Martin Automatic Inc

Reduce Waste, Increase Profitability

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Why are you in the label converting business? You might give any number of answers, such as: To make a quality product. To do something I enjoy. To elevate my standard of living. To make a difference through my work in the community, or in the world.

At some level, none of these goals is possible unless you are profitable. So we might honestly answer the question—"Why are you in the label converting business?"—with this answer: To make a profit. So how do you succeed in meeting this profitability goal?

Mike Fairley of the Tarsus group, a "guru" of the label industry, addressed this in his 2008 presentation to the FINAT annual meeting in Paris, entitled "The Future of Pressure-Sensitive Labeling." He noted some of the issues facing converters, including the challenge to reduce waste, cut downtime, better control environmental costs, reduce energy consumption, maximize production and improve margins. And in reviewing the findings of a 2-year converter survey, Fairley pointed out the need for "urgent investment" as a requirement for improving margins and profitability. A specific question Fairley would have converters ask is, "How can I perform better than my competitors and become more profitable?"

One way to answer that question, and the focus of this paper, is to reduce your waste. A lean manufacturing expert may tell you that waste is anything other than the minimum amount of a resource that is necessary to add value to your product. On the materials side, waste could be defined as the difference between what you purchase (and its cost to you) and what you actually deliver (and invoice) to your customer. Or consider this example: If you can make a 15% margin on your production, then eliminating $150,000 of waste is equal to an additional turnover of $1,000,000.

Here is the point: Waste directly equates to lost profit. Hence the title of this discussion: reducing your waste will cause your profit to increase.

Identifying waste

In order to reduce your waste, you first need to identify the causes and amounts of waste in your processes. This will open up opportunities to improve productivity, quality, competitiveness…and profitability.

Do you know the causes of your waste? These causes can range from the handling and storing of materials to operator training and skills. Looking at the major causes of waste in a label environment, we can identify 6 primary components related to roll and material management:

- Damage to rolls during shipping and handling
- Web breaks
- Butt rolls
- Unnecessary material stripped from the outside of rolls
- Material left on the core
- Material loss during down time associated with roll changes

Damage to rolls during shipping and handling

There are numerous ways in which raw material can become waste even before you get it onto the press. How old is your material when you get it from your supplier? How well is it wrapped and protected from temperature and humidity changes? How long do you stock material before use? Also, is your raw material storage all it should be? Are your rolls stored properly, not only for safety but to avoid damage? And how are they transported and presented to the press area?

Here is something to consider: How clean is your floor? If a roll goes over a pebble that puts a 2mm deep dent in it, that small dent can equal 8 wraps that need to be removed. Since one wrap on the outside of a 40" diameter roll is about 10 feet, that small dent can cause the loss of 80 feet of stock. That's immediate waste, and immediate loss of profit.

Minimize your waste during shipping, storing and handling. Take greater care, and if necessary implement new practices, in material handling and storage. Evaluate your roll handling methods and consider investing in new, quality roll handling equipment. And insist on a clean operation. Cleanliness may not be next to godliness, but a lack of cleanliness is a precursor to lost profit.

Web breaks

A web break has the same negative waste effects as any other press stoppage, in addition to the aggravation caused to the operator. Some of the typical causes may include: poor material or material that has been poorly handled (see above); poorly maintained equipment; inefficient splicing, whether manual or automatic; and tension control issues. Minimizing web breaks can be as simple as addressing these causes. Use a good quality

material. Maintain your equipment adequately. Insist on a high splicing efficiency. (And by the way, make sure you are using the proper splicing tape for your material and your process.) And improve your tension control so the press and auxiliary equipment is optimized for the materials you are running.

Butt rolls

What do you do with a butt roll or partial roll when the press run is complete? Do you overproduce and bill to the customer? Or do you return it to stock and plan on using it later? Our informal research indicates that many converters will return a roll to inventory if it is longer than about 600 feet. Less than that and it may be set aside or thrown out. Fact is, many converters have an area in their plant where butt rolls go to die—stacked, forgotten, and eventually discarded. Even if they're paid for by your customers, could you make use of those rolls?

Some of our customers use butt rolls for clean-up and for doing preventive maintenance on their presses. The best way is to use these butt rolls, however, is in profitable production.

Depending on the timing and frequency of a particular job, you may be able to store the butt roll and retrieve it from stock for the next run. This becomes an attractive option if you have an automatic butt splicer on the press. In that case, you can start with the butt roll and, when it has expired, splice over automatically to a new roll.

Also, consider using butt rolls during make-ready. Make-ready waste is often taken for granted, but you may be able to use butt rolls when making ready a job with a similar stock. Some converters even substitute cheaper material for make-ready before splicing over to the more expensive stock. Again, this may be an attractive option, but only when used with a butt splicer.

Our production model

To evaluate the next 3 components of waste, it will be necessary to create a production model. Our model may be different from yours, but the principles are sound and can be applied to your own processes. Here is our model of a typical press:

- Label printing press with web width = 16 in
- Web length = 150 feet
- Average speed = 150 feet/min (including stops)
- Hourly rate for this press
  - $ 240 - per hour
  - $ 4 - per minute
- Running 16 hours per day, 5 days a week, 50 weeks
  - Total of 4000 hours per year
- Roll changes = 16 per day
  - Total of 4000 roll changes per year

We will also make some conservative assumptions about the substrate used:

- PS Label stock .006 inch
- 30 inch outer diameter
- 10,000 feet per roll
- 450 pound roll weight
- Weight per msi = 0.234 pounds
- Purchase price per msi = $0.35

Converters recognize that wasted stock in the press also means wasted inks, varnishes, laminate material and foil, as well as power and compressed air. The majority, however, have not quantified this. This is certainly worth evaluating, but we will not do that here.

We do need, however, to take into account the cost of disposing of wasted material. Disposal costs vary among materials and geographical locations. Landfill and hauling fees in Europe, for example, are generally significantly higher than in the United States. Here is a conservative, average estimate of disposal costs that does not account for recycling or biomass projects:

- Average cost per ton = $100
- Average cost per pound = $0.05
- Average cost per msi = $0.012
  ($0.05 x 0.234)

Adding the purchase price of the material to the disposal cost, we arrive at a total value of wasted material:

- Purchased value = $0.35 per msi
- Disposal cost = $0.012 per msi
- Total value = $0.362 per msi

Strip waste

Now we're ready to evaluate the other 3 components of waste, starting with the most dangerous person in your press room—the operator with a utility knife. Even if the floor is clean and care is taken in getting rolls to the press, our observations indicate that you will incur some strip waste. In discussing this issue with converters, the stripping of 4 layers of stock off a new roll is a reasonable average. Here is the result, over a year's time, of this level of strip waste:

- 4 layers on 30-inch dia roll = 31.4 linear feet
- At 16-inch web width = 6.032 msi per roll
- At 4000 rolls per year = 24,127 msi per year
- Total of 24,127 msi per year or 5,646 pounds per year
- Total value = $2.18 per roll

($0.362 x 6.032 msi)
- Total value = $8,720 per year
(4000 rolls/year x $2.18/roll)

Strip waste at this level represents 12.6 rolls wasted per year. That goes right against your bottom line. The challenge for owners and managers is to go out to the floor, see what your operators are doing, and encourage them to use the utility knife with greater precision!

Core waste

One of an operator's worst nightmares is having to re-web the press. So he or she will always make sure that there is no danger of miscalculating when the running roll is about to expire. Around the world, we find that about 150 feet is a reasonable average length of substrate left on the core at each manual roll change. In our production model, we'll use a more conservative 100 feet:

- 100 feet per roll = 19.2 msi
- At 4000 rolls per year = 76,800 msi per year
- Total of 76,800 msi per year
or 17,971 pounds per year
- Total value = $6.95 per roll
($0.362 x 19.2 msi)
- Total value = $27,800 per year
(4000 rolls/year x $6.95/roll)

Core waste at this level comes to an equivalent of 40 rolls per year. Operator training may help reduce this, as may a more advanced method of detecting the end of the roll. An automatic roll changer (splicer) with accurate roll diameter calculation—or better yet, a means of unwinding the roll down to and even off the core—can significantly reduce the amount of core waste.

Waste due to manual roll change

Any time the press is stopped, whether to change rolls or for some other reason, material is wasted. Web that is in the press at a stop is usually not saleable. And with older presses, there is a greater tendency to move out of register during deceleration from and acceleration to production speed, creating even more waste than we might see on newer servo drive presses.

In our model, we will assume that waste for a manual roll change equals one press web length of 150 feet. Here is the annual loss:

- Press length 150 feet per stop = 28.8 msi per stop
- Un-saleable product due to slow down and speed up = one more press length of 150 feet = 28.8 msi per stop

- Total loss of substrate = 300 linear feet = 57.6 msi per stop
  (300 linear feet x 16 in press width)
- At 4000 rolls per year = 230,400 msi per year or 53,913 pounds per year
- Total value = $ 20.85 per stop
  (57.6 msi x $0.362/msi)
- Total value = $ 83,400 per year
  (4000 rolls/year x $20.85/stop)

As the above calculations demonstrate, even this conservative production model has a very high level of material waste associated with it. To put it another way, this model, with 2 shifts of production operating 250 days per year, is wasting material at an annual rate of

- 173 rolls, or
- 39 tons, or
- $120,000.

Reducing waste by automating roll changes

As can also be seen, the largest component of this waste is due to stopping and starting for manual roll changes, the elimination of which is one way to reduce your waste significantly. The use of an automatic butt splicer and automatic rewinder provides possibilities for significant savings, including not only reduced waste on expensive raw materials but also reduced downtime on an expensive press. A return-on-investment (ROI) calculation is a good place to start, both for identifying wasted material and downtime, and for determining how much savings you can expect from automatic roll changing.

Time waste due to manual roll change

Most ROIs will attempt to account for time waste due to manual roll change. In our model, the calculation would look like this:

- Manual roll change takes 7 minutes (average)
- Hourly rate for your press line
  - $ 240 per hour
  - $ 4 per minute
- Total loss on revenue = $ 28 per change
  (7 minutes x $ 4 press rate per minute)
- Total value per year = $ 112,000
  (4000 rolls per year x $ 28 per roll change)
- Total time loss per year = 467 hours
  (= 29 days or nearly 6 weeks in a 2 shift operation)

Turnover loss due to manual roll change

Perhaps a more informative calculation is to consider the saleable value of the products produced by the press and the people who operate it. Price per 1000 is reasonably common. Whenever, during its agreed operating time, the press is not producing saleable product, the converter is incurring a loss on turnover. When the reason for not producing saleable product is downtime to change rolls manually, here is the magnitude of turnover loss incurred on our model press:

- Manual roll change takes 7 minutes (average)
- Assume a sales value of $ 5 per 1000 labels
  - 12 labels per linear foot (4 across x 3 per foot)
  - At 150 fpm average speed = 1800 labels per minute
  - At $ 5 per 1000 labels = $ 9 per minute
- Total loss on turnover = $ 63 per roll change
  (7 minutes per stop x $ 9 possible turnover)
- Total loss on turnover per year = $ 252,000
  (4000 rolls per year x $ 63 per roll change)

If the converter in our model can earn a 15% margin on turnover, his or her annual loss on profit is equal to $37,800 (15% x $252,000).

Summarizing our findings below, our production model is losing over $150,000 per year. The 3 largest components are those that can in large measure be eliminated by the addition of automatic roll changing.

Summary on waste figures	**Total value per year**
Stripped waste	**$ 8,880**
Waste left on core	**$ 27,800**
Waste due to manual roll change (stop/start)	**$ 83,400**
Margin loss due to loss of turnover (stop/start)	**$ 37,800**
Total waste / lost profit	**$ 157,880**
Revenue lost due to manual roll change (press stop)	***$ 112,000***
Not realized turnover due to press stops	***$ 252,000***

Advantages of automatic roll change

In addition to the advantages described above (eliminating material waste, reducing core waste, making efficient use of butt rolls, and eliminating lost time and unrealized turnover), automatic splicing will likely contribute other advantages to your operation. It is not uncommon, for example, to realize an increase in net production speed of 5% to 15%. This is a function of several factors, including: one, the confidence of an operator to run faster with automation; and two, a more straight-line production speed unaffected by slowing, stopping, and restarting at every roll change.

In addition to pushing more work through the press faster, automatic splicing can improve process quality. Running at a consistent speed has a positive effect, for example, on curing quality, as speed reductions on UV presses can often result in changes in UV power output and curing intensity.

Automation may also have a positive effect on other operations. The loss of 150 feet of stock in a press due to a manual roll change also requires that same 150 feet to be edited out of the print run. Eliminating that loss also affords substantial savings in post-press editing.

The combination of these advantages means improved service and delivery to your customers; and for you, a faster turnaround on jobs, a shorter billing cycle, and a greater ability to compete for orders that you might otherwise have had to decline.

All of which will contribute to your reason for being in business…profitability.

About the author -- Craig Thomson has more than 20 years' experience in web handling and roll changing. He is southeast (US) regional manager and marketing manager for Martin Automatic Inc. Martin Automatic, headquartered in Rockford, IL, is a global provider of automatic splicing, rewinding and tension control systems.