How Newspaper Product Properties Influence Mailroom Disturbances

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Abstract: In the Nordic newspaper industry, the occurrence of inserts is gradually increasing. This means new production conditions in the printing plants, especially in the mailroom. Interviews with production staff have indicated that, inserting (including winding and unwinding) and stacker operations are considered as the main problem areas in the mailroom.

Earlier studies show that the mailroom disturbances also have large impact on unplanned press stops. One of the studies showed that 30-40% of the unplanned press stops originated from the mailroom. Most Swedish newspaper printing plants have on-line production with respect to printing and mailroom operations. In some companies, the idea of using buffer systems has been considered in order to separate the printing and mailroom operations.

In this paper we focus on the relationship between unplanned stops in the mailroom and the number of pages in combination with the number of inserts. Results in the area of down time and error frequency are presented and analysed. The study is based on real production data from three newspaper production plants.

INTRODUCTION

Background

In 1998 Liljekvist et al. wrote “the (newspaper) product tends to become more flexible with respect to the number of pages, use of colour and occurrence of inserts”. Today, inserting and zoning in the Nordic newspaper industry are gradually increasing. This leads to new production conditions in the printing plants, especially in the mailroom.

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In the past most research on newspaper productivity has been in press and pre-press areas. The mailroom has been left aside. But now the focus is put more on the mailroom. IFRA has released several reports for example Special Report 4.11.2 in which a formula for calculating the average net performance of inserting is presented. And at the annual IFRA Expo 2002 in Barcelona one seminar was dedicated to mailroom issue.

One earlier study shows that around 30-40% of the unplanned press stops could be related to the mailroom (Halonen, L., Stenberg, J., 2002). Another study showed that the inserting operation is the main reason for mailroom errors (Haeggström, C. 1999). In the inserting operation the winding and unwinding had the longest down times. Since most printing plants in Sweden have on-line inserting this will affect the printing process to a large extent.

The objective of my research is to investigate the relationship between the product printed and the productivity in the press and mailroom. Initially, I have focused on identifying problem areas and categorising production statistics.

Delimitations

In this study, the production process under observation is limited to the mailroom. The study is based on production data from three printing plants and three rather similar, broadsheet newspaper products and their inserts.

In this paper the mailroom is dealt with as one operation. The mailroom is not divided into specific operations like inserting, stacker operations etc. since that kind of data was not available at any of the print facilities observed.

Many printing plants have older mailroom control systems with limited possibilities of capturing production error data. In these cases it is possible to collect data, but to retrieve it from the machines is very difficult and therefore not worth it for the companies. The data used comes from the press control system and is therefore related to the press; the mailroom down time that is reported is the one that also makes the press stop.

Method

After our first study made (Halonen, L., Stenberg, J., 2002). on press stops we was decided to investigate the mailroom more in depth. One hypothesis was formulated:

The mailroom down time increases with the number of inserts.

Three Swedish newspaper printing plants provided production data. The production data collected from databases connected to the press control system. Some of the information was not possible to collect in any appropriate digital format so paper copies were printed out (from the database) and the information has been entered into spreadsheet software manually. At one of the companies the press operators manually report some of the errors into the system.

Two measurements are used to describe the relationship between the product structure and the down time in mailroom, MTBF (Mean Time Between Failure) and MDT (Mean Down Time).

MTBF = the mean time between failures of the operation calculated through operating hours / number of failures (Slack et al).

MDT is defined as "the average length for the time period the system is not working, the time spent for waiting on staff is included" by Bergman et al. (1995).

When MTBF and MDT have been calculated it is assumed that the mailroom operation time is the same as registered for the press in the press control system. These measures are used to find out how often the stops occur during production and the length of the stops.

The data concerns production of three broadsheet products. All newspapers are printed on 45 g/m^2 newsprint. The studies cover year 2000 and the first quarter of 2001.

Some production runs have been excluded because it was obvious that the data included serious errors.

The literature study carried out involved previously published academic research results and articles in trade press in the field of newspaper production.

One field study has been made at one of the printing plants during two nights and two days. One day has also been spent at the product-planning department (dummy work). At the other two companies shorter field studies has been carried out.

COMPANIES

Company 1

The printing plant has four KBA Commander 70 (satellite) presses. The presses are double width - double round newspaper offset presses. Each press has one folder.

The presses are constructed to print at 35 000 copies/hour in collect run and at 70 000 copies/hour in straight run. Each printing press is connected to (exactly) one mailroom line.

Each line has an inserting drum with the capacity of inserting three products, one product from a Rotadisc and two products from hopper loaders. Maximum speed of each inserting drum is approximately 30-34 000 inserts/hour according to technicians and the mailroom manager.

Each mailroom line has two stacker pairs (four stackers) leading to one strapping machine. It is possible to get double straps or a "cross" strapping. The strapping machine works with maximum 32 packages/minute single strap and maximum

18 packages/minute double straps. At the end 11 loading docks (placed two and two above each other) are waiting for the completed newspaper bundles

The observations from company 1 are presented in figure 1, (data concerning one broadsheet newspaper). 1245 production runs (during 2000 and 2001) were covered.

All presses/ pages	36	40	44	48	52	56	60	64	68	72	76	Sum
0 inserts		20	34	30	22	9						115
1 insert		27	94	90	66	40	29	45				391
2 inserts		22	40	104	79	81	40	59	37	32		494
3 inserts				28	29	54	46	64	24			245
4 inserts												
Sum		69	168	252	196	184	115	168	61	32		1245

Figure 1. The total number of productions observed at company 1 and how they are divided between the different product structures. Page counts are in broadsheet format.

Company 2

The printing plant has one double width - double round newspaper satellite offset press with two folders.

The press is constructed to print 30 000 copies per hour at collect run and 60 000 copies at straight run. Two mailroom lines are attached to the press. Both folders can deliver newspapers to both mailroom lines.

One of the mailroom lines has only one pair of stackers. The other is a complete line, with trimming, one inserting drum (three hopper loaders). After the inserting drum there is one line with three stacker pairs (six stackers), and one line with ink jet addressing and quarter folding (two stackers). From these two lines the bundles go to two strapping machines or two machines that perform plastic wrapping of the bundles. Then the finished bundles go to the loading dock or to a pallet loading station.

For product B (one broadsheet newspaper), 218 productions have been analysed.

B/Pages	12	16	24	28	32	36	40	44	48	52	56	Sum
0 inserts				37	35	27		33	24			156
1 insert				19	21	22						62
Sum				56	56	49		33	24			218

Figure 2. The total number of productions of product B observed at company 2 and how they are divided between the different product structures. The page counts are in broadsheet format.

Company 3

The printing plant has two KBA Commander 70 (satellite) presses. The presses are double width - double round newspaper offset presses. Each press has one folder.

The presses are constructed to print at 35 000 copies/hour in collect run and at 70 000 copies/hour in straight run. Each printing press is connected to one mailroom line.

One of the lines has an inserting drum with the capacity of inserting three products, one product from a Ferag-Minidisc and two products from hopper loaders. Maximum speed of the inserting drum is approximately 35 000 inserts/hour according to technicians and the mailroom manager.

Each mailroom line has two stacker pairs (four stackers) leading to one strapping machine or four pair of stackers on one line (main production). It is possible to get double straps or a “cross” strapping. The strapping machine works with 32-packages/minute single strap and 18-packages/minute double straps. At the end 8 loading docks (placed two and two beside each other) are waiting for the completed newspaper bundles.

C/Pages	12	16	24	28	32	36	40	44	48	52	56	Sum
0 inserts					55	24	16	15	18			128
1 insert					28	27	33	26	23			137
2 insert							13	18	18			49
Sum					83	51	62	59	59			314

Figure 3. The total number of productions of product C observed at company 3 and how they are divided between the different product structures. The page counts are in broadsheet format.

RESULTS

The table below show the shortest and longest down time for each product category. Every row represents one printing plant. If looking at 32 pages, this means that two of the three plants have products with 32 pages.

Company 1

The company has four mailroom lines and four presses. The data for all presses have been combined. The pie diagrams below show how the down time reasons, in % of total down time, are divided into eight categories. The different companies report different stop categories and these eight are common for all three printing plants studied. Therefore these eight categories have been chosen to represent the down time reasons. The category "unknown reasons" contains a lot of reported reason but the amount of them is too small to be able to use in any appropriate way. The data will be too uncertain. There is an increase in mailroom down time for two and three inserts.

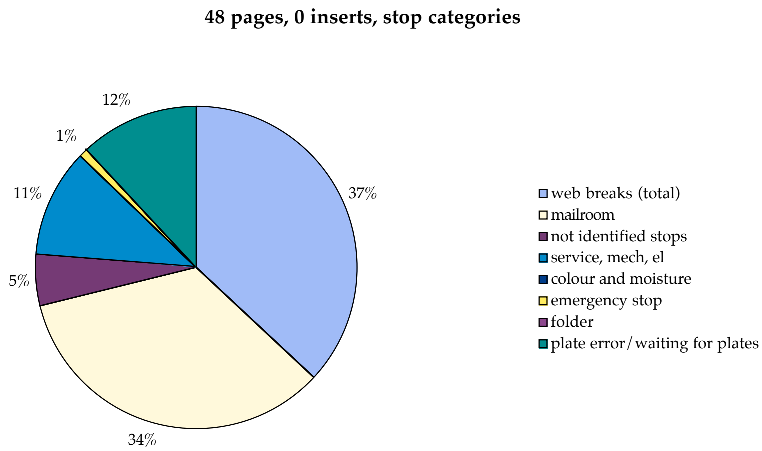

Figure 5. The stop categories in % of total down time in company 1 for 48 pages with no inserts.

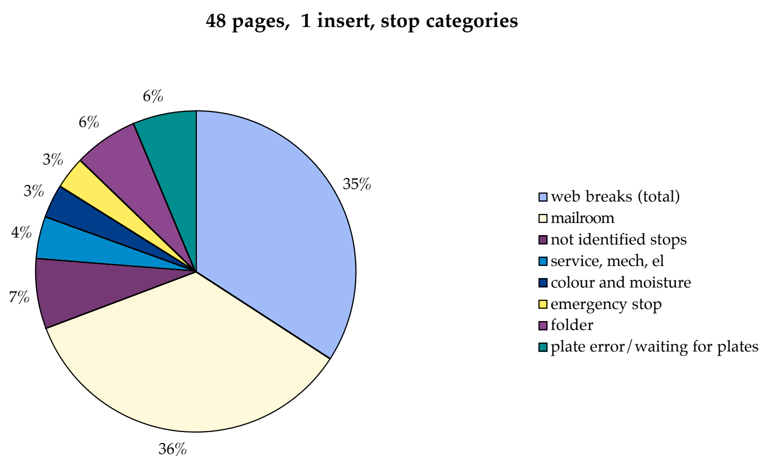

Figure 6. The stop categories in % of total down time in company 1, for 48 pages with 1 insert.

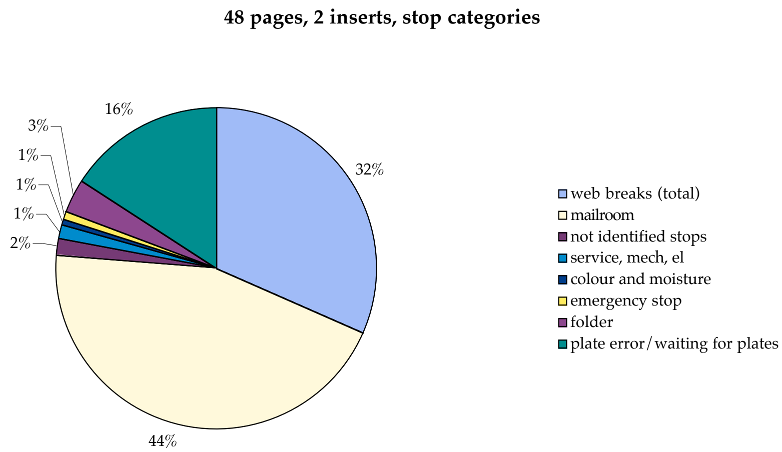

Figure 7. The stop categories in % of total down time in company 1 for 48 pages with 2 inserts.

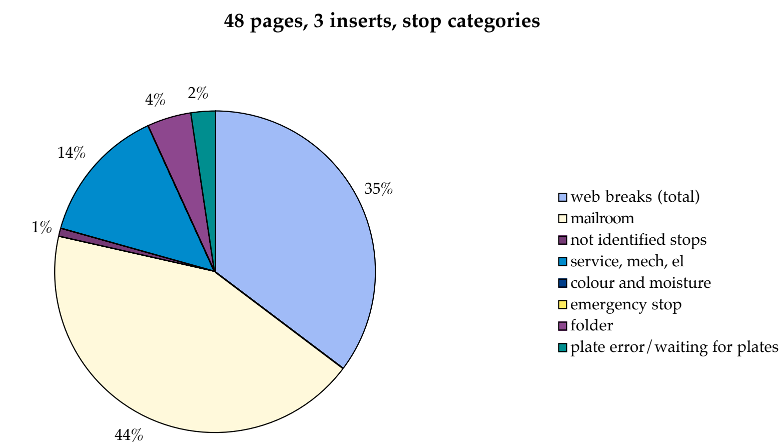

Figure 8. The stop categories in % of total down time in company 1 for 48 pages with 3 inserts.

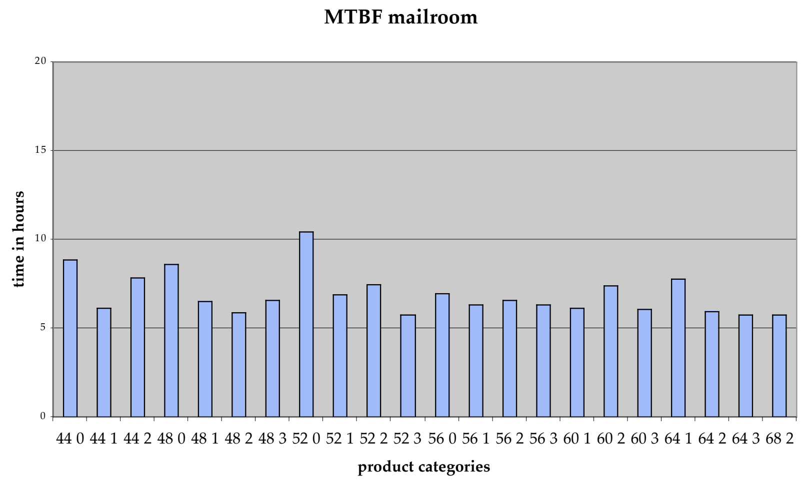

Figure 9. MTBF in the mailroom for the different products in company 1. 44 0 indicates a product with 44 pages and no inserts.

MTBF is used to show how the different product categories affect the time between mailroom errors (figure 9). MTBF is quite even over the product categories and lies between 6 and 10 hours. Most product categories have a MTBF between 6 and 7 hours.

The average mailroom down time (figure 10) for products without inserts is 0,23 hours and for a product with one inserts 0,40 hours, 0,37 for 2 inserts and 0,39 for a third insert. In these figures all different product categories with regard to number of pages are included. The result is not as clear as the hypothesis says, but a pattern can be seen.

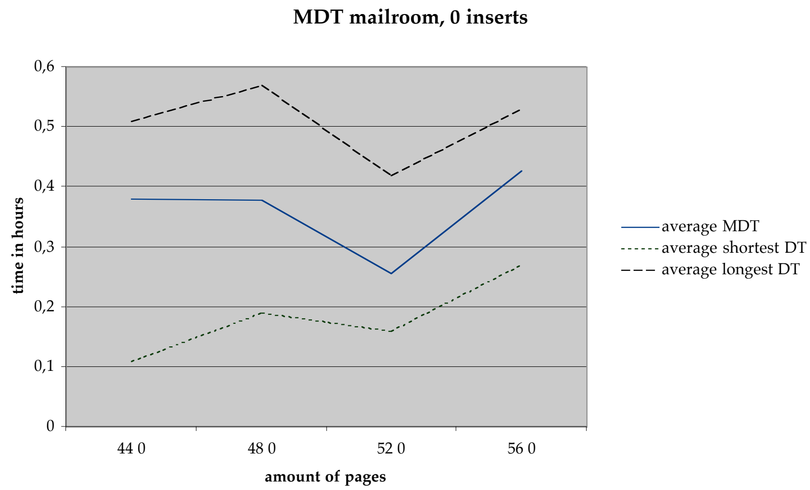

Figure 10. MDT for products without inserts.

The least error prone production observed was 52 pages without inserts. The product has the lowest down time figures and also the smallest gap between the three different measures. 44 pages and 48 pages have quite equal down times, although slightly lower down times for 44 pages. MDT lies between 0,25 to 0,43, shortest DT 0,1 to 0,3 and longest 0,4 to 0,5 hours.

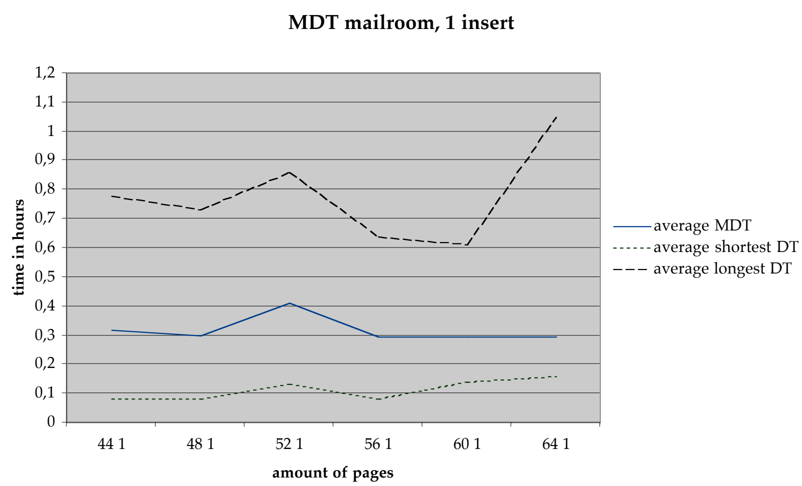

Figure 11. MDT for product with 1 insert.

Products with one insert and 52 pages show an increase in down time (figure 11). The gaps between the three down time figures are the same for all but the product with 64 pages, which show a clearly larger gap. 0,3 to 0,4 shortest DT 0,1 to 0,2 and longest DT 0,6 to 1 hours.

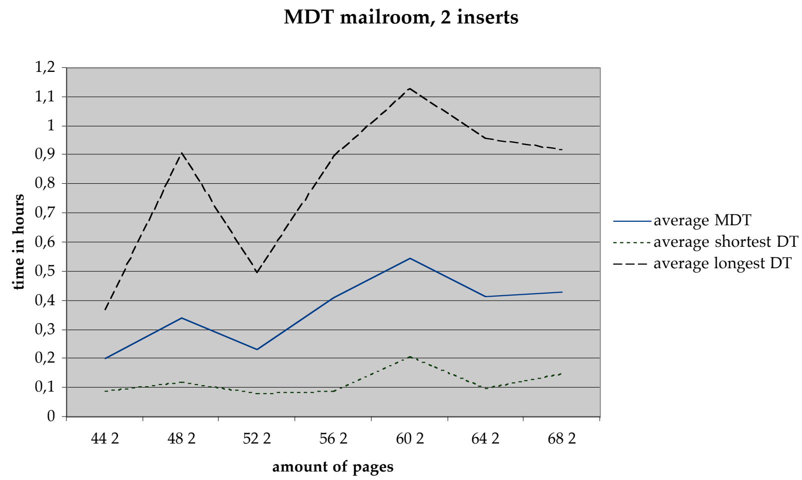

Figure 12. MDT for products with 2 inserts.

For products with two inserts, there are two peaks at 48 and 60 pages (figure 12). 52 pages have a dip and seem to provide the best production conditions. There is a decrease in MDT from 60 pages down to 64 and 68. The biggest gaps between the three down time figures are for 56 pages forward. MDT is between 0,2 and 0,5, shortest DT 0,1 to 0,2 and longest DT 0,4 to 1,1 hours.

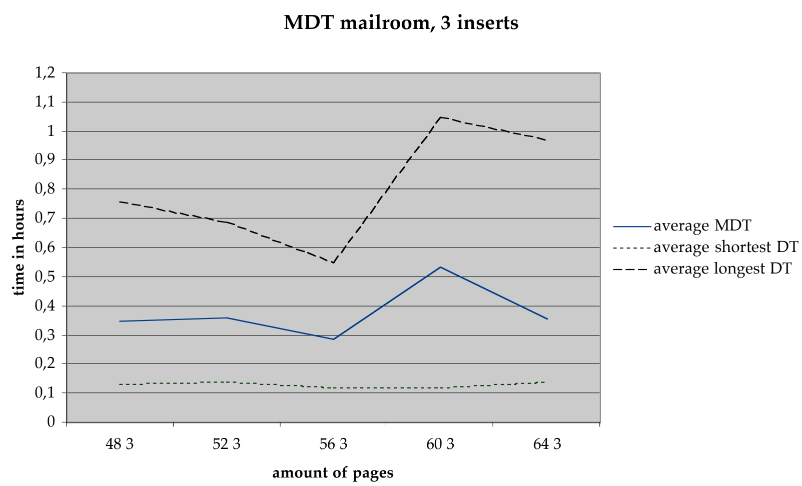

Figure 13. MDT for products with 3 inserts.

For products with three inserts a decrease in MDT can be seen from 56 pages and a peak for 60 pages (figure 13). MDT is around 0,3 to 0,5, shortest DT lies between 0,1 and 0,2 and longest DT 0,5 to 1 hours.

An increase in the number of pages and inserts means an increase in the mailroom down time. 60 and 64 pages have more mailroom downtime in general. In average, a product with no inserts has shorter MDT. The curve for shortest down time is more or less even for all types of inserting. But for the products with no inserts the curve is increasing with the number of pages.

Company 2

For company 2 the pattern is clear. There is an increase in mailroom down time between zero inserts to one insert (figures 14 and 15).

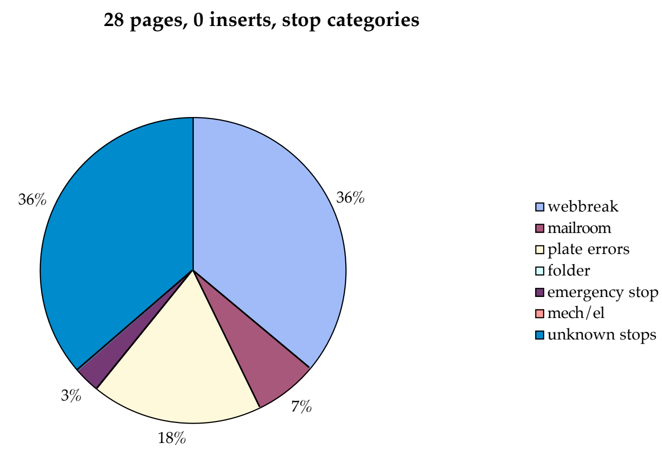

Figure 14. The stop categories in % of total down time in company 2 for 28 pages with no inserts.

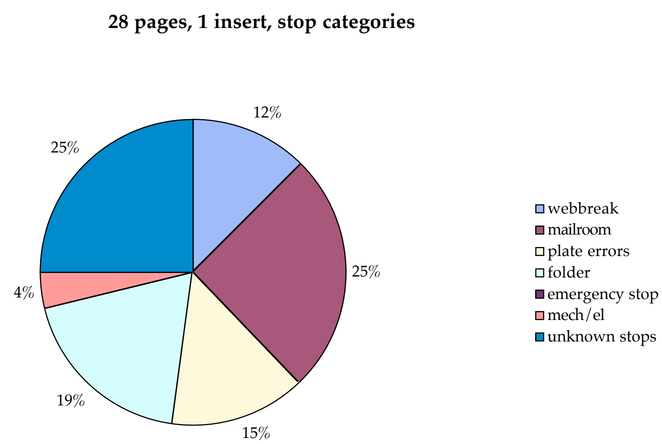

Figure 15. The stop categories in % of total down time in company 2 for 28 pages with 1 insert.

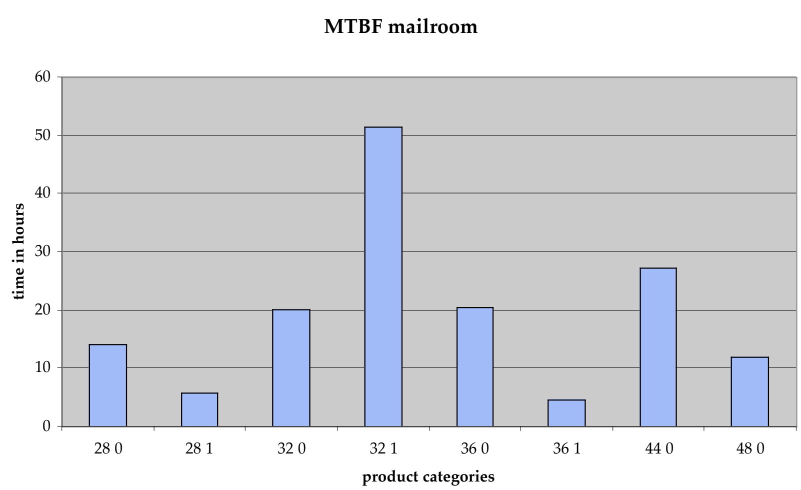

Figure 16. MTBF in the mailroom for the different products in company 2.

When comparing products with the same page count with variation in amount of inserts MTBF are mostly longer for those without inserts (figure 16). The amount of observed products in each category is at least 20 (19 for 28 pages with one insert) products. In the case of 32 page products the reported stops in the mailroom are fewer than for the other products. This might be one explaination to the difference shown in figure 16.

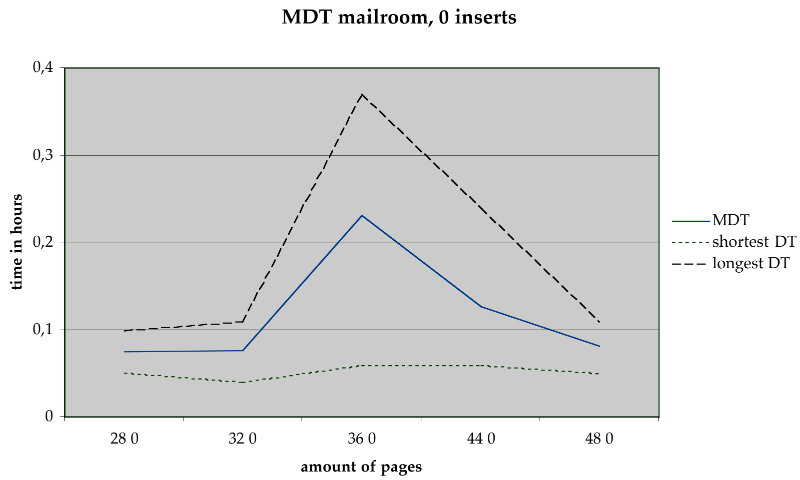

Figure 17. MDT for products with no inserts.

Regarding MDT, 36 pages seem to be very unstable for products with no inserts (figure 17). From 36 pages up to 44 and 48 pages there is a decrease in down time. MDT lies between 0,1 and 0,2 hours, shortest down time around 0,05 and the longest between 0,1 and 0,4.

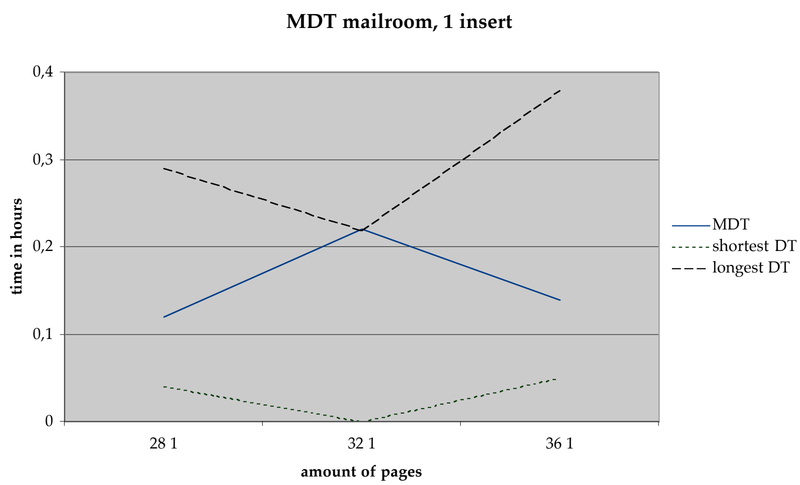

Figure 18. MDT for products with 1 inserts.

For products with one insert a 36-page product is the worst case (figure 18). MDT lies between 0,1 and 0,2, shortest down time 0,05 and longest 0,2 to 0,4 hours.

Company 3

The data for company 3 show an increase in mailroom/conveyor-gripper down time when inserts are used (figure 19 and 20). The mailroom down time in % of total down time doubles when using inserts. A lot of the down time is due to "unknown reason". Most of these reasons are gluing problems while changing reels, some are reasons seem to actually be unknown.

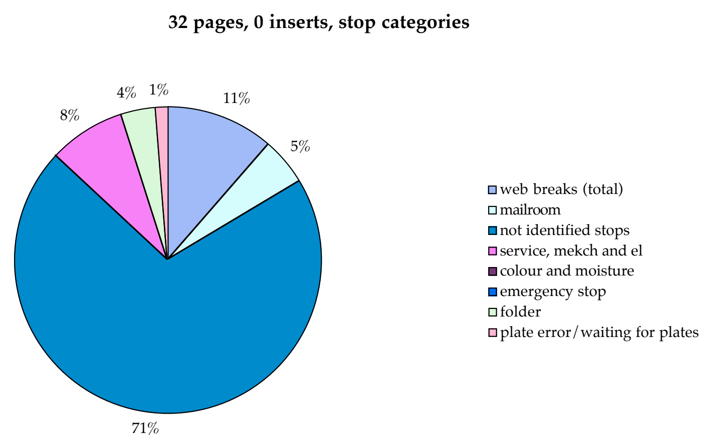

Figure 19. The stop categories in % of total down time in company 3 for 32 pages with no inserts.

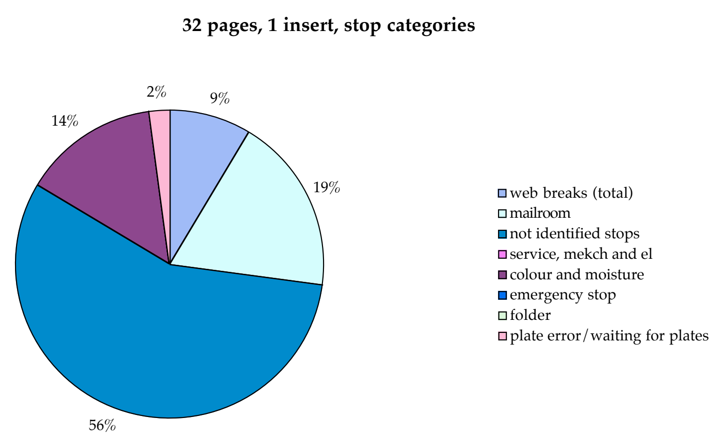

Figure 20. The stop categories in % of total down time in company 3 for 32 pages with 1 insert.

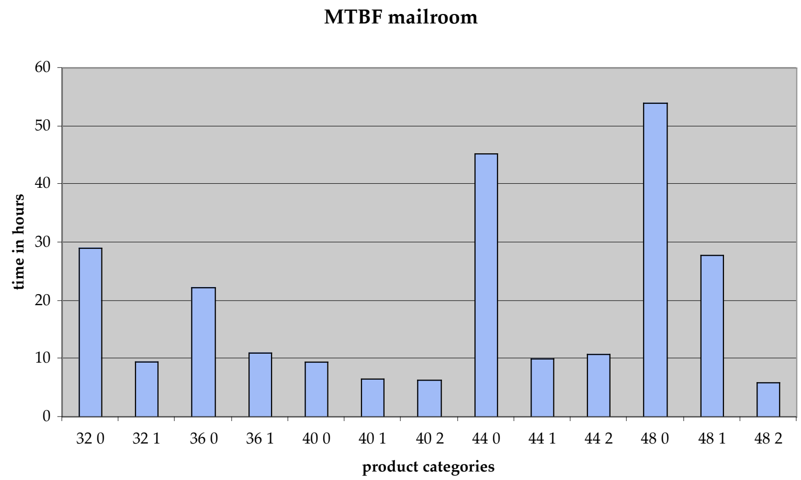

Figure 21. MTBF in the mailroom for the different products in company 3.

The graph (figure 21) shows that MTBF is higher for products without inserts. Then MTBF decreases for one and two inserts, the biggest gap can be found between no inserting and inserting.

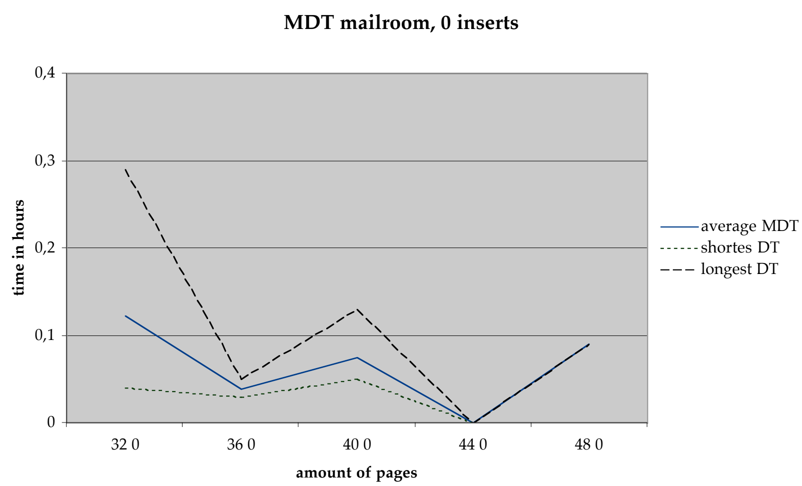

Figure 22. MDT for products with no inserts.

A 32-page product with no inserts has great variations in mailroom down time (figure 22). 36 pages and 44 pages seem to be the best. The results for a 44-page product are irrelevant since no stops were observed. The MDT is 0 – 0,1 hours, the shortest DT varies between 0 – 0,05 hours and the longest DT 0 – 0,3 hours.

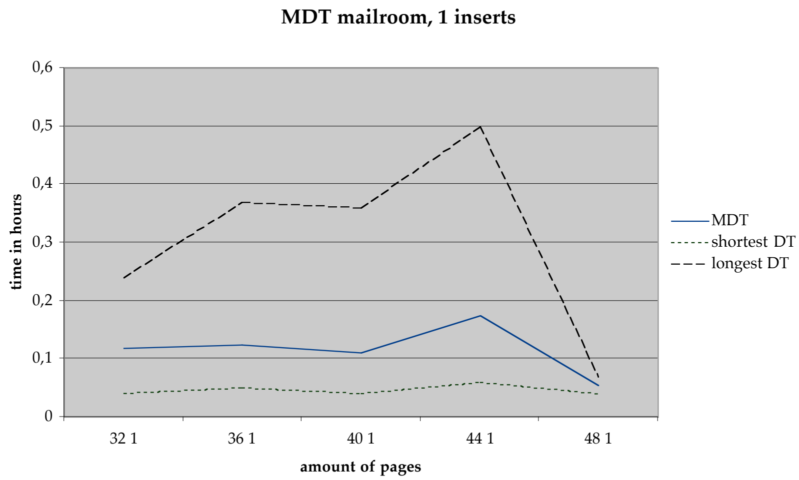

Figure 23. MDT for products with 1 inserts.

With one insert, a 48-page product is the most efficient one and a 44-page product has the least efficient production (figure 23). MDT lies between 0,1 – 0,2 hours, shortest 0 – 0,05 hours and longest 0 – 0,5 hours.

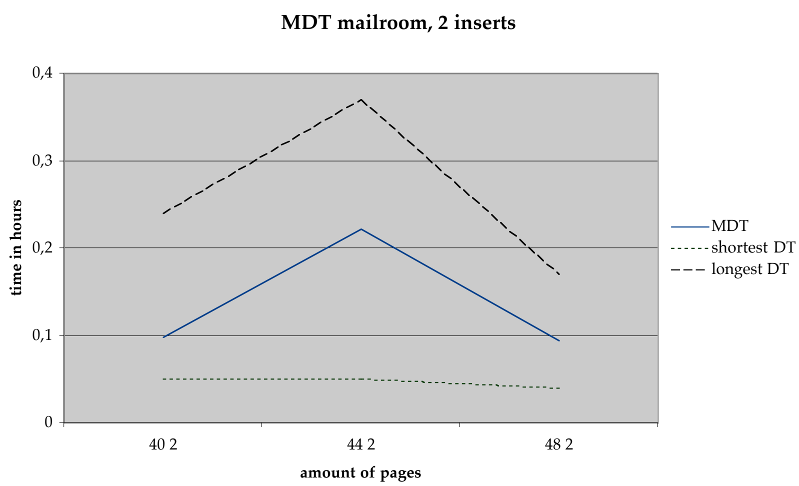

Figure 24. % of total down time in company 1 for 48 pages

Products with 40 pages and 48 pages seem suitable for two inserts but not 44 pages (figure 24). MDT is 0,1 – 0,2 hours, shortest 0 – 0,05 and longest 0,2 – 0,4 hours.

DISCUSSION AND CONCLUSIONS

The total down time in the observed production runs varies between 10-15% of the overall production time. Time for make-ready and cleaning has not been included. The down time in mailroom varies from 1 to 40% of the total down time in the printing plant. It is very clear that when the share of mailroom disturbances is 40% of the total, the products are more complicated in terms of page count and occurrence of inserts. This result is for the company with four mailroom lines. No matter how long or short down times, the mailroom errors remain among the four biggest down time reasons, together with web breaks, plate errors and errors of unknown reason.

A certain type of products, produced with a low disturbance percentage at one company, may well be produced with disturbances at another company. This makes it difficult to come to any specific conclusions on how the number of pages and the number of inserts affect manufacturing disturbances.

It is, however clear that the inserts affects the performance of the mailroom. For company 2 and 3, the down time percentage caused by the mailroom is doubled, when going from no inserts to one. At company 1, there is also an increase in mailroom down time related to inserting, but the figures are not as clear as for the other two companies.

The results show that products with inserts will reduce the productivity – the production is getting unstable, the MTBF decreases and the MDT increases.

The gap between the different down time figures is lager for product with more pages and inserts. The MDT interval is the same for products with inserts and products without. Although the shortest DT is about the same for the different numbers of inserts, the interval for the longest DT is lager for 1 to 3 inserts than it is for no inserts. These results are the same for all three companies.

Since it is not clear that a certain product causes more problem than another, other factors have to be taken in account, such as paper quality and the weight of inserts and pre-prints, thickness and size of the inserts. Different inserters may be better or worse in opening a newspaper for inserting? According to IFRA (2001) inserts sizes and materials have a direct impact on inserting speed. IFRA (2000) states that a lot of improvements need to be made by the mailroom equipment manufacturers.

In IFRA (2000) it is pointed put that "the physical threshold values of the personnel working at the hopper feeder should be taken into account" futher pre-prints and commercial inserts must be available in machine-processable form i.e. stacked in an orderly manner, flat, without turned-over edges and corners, not sticking to another, without falling-out parts such as reply coupons, etc.

IFRA (2000) presents a formula for calculating the average net performance of inserting. The formula is based on experience from mailroom installations and from data received from manufactures.

The example featured shows that with one insert the production speed goes down from 37 632 copies/hour to 31 987 copies/hour. This clearly shows that the inserting has an effect on productivity in form of speed. This also confirms that the inserting does affect the productivity in a negative way.

Separating the mailroom from the pressroom is becoming more common in the Nordic newspaper production. But still online mailroom-pressrooms dominate. The separation makes the mailroom influenced press stops less frequent or non-existing. And since the web breaks are more likely to occur during press start, this should reduce the web breaks.

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