

Dynamic Pre-Loading of Newspaper Bundles

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Abstract: The newspaper distribution organizations use trucks to distribute newspaper bundles to drop-offs for further delivery. Today, the loading process in the distribution center depends on earlier production processes, since the bundles are loaded online, in sequence with the mailroom and printing activities.

However, by pre-loading the newspaper bundles on pallets, the trucks can arrive at the loading dock when the entire load has been produced. Furthermore, the truck drivers do not have to wait at the loading dock if the production is interrupted.

In this paper we describe how the arrival time at the loading dock for truck drivers can be reduced by pre-loading and we argue that this will result in reduced waiting times and will also reduce the total cost for transportation and give more flexibility to the loading process. Pre-loading also creates a buffer between the printing press and the loading operation. The buffer makes the distribution operation less dependent on the reliability of the printing process.

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1. Introduction

1.1 Background

The newspaper distribution usually has to be carried out during a pre-defined period of time, since the production start and the delivery deadlines often are fixed. However, the production start can vary due to late deliveries from the pre-press department. According to Stenberg et al. the actual output of the printing process is often 50-80% of the cruising press speed, depending on the number of pages and inserts [Stenberg et al, 1998]. Due to late production starts and stops in the production, the start of the distribution will vary from day-to-day even though the planned distribution start is the same each day.

There are two loading strategies that can be used when loading newspaper bundles. The first strategy is to load the bundles online, in sequence with the printing process and the mailroom activities. The other strategy is to pre-load the bundles on pallets, and thereafter load the pallets onto the trucks.

The first strategy demands that the trucks have to be at the loading dock when the bundles are produced [Olson et al., 1997]. When the last bundle is produced and loaded, the trucks will depart from the loading dock.

The second loading strategy involves pre-loading of newspaper bundles on pallets or detachable load-carrying equipment. When using this loading strategy the trucks do not have to be available at the loading dock when the newspaper bundles are produced and loaded. However, time for pre-loading and buffering must be included in the distribution plan.

We argue that pre-loading and buffering the newspaper bundles will improve the control of the truck departures and also improve the flexibility in the loading arrangements. This could also improve the working environment for the truck drivers as well as reduce lead times at the loading dock for the trucks.

1.2 Method

In this paper two case studies are described. These case studies involve the distribution plans of two newspaper distribution companies in Sweden. The companies were chosen as being representative for metropolitan and medium size newspapers in Scandinavia. The delivery deadline for these newspaper companies is 6 a.m. on weekdays, which is common in Sweden. However, on Saturdays and Sundays the distribution deadline is later. This is not taken in consideration when studying the distribution plans of these two companies.

Quantitative studies were conducted regarding the planned starting times and lead times for the transport process and the carrier district process [Rehn et al, 2000] in order to find the lead times between the processes. The distribution plan for one of the studied companies (case study 1) involves approximately 260000 copies, 74 transports and 1141 carrier districts. The second company (case study 2) involves approximately 80000 copies, 22 transports and 264 carrier districts. Case study 3 only involves studies of planned departure times compared with real departure times. Only trucks that drop newspaper bundles at drop-offs were included in this study but not the trucks that transport bundles to re-sellers. This delimitation was made since most of the re-sellers do not have the same delivery deadline as the subscribers, e.g. most of the re-sellers do not open at 6 a.m.

Qualitative studies were conducted regarding the loading process at six printing plants, where three newspaper titles were loaded on pallets and four newspaper titles were loaded onto the trucks in sequence with the printing and mailroom process. The differences in the loading process were studied and semi-structured interviews were made with the personnel at the mailroom and at the loading dock. The newspapers studied represent circulations between 25000 to 500000 copies.

Literature studies of academic logistic research were made in order to find other industries that have similarities to the newspaper distribution industry.

1.3 Limitations

In this study, the printing process, the mailroom process and the loading process were studied as well as the transport process and the district delivery process. The preceding processes have not been studied and therefore not discussed or taken into consideration. Moreover, are transports to drop-offs where carriers pick up newspapers were only included in the quantitative study of the distribution plans.

2. Distribution Planning

The physical newspaper distribution process involves carrier districts, truck routes and loading [Rehn et al., 2000], [Stenberg, 1996]. However, the distribution start depends on the printing start and the mailroom activities. Therefore, the printing process and the mailroom process, hereafter called the production process, have to be considered in the distribution planning. All processes have to be planned to meet the delivery deadline. Therefore, the planning of the process should be in the reverse process order.

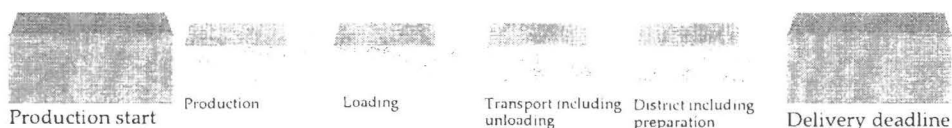


Figure 1: The processes, which have to be considered in the planning of the distribution. The planning should be in the reverse process order.

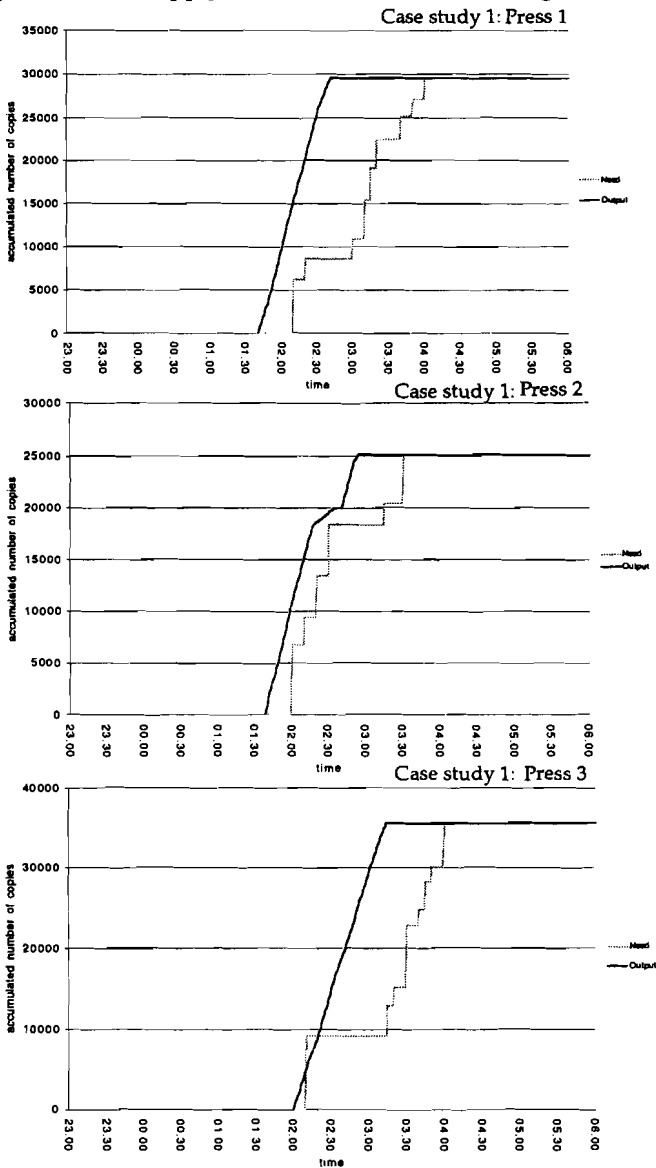
When the delivery deadline is set, an analysis of the process times for each process in figure 1 will generate the required starting times for each process. The carrier districts have to be finished by the delivery deadline and therefore the carriers have to start at a certain time, which is called carrier install time. The transports have to depart from the loading dock at planned departure times in order to arrive to the drop-offs before or at the same time as the carriers start their districts. When the transports depart from the loading dock, the correct load, edition and edition version of the newspapers have to be loaded and therefore the production has to be finished before the planned departure times of the transports [Fällström, 1998].

3. Printing Process

3.1 Output

The distribution start depends on the printing start and output, hence an earlier start and a faster output will result in an earlier distribution start. However, the actual output is normally only 50-80% of the cruising speed, and therefore the actual output may vary from day-to-day [Stenberg et al., 1998], [Stenberg, 1996]. Since the production output varies, the truck departures will also vary, if the loading of newspaper bundles is carried out immediately following the production.

The two studied companies load their trucks online in the production process. Thus, the truck departures depend on the production process. Normally when loading in sequence with the production process, each truck driver receives newspaper bundles, which are produced in a specific press. A study has been conducted of an actual printing output for a specific edition from four presses and the required number of copies, which each press should supply to a number of trucks, see figure 2.



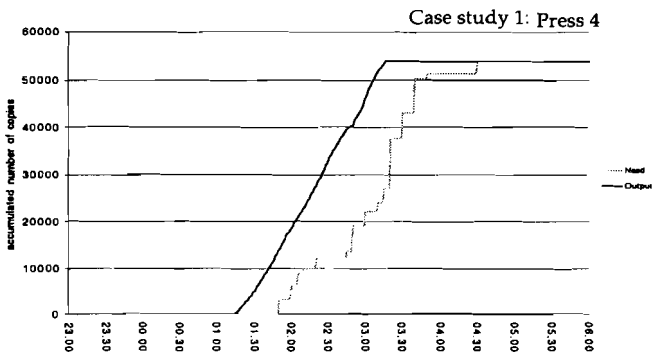


Figure 2: The printing output from each press and the required number of newspapers each press must supply for the trucks in order to meet the planned departure times.

In this case, three of the presses supply the trucks with newspapers before the trucks need to depart from the loading dock, according to the planned departure time. However, one of the presses (number 3) does not meet this requirement. Since this study of the printing output concerns the same edition, it does not matter from which press each truck will load. Therefore, the total printing output of the four presses could supply the total requirement of newspapers for all trucks. In figure 3, the total printing output is shown.

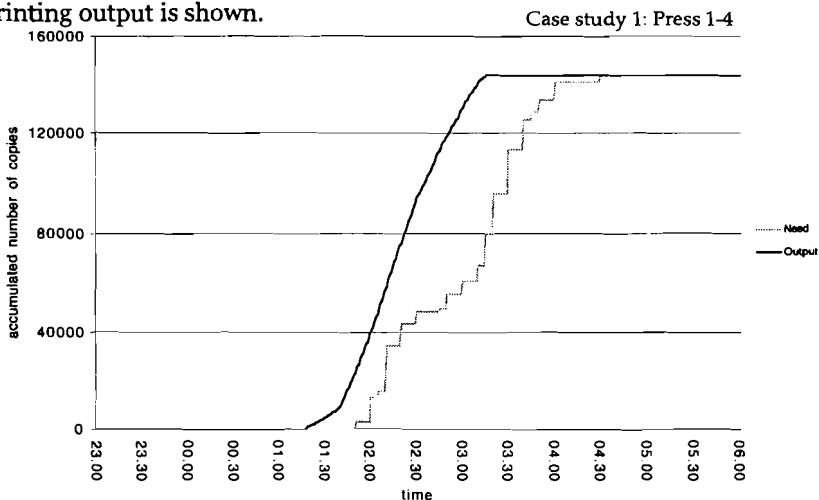


Figure 3: The printing output for one edition from four presses and the total need for newspapers.

As seen in figure 3, the printing output from all presses will supply the total need for newspapers before the trucks have to depart according to the planned departure time.

4. Need for Newspapers in the Distribution Process

The trucks arrive and depart to and from the loading dock at different times during the night. Each truck needs a specific number of copies of a certain edition or edition version [Fällström, 1998]. By studying the total need for copies from each edition and edition version, it is possible to determine if the planned printing output will meet this demand.

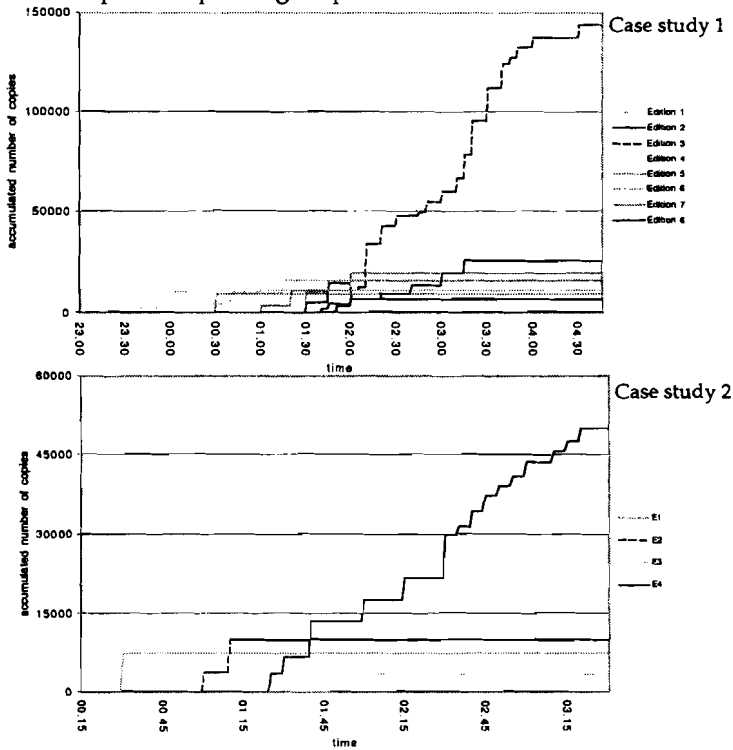


Figure 4: The need for newspapers of each edition at the two studied companies.

At the studied companies, the required number of newspapers varies, due to the trucks' planned departure times. The total need for newspapers include all editions and edition versions. The different editions and edition versions must be loaded on specific trucks in order to be transported to specific carriers. Therefore, each edition and edition version must be separated in the loading process as well as in the distribution process [Krantz, 2000]. In figure 4, the required number of newspapers of each edition is displayed according to the specific transportation plans of the two companies. The production process must supply the required number of newspapers in order not to cause late departures.

5. Transport

5.1 Install Time

Most of the newspaper distribution companies in Sweden define an install time for the truck drivers in order to know that each truck is available when the newspapers are produced. Each truck has to arrive at the loading dock before or at the same time as their first bundle is packaged, since the loading process is carried out immediately after the production process. The printing output depends on the complexity of the production run which normally varies from day-to-day and is difficult to predict. Therefore, the install times for the trucks are mostly set so that the trucks will be available at the earliest possible loading start. This can cause long lead times for the truck drivers when production is delayed.

5.2 Loading

The newspaper loading process starts when the first newspaper bundle is produced. The trucks have to arrive at specific loading docks where the truck drivers will load the newspaper bundles. The size of the load, the printing capacity and the mailroom capacity as well as the truck drivers' ability to receive and load the bundles, will determine the speed of this process.

5.3 Departure Time

The trucks should depart at a planned departure time in order to drop newspaper bundles at each drop-off on their routes at specific times.

	Number of studied departures	Number of studied days
Case study 1	572	7
Case study 2	599	30
Case study 3	1169	72

Table 1: The number of studied departures and the number of studied days at three different distribution companies.

Studies of 2340 departures at three different distribution companies show that approximately 40-50% of the trucks were loaded 20 to 40 minutes earlier than the planned departure time. Approximately 30-35% of all loaded trucks were completed within ± 10 minutes of the planned departure time and the remaining 15-30% of the departures were more than ten minutes late.

5.4 Transport Route

The transport route for each truck is designed to supply a specific set of carriers with newspapers. Each truck follows a pre-determined route, which includes a certain number of drop-offs. At each drop-off the truck driver will drop a specific number of copies for one or more carriers. The transport time between each drop-off on the same transport route will be different due to a number of factors, especially distance and driving restrictions, e.g. speed limit. However, the time from one drop-off to another also depends on the un-loading time at each drop-off. The un-loading time varies, due to the number of newspaper bundles to un-load but also due to different conditions at the drop-off.

In this study, five transport routes at two companies were compared with the carriers' install time at each drop-off. In figure 3, the lead times between the trucks' arrival at the drop-off and the carrier install time were compared.

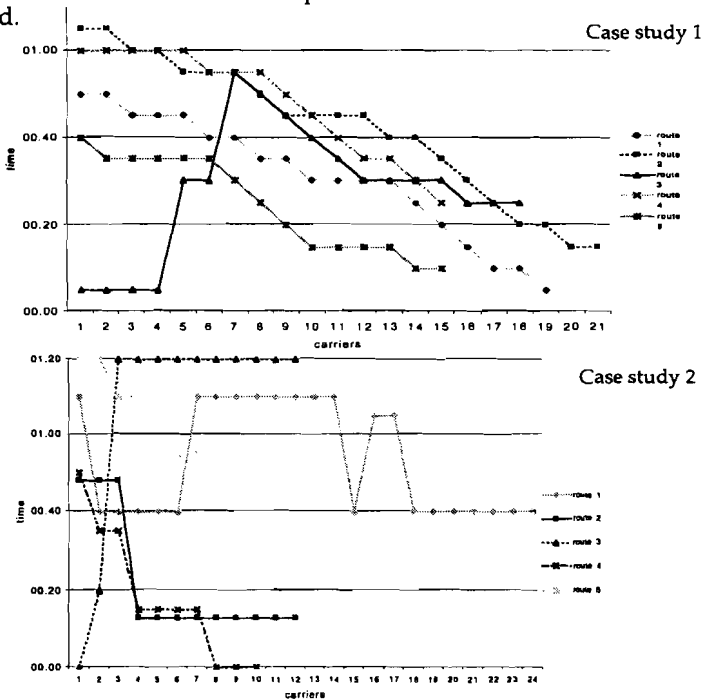


Figure 5: The difference between truck arrival time at each drop-off and the carriers install times for five transports routes at two different companies.

The difference between the arrival times of the transports to the drop-off and the install time for the carriers at these ten transport routes can be optimized to use the predefined distribution time more efficiently.

6. Carriers

Each carrier may distribute newspapers on one or more carrier districts each night [Rehn et al., 2000]. These districts may vary in length, time and transportation method, e.g. car, bicycle or walking and therefore the starting and finishing times for the carriers may vary.

6.1 Starting time

The starting time for each carrier should be planned in order to meet the delivery deadline. However, in practice this is not always the case. Figure 6 shows the number of carriers that actually start at a specific time and the number of carriers that *could* start at a specific time in order to meet the delivery deadline. This comparison shows that several districts start earlier than necessary in order to meet the delivery deadline. However, carriers may deliver newspapers at two districts, which have to be taken into consideration. In these case studies some of the carriers that start 2.30 am for case study 1, and 1.15 am for case study 2 deliver newspapers at two districts.

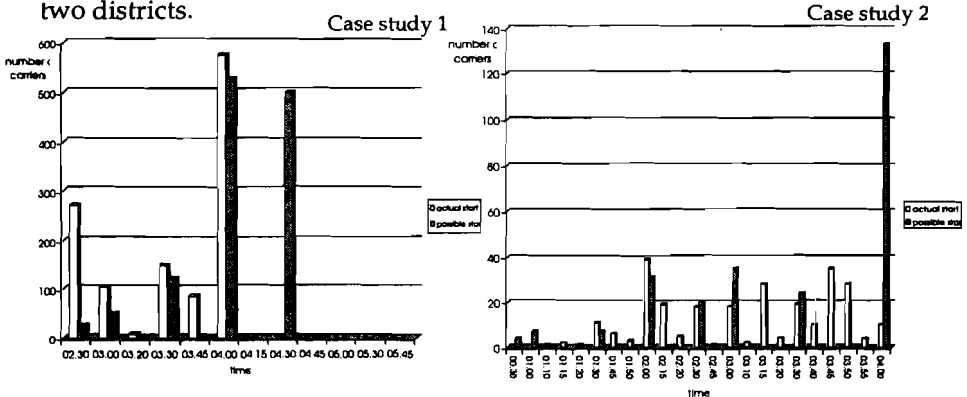


Figure 6: The number of carriers that actually start at different times during the night and the number of carriers that could start at different times in order to meet the delivery deadline.

6.2 Finishing time

The finishing times for the carriers depend on the starting time and the district time. The finishing time should meet the delivery deadline. However, the finishing time should be as close to the delivery deadline as possible in order to use the time and resources efficiently. Studies of the finishing times at two distribution companies show that more than 50% of the carriers are finished 30 minutes or more before the delivery deadline. On the other hand, some of the carrier districts are completed later than the delivery deadline. In order to use the time efficiently and meet the delivery deadline, the install time for these carriers should be changed.

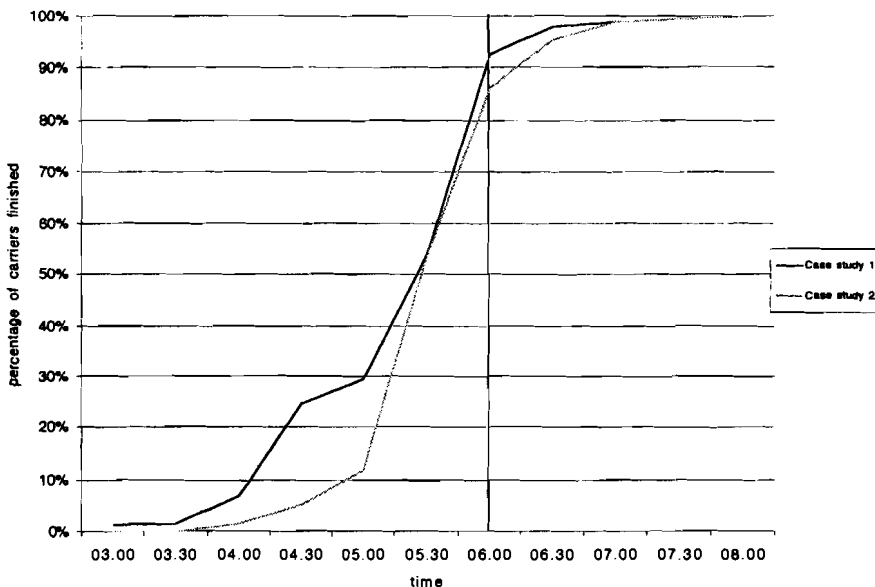


Figure 7: The percentage of carriers that are finished at different times according to the planned start time and planned district time. The distribution deadline is set to 6 a.m.

7. Discussion

By studying the production and the distribution process it is possible to obtain knowledge about which lead times that could be decreased and which starting times that could be changed in order to avoid slack related to the subsequent processes. Since the lead times at the studied companies could be decreased, this time could be used to pre-load the newspaper bundles before they are loaded onto the trucks. The pre-loading can be managed using pallets. By pre-loading the bundles, each truck can be loaded according to the planned departure time and not according to the production process. The production process can thus be separated from the loading and delivery operations.

The lead times for the trucks can be decreased if the loading process starts when the entire load is produced. Moreover, the truck departures can also be controlled when the loading process is carried out to meet the planned departure time. The truck drivers should therefore be available at the loading dock at a certain time before the planned departure time, due to the necessary loading time. The loading time depends on the amount of newspapers and will not be the same for all trucks.

According to this study, a high percentage of trucks depart ten minutes or more before the planned departure time. All these departures could depart according to the planned departure time if the pre-loading strategy is used. Moreover, if the un-used time within the distribution process is decreased, this time could be used to buffer the newspaper bundles. This buffering of newspaper bundles can result in a decrease of the number of late departures. The buffering time will determine how the production disturbances will affect the distribution process. The buffering time should therefore, be planned according to the capability in the production process.

8. Conclusion

The existing distribution plans at the studied companies can be changed in order to shorten the lead times as well as to reduce slack in the distribution process. By changing the distribution plan and pre-load the newspaper bundles, a buffer of newspapers could be used to prevent late truck departures as well as to reduce the waiting times and delays for the truck drivers and the carriers.

By pre-loading the newspaper bundles the loading process does not have to be adjusted to and be dependent on the production process. Therefore it is easier for the trucks to depart at the planned departure time.

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