A Study of Mailroom Runnability and the Occurrence of Unplanned Stops

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Abstract: It is notable how inserting in newspapers has increased in the Nordic countries in the last 10 years. The days without inserting are becoming less frequent, and multiple inserts are used several days a week. The newspaper product structure is becoming more complex and this makes high demands on the printing plant and especially on the mailroom operations. Many companies today have older mailroom equipment and are planning new investments.

Earlier studies, based on data collected from printing press systems, show that mailroom stops belong to one of the four main reasons for press downtime. But this data only gives information about the stops in the mailroom that cause the press to stop. Manual reports from the mailroom mostly give the same data as the press control system. Another study shows that in the inserting operation, it is the winding and unwinding of inserts that cause the most problems. Interviews with production staff have indicated that inserting and stacker operations are considered being the main problem areas.

This paper focuses on the different causes of mailroom stops, downtime, and reduced production speed in the mailroom and on how inserts affect the production. Two different studies were carried out at two newspaper printing plants in Sweden. One of the studies examines the minor mailroom stops that never get registered in any system, the other focuses on the reported stops and on interviews about mailroom disturbances. Interviews with technical managers and mailroom managers at several other printing plants were also conducted.

The studies indicate that inserting and stacker stops might cause longer down time in the mailroom that force the press to be stopped. Stops in the packaging lines can be handled in parallel to the production through increased personnel efforts by the production staff in the mailroom.

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INTRODUCTION

Background

In Sweden, on-line mailroom production is the most common way of producing newspapers. This means that stops in the mailroom will affect the press and the other way around. Earlier studies (Halonen et al. 2003, Liljeqvist 1999) have shown that mailroom stops are among the four main reasons for press stops, together with plate errors, unknown reasons, and web breaks. There are indications that the inserting process is the main stop reason in the mailroom (Haeggström 1999).

Inserting in newspapers has been increasing in Sweden during the past 10 years (Liljekvist 1999). Days when no inserts are used are becoming less common and days with more than one insert are increasing. This puts new demands on the printing plant, especially on the mailroom.

In many companies, old mailrooms seldom have computer systems for collecting production data. Some companies use hand-written reports and others seem satisfied with the information provided by the press control system. But the press control system only detects the mailroom stops that affect the press, not the minor stops that occur daily but are handled by the operators during production. In addition, the data from the press control system often refers to mailroom stops simply as "mailroom" with no specification of what or which machine caused the stop.

Aim

One aim of this paper is to identify the minor stops and disturbances that occur in the mailroom. These are stops that are handled during production and normally never reported. Another aim is to relate the reported stops that affect the press to a specific machine in the mailroom. This is made in order to see how the product, and mainly the number of inserts, might influence the speed, down time or number of stops in the mailroom.

Method

Observations were used to examine the minor mailroom disturbances. If looking at the literature, observations as a method is used when observing people, behavior, etc., never for collecting data, so to say using qualitative methods to get quantitative data. The name of the different observation methods also changes. *Holme, Solvang 1997* calls the two different methods hidden and open observation, which by *Bell 2000* are named participant and non-participant observation. In this study non-participating or open observation was used. Another study, focusing on mailroom stops that affect the press, was carried out at another Swedish newspaper printing plant. This study was based on stops reported by the mailroom staff. Interviews were also carried out at the company regarding the process of inserting.

Semi-structured interviews (Lantz 1993) regarding mailroom performance were also conducted with technical managers and mailroom managers at four additional companies.

Two measurements have been used in this study:

Average net production speed =
Total number of copies delivered to the mailroom divided by total production time, downtime and time for plate changes included.

Average cruising speed =
Total number of copies delivered from the mailroom divided by the total production time when downtime and time for plate changes has been excluded.

COMPANIES IN THE STUDY

Altogether, six newspaper printing companies, here identified as Company A through Company F, have been involved in this study. The four companies in addition to C and D are presented to show today's status of computer systems in the mailroom.

Company C and Company D have been the subjects of more detailed case studies and their mailrooms are described in the section on "Results." The reason for choosing these two companies was that they are relatively small and a single observer could overlook the production in the mailroom. Both companies also have almost the same type of mailroom layout.

Company A

The company has three printing presses; two of the presses have two folders, the third printing press has one folder. Each folder has two mailroom lines attached. The lines consist of inserting drum, stackers, inkjet addressing, top sheet and under wrapper, plastic wrapping and strapping.

Company B

The company has three printing presses, three folders and one mailroom line for each folder. The lines consist of inserting drum, stackers, inkjet addressing, top sheet and under wrapper, plastic wrapping and strapping.

Company E

The printing plant has one press with two folders. Two mailroom lines are attached to the press. One of the mailroom lines has only stackers. The other mailroom line is a complete line including trimming and inserting drum. After the inserting drum there are two alternatives, one line with stacker and one line with inkjet addressing and a quarter folder. From these two lines the bundles go to strapping machines or machines that perform plastic wrapping of the bundles.

Company F

The company has one printing press. From the press there are two alternatives: either to a winding station or transportation to stackers. The company has off-line production in the mailroom and, if the newspapers need postpress operation, the winding station is used. The mailroom has a biliner for inserting products and, similarly to the other companies, inkjet addressing, plastic wrapping, and strapping machines.

Additional information on the companies is shown in table 1.

Table 1. *Overview of press and mailroom data sources. PCS = press control system.*

Company	PCS	PCS reports including mailroom	Mailroom data specified	Downtime reported	Maintenance reports
A	X	X	X	X	Computer based
B	X	X	X	X	Computer based
C	X	X	X by personnel	—	Paper
D	X	X	—	—	Paper
E	X	X	—	—	Paper
F	X	Off-line production	—	—	Paper

Data on Mailrooms

Five out of the six companies have a press control system where the mailroom stops that cause the press to stop are reported.

Three out of five companies with PCS (press control system) reports do attribute the mailroom stops to a specific machine. Two out of these three printing plants report downtime.

None of the companies registers minor stops that the mailroom personnel will handle during production. The companies make no analyses of these stops.

Maintenance reports are collected in a computer system or on paper at all companies. The paper reports do not include downtime (the time it took to fix the machine). One company mentioned that it has a top-ten list of the most common problems in the mailroom during a month. The top-ten list aims at fixing problems on a long-term basis. The company has information on each specific machine and can see if one stands for the most problems. The company cannot, however, see if one machine has more working hours than another.

RESULTS

Case Study 1 at Company D

The study of minor stops was conducted at company D (see table 1). The company has two printing presses. The mailroom has two mailroom lines. One of the lines has an inserting drum with the capacity of inserting three products, one product from a winding station and two products from hopper loaders. Each mailroom line has two stacker pairs (four stackers) connecting to one plastic wrapping machine and then to a strapping machine. Alternatively, all four pairs of stackers can be used by one line (main production). At the end, eight loading docks (placed two and two beside each other) are waiting for the prepared newspaper bundles.

In this study, during half of the production time each night two stacker pairs were used. The other half was main production. The total production time observed was 36 hours; the plate changes and other stops in the press that caused the mailroom to stop (no newspapers to the mailroom) not included. The productions was divided into 5 days with no inserting, 5 days with one insert, and 3 days with two inserts. The inserts are described in table 2. The page count in the main paper varied from 32 pages to 44 broadsheet pages.

Table 2. *The inserted products.*

Insert	Number of Pages	Size (cm)	Paper Quality
P	8	30×41,5	Improved newsprint
N	24	Tabloid	Newsprint
I	12	28×38	Improved newsprint
M	4	21,5×31	Glossy thick paper
E	12	Broadsheet	
T	16	Tabloid	Newsprint
RT	56	25,5×36	Newsprint-like
R	16	A4	MF paper

The average downtime per night, caused by minor stop reasons, was 15 minutes. The average number of stops per night was 19. The total downtime caused by minor stops varied between 5 minutes and 35 minutes. The downtime for a single stop varied between 10 seconds and about 6 minutes, the average downtime for one minor stop is 48 second (see table 3).

Table 3. *The observed stop data for the produced products. The numbers are rounded off.*

Date	Effective production time (hours)	Downtime minor stops (min)	Number of stops	Shortest downtime, one stop (sec)	Longest downtime, one stop (min)	Average down-time, one stop (min)
10/9	2.7	4.5	10	20	0.7	0.5
11/9	2.7	6.2	13	10	2	0.5
12/9	3.0	12.1	11	15	4	1.1
13/9	2.7	10.4	17	10	2	0.6
14/9	2.8	35.5	26	10	6	1.4
15/9	2.8	7.7	21	20	0.4	0.4
16/9	3.8	7.7	13	10	1.5	0.6
17/9	2.8	24.8	22	10	5	1.1
18/9	2.8	22.1	25	10	1.5	0.9
19/9	2.8	14.3	14	10	3	1.0
20/9	2.7	15.2	35	10	1	0.4
22/9	3.0	10.3	17	10	1.5	0.6
23/9	2.8	24.4	26	10	1.5	0.9
Av.	2.9	15	19			0.8

The average downtime seems to be slightly longer for production with no inserts than for the other productions (see figure 1). The shortest downtime is more or less equal for all types of productions, whereas the longest downtime varies within a wide range. There is a tendency towards that products with no inserts or with one insert have a bigger spread between the shortest and longest downtime.

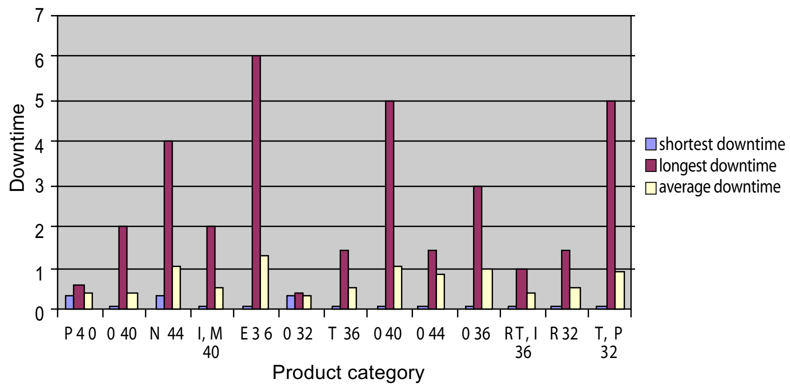

Figure 1. *The average downtime in minutes for the different products and production runs produced during 13 nights. The shortest downtime and longest downs time are also included. At the x-axis, the letters refer to the inserts (see table 1) and the number to the pagination of the main product.*

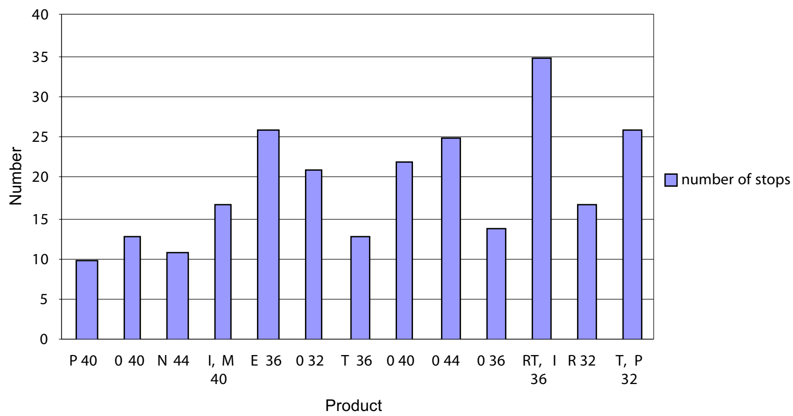

Figure 2. *The number of stops for each product produced during 13 nights. On the x-axis, the letters refer to the inserts (see table 1) and the number to the pagination of the main product.*

The number of stops seems to be increasing when using two inserts or no insert (figure 2). Thick inserts and thick products seem to cause more stops. However, it is not the inserting process that causes the stops. The product becomes thick with more inserts and the bundles can become uneven and this may cause stops in the plastic wrapping and strapping machines. For productions with one insert, the number of stops is close to average, 19. On the day that insert E was produced and on the fourth day with no inserts, the strapping machine had technical problems. So the numbers of stops on these days were probably higher than they normally should have been.

Most stops were caused by plastic wrapping and strapping except for insert R, which had some hopper stops.

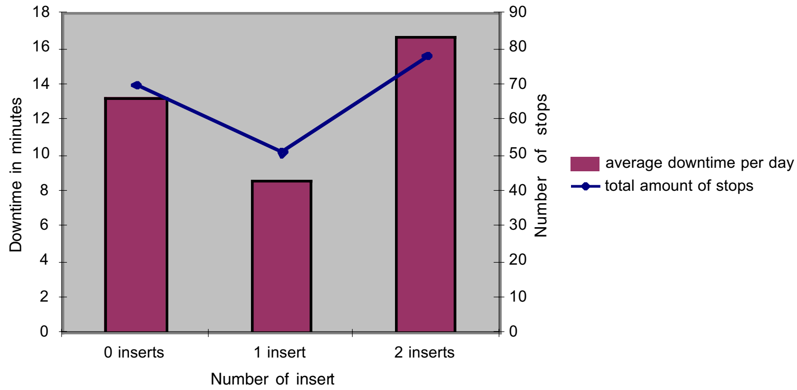

Figure 3. *A comparison of the three different product categories.*

Table 4. *The production during 11 nights. The two days with specific machine problems have been excluded. The production time is included to show that during a shorter production time, with two inserts, more stops did occur.*

Product	**0 inserts**	**1 insert**	**2 inserts**
Number of products	4	4	3
Good newspapers	263,109	261,154	195,375
Production time in hours	11.0	11.3	8.1

Since the production time and the number of printed newspapers are more or less similar, a comparison of the three different product categories was made (figure 3). Products with one insert seem to cause fewer minor stops whereas products with no or two inserts seem to have a larger number of minor stops. The average downtime per day is also higher for products with no or two inserts than for products with one insert. It must, however, be pointed out that it is not the inserts or the inserting process that cause the minor stops.

The strapping machine causes 60% of the minor stops (figure 4). The plastic wrapping machine causes 16% of the minor stops, and 15% are caused by the line that contains the plastic wrapping and strapping machines. In some cases, it has not been possible to identify the machine and therefore the category plastic wrapping/strapping has been used. A total of 90% of the minor stops are caused by plastic wrapping and strapping.

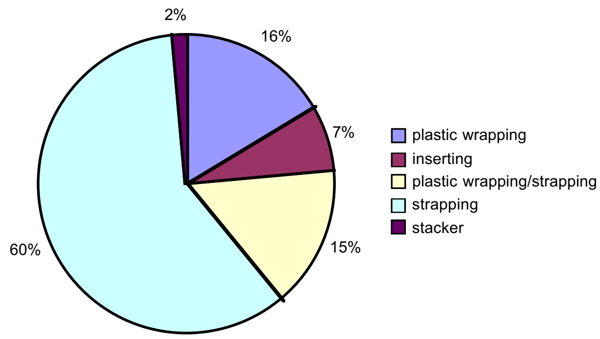

Figure 4. *The number of minor stops divided in to the different stop categories.*

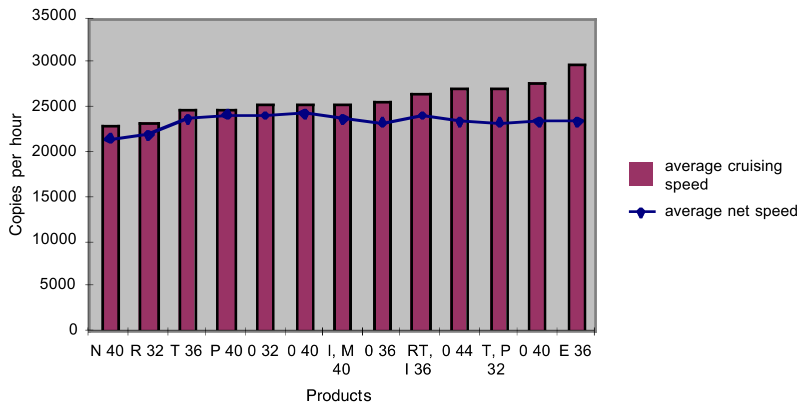

Figure 5. *The average net speed and the average cruising speed in the mailroom for the different products produced during 13 nights. On the x-axis, the letters indicate the insert (see table 3) and the number to the pagination of the main product.*

The average net production speed in the mailroom seems to vary within a rather narrow range for the productions observed. A similar observation can be made regarding the average cruising production speed. The highest net speed is around 25,000 copies per hour, and the average cruising speed is about the same. When the average cruising speed increases, the net speed does not.

Earlier studies (Halonen et. al 2002) show that the average net production speed for the press was higher for products without inserts. A separate, unpublished, study made by the authors at the same company in 2001 shows the same tendencies (see figure 6).

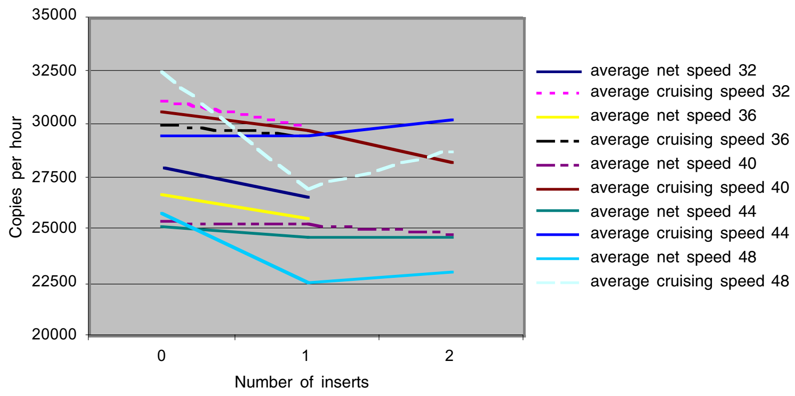

Figure 6. *The average net speed and the average cruising speed in the press at company D. The figures are from year 2001 (unpublished).*

Case Study 2 at Company C

At newspaper company C (see table 1), the printing room has two printing presses and two folders and the mailroom line has an inserting drum with the capacity of inserting two products, one product from a Rotadisc and one product from a hopper loader. The line has two stacker pairs (four stackers) leading to one plastic wrapping machine and then to a strapping machine. Inkjet addressing and quarter folding is performed in a separate line.

This study is based on production data from the mailroom. The reported stops are the ones that force the press to stop and the mailroom stops are specified. The specified data is keyed manually into a management system. The data was collected between February 2003 and May 2003, a total of 97 production nights. Out of these 97 nights, 28 have indications that some disturbance has happened during the production. One stop is defined as one day when the specific stop occurred. This means that more than one stop of a specific category can occur during the same night, but it is only reported once.

It is clear here that inserting stands for the most stops in the mailroom (figure 7): 44% of the total number of stops where caused by the inserter whereas the stacker is responsible for 28% of the stops.

The results from the interviews confirms that inserts coming from external companies are seen as a major problem. The format, the shape, and the condition of the inserts are of major importance for the runnability in the mailroom.

The hopper station is affected by the condition of the inserts. For the hopper, it is important that the insert is not wrongly folded, wrinkly, or have turned edges. The bundles sometimes have a format that cannot be to put into the hopper loaders. Straps around bundles break the back of the inserts. Other problems are that the inserts are not placed correctly on the pallet, they are sticking out from the pallet, or are broken and not usable in production since they most likely will cause stops in the machinery.

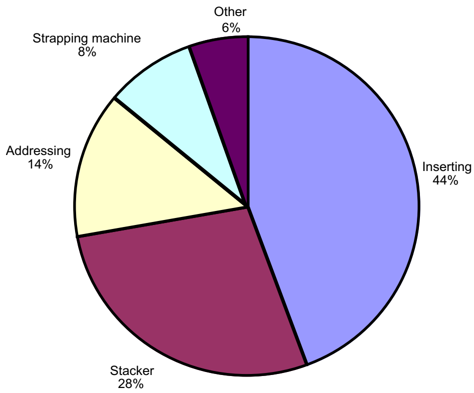

Figure 7. *The mailroom stops that force the press to stop dividend into six categories. The total number of days that is presented, so more than one stop can occur during one night.*

The stacker is sensitive to the thickness of the main newspapers and the inserts. A thick main product is good for inserting. The newspaper is steady. The stacker, on the other hand, is sensitive to thick newspapers and thick inserts. If the inserts are too thick, they will cause problems in the stackers and in the strapping machines. A quarter fold is needed for newspapers that are to be mailed. Newspapers that have many inserts (thick newspapers) and must be quarter folded are a problem.

Problems in the strapping machine are the most common stop reasons, according the interviews, but in the statistics they are only ranked fourth. This may depend on the fact that most stops are of such a minor importance according to the personnel so they do not write them into the computer system.

Possible Sources of Error

The collected data on minor stops comes only from 13 nights. This gives uncertainties when looking at the results on a long-time basis.

At the company studied in case 2, the specified data on mailroom stops was keyed manually into a computer by the mailroom staff. This can affect the validity of the mailroom data as can the use of observations as a method. The stops are sometimes very short and since one person has to overlook both mailroom lines, it is easy to miss some of the shorter stops. The aim was to collect all data directly from a computer system. This kind of data was not available at the company in question (see table 1).

The day insert E was inserted, the production staff reported on the minor stops. They had to fix production problems and had no time to clock the length of each stop. They counted the stops and gave each stop the average time for that type of stop.

CONCLUSIONS AND DISCUSSION

In the first case study, the focus was on minor stops with no impact on the actual printing process. These mailroom disturbances are normally not reported and do not influence the total production time. The average downtime per night caused by minor stops in the mailroom is 15 minutes and the average number of stops is 19. The total downtime per night varied between 6 minutes to 35 minutes. The time for one stop varied between 10 seconds and about 6 minutes. The average minor stop was about 48 seconds and when the stop time reaches one minute the staff needs to start moving the bundles.

The strapping machines and plastic wrapping machines, and the line consisting of strapping and plastic wrapping (in some of the observations it has not been possible to determine what in the line caused the stop) caused 90% of the minor stops. The inserting process caused very few minor stops except for insert R that had many hopper disturbances. R is an A4 insert with 16 pages, printed on MF paper. In the interviews, experts from other companies confirmed that it is the strapping and plastic wrapping machines that cause most of the stops in the mailroom although they do not affect the press

It must be pointed out that the number of inserts does not directly affect the machines that cause the minor stops. But if the size of the bundles is changed, the number of inserts can affect the machines in the mailroom lines. If the bundle sizes are smaller, the bundles arrive more frequently and this might affect the stackers, the plastic wrapping machine, and the strapping machine. If the bundles are larger or twisted or in some other way differ from normal, they might also affect the behavior of these machines.

Case study 2 shows that inserting is the mailroom function that stops the press most often. Inserting causes 44% of the mailroom stops and 28% are caused by stacker operations. Thick inserts result in smaller bundles which the stackers have difficulties in handling. Also inserts coming from external companies cause problems: sometimes they are in bad condition, strapped on pallets and broken, or in the wrong format for the hopper station, too thin, etc. Interviews conducted at other printing plants confirmed that they also have problems with inserts coming from external companies.

A study made by Haeggström (1999) shows that the inserting process stops most of the processes in the mailroom. In the inserting process, both the winding and unwinding of inserts are included. It was found that the winding and unwinding caused more stops than the inserting drum.

Investments in more complicated and advanced machines may generate a need for more staff to supervise production. If something happens today, extra staff is normally needed to handle the problem and this will probably not change in the future. The layout of a mailroom is very important. Today much of the newspaper flow is temporarily “stored” in the gripper-conveyors when a machine in the mailroom stops. Also, the line after the stacker has a certain length where the bundles can be "stored" if the plastic wrapping machine or the strapping machine stops. But they cannot be "stored" for a long time so here the rapid intervention by the staff becomes very important. Bundles must be removed if the stops are too long. Some companies have or are investing in buffer solutions so they can wind up the newspapers coming from the press if something in the mailroom stops.

In case study one, there is an average of 19 minor stops during a normal production run of the main product. These stops can only be tracked by automation. The machine collects information on the stops and sends it to a computer system where the data can be monitored and analysed.

Mailroom minor stops can cause the same total downtime as the stops that force the press to stop. The total downtime for the press caused by the mailroom varies from 8 to about 21 minutes, according to an earlier study (Halonen 2003). The company where this study was made had only one very short mailroom stop that affected the press during the period of the study. Generally, it was the other way around: the press stops caused the mailroom to stop or to wait for newspapers or a delayed start. Also it must be mentioned that the highest average net speed in the mailroom was around 25,000 copies per hour. The average cruising speed at that time was almost the same, but when the average cruising speed increased the average net speed decreased.

Additional studies are needed to support any further conclusions on minor stops. An observation made is that, despite the high level of automation in the mailrooms observed, several operators were needed in order to supervise the operations and to make the process run. To be able to handle all the different machines and to be able to help and prevent stops when required, the staff may need additional training on handling the different machines in the mailroom.

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