

**COVERED HOPPER CAR SUPPLY FOR GRAIN:
IMPACTS ON THE STATE OF
NORTH DAKOTA**

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Covered Hopper Car Supply For Grain: Impacts On The State Of North Dakota

North Dakota Rail Services Planning Study

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HIGHLIGHTS

During late 1987 and early 1988, car shortages were perceived as being a major problem by shippers in the Upper Great Plains. In analyzing recent trends, there are several factors which indicate that a long term acquisition of rail cars for grain will become necessary in the near future.

The objective of this study is to appraise the issues and problems of rail car supply in North Dakota from the shippers' perspectives. The study also attempts to provide recommendations for future research in this area, with special attention given to examining carrier and shipper concerns. However, the study makes no policy recommendations of its own.

With the use of a shipper survey, the study shows three main things. First, the 1987-88 grain shortage had a significant impact on rail shippers in North Dakota. Second, that the car shortage resulted in several shippers substituting truck transport for rail transport. Finally, the grain car shortage in 1987-88 restricted the logistical options of shippers and created several associated problems.

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I. INTRODUCTION

During late 1987 and early 1988, agricultural shippers in the Midwest and other parts of the country complained of acute shortages of grain covered hoppers. Limited supplies of covered hopper cars spurred prices in the rental market. The monthly lease charge for a typical covered hopper car rose from one hundred and fifty dollars per month in August of 1986 to four hundred and fifty dollars in the spring of 1988.

Significant trends have occurred in grain movements in recent years which suggest increased future grain car shortages (Norton and Klindworth). Total grain movements in the United States have increased more than twenty-nine percent since 1978. In addition, rail movements of grain have increased from fifty-seven percent of all U.S. grain movements in 1984 to nearly seventy percent of all U.S. grain movements in 1987.

Along with grain movement trends, an analysis of recent railroad behavior and performance suggests that rail car shortages may become increasingly severe in the future (Norton and Klindworth). Since 1982, there have only been a few significant covered hopper car purchases by Class I carriers.¹ In addition, the annual retirement rate of covered hopper cars averaged 2.7 percent between 1977 and 1987. Four percent of the covered hopper car fleet was out of service in 1989, and this percentage is expected to increase as the age of the fleet increases. Finally, while cycle times decreased 2.2 percent per year between 1983 and 1987, they are not expected to decrease more than 1.5 percent per year in the future. This is because the majority of the improvement in cycle times has been the result of reducing empty hauling, and this component can only be decreased by a limited amount. Norton and Klindworth estimate that with improvements in cycle times

¹CSX has made a recent purchase of 2,000 covered hopper cars, and the BN has recently announced the purchase of 1,000 covered hopper cars.

of 1.5 percent per year, a grain car deficit of 29,700 will exist by the year 2001.

Car shortages like those occurring in 1987 and 1988, are particularly frustrating to landlocked states in the Upper Great Plains. Shippers in North Dakota, eastern Montana, and other parts of the region do not have the option of barge transportation for the shipment of grain. In many instances, motor carriers provide the only competition and alternative method of movement. The lack of competition for the transport of grain in this region may affect the railroads' priorities in supplying covered hopper cars. One theory voiced by shippers and some analysts is that carriers tend to first allocate cars to regions where stiff competition for grain movements exists. If this practice occurs, it may limit the ability of shippers in the Upper Great Plains to participate in market peaks.

From the railroads' perspective, carriers do not have adequate incentive to supply the car capacity desired by shippers in peak use periods. As Table 1 shows, there is a large degree of seasonal variance in rail grain movements. This seasonality requires the utilization of a much larger grain fleet during seasonal peaks. Thus, carriers would face excess capacity in trough periods if capacity to meet peak demand were obtained.

Carriers also contend that other factors may create the appearance of car shortages when they do not actually exist. One of these system factors is inadequate port capacity. If export ports are full, and/or the grain houses have limited throughput capacity, cars can sit idly in freight yards for several days. Another factor is car service rules which require foreign cars to move toward the owning railroad after being received by a foreign railroad (Felton). This increases the amount of empty haulings and does not allow rail cars to move to points of greatest shipper demand. A related factor is inflexible per diem rates. Market based per diem rates (without car allocation rules) would allow rail cars to move to points of greatest shipper demand, and would provide incentive for additional car

Qtr.	Barley	Corn	Oats	Rye	Sorg.	Soyb.	Wheat	All
Jan-Mar	19	25	26	22	22	30	24	24
Apr-Jun	23	31	17	21	21	19	25	29
Jul-Sep	36	19	32	33	11	13	34	24
Oct-Dec	22	25	25	23	46	38	18	23

Source: Norton and Klindworth

purchases when per diem rates rose above the daily car ownership costs (Felton). Finally, the free time allowed to shippers, before demurrage charges are applied, decreases car utilization (Felton). Shippers can typically detain rail cars for 1 to 2 days before being charged a demurrage or rental charge.

The purpose of this study is to assess the issues and problems of rail car supply in North Dakota from the shippers' perspectives. As part of this project, a survey was designed and administered to grain shippers in the state. The results of that survey are detailed later in this report. While there are many legitimate carrier concerns which are different from those of shippers, they are not directly addressed in this study. As a result, no policy recommendations are presented in the report. However, the authors do set forth recommendations for ongoing and future research which will delve further into carrier and shipper concerns. The analysis begins with an overview of recent trends and issues in covered hopper car inventory and usage.

II. RECENT TRENDS

The number of covered hopper cars has been decreasing for all railroads since 1982 when there was a record high number of operational covered hoppers (Table 2). According to the American Association of Railroads (AAR), the average number of surplus covered hopper cars² has decreased by more than 30,000 cars since 1982.

Number of Covered Hopper Cars			
Year	Maximum	Minimum	Average
1982	49,058	31,788	41,041
1986	27,326	7,731	16,287
1987	16,532	4,082	8,657

Source: American Association of Railroads, 1988.

A.) The Need For Future Acquisition Of Rail Cars

There are several indications that a long term acquisition of rail cars is going to become necessary in the near future. First, the average age of the operational hopper car fleet has increased substantially. The average age of a hopper car in 1989 was 14.24 years (Norton and Klindworth). More significantly, the average age of railroad owned cars was over fifteen years in 1989 with twenty-seven percent of the railroad fleet being twenty years old or more. Based on an estimated economic life of thirty years for covered hopper cars, the amount of future retirements should be large. The amount of rail cars needing repair will also be affected by this increase in the age of the fleet. Second, the

²Defined as empty covered hopper cars not in transit - in excess of shippers' orders.

amount of grain being shipped by rail has been increasing since 1978. Norton and Klindworth project rail grain volumes to steadily increase through 2001, and to become more variable between seasons. This will make the peaks in rail demand even larger than they are presently. With greater variability between seasonal rail demand, railroads will be less willing to purchase the required number of rail cars for peak demand. A third factor which must be considered is the amount of active jumbo covered hopper cars that are used for grain shipments. Only sixty-six percent of the jumbo covered hopper cars in service were used for grain shipments in 1987 (Norton and Klindworth). If chemical shipments, mill product shipments, or other shipments in jumbo covered hopper cars increase, the need for additional rail cars for grain will increase. Finally, utilization trends suggest that future rail car needs will be great. Most of the recent improvements in cycle times have been the result of fewer empty haulings. Because rail grain movements are from grain supply locations to grain demand locations and back, it would be difficult to reduce the empty component of the cycle much below the loaded component.

B.) Factors Affecting The Acquisition Of Rail Cars

In dealing with the impending covered hopper car shortages, carriers and shippers have several options. Among these options are the purchase of covered hopper cars by carriers or shippers, the restoration of the existing hopper car fleet by carriers, and the lease of covered hopper cars by carriers or shippers.

1.) Rail Car Purchases

The purchase of new covered hopper cars by carriers and shippers is the most obvious solution to future rail car shortages. In assessing the incentive of carriers and shippers to purchase new rail cars, excess capacity must be considered. Carriers are

unwilling to purchase new covered hopper cars to meet peak demand, since they would realize excess capacity during the rest of the year. Shippers are generally reluctant to purchase new covered hopper cars, because they feel they will incur excess capacity costs due to rulings in the SCOT-5 case. The SCOT-5 case was a complaint by Shippers Committee OT-5 against the practices of most of the nations railroads in regards to the use of privately owned covered hopper cars in rail transportation. The ICC ruled that shipper-owned cars could not be denied access to the rail system, unless railroad cars were available. But, the ICC also ruled that carriers could veto private car use because of inadequate track storage space. This allows carriers to use their own cars most of the time, placing the burden of excess capacity on shippers.

Car purchases remain a problem, even when carriers and shippers are ready to buy rail cars. This is the result of car builder limitations. There has been a substantial decrease in the number of rail car builders and component suppliers since the car order recession in 1982. Virtually no orders for new rail cars were placed in 1982, and many rail car builders and component suppliers were driven out of business. This has lead to an increase in order backlogs as the demand for rail cars has increased.

Many car builders are operating well below facility capacity, but up to their company's current capability. These companies don't have the capability to produce at facility capacity levels, because of a lack of skilled workers. Car builders are reluctant to hire skilled workers to meet facility capacity, because of uncertainty about future car sales.

Rail car component suppliers suffer from many of the same problems that rail car builders do. Since the early 1980's there has been a noteworthy decrease in the number of suppliers of vital car components. Rail car builders have experienced difficulties in

obtaining wheels, axles, and other vital components. It is likely that delays in rail car orders are partially the result of an inability by rail car builders to obtain needed parts from a limited number of component suppliers.

2.) Rail Car Restoration

Due to the expense and time delay involved with purchasing new covered hopper cars, many carriers are repairing and rebuilding existing rail cars. This strategy has several inherent problems. One problem is that rebuilt rail cars will have a much shorter life than new cars, because the car bodies wear out. As a result, cost-efficient rebuilding possibilities become limited. Another problem is that of obsolescence. Covered hopper cars built in the 1960's have much smaller capacities than those built today. Finally, repairing and rebuilding rail cars will be affected by the backlog in obtaining parts from rail car component suppliers.

3.) Rail Car Leasing

Another option available to carriers and shippers as an alternative to buying rail cars is leasing rail cars. Leasing presents less risk in the long run for shippers and carriers, since the rail car may not be needed in future years. However, continued leasing will cost more in the long run than buying if the car will be needed far into the future. Leasing may be a good alternative to buying if uncertainty exists. If leasing is to be used as a wide-spread alternative, leasing companies will eventually have to purchase additional cars. Increased demand for leasing may create the incentive for car purchases by lessors.

III. METHODS AND DATA

The shipper survey is described in this section of the report. Altogether, one hundred and fifty-one grain elevator operators in North Dakota were surveyed in April of 1988. Several questions were asked in the survey in order to obtain information on the perceptions and experiences of shippers in North Dakota pertaining to covered hopper car shortages.

First, questions were asked which sought information about the elevator characteristics. These questions were asked so classifications could be made by size and type of elevator.

Next, the survey asked about waiting times encountered by shippers. Shippers were asked about the length of waiting times between the time cars were ordered and delivered, and between the time cars were loaded and picked up by carriers. Waiting times encountered by shippers between car order and delivery will give an indication of the magnitude of car shortages.

Shippers were then asked what changes were made between truck and rail shipments because of shortages. Since rail car shortages may prevent shippers from getting in on the high end of the market if they continue to ship by rail, shippers may be willing to pay the extra transportation costs associated with trucking in order to sell grain for higher prices. The increase in truck use can also give an indication of the magnitude of rail car shortages.

Then, shippers were asked what kinds of problems they encountered due to covered hopper car shortages. This will give an indication of what kinds of costs the covered hopper car shortages can impose on shippers.

Finally, shippers' opinions were asked about the Burlington Northern's COT program. The COT (certificate of transportation) program allows shippers to bid for rail cars in future periods, and guarantees delivery within a two week period. The purpose of these questions was to find out if COTs have helped to alleviate the problems of rail car shortages.

IV. SURVEY RESULTS

The perceptions and experiences of shippers in North Dakota pertaining to the rail car shortage of 1987-88 are summarized in this section. The response rate for the survey was always above sixty-six percent with the exception of one question. This question asked for an estimated inventory cost per 100-ton hopper car for each day it sits loaded waiting for pickup. Its response rate was fifty-six percent.

A.) Car Delivery And Pick Up

Shippers and carriers frequently have different perspectives concerning the allocation of the grain hopper car fleet. From the shipper's perspective, the inability to obtain cars results in a logistical backlog and possible loss of markets. For every day that grain sits waiting to be loaded and shipped, the shipper incurs a significant inventory or imputed interest cost on the grain. However, the costs are not all on one side of the equation. The carrier experiences a substantial opportunity cost on covered hopper cars which are idle or in nonproductive use. When shippers over-order cars or cause undue detention at industry sidings, the number of annual miles that a hopper car can attain declines. As a result, the effective utilization of the fleet is diminished.

Car delivery and pick up times are important determinants of a railroad's operating efficiency. The distribution of a carrier's limited car supply can have a major

impact on how a shipper does business. In the following analysis, single car and multiple car shippers are considered on a separate basis to determine if there are differences in the perceived quality of service received by each of these two groups.

1.) Single Car Shippers

The single car shippers experienced a substantial increase in waiting time between placing an order and delivery in 1988 versus 1987. The average waiting time to receive cars was 14.19 days in 1988 versus 8.54 days in 1987 (Table 3). This represents a 66 percent increase in the number of days between order and delivery.

Table 3 Car Delivery and Pickup Times For Single Car Shippers (1987-1988)			
Length of Time Spent Waiting (In Days)			
Time Period	Shortest Time	Longest Time	Average Time
After Car Order (1987)	4.38	15.12	8.54
After Car Order (1988)	7.65	29.03	14.19
After Loading (1987)	2.37	6.46	3.82
After Loading (1988)	2.27	7.32	4.42

The difference in the waiting time between car loading and pickup in 1988 compared to 1987 was not as great. The single car shippers experienced a 16 percent increase in the number of days before a loaded car was picked up (Table 3). This increase in time between car loading and pickup is not expected during a car shortage because carriers must maximize car utilization during shortages in order to minimize the problem.

However, this might be explained by locomotive power shortages, port capacity problems, or other factors that were occurring during this time.

2.) Multiple Car Shippers

The change in carrier service to multiple car shippers from 1987 to 1988 was mixed. While the number of days the shippers reported waiting for cars to be delivered increased dramatically from 9.49 days in 1987 to 25.63 days in 1988, the number of days between loading and pickup actually decreased slightly from 3.83 days in 1987 to 3.25 days in 1988 (Table 4). These findings are not surprising when one considers the conditions under which they occurred. During a car shortage, carriers maximize utilization in order to fill orders as quickly as possible.

Table 4 Car Delivery and Pickup Times For Multiple Car Shippers (1987-88)			
Length of Time Spent Waiting (In Days)			
Time Period	Shortest Time	Longest Time	Average Time
After Car Order (1987)	5.18	17.86	9.49
After Car Order (1988)	13.43	47.38	25.63
After Loading (1987)	1.58	5.99	3.83
After Loading (1988)	1.84	7.92	3.25

B.) Factors Influencing The Choice Between Rail And Truck

The number of rail cars available to the shipper has a profound effect upon the choice between two alternatives in the transport of grain to terminal market. There was

an increase in the percentage of grain shipped by truck versus rail in the first three months of 1988 versus the first three months of 1987 (Table 5). In the first three months of 1987, 19 percent of the total grain shipped from North Dakota was by truck. From January 1st to April 1st 1988, the percent of grain shipped by truck was 27 percent of total grain shipments. The lack of available rail cars was the primary reason stated by shippers for choosing trucks over rail.

Table 5		
Percent of Grain Shipped By Rail and Truck Jan-Mar (1987 and 1988)		
Mode	Percent Shipped 1988	Percent Shipped 1987
Truck	27	19
Rail	73	81
Source: Unpublished UGPTI/North Dakota Public Service Commission Data		

There were numerous reasons why shippers increased the use of trucks to haul their grain to markets. As stated above, the primary reason given by shippers for choosing to haul by truck was the lack of rail cars available to haul grain. The three remaining reasons for choosing truck over rail service had substantially fewer responses. However, they were deemed important by many shippers. First, rising freight rates caused by increasing rail labor costs were forcing shippers to consider trucks as a viable alternative. Second, insufficient or nonexistent rail service was forcing shippers to choose truck over rail. Shippers attributed these diminishing service conditions to poor track conditions, lack of communication between carriers and shippers, erratic rail service, and lack of dependability. The need for quicker turnaround time was the last reason stated for choosing truck service over rail. Shippers need to load and unload their grain as

quickly as possible in order to react to changes in the market.

Very few shippers actually increased rail use in 1988, according to the survey. Of those who did, most chose to do so in order to take advantage of newly installed unit-train loading facilities. Perhaps the shippers who had invested money in making their elevator more rail efficient felt compelled to use the new equipment in order to realize the cost benefits of shipping by rail.

C.) Problems Caused By Rail Car Shortage

Many problems were created during the 1987-88 rail car shortage, according to the survey. These problems ranged from higher interest costs to decreased market prices.

Most of the problems centered around money lost due to increased operating costs (Table 6). Operating costs such as inventory and interest costs were eating into shippers' profit margins. Many shippers also experienced severe cash flow problems. The increased operating costs and lack of liquid funds of some shippers contributed to a loss of business to competing elevators. Smaller elevator operations were especially vulnerable. Many could not pay producers upon receipt of grain, causing producers to go elsewhere.

Not all the losses were directly related to a lack of working capital. Many of the shippers lost business due to the limited storage space for grain. Shippers were forced to store a portion of their grain outdoors without any protection from the elements. This led to a decrease in the grain's overall quality and a reduction in its market value. The decision as to how much grain to buy (and when to buy it) became even more difficult because of a lack of information on delivery times and quantities of rail cars that would be available.

Problem	Percent of Respondents
Increased Interest Costs	21.19
Increased Inventory Costs	7.28
Increased Rail Rates Upon Delivery of Cars	5.96
Increased Transportation Costs For Trucks and Leased Rail Cars	5.30
Decreased Market Prices	5.30
Discounts Due to Late Delivery	5.30
Loss of Spot Market	3.97

Other difficulties expressed by shippers were increased rail rates upon delivery of cars, increased transportation costs for trucks and leased rail cars, decreased market prices, discounts due to late delivery, and loss of spot market (Table 6). In the event of more severe shortages, decreased market prices and loss of spot market will become more dominant. The lower market prices and loss of markets could become permanent as foreign countries find other reliable suppliers of grain.

D.) Evaluating The Burlington Northern COTS Program

On January 1, 1988 the Burlington Northern introduced a market or demand-based approach to grain car allocation. The program, which utilizes Certificates of Transportation (COT), allows shippers to bid for up to 40 percent of the hopper car fleet. Bids must be above a specified minimum level, and are not seen by other parties. Successful bidders are guaranteed delivery of hopper cars within a future two week interval.

Originally, only 54 car trains were auctioned off. Shippers were also required to pay the entire auction price at the time the bid was accepted. The Burlington Northern paid an interest rate to the shipper from the time the money was received until the time of delivery. This interest rate was well below the interest rate considered to be the opportunity cost of capital for shippers.³

BN's COT program was met with resistance by many grain shippers responding to the survey. The majority of the respondents felt that the program should be totally abolished. The issue of fair treatment for both large and small shippers was frequently mentioned as a concern. A majority of the smaller shippers feared that the COT program provided large unit train operators with an unfair advantage. The large shippers stated fewer problems with the current COT system. Most thought it was a good program which offered a way to deal with rail car shortages.

A number of the shippers suggested ways that the BN could improve the COT program. One such suggestion was that the BN require a percentage of the total price at the time of the bid, instead of the entire cost. Another recommendation was that the market rate for the COT should be allowed to fall below the specified minimum rate. Other respondents stated that a more equitable system for distributing cars between small and large shippers should be devised. These shippers felt that the program should be modified to allow non-unit train shippers to participate as well. Some of these suggestions have been taken into account by the BN since the time of the survey.

It must be noted that shipper perceptions of the COT program may have been affected by the concurrent car shortage. During the time of the survey, shippers were

³The interest rate paid by the BN was a 5.9% annual rate. The opportunity cost of capital for shippers can be estimated by the long term interest rate charged to shippers when borrowing. The long term interest rate was 10% at this time (Heitkamp).

facing order backlogs, which may have generated negative attitudes about carrier car service in general. The concurrent shortage may have contributed to some of the negative responses about COT in the survey.

V. SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate concerns about rail car supply in North Dakota. There are many legitimate carrier concerns which were not considered in this paper, but the main purpose of the study was to gain insight into shipper perceptions of the problem.

The results of the survey suggest that the covered hopper shortages of 1987 and 1988 had a noticeable effect on shippers in North Dakota. Shippers experienced long waiting periods between order and delivery of rail cars. These delays occurred for small and large shippers. As a result of long delays, many shippers shifted to truck as a substitute for rail transport. Shippers also incurred increased interest costs, increased inventory costs, increased rail rates upon car delivery, increased truck rates and leased car rates, decreased market prices, discounts from late delivery, and loss of spot markets as results of the rail car shortage.

Norton and Klindworth predict that rail car shortages are only beginning, suggesting that these problems will become much more severe in the future. With continued rail car delays, it is possible that some of North Dakota's and the nation's agricultural export opportunities could be negatively affected.

Programs such as the Burlington Northern's COT should help alleviate car service problems, with certain qualifications. The COT program should help the BN to better plan car distribution, and improve overall utilization of the fleet. Thus, the program should provide some incentive to the BN to buy cars in the future. Logically, the BN will

buy more cars when the return on investment is good (e.g. when the bids are very high).

There is concern among some shipper groups that the COT program still encompasses some elements which may not allow the market to operate freely. First, the COT program does not allow bid prices to start below a specified minimum rate. This may keep bid prices artificially high. Second, COT bids are not seen by others. This doesn't necessarily allow bidders who value on time shipments the most to obtain them.

Some of the early problems with COT related to the equal treatment of small and large shippers have been corrected. Shippers can now buy single car COTs and are only required to pay twenty-five percent of the bid price when the bid is accepted.

In summary, the study has shown that: (1) North Dakota rail shippers were significantly impacted by the 1987-1988 grain car shortage, (2) many shippers shifted to truck transport during the car shortage, and (3) the shortage restricted shipper logistical options and created several associated problems (e.g. increased inventory cost). While this study focused solely on grain shippers in North Dakota, it has underscored the need for more research at both the national and regional levels. Future research should have the objectives of (1) determining the rail car supply which will maximize the benefits to society, (2) determining the optimal fleet size from both carriers' and shippers' perspectives, (3) illustrating the tradeoffs between shipper and carrier costs, and (4) assessing interregional differences in car supply.

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