance interactions seen by a printing press designer.

Different types and vintages of press equipment can make significantly different demands on paper. An overview of the newspaper marketplace will therefore set the stage for analyzing these differences.

For daily newspapers only, approximately 80% of users employ single-width equipment. Newsprint tonnage to the 20% who are the large double-width users probably turns this ratio around. Double-width users consume twice the tonnage per roll due to twice the width. They are typically the multi-press, large metropolitan sites with high circulation and large page counts.

Of 1380 North American dailies, approximately 280 are double-width. Around 64 of these still use the letterpress process including DiLitho and presses with flexographic slip-in units. This is 23% of the marketplace—lower in paper tonnage used. Since double-width offset presses came into the newspaper market in 1966, most letterpress equipment is now more than 30 years old. Much early offset equipment is still in service, although almost a quarter of today's presses is of the newer, tower style introduced in 1988.

The term "press" embodies several distinct subsystems that require understanding since each has its own impact on the paper being handled. For this discussion, the press has three subsections: the unwind and splicer, the printing units, and the folder. The unwind section usually known as the reel, tension, and paster (RTP) deals with the paper roll and a white web. The printing units add ink and water for the offset process. The recent explosion in color use has placed new requirements on the paper flowing through the press. The folder collects the many webs for folding, cutting, and refolding into a broadsheet or tabloid newspaper product.

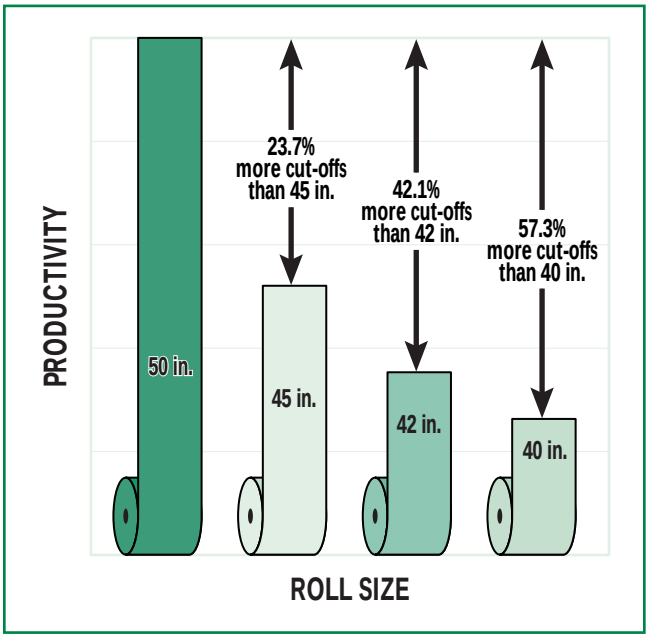
UNWIND REQUIREMENTS

From one generation to the next, the RTP has offered larger and larger paper rolls. Simultaneously the cost of newsprint has slowly driven the width of the web downward. This was especially true in recent years.

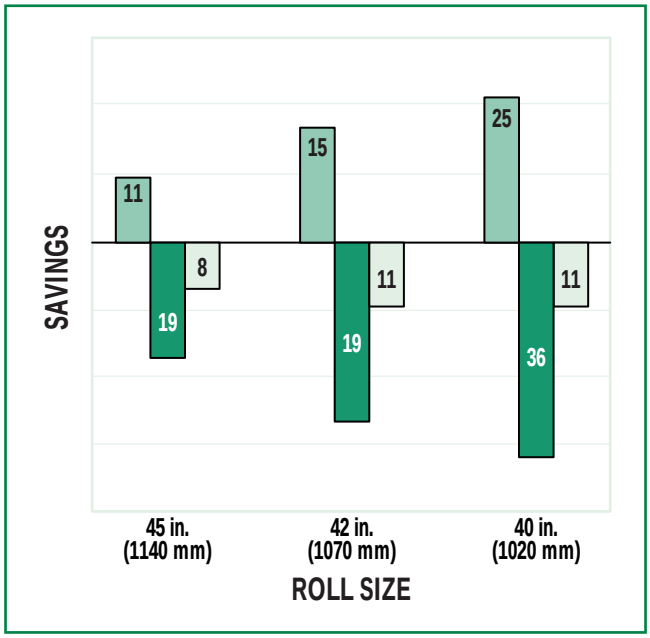
The current North American web width is typically 55 in. (1400 mm). Some discussions within the editorial and production communities mention a standard 50-in. (1270-mm) web width. The impetus for this is not due solely to paper costs but to promote a standardization in advertisement size and rates. This effort may not be taking hold very quickly, if at all. It needs careful watching, however.

The harder to predict size for the next paper roll diameter always makes an interesting discussion. Use of 50-in. (1270-mm) diameter rolls grew quickly following introduction into North America approximately eight years ago. To understand fully where we may be heading for yet another diameter increase, examine how newspaper production personnel view the productivity benefits of large diameter rolls.

Everyone understands there is more paper per roll on a larger diameter roll. How much more surprises most



1. 50-in. diameter roll productivity



2. Stripper waste savings with 50-in. diameter rolls

people. Because press equipment serves a user for approximately 20 years or more, the potential of 50-in. diameter reels is usually presented to a user who currently runs 40-in. or 42-in. diameter rolls. **Figure 1** shows how many additional copies of a newspaper the new 50-in. diameter rolls will provide. The percentage is what usually surprises most people.

These raw figures are only the beginning of the interest by newspaper production managers. Adding the parallel benefits of reduced core and wrapper handling further complement the immediate benefits of handling fewer rolls and making fewer pasters. An additional key factor is waste reduction.

The magnitude of waste reduction potential is not obvious. While fewer rolls will clearly be handled, most people assume an increase in stripper waste will negate any overall waste reduction. A careful analysis supported by the now substantial user community shows that the ratios are strongly in favor of significant waste reduction with the larger rolls. **Figure 2** demonstrates this for the simple assumption that all rolls are stripped to the same 0.25-in. (6-mm) depth. The bars above the baseline clearly show the higher stripper waste per roll with increasing diameter. The opportunity to strip a roll decreases with the larger rolls since far fewer are necessary for a given run size as the darker bar below the baseline shows. The net total waste is the waste per roll times the number of rolls stripped. As the lighter bars below the baseline show, the larger roll always provides a net savings. This is not merely 1–2% but a significant savings to users.

The actual savings realized typically exceed such simple projections for several reasons. The assumption that all rolls would receive equal stripping is too simple. Those investing in new presses usually purchase new peripheral equipment also. Newer paper handling systems treat rolls much better than equipment that is decades old. These larger rolls either through their sheer size or better operator training appear to command more respect from those handling them. In-house damage per roll is therefore less than experienced on the previously used, smaller sized rolls. The savings shown in Fig. 2 are therefore conservative values. Actual savings are typically better than shown.

With this productivity understanding, key questions remain. Is there any logical end to the growth in paper roll diameters? What will be the next big jump, and when will it occur?

Paper suppliers know about some very large roll size equipment in other areas of paper use. In the world of newsprint, the design of the press and the building housing it seem to limit roll size increases. **Figure 3** shows the popular press arrangement in use today. It is designated a tower press because of the stacking of couples above one another for color capability.

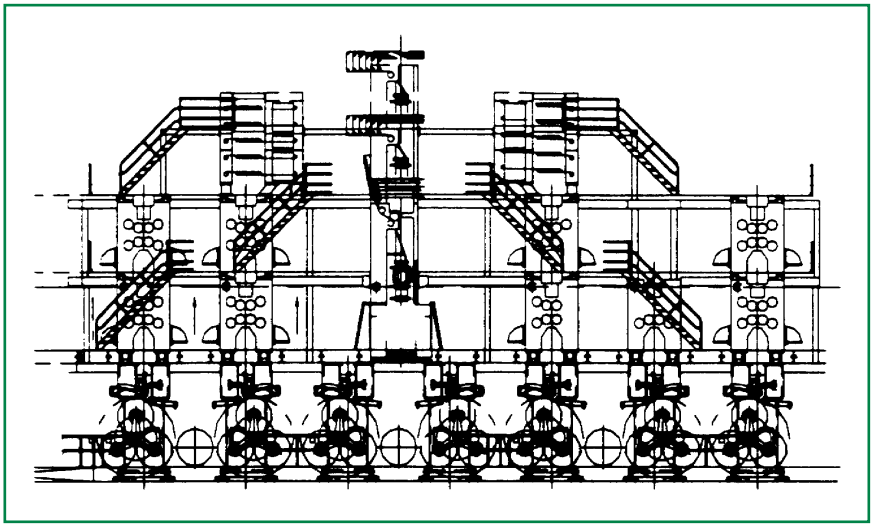
This arrangement shows a 50-in. roll capacity RTP. It allows the same spacing between the press units and the RTPs. With larger rolls, the reel room would grow to become longer than the pressroom. That is a bit awkward but possible. Carried to an extreme, the impacts on length and ceiling height would be ridiculous.

	40 in.	42 in.	45 in.	50 in.	56 in.
Paper per roll:					
Copies per roll	19227	21280	24453	30240	37991
Added mileage, %	98	79	55	26	-
Additional inertia, %	406	316	216	57	-
Run-off time at 50 km/h net speed:					
Time/roll, min.	23.1	25.5	29.3	36.3	45.6
Time increase, min.	22.5	20.1	16.2	9.3	-
Waste:					
Waste/roll, lbs.	22.4	23.6	25.2	28.1	31.4
Increased waste/roll,%	40	33	25	12	-
Fewer rolls, %	-49	-44	-36	-20	-
Decreased waste, %	-29	-25	-20	-11	-

56-in. diameter roll usage

Since production personnel are not architects, consider their view of advantages to a larger roll. After examining roll sizes between 55-in. and 60-in. diameter, **Table I** shows the benefits of a 56-in. (1425-mm) diameter roll.

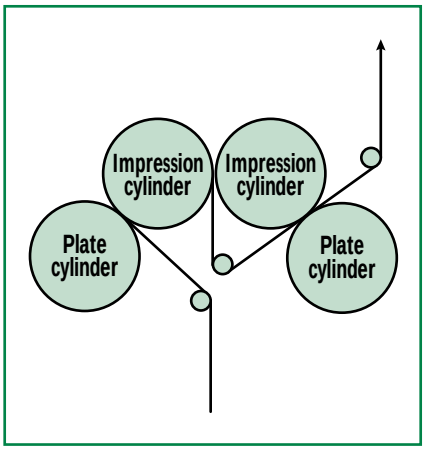
As the extended chart shows, a 56-in. diameter roll yields more than 25% more paper per roll than the current 50-in. diameter roll. This is approximately 100% more than a 40-in. diameter roll. Waste reductions are again significant. Users will focus on these benefits. There will be no concern over the technical difficulties of winding such a roll. Predicting if or when another diameter increase will occur or if 56-in. diameter is the magic number is impossible. Armed with this perspective, one can understand the motivations of customers seeking such productivity gains and waste reductions.



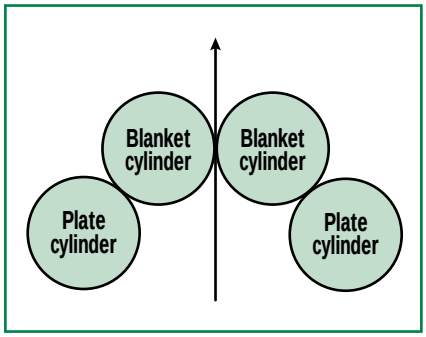
3. Tower press

The diversity of cores is a seemingly fruitless burden born by all paper mills. The selection of all-fiber or tipped cores is not RTP driven. Press suppliers have to cope with these diverse selections also. In the past five years, 40% of the reels ran with all-fiber cores. The balance used several caps. There may be a slow increase in the all-fiber core. Often the selection seems tied to the user's ability to obtain efficient recycling of the cores. The prevalence of tapered chuck nose cones in the North American market has added a bevel requirement to core ends—fiber and capped—in many locations. This has proven beneficial in roll loading at some sites that did not originally specify such a profile. Although the wide variety of cap sources sometimes involves a press manufacturer to assure workable integration, the RTP never dictates the need for these products. In some all-fiber core or core driven reel cases, there will be a recommended material specification by the press manufacturer.

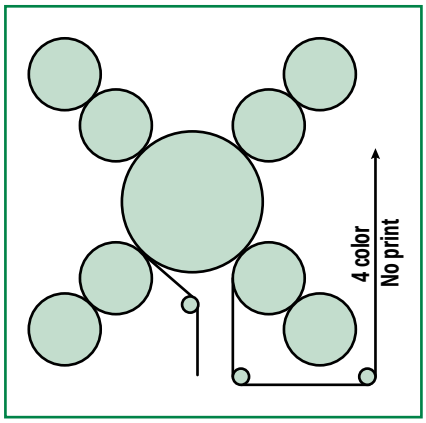
Looking back for a moment at the potential for larger diameter rolls, there is a shared technical concern between paper mills, press manufacturers, and core suppliers that the 3-in. (76-mm) inner diameter (ID) core would be inadequate for such a roll. Agreeing on a new standard for a larger roll would be far easier than solving the logistics of its introduction into the existing market. Mixed windings in the mill and mixed but incompatible inventory in printing plants with both older and newer



4. Letterpress



5. Offset



6. CIC color unit

presses only skim the surface of this issue. If anything can be said with certainty regarding the larger roll, it is that such an effort would have to be a joint development involving paper makers, core suppliers, and the press designers.

Before considering the printing units, it is worth noting the impact of RTP vintage on paper requirements. Reels built about ten years ago had heavy, often viscous-damped dancers or floating rollers as part of the tension system. These rollers moved to feed a closed loop tension system, but their inertia and the damping often put significant loads on the fragile web.

The importance of lightweight, undamped dancers emerged with modern electronic controls that allow them to exist. These newer reels are far more forgiving to things like out-of-round rolls than previous hardware. Modern controls also provide more accurate speed matches at pasters. This again provides better performance from the same fragile web. Naturally mills have to sell to users with all vintages of equipment. An awareness of this vintage impact may help to solve performance issues that users see.

PRINTING UNIT

The evolution of the printing unit provides a wider variety of hardware in the marketplace than the unwind unit. Although the variations today are more due to configurational differences than a variety of printing processes, these differences significantly affect the paper.

With 23% of the double-width market still using the letterpress unit shown in **Fig. 4**, one cannot ignore it. Differences in newsprint for letterpress vs. offset have disappeared. This older process did allow the press operators to control the tension in the web as it passed through the press by adjusting the impression or squeeze between the plate and impression cylinders. Offset units do not have this interface and must cope with web control in other ways. Due to the printing process and lighter inks, linting is never an issue in a letterpress site.

Since its introduction into double-width newspapers in 1966, the offset process shown in **Fig. 5** has been the only process sold until challenged briefly by flexography in the late 1980s. Offset was a revolution in the pressroom and brought with it new paper requirements and issues. Since the inked image transferred from a flat blanket rather than the raised type of letterpress, the first impact was the need for a smoother sheet.

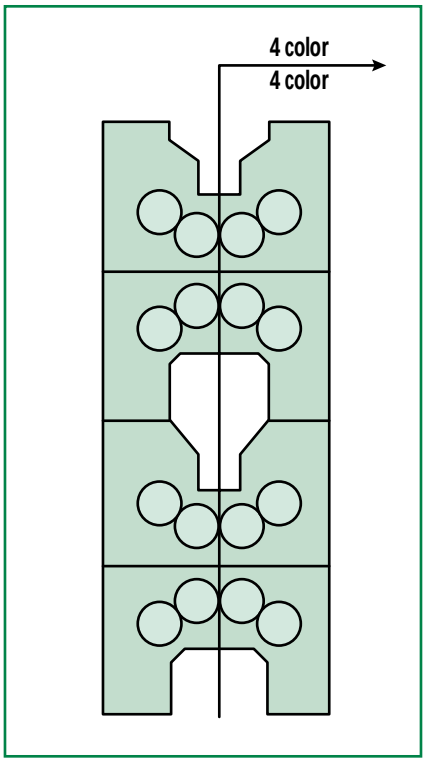
Since that need emerged in 1966, the whole paper making process has evolved. Avoiding placement of the front page on the rougher "wire side" is no longer a consideration today.

Initially the offset units emulated the letterpress arrangements. They required long leads from one unit to another for color. This often presented a problem, since the blanket-to-blanket design no longer provided any tension control by using the impression adjustment. Varying the packing under the blankets was possible, but this had an impact on the printing. It was therefore not a satisfactory tension control and was not an on-the-run adjustment. Fortunately the debut of new folders offered band adjustments that helped by controlling the web pull from the folder.

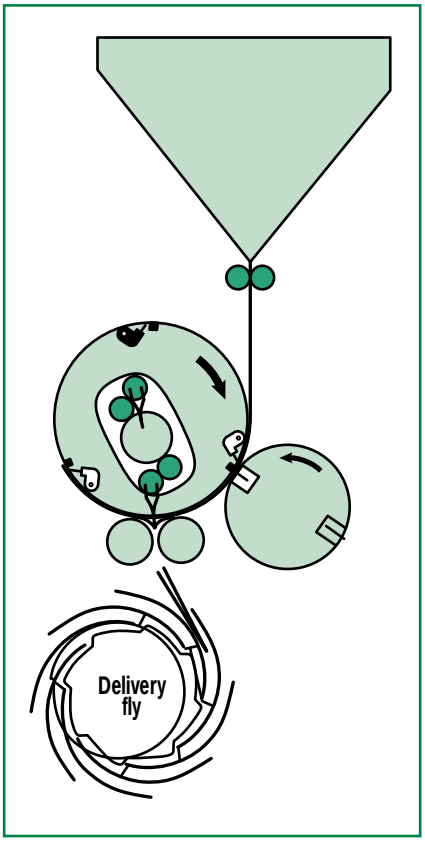
As color became more popular, dedicated units with a common impression cylinder (CIC) shown in **Fig. 6**—satellite units—allowed all colors on one side of a web to be laid down while the web was held against the common center cylinder. This local control of the web within the unit during the printing greatly reduced the color register variations typical in the longer unit-to-unit leads. The much shorter lead also reduced register shifts due to modulus changes especially at pasters. Image alignment on opposite sides of the sheet was still a large variable since leads between units remained long.

While the CIC made a great impact on color printing, the explosion in color in the early 1980s began to highlight the problems with such a unit. Since it printed on one side only, the web still had to go to another printing unit and another CIC if color on both sides were necessary. This two-footprints-per-color-web was space consuming in the press layout. The layout of the cylinders made plating, webbing, and cleaning demanding tasks. It was not the ideal press for the rapidly growing demand for color.

In 1988, the tower press shown in **Fig. 7** entered this market. This is an impressive four-high set of cylinder pairs offering two-sided, full color in a single footprint with easy access to all functions. It was rapidly adopted for new sales and many site add-ons. Its longer color-to-color distance and the free web between cylinder pairs brought some new web control issues.



7. Tower color unit



8. Rotary folder

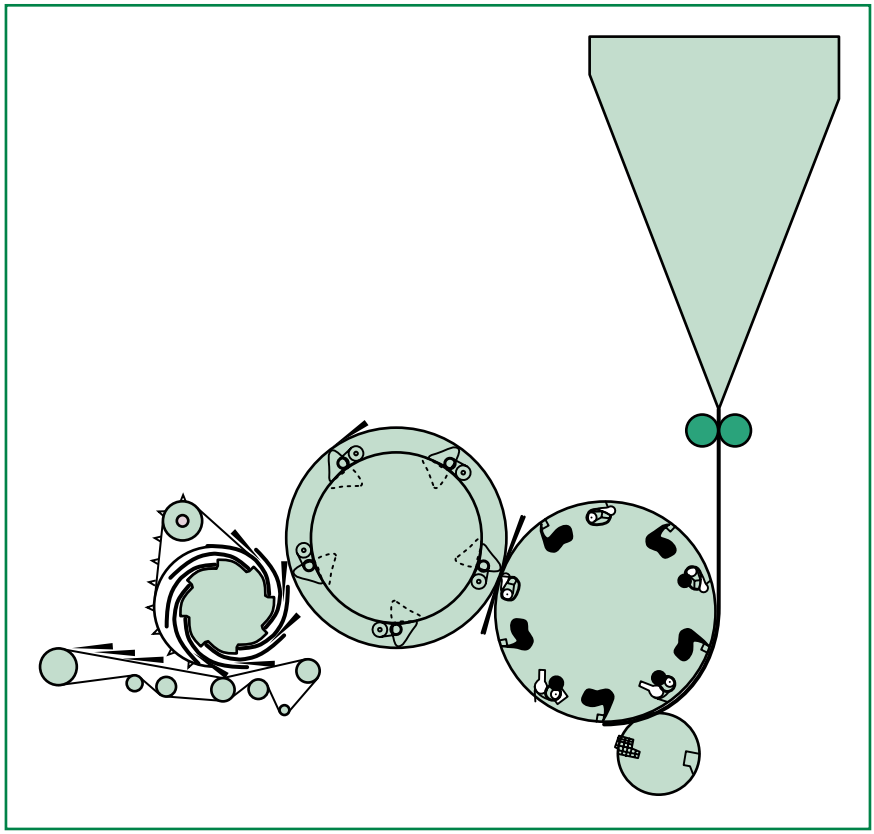
The most significant new issue was "fanout" due to the moisture added to the web in the offset process. Fanout is lateral misregister due to the growth of the web with moisture absorption. In a nonheatset process at newspaper speeds of 2500 ft/min (750 m/min), absorbency in the sheet is necessary. The water portion of the offset printing process will be absorbed with the ink vehicle. A color lead will have about four times the water applied as a black lead. It is the only lead where fanout applies. With much more color being run today, more water is being taken up by the webs. Obviously this affects the web characteristics on the rest of its run through the press. If the press operator does not carefully control the ink to water balance, the web can "stick" to the former and not run smoothly through the folder. This can present product distortions similar to a rougher surface sheet without excess moisture.

Today's higher speeds minimize fanout since moisture has less time to soak in. The standard solution for fanout is to shift the plates inward on the first cylinders to lay its image where that image will move due to the web growth to match the latter cylinder image positions. The spread varies with speed so this fixed plate shift is set for typical printing speeds. Fanout therefore will be greater at lower or startup speeds. It would obviously be best if all sheets from every supplier had the same absorbency characteristics.

Over the years, many designs of inkers and dampeners have been employed. While these vary considerably in quality of printed image, user access, or operational ease, they all strive to bring the correct balance of ink and water to the plate. There is therefore little difference to the web regarding what hardware is being employed. For that reason, even the future potential of single fluid lithography should not bring new requirements to the paper.

The printer will add to the paper specification requirements of whiteness, brightness, lifting restrictions, and other factors. These requirements are not significant in the design of the hardware but are factors in achieving the image quality sought by the user and his advertisers.

Initially there was great concern over the introduction of recycled paper into this market. Press designers and printers alike were already working with the lowest grade of paper available. Recycled paper would be another step downward. Realistically, the introduction has gone better than expected. The assumed weaker sheet was not less runnable. Deinking surprised many in its efficiency. Instruments are necessary to measure dif-



9. Jaw folder

ferences in sheet appearances. The only concern is a higher tendency to lint on some recycled stocks. This can affect production by added blanket cleanings and sometimes replacement of worn plates.

FOLDER

Until recently, the rotary folder was the only style used by the North American double-width newspaper business. **Figure 8** shows its basic operation.

The primary paper factor affecting folder performance is surface smoothness. In rotary folders especially, there is considerable sliding action. A rough surface will therefore affect actual motions. The first action of any folder is the first fold accomplished by bringing the sheets down the V shaped former board until it doubles over at the tip or nose of that board. Pumping low pressure air into holes along this board was introduced with the offset process due to the "stickiness" of the wetter sheet. Even with this assist, a rougher sheet can pull wrinkles not seen in smoother sheets.

Other key slip points are the strippers and guide shoes in the rotary folder delivery. Newer shoes have designs and coatings to reduce product sticking issues. A rougher sheet can significantly slow many folders until delivery of a properly folded product. In some extreme conditions when running a tabloid format, silicone is applied to the web in the press to facilitate smooth deliveries and allow high speeds.

During the letterpress era, 2:1 folders served almost every user. Then 3:2 folders accompanied the new offset presses in 1966. The ratio refers to the diameter relationship between the folding cylinder and the cutting cylinder. The variable expansion bands of the 3:2 were very helpful in web control, since the offset units lost the feed control of the impression adjust. The bands affected all webs and were adjustments requiring a stopped press. Introduction of running band adjust in 1995 allowed faster and easier web control.

In the past few years, the jaw folder shown in **Fig. 9** has jumped strongly into the North American double-width newspaper market. New designs have decreased costs and increased page counts and speeds. The other keen interest driving this quick acceptance was the reduced waste due to the control afforded by this folder. The positive grip on the copies eliminates shifting of the second fold lap—a major factor in startup waste. These jaws also eliminate stripper shoe problems and make jaw folders far less sensitive to sheet surface roughness. The steep former boards used with these newer folders further reduce the effects of surface roughness at the formers.

There is some impact on folder performance with caliper reduction, but most newspaper folders operate well with calipers down to 26 lb/ft^2 (42 g/m^2). While many users tried lighter stocks of 28–30 lb/ft^2 some years ago, most have returned to 32 lb/ft^2 (52 g/m^2) primarily due to print show-through issues.

Folders are usually run to align the outside edges of all sheets. When half rolls are run on either side of a press, a sheet that is too wide will result in a narrow ribbon of paper called "spaghetti" being cut off at the center slitter. The buildup of this spaghetti is very troublesome in a folder and can easily collect and take out one or more sheets in the folder. Many users will order their half rolls 0.125 in. (3 mm) narrower that an exact half sheet to avoid this slitter issue. Besides the cost of unused

paper, this is one performance area that will suffer if width tolerance is not maintained.

NEWSPRINT COSTS AFFECTING PRESS DESIGN

Perhaps nothing brings a mill faster feedback than a price increase. It may surprise papermakers how extensively the price issue reaches into the design of the press itself.

Keyless inkers are rapidly becoming the inker of choice. Describing an inker that requires no column to column setting but simply delivers the correct amount of ink required in each print area would clearly seem an easy sell to users. It was the production personnel seeing the fast cleaning and low startup waste that drove the development and sale of this type of inker. Paper is the primary cost in startup waste. With today's increasingly shorter runs due to more targeted editions, waste reduction is a strong driving force.

Once the image becomes ready for sale faster, it becomes equally important that the folded product also be presentable. The superiority of the jaw folder in controlling the fold at low startup speeds is again why this product was redesigned to meet the paging requirements of the North American market. If paper were much lower than its current costs, it is unlikely that these new products would have come to market as quickly.

Any press manufacturer knows that an announcement of a paper cost increase will bring a flood of requests for paper width reductions for its user's presses. Typically affecting plate lockups, folder rollers, slitters, and folder delivery parts, such orders come in surges—always tied to paper cost increases. Paybacks on these efforts are justified due to the high usage of paper.

The most frequent measure of paper runnability is the rolls per break yardstick. While very useful, it is not a common measure across the customer base for many reasons. Obviously a site running 50 rolls per beak and using 50-in. diameter rolls is doing far better than another with the same break frequency but running 42-in. diameter rolls. There is nearly 50% more linear paper run between breaks at the 50-in. diameter roll site without accounting for any cutoff differences. Definitions of a break vary, especially when defining paster averages.

Beyond the statistics, it is the information about the cause of the breaks that is necessary before attempting any effective remedies. For in-house maintenance, press manufacturer, or paper supplier, simply knowing the statistics—even broken down by reel or unit—is of little help. Many industry groups have supplied information, charts, and even error readouts on the hardware to help define what causes a break. Data collection and expertise in correct analysis vary greatly from site to site. In newspaper printing, there is usually more pressure to return to production rather than to analyze a break.

All these considerations drive designers to supply sensors and readouts wherever possible to indicate problem areas or at least define timing or conditions when the break occurred. Sometimes this feeds directly into a data collection system. The ability to collect roll ID information later tied to running performance is an effective tool in maximizing total production. **TJ**

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