

The Paper Industry

By Rudi Burkhard

Many paper companies all over suffer from poor profits, excess inventories and high costs. Customers are dissatisfied with service – it takes too long to get the product they need and promised delivery dates are unreliable. The industry as a whole is suffering – over-capacity aggravates the situation for all and is probably seen as the cause by many in the industry. Is it the real cause?

We believe the cause is different. The cause is likely to be the **Policies** (or business rules), **Measurements** and **Behaviours (PMBs)** of the organization. PMBs are the likely cause because a paper company or factory is probably not capacity constrained. Lets look at common industry measures – something that most paper companies use.

I remember, from the days of my childhood, going to the paper plant to collect my father after work. In the courtyard stood a big sign that showed the plant performance – how many tons they produced the day before and the record production. Tons-per-day was what drove the entire plant – from the technical section to the workers at the machines. This plant was very successful – they went from record to record as their technical section made upgrades to the machines – allowing them to run faster and faster. Tons-per-day was (and still is) important because the company must use its very expensive paper machines effectively. The more tons produced in a day, the more effectively the machines are used.

“Tell me how you will
measure me, and I will tell
you how I will perform. ”

Eli Goldratt

If you believe the statement to the left and a paper factory's primary measure is tons/day (or a similar measure of effective use of equipment), then tons/day will determine how every manager, supervisor and employee will behave. What will be the consequences?

Production managers find themselves in a very real conflict or dilemma. On the one hand they must use their expensive machines effectively and on the other they are under enormous pressure to deliver products on time and with short lead times. Not only that, sales and marketing are asking for even more product variety – often a killer for effective production!

Changeovers from one paper grade to another involve setting up the machine to produce the other grade. Production is lost during the time it takes to make the change and to get the machine to 'settle' into make the right quality and basis weight. All this lost production time means ZERO tons per day. If changeovers mean a long period of ZERO tons/day then obviously the production team will try to minimize changeovers. They produce more than the customer order and too often more than

near or even medium-term demand. What are the consequences?

Inventories will go up. Customer service will suffer because production is too busy producing tons/day (using their equipment effectively) to make a change for customers that need another product now. Sales will be lost (but fortunately these customers will come back – the competition operates in the same way). If sales are being missed, profits must be down. If sales are missed because of non-availability isn't an opportunity to gain market share also being missed at the same time? Doesn't missing share gains have a long-term impact on the profitability of the company? Profits must be damaged by a lack of availability. Of course, if all paper companies operate in exactly the same way, then nobody gets hurt – market shares and profitability stay about at the same levels for all companies.

Imagine that one company figures out how to guarantee availability of all their products (of course without a mountain of stock!). Imagine what would happen to market shares and profits.

I suspect that different paper products have different production rates. Some products are produced at a low number of tons/day while others have a considerably higher production rate. As a production supervisor, my performance suffers whenever we have to produce those low tons/day products. If a high tons/day product is on the machine could it happen that this product is left on the machine longer than necessary? "We need to meet our tons/day target so we had better produce more of this product before we switch."

If high tons/day products are kept on the machine longer than necessary inventory of these products will grow. At the same time the low tons/day products will tend to experience shortages and, as a result, lost sales. Profits are hurt. Costs look low, but the money spent on production is simply hiding in the piles of inventory. If the plant has to be shut down for an inventory correction the impact will immediately be felt in profits.

Non-production results in ZERO tons/day. To achieve a good tons/day number machines must never stop. So they don't. Pressure on cost per ton has the same effect. No production for a few days in a month will dramatically increase unit costs. The cost per ton measurement creates the same sort of pressures as tons/day. Rather than shut down machines, paper factories tend to run continuously – making loads of inventory that will hopefully be sold - some day.

The impact is the same – inventory up to the rafters – especially of the high productivity products. The excess inventory puts a strain on the corporate cash flow – after all materials have to be paid for. At the same time too much of the high productivity items coupled with a decree for lower inventories (this happens from time to time) will ensure that lower productivity items are in short supply and sales will be missed. Profits are down.

Paper has a relatively long shelf life, but ... Damage will occur. Paper and its packaging does change with age and people don't like to buy old stuff with yellowed and dusty packaging. Over time it might happen that customers change habits – a popular product becomes a slow-moving one. Excess inventory is no longer a 6-month supply suddenly it's an 18 month supply. Holding a lot of excess inventory is risky business.

The phenomenon of excess production has another effect. The company may have purchased a quantity of a certain type of pulp in order to produce 2 or more different papers. Production could easily consume all of that pulp to make a nice long run of one of those papers. However, the other grades are needed too – and now there is no pulp left – the factory has to wait until the next shipment of that pulp. Effectively production has 'stolen' pulp from products that have customers waiting. What will happen? Customers go elsewhere. (Is it fortunate that there are not too many different pulp types in a factory?)

The phenomenon of 'stealing' is quite common. It can happen at every point of bifurcation – where a semi-finished product can be processed into 2 or more products. It can happen in coating, in slitting and in sheet production. (The paper industry is not alone. Steel and other metals suffer from the same effects.)

Conclusion: The tons/day and/or cost/ton measurements are causing the production of a lot of excess stock, poor customer service (particularly of those items produced at lower tons/day and higher unit costs). With over-production happening all the time a paper company's cash flow will be hit, cash will be scarce and profits will tend to be low. The key performance measures should be reviewed and redeveloped to change the organizations behaviour into something that makes more money and sense. The problem is that paper companies are in a conflict – they should do 2 mutually exclusive things at the same time. Lets define these:

1. Production management wants to manage to minimize production costs and use their expensive investment as effectively as possible. They want to minimize unit costs and produce as much good product as possible. What this means is tons/day must be maximized everywhere. Every machine (or cost centre) must maximize their tons/day.
2. Management also wants to protect sales revenue (or Throughput). They want to maximize sales. The flow of products to customers must be uninterrupted. Customers must get the products they need when they need them for their own commitments to their clients. This means the organization must never jeopardize any demand from a real customer (as opposed to work-orders for inventory).
3. The two strategies seem to be (are) mutually exclusive – as we have seen, a factory cannot maximize tons/day AND meet customer requirements for

product, lead-time and due-date reliability at the same time.

In order to be a good production manager must on the one hand control cost and on the other hand never miss a sale. Clearly **both are essential** for a successful business.

In point 1 above we said production management must control cost by maximizing tons/day. BUT, if we make more than needed to supply the market (produce inventory), are we controlling cost or increasing cost? In fact our fixed costs (labour and depreciation) don't change, we do increase our variable costs (materials), our inventory holding costs, our financing costs (our credit rating might decline), our available cash declines as it is stuck in inventory. At the same time the resultant increase in lead-times and decline in the reliability of our due dates costs lost sales. Every lost sale costs us its selling price less our materials cost. Would that be about 40% of every Euro of missed sales? Lets look at a model.

Our model paper factory has a capacity of 200ktons and sales of only 160ktons. For our model production manages to produce 200ktons – so their inventory of paper increases by 40ktons in the period considered. Their numbers look something like this:

		Sales	Production	Inventory Impact (Assets)	Cash Impact
Sales Volume	ktons	160			
price	€/ton	800			
Sales Revenue	k€	128000			
Production	ktons		200		
Materials	k€	76800	96000	19200	19200
Throughput (Contribution Margin)	k€	51200			
Plant Fixed Cost	k€	23200	29000	5800	5800
Manufacturing Cost	k€	100000	125000		
Manufacturing Cost	€/ton	625.00	625.00		
Marketing, Sales etc Fixed Cost	k€	28000			
Reported Profit	k€	0			
Reported Return on Sales	%	0.00%			
Inventory (an Asset)					
Value Increase	k€	25000			
Impact on Cash	k€	25000			

To produce the 200ktons the factory had to buy 40ktons more pulp (and other materials) at a cost and (cash impact) of more than 19 million€. All of the surplus production goes into stock – along with a fairly large portion, almost 6 million€, of the factory's fixed costs. With the fixed costs the factory has reported in their P&L it is able to show a breakeven. But, cash reserves have declined by 25 m€. 5.8m€ of current costs have been 'hidden' in inventory on

the balance sheet - as an asset. Doesn't this asset feel more like a liability?

Imagine our paper factory has different policies – it always strives to meet market demand; it works hard not to miss a sale. Imagine that by this work they can actually sell 20 ktons more and because their paper is much more readily available they realize a 10% premium for their products. Their numbers would then look like the table to the below:

		Sales	Production	Inventory Impact (Assets)	Cash Impact
Sales Volume (no missed Sales)	ktons	180			
Price (+ 10%)	€/ton	880			
Sales Revenue	k€	158400			
Production	ktons		180		
Materials	k€	86400	86400	0	0
Throughput (Contribution Margin)	k€	72000			
Plant Fixed Cost	k€	29000	29000	0	0
Manufacturing Cost	k€	115400	115400		
Manufacturing Cost	€/ton	641.11	641.11		
Marketing, Sales etc Fixed Cost	k€	28000			
Reported Profit	k€	15000			
Reported Return on Sales	%	9.47%			
Inventory (an Asset)					
Value Increase	k€	0			
Impact on Cash	k€	15000			

The impact on cash is a positive 15m€ - a swing of 40m€ in the right direction. Profits are 15m€ (9% return on sales) largely due to the 10% price premium and additional sales volume. The plant has also covered ALL of its fixed cost – no 5.8m€ ‘hidden’ in inventory!

If the factory cannot get a premium for its much better service then making and selling 180 ktons results in a breakeven and there is no negative impact on

cash. It all depends how much of a premium the plant can get for excellent service! Every 1% premium realized brings 1.44m€ to the bottom line! Maybe service is worth something.

Our little model shows that producing only what the market needs (or wants) is probably a much better strategy than maximizing tons/day or cost/ton. Maybe the cost of missed sales should be added to the unit cost from a high tons/day performance. Better still, we should probably simply throw out the tons/day measurement and use something else to drive the factory’s behaviour and performance.

Wouldn’t it make sense to measure what we call Throughput – the rate at which the factory makes money through sales of paper? Since Throughput is sales less materials we cannot hide fixed costs in our assets. It is still possible to produce beyond the market’s requirements, but there is no benefit in doing that. Cash generation (or consumption) should also be measured – to help prevent over buying and over production.

The factory probably needs a few more measures:

1. A measure of lead-time or product availability. Since this is a make to stock operation availability is key. When a client comes, any catalogue product must be available – within a short lead-time. The two following measures control availability.
2. RELIABILITY – a measure of how long products have not been available for sale relative to the promise the factory makes. The number should be close to zero.
3. EFFECTIVENESS – a measure of how much and for how long we have held our stock. The number should trend towards zero, but not at the expense of

reliability!

If the factory had such measures, how differently would the organisation operate?
What would drive the actions of production personnel? How long would it take for
results to show up in the balance sheet, P&L and cash flow statements?

Should the factory go for it?