

Comparative Analysis of Outsourcing Railcar Maintenance

An Interactive Qualifying Project

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BRUNSWICK  RAIL

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Abstract

The purpose of this project was to analyze Brunswick Rail’s recent transition to outsourcing railcar maintenance. The sponsor agency, Brunswick Rail, is a Russian freight railcar leasing company. In March 2016, the company began outsourcing railcar maintenance to reduce operating expenses. There are three phases to this report. First, the transition from insourcing to outsourcing maintenance was audited. Second, the best practices of railcar leasing companies in North America and Europe were researched. Third, recommendations for Brunswick Rail were derived.

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Executive Summary

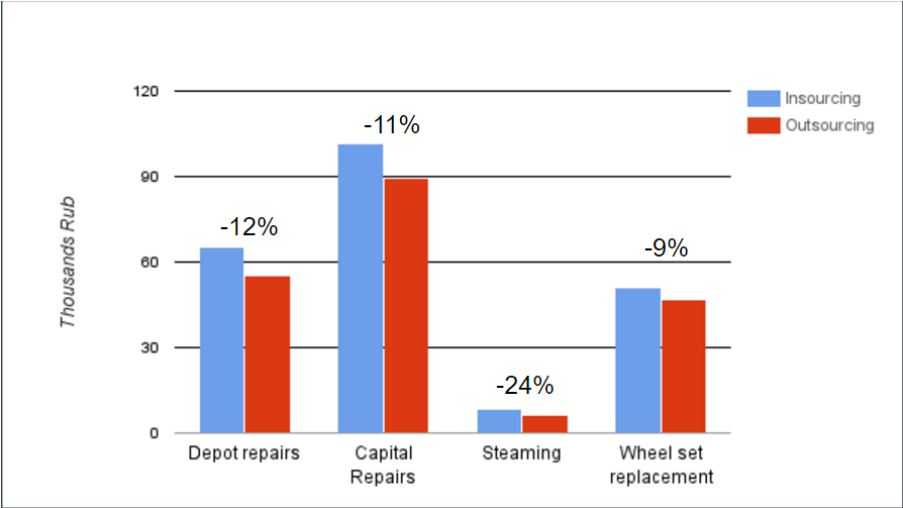
Brunswick Rail is a railcar leasing company based in Moscow, Russia. The company recently changed the way its railcars are maintained. Until March 2016, a technical department existed at Brunswick Rail that dealt with the logistics of maintenance for the company's railcars. To cut costs, Brunswick Rail is now contracting two outside companies to maintain its railcars and manage the logistics of the fleet. The goal of this project is to analyze Brunswick Rail's recent transition to outsourcing railcar maintenance.

The first objective was to research Brunswick Rail's current practices for freight railcar maintenance and perform a numerical analysis to determine the effectiveness of switching to outsourcing. The methodology used to achieve this objective consisted of analyzing financial documents and interviewing Brunswick Rail employees. Then, a SWOT analysis for both insourcing and outsourcing maintenance was performed, using the data from the documents and interviews. After, a categorical cost comparison was done to determine any difference in expenditures between insourcing and outsourcing.

The SWOT analysis for insourcing maintenance indicated few benefits for insourcing when compared to outsourcing. The only key advantage to insourcing maintenance is increased

oversight by Brunswick Rail. There are significant financial savings in outsourcing railcar maintenance. In four areas of railcar maintenance: depot repairs, capital repairs, steaming, and wheelset replacements, the costs were reduced by switching to outsourcing maintenance. The cost reductions in each of the four categories are listed in Figure 1:

Figure 1: Cost Savings of Maintenance Outsourcing



The second objective was to compare Brunswick Rail’s new strategy for maintenance with the best maintenance practices of other companies in North America and Europe. The North American and European companies were used to benchmark Brunswick Rail’s railcar maintenance practices. The study consists of nine companies. The data is contained in a spreadsheet that can be found in Appendix 8.

Three trends were examined for North American and European railcar leasing companies. The first trend of interest was the prevalence of maintenance outsourcing. The central component of this study was to analyze the decision by Brunswick Rail to outsource railcar maintenance. Therefore, it was prudent to consider whether other companies outsource railcar maintenance. Second, of the companies that insource maintenance, the trend of offering maintenance services to other companies was determined. The third area of interest was whether the company preferred an internal or external maintenance logistics department.

Pie charts were generated to show the three trends through analysis of North American and European companies. First, outsourcing railcar maintenance is not as common as insourcing. Most of the companies researched were significantly larger than Brunswick Rail, and have the financial capabilities to insource. Second, of those companies that insource, a slight majority offer maintenance services to other companies. Third, nearly two thirds of maintenance companies run an internal logistics department.

The third objective of the project was to generate recommendations for Brunswick Rail. The recommendations were inspired by: the best practices of North American or European

railcar leasing companies and Brunswick Rail's internal ideas. To evaluate potential recommendations for the company, a SCOPE analysis was used.

A recent development has occurred between Brunswick Rail and the General Maintenance Company or GMC (See Section 2.5.2 for an explanation of the name used). Due to increased depot costs, GMC can no longer fulfill the contracted terms that the companies agreed upon. Three viable options were provided to Brunswick Rail:

1. Terminate the contract with GMC, and switch back to insourcing maintenance at Brunswick Rail. **This was not deemed a valid option.** The main concerns were increased spending on staff, and an expected maintenance price increase.
2. Terminate the contract with GMC, and sign a new contract with a different company. **This also was not deemed a valid option.** Even the renegotiated prices that GMC provided were low enough to be some of the best in the market. Securing a contract with lower prices would be nearly impossible.
3. Continue working with GMC and accept the price increase. **This is the recommended option.** Even with the price increases, GMC would still be providing Brunswick Rail with low enough rates to justify retaining outsourcing.

Rates of both railcar leasing and railcar maintenance are subject to frequent changes due to the unstable Russian economy. If Brunswick Rail signs contracts with other companies to outsource repairs, the company will be able to lock in prices of maintenance. That way the company is able to secure beneficial rates for both leasing operations and railcar maintenance for prolonged periods of time. Because of these factors, it is recommended that Brunswick Rail continue to outsource its maintenance.

The next recommendation is that Brunswick Rail should seek to join an industry trade group. Currently, the majority of oversight in the Russian freight rail industry is through Russian Railways (RZD). In North America, industry standards are set by AAR. Since the collapse of the USSR, the Russian rail industry is increasingly becoming more privatized (M. Montencourt, Personal Interview, September 6, 2016). Although RZD still sets regulations, it is only a matter of time before these decisions are placed in the hands of private companies. When this opportunity arises, Brunswick Rail should seize this opportunity, to become one of the standard bearing members and set an example for Russia.

1. Introduction

The freight rail system is an integral part of the Russian economy (Harral, Winner, Thompson, Sharp & Klein, 2015). There are more than 80,000 kilometers of railroads, carrying 83% of the goods in the world's largest country each year. It is not always feasible for shippers to purchase their own railcars so shipping companies will often seek other options. Railcar leasing is an attractive option because the shipper can fashion a contract that calls for the utilization of railcars for a set number of years, at a less expensive rate than the cost of

purchasing railcars outright. Additionally, railcars would not be on the lessor's balance sheet. This provides a significant tax benefit. Therefore, capital would not have to be diverted to non-core assets (R. Sultanov, Personal Interview, 2016).

There is a strong correlation between Gross Domestic Product (GDP) and the rail industry. The Russian economy is in decline and companies have been forced to cope by experimenting in order to decrease spending (Harral, Winner, Thompson, Sharp & Klein, 2015). Brunswick Rail was leasing its railcars at near 100 percent capacity in the previous fiscal quarter (Brunswick Rail, 2014). The ruble has depreciated by a factor of two since 2012 (World Bank, 2016). Overproduction of railcars since the recovery from the 2008-2009 financial crises has caused a massive drop in railcar pricing. In 2014, Russia entered a recession due to falling oil prices and geopolitical factors. As a result, both the demand and the value of railcars plummeted. See Appendix 7 for further information.

One of the largest Russian companies that lease railcars is Brunswick Rail. Founded in 2004, during the post-Soviet market boom, the company has led the way in railcar leasing. Brunswick Rail has a fleet of over 25,000 railcars. The company is currently undergoing financial restructuring. Brunswick Rail determined that outsourcing railcar maintenance was an area where the company could save money.

In March 2016, Brunswick Rail changed the way the company managed its railcar maintenance. The company previously employed personnel to manage the logistics of the maintenance of its railcars: when the railcars were required to have maintenance, how long the railcars were out of commission due to repairs, and whether the maintenance was up to Brunswick Rail's standards in the level of operation and quality. When Brunswick Rail outsourced its maintenance logistics, the company was able to minimize the number of staff in the technical department. Brunswick Rail also saved money by having two contracts with outside companies to perform maintenance on railcars, instead of paying for each maintenance transaction separately.

The goal of this project was to analyze Brunswick Rail's recent transition to outsourcing railcar maintenance. The goal was accomplished by:

1. Researching Brunswick Rail's current practices for freight railcar maintenance and performing a numerical analysis to determine the effectiveness of switching to outsourcing.
2. Researching the best practices in freight railcar maintenance from North American and European companies.
3. Comparing Brunswick Rail's current maintenance practices with industry standards and providing any recommendations.

2. Background

This chapter consists of three sections. The first section is an overview of the Russian freight rail system and the sponsor, Brunswick Rail. The second section reviews the technical

details of railcar maintenance in Russia. The third section contains an overview of foreign rail markets.

2.1 Russian Freight Rail Industry

The freight rail system in Russia is managed by Russian Railways, RZD (РЖД) and the Ministry of Transport of the Russian Federation. Russian Railways is a government-run company and the third largest railway company in the world. RZD is responsible for management of all the rails in Russia and CIS. RZD also manages the Russian passenger and freight rail lines. Since RZD was founded in 2003, the company has made major advancements in the Russian rail industry. Russian Railways has several goals for the future, including laying 20,000 km of new rails by 2030, upgrading railroads throughout Russia, and expanding high-speed passenger railways. (Russian Railways, 2016)

The Ministry of Transport of the Russian Federation is the executive authority of all transportation in Russia, managing all forms of transportation from air travel to managing road traffic. The Ministry of Transport manages the rail system in conjunction with Russian Railways. (Ministry of Transport, 2015)

2.2 Overview of Brunswick Rail

Brunswick Rail is a freight railcar leasing company based in Moscow, Russia. Working with multiple shipping clients, Brunswick Rail provides railcars for almost any kind of product, ranging from construction materials to oil and coal. The company possesses a fleet of over 25,000 railcars. Old generation railcars make up most of Brunswick Rail's railcar fleet. The company owns a small number of new generation railcars (NGRs) that have higher carrying capabilities and longer maintenance intervals. The company has been in business for over ten years and has grown to be one of the largest railcar leasing companies in Russia.

2.2.1 History of Brunswick Rail

Brunswick Rail was founded in 2004 with the help of international investors and by the end of 2004, the company owned close to 600 railcars. The number of railcars purchased by the company each year continued to increase as investments were made by private companies and international organizations. In five years, the company's fleet had over 10,000 railcars. During the 2008-2009 global financial crises, Brunswick Rail halted its expansion.

In 2010, Brunswick Rail managed to secure a deal for more than 2,000 new railcars and continued expansion in 2011 after receiving over \$500 million from various investors. These investments allowed the company to double the fleet bringing the total number of railcars to 21,700. The fleet's growth has slowed down in recent years with the total number of railcars reaching 26,700 by 2016. (Brunswick Rail, 2016)

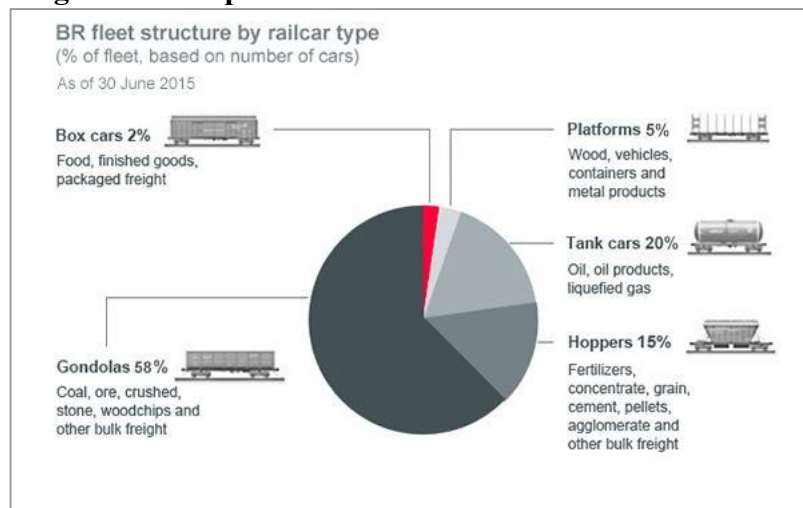
In 2012, Brunswick Rail was issued a \$600 million bond that is due in November 2017. In order to acquire the assets to repay the bond, the company has been restructuring and cutting costs wherever possible. When Brunswick Rail outsourced its maintenance, the company was

able to reduce the number of staff in its technical department. In addition, there was the expectation that there would be a direct cost savings from outsourcing maintenance. This point is discussed in depth in Section 4.2.

2.2.2 Brunswick Rail's Railcar Fleet

Brunswick Rail operates over 25,000 railcars. 58% of the railcars are gondolas, 20% are tank cars, 15% are hoppers, 5% platforms and 2% closed box cars. These percentages nearly represent the market demand in each type of railcars. As of now, all of Brunswick Rail's railcar fleet is operating at full capacity.

Figure 2: Composition of Brunswick Rail's Railcar Fleet



Source: <http://eng.brunswickrail.com/>

2.2.3 Services Provided

Brunswick Rail offers two types of contracts: railcar leasing and operating leaseback. Railcar leasing is the main service the company provides. The length of the contracts usually lasts from one to ten years with adjustments based on the market situation or needs of the customer. The second service is operating leaseback. It is very similar to regular leasing but provides the customer with more freedom in the way Brunswick Rail operates the railcars. Under operating leaseback, the customer gains more flexibility, but incurs the responsibility for managing the fleet. (Brunswick Rail, 2014)

2.3 Outsourcing Practices at Brunswick Rail

Until December 2015, Brunswick Rail managed all of the logistics of maintenance for its railcars internally. For a four month period from December 2015 to March 2016, Brunswick Rail held a trial period of outsourcing maintenance with a company called EuroKit. In this trial, EuroKit managed the logistics of maintenance for Brunswick Rail. After this trial, Brunswick Rail signed three year fixed rate contract with two companies, EuroKit and the General Maintenance Company (GMC), to handle the maintenance of Brunswick Rail's railcars.

2.3.1 Maintenance Practices

Until March 2016, a group of fifteen employees at Brunswick Rail determined when the railcars in the company's fleet needed to be maintained. Brunswick Rail internally managed all of the logistics of railcar maintenance, including tracking position of each railcar, the maintenance status (in terms of time and mileage), and how long the railcar was out of service when undergoing maintenance.

As a result of difficulties in the Russian economy, Brunswick Rail adjusted its railcar maintenance practices. Brunswick Rail was looking for a company that provided both maintenance operations and logistics. The contracted company would manage which railcars needed to go in for repairs and at what time. Factors included determining when the railcar needed maintenance, how long the railcar was out of commission, and other aspects of fleet management. After the trial, two companies were chosen to continue outsourcing maintenance. The General Maintenance Company (GMC) was selected for the majority of operations including capital and current repair. EuroKit was chosen to handle wheel maintenance.

2.4 Maintenance of Railcars

Railcars require repair for different reasons throughout their lifetime. There are three types of maintenance for freight railcars: depot repair, capital repair and current repair.

2.4.1 Depot Repair

Depot repair is preventive maintenance. It consists of basic repair that can be done by workers at any regular train depot. Depot maintenance ranges from visual inspection of railcars, which does not require detaching them from the train, to simple repairs that can be done on the spot by depot staff. In almost every case, the entire process consists of making sure that every aspect of the railcar is within regulations. Depot repair is the most common type of maintenance, because in Russia, it is required for every cargo railcar every 160,000 km.

2.4.2 Capital Repair

Capital repair is required when a railcar has reached a certain age or has exceeded the limit of its travel distance before inspection. All cargo railcars are required to go through capital repair after being in operation for 10 years. Capital repair requires special facilities and staff trained for these types of repairs. This is the process for inspecting and repairing the main systems of railcars, which can range from suspension repair to repainting of the hull. No matter how old the railcar is or the distance it has traveled, this type of maintenance is still required even if the railcar is not damaged. Railcars in pristine condition are required to go through these inspections due to government regulations in Russia.

2.4.3 Current Repair

Current repair refers to emergency repairs. If a railcar is not within specifications, it must be fixed immediately. Current repairs run through Russian Railways and the VRK repair companies. The VRK companies consist of VRK-1, VRK-2 and VRK-3, and are the maintenance facilities that were created by Russian Railways as part of an initiative to restructure the railcar maintenance industry. (VRK, 2016) It is the responsibility of Russian Railways to identify broken cars and direct them to one of the VRKs' repair shops. Russian Railways then charges the owner (P. Gordievsky, Personal Interview, August 31, 2016). Generally these types of repairs are minimal due to the strict preventative maintenance schedule.

2.4.4 Regulations in Russia

Regulations for railcar maintenance in Russia are very strict when it comes to defining standards of quality. Each type of railcar has its own extensive "ГОСТ" document ('GOST' Government Standard rus.). Every aspect of the maintenance is catalogued, down to the smallest step of every procedure. These documents are extremely precise in their descriptions and are filled with technical data about every part of a railcar and the way it must be maintained.

There are general regulations that apply to most types of railcars regardless of their specifications. As mentioned in Section 2.4.1 and Section 2.4.2, these regulations concern the travel distance limit of all basic railcar types before maintenance is required as well as active service time between mandatory maintenance procedures. Any other specifications are shown in the GOST documents.

Lastly, as with all systems, there are events that cannot be accounted for. There have been concerns of poor quality, including repairs not being completed properly or expired parts being fitted on trains. However, legislation passed in August 2016 has seemingly eliminated loopholes and ensures that nefarious actions would be detected. As an example, one of the legislations strengthens the independent monitoring organization ГBC (P. Gordievsky, Personal Interview, August 31, 2016). It is now difficult to have a railcar part be unaccounted for, a bad part used when it should be scrapped, or trains leaving repair yards with other damage. Although, it should be noted that since it is a very recent change, some loopholes may be found in the future.

2.4.5 Technical Details for Maintenance Outside of Russia

The main difference between the European, North American and Russian freight rail infrastructures is that the European and North American industries are more privatized than the Russian one. This is especially true in America where railroads are privately owned. Industry privatization leads to much more relaxed government regulations on railcars. Private companies create their own guidelines for maintenance which are driven by maximizing safety and profit (M. Montencourt, Personal Interview, September 6, 2016). In America, regulations can be stricter because different states have their own sets of regulations, forcing companies to follow additional regulations instead of only the federal government ones or ones set in place by private companies.

2.5 Brunswick Rail's Contracted Railcar Maintenance Companies

In March 2016, Brunswick Rail signed contracts with two maintenance companies: EuroKit for the maintenance of the wheelsets, and the General Maintenance Company (GMC) for all other types of maintenance. This section includes background information on the companies.

2.5.1 EuroKit

EuroKit is a company that provides railcar maintenance and testing. EuroKit was founded in 2013, and they perform railcar safety testing services for Russian Railways, Moscow Metro and Aeroexpress. EuroKit performed a four month trial with Brunswick Rail for its maintenance outsourcing from December 2015 to March 2016. After this trial, EuroKit was selected to manage the wheelset maintenance for Brunswick Rail.

2.5.2 General Maintenance Company

To maintain a level of confidentiality in the maintenance outsourcing contract, the name of the company that Brunswick Rail has contracted will be referred to as the "General Maintenance Company" or GMC, throughout the paper.

2.6 The Freight Rail Industry in North America and Europe

One of the objectives of this study was to compare railcar maintenance practices between railcar leasing companies around the world. To fulfill this objective, it was necessary to conduct background research on companies of interest that may be selected for the comparison study. What follows is background information on railcar companies that can be found in North America and Europe that were included in the study.

2.6.1 North American Freight Rail Industry

The largest distinction in North American markets is that freight rails are privately owned. Although there are some federal regulations, most standards are set by the American Association of Railroads (AAR). The association is an industry member run organization.

A key difference between the Russian and North American freight rail markets is their governing bodies. In Russia, rules are developed by either the Ministry of Transport or Russian Railways. AAR's members are class I American railway companies. As opposed to the Russian standards, American standards are set by the companies themselves. Therefore, the AAR is motivated to do what is most efficient, cost effective and easy for the industry.

What follows are background details about large North American freight rail companies. The maintenance practices of these three companies were compared to those of Brunswick Rail.

Founded in 1898, GATX is one of the largest freight railcar leasing companies in North America. The company commands a fleet of over 125,000 railcars, primarily around its headquarters in Chicago. In addition, GATX commands an auxiliary fleet of 23,000 railcars in Europe and India. Similar to Brunswick Rail, GATX focuses on leasing operations. In addition,

GATX has 30 maintenance locations throughout the United States, 20 of those being mobile maintenance locations for minor repairs, 6 major service facilities to perform capital repair and four field maintenance facilities to perform smaller, depot repairs. (GATX, n.d.)

TrinityRail is one of the companies in the Trinity Industries group. TrinityRail is a railcar maintaining and management company. It is based in Dallas, Texas, USA. The company provides a number of services to its clients including asset and inventory management, railcar maintenance, and rail fleet optimization. TrinityRail has five maintenance facilities located in the southern United States. (TrinityRail, n.d.)

Progress Rail is a railcar company that provides services in North America, Canada and Mexico. Progress Rail offers railcar leasing contracts that include maintenance from its facilities. There are four different types of leasing contracts that Progress Rail offers, full service lease, net lease, per diem lease and purchase leaseback. Progress Rail also sells used railcars. The company has nine mobile repair facilities spanning from Texas to Indiana. (Progress Rail, 2015)

2.6.2 European Freight Rail Industry

The European railway system is extremely large and spans wide. There are many companies throughout Europe that practice similar leasing styles to Brunswick Rail, and those will be outlined here to provide background for the comparison.

VTG is a railcar leasing company based in Europe, with a small fleet in North America and new acquisitions in Russia. Founded in 1951 and privatized in 1961, VTG has the largest privately owned railcar fleet in Europe, possessing over 80,000 railcars with 1,000 different types. VTG's three departments are the wagon hire department, the logistics department and the tank container logistics department. VTG has maintenance facilities in France and Germany, and a construction plant in Germany. (VTG, 2015). The logistics division of VTG helps private companies who want to lease railcars plan out the logistics of the trip, and gives each one an advisor to oversee the travel of the company's railcars.

European Rail Shuttle (ERS Railways) is a European railcar company with over 450 customers. ERS Railways is an independent company that has offices in Germany, Poland and the Netherlands. The company is one of the leaders in Europe. ERS Railways attributes its success to having strategic partnerships and also having a marine network. The company is also very environmentally conscious, with sustainability as a core value. ERS Railways is also one of the leading railcar companies in safety in this industry. (ERS Railways, 2016)

3. Methodology

The goal of this project was to analyze Brunswick Rail's recent transition to outsourcing railcar maintenance. The goal was accomplished by researching the results of the switch to outsourcing maintenance and comparing them to other effective railcar maintenance practices in North America and Europe. Effective practices are those that are economically profitable or generally accepted in industry. After analyzing these factors, recommendations were presented to Brunswick Rail.

3.1 Objective 1

The first objective was to review Brunswick Rail's current outsourcing maintenance practices, and compare them to the company's previous insourcing practices. There are two parts to this objective. The first part is a qualitative analysis to determine the benefits of both maintenance practices. The second part is a quantitative analysis to determine the cost savings or cost increases.

3.1.1 Qualitative Analysis

The first part of the methodology for objective one was to audit Brunswick Rail's current and previous maintenance practices. Brunswick Rail was looking to reduce its operating costs, and the maintenance of its railcars was an area determined to have inefficiencies and opportunities for cost to be reduced. There are two methods by which this objective was executed.

The first method utilized was personal interviews. It was crucial to have a strong understanding of the nuances of the business. Individuals who were interviewed include, Richard Sultanov, the project's liaison, Pavel Gordievsky from the technical department at Brunswick Rail and John Winner, one the authors of a due diligence report commissioned by the company in 2015.

The second method was analysis of documents. Many documents, both public and classified were provided to this group from Brunswick Rail, consultants, and industry experts. The data was analyzed in the audit of the company's maintenance.

The data from the previous two methods was compiled into two SWOT analyses of Brunswick Rail's maintenance practices, before and after the outsourcing contract. SWOT is an acronym for strengths, weaknesses, opportunities, and threats. The information about Brunswick Rail, that was gathered through documents and interviews were sorted into those four categories. The purpose of this analysis is to understand factors that cannot be explained by numbers alone.

3.1.2 Quantitative Analysis

The second part of this objective was to perform a numerical analysis to quantitatively determine the effects of outsourcing railcar maintenance. Students from the Financial University were consulted for this portion.

The analysis was a direct cost comparison between insourcing and outsourcing railcar maintenance. The costs were evaluated categorically. The following costs were investigated before and after outsourcing:

1. Depot repairs: The cost Brunswick Rail is billed to have a depot repair performed by GMC
2. Capital repairs: The cost Brunswick Rail is billed to have a capital repair performed by GMC
3. Steaming: A cleaning process for tanker railcars.

4. Wheelsets: The cost of a wheelset replacement.

Although the entire cost of maintenance may be higher or lower, it was important to understand which areas had significant change. From that, recommendations were derived.

3.2 Objective 2

The purpose of this objective was to determine the effectiveness of maintenance practices of other companies in North America and Europe. These findings were compared with Brunswick Rail's practices for outsourcing maintenance. Brunswick Rail was then advised on how the company's current maintenance strategy compares to the findings from the data.

This objective was carried out by doing online research of industry journals and websites. In order to do a comparative analysis of different contracting maintenance practices, there was a fixed set of criteria to compare the different companies in the study. These criteria include: the cost of maintenance, how often railcars are maintained and other factors that determine how costly, effective and efficient the maintenance process is for that company. The names of each criterion and their respective meanings are listed in Appendix 7.

After the data was collected, a comparison table was generated from the different companies. The table included key qualitative and quantitative information about each company. Not all fields were made publicly available by each company. However, because more than enough companies were reviewed, there were always a statistically significant number of companies' facts for each criterion.

Finally, trends were generated from the spreadsheet. There were three kinds of trends that were of interest. The results of the previous three analyses are presented as pie charts in Section 4.3. These pie charts show the acceptance among industry of particular practices (see Appendix 7). Correlations were deduced between these practices and the size of the fleet.

3.3 Objective 3

The final task is to generate recommendations for Brunswick Rail. To evaluate all of the proposed recommendations, a SCOPE analysis was used. Figure 3 describes the SCOPE analysis. The SCOPE method is optimal for analyzing recommendations. Conversely, the SWOT analysis is designed for evaluating current practices. Therefore, the SCOPE analysis was selected to effectively provide recommendations based on different situations. Figure 3 shows a chart that describes the five aspects of SCOPE analysis.

Figure 3: Explanation of the SCOPE Analysis

<i>Situation</i> : Potential background scenario
<i>Core Competencies</i> : Internal factors at which Brunswick Rail excels
<i>Obstacles</i> : External factors that may affect the situation
<i>Prospects</i> : Most favorable outcomes
<i>Expectations</i> : Realistic outcomes

The “situation” and “obstacles” components are more likely to change with time. It was important to develop recommendations not only on the current situation and obstacles of Brunswick Rail, but of hypothetical situations and obstacles. Currently, Brunswick Rail does not possess the liquid assets for a large infrastructure development (Harral, Winner, Thompson, Sharp & Klein, 2015). Hence, many aspirations of the company cannot be implemented for the foreseeable future.

4. Results

The results are organized by objective. Section one is the qualitative audit of Brunswick Rail’s maintenance practices presented as two SWOT analyses. Section two outlines the comparative cost analysis for before and after the outsourcing contract. Section three contains the best maintenance practices in North America and Europe. The final section contains potential recommendations and their SCOPE charts.

4.1 SWOT Analysis of Brunswick Rail’s Outsourcing

This section shows the strengths, weaknesses, opportunities and threats of Brunswick Rail’s previous and current maintenance practices. Figure 4 is a SWOT chart of the company's maintenance practices before the company switched to the outsourcing system in March 2016.

Figure 4: SWOT Analysis of Brunswick Rail’s Maintenance Practices Pre-Outsourcing

<p>Strengths</p> <ul style="list-style-type: none"> • More control over the maintenance process 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Time and manpower to manage maintenance logistics • Additional operating expenses
<p>Opportunities</p> <ul style="list-style-type: none"> • Easier to expand fleet 	<p>Threats</p> <ul style="list-style-type: none"> • Poor quality of maintenance • Potential for corruption

Control over the process: Brunswick Rail has complete control over the logistics of the fleet and can make adjustments if deemed necessary. Aspects of maintenance include, which repair depots are utilized, moving the railcars across the country to the depots, and timing.

Time and manpower to manage: Brunswick Rail needed fifteen employees to manage maintenance logistics. Hence, an undesirable increase in payroll, which could not be diverted to paying off debts.

Additional operating expenses: Brunswick Rail has to pay certain depot fees to RZD in order to be able insource maintenance.

Easier to expand fleet: Since Brunswick Rail is independent of other companies; it can increase the size of its fleet without having to change already existing maintenance contracts or creating new ones.

Poor quality of maintenance: Monitoring multiple large facilities is a difficult task. This makes it difficult to ensure that repairs are meeting industry and company standards and expectations.

Potential for corruption: The possibility of repair facilities being dishonest with their customers must be considered. Dishonest actions can include unnecessary maintenance, using expired parts, or damaging the railcars.

After the Switch to Outsourcing in March 2016

Figure 5 is a SWOT chart of Brunswick Rail's maintenance practices after the company switched to the outsourcing contracts.

Figure 5: SWOT Diagram of Outsourcing Maintenance

<p>Strengths</p> <ul style="list-style-type: none"> ● Maintenance is managed for Brunswick Rail ● Reduced capital cost - 15 employees and the resources they consume ● Locked in price 	<p>Weaknesses</p> <ul style="list-style-type: none"> ● Reduced Oversight of maintenance logistics
<p>Opportunities</p> <ul style="list-style-type: none"> ● Ability to involve multiple outsourcing companies to negotiate the best rates 	<p>Threats</p> <ul style="list-style-type: none"> ● Poor quality ● Potential for corruption ● Partner failing to provide expected workload

Maintenance is managed for Brunswick Rail: The company no longer has to manage its own maintenance logistics.

Reduced capital cost (employees): Staff in the logistics department at Brunswick Rail can be reduced, since outside maintenance companies take that responsibility.

Locked-in price: The maintenance contract contained fixed pricing. This is an advantage to Brunswick Rail, as the company would previously have to pay for repairs individually at the depots, which could yield higher prices.

Reduced oversight: Brunswick Rail no longer has the same level of oversight in railcar maintenance as when the company practiced insourcing. With GMC and EuroKit, performing the work on Brunswick Rail’s behalf, it is imperative to have trust in these companies.

Ability to involve multiple outsourcing companies to negotiate the best rates: This opportunity was utilized by contracting both Eurokit and GMC to maintain separate portions of railcar maintenance. Eurokit offered the best rate on wheelsets. GMC offered the best rates overall on other aspects of maintenance.

Poor quality of maintenance: Monitoring multiple large facilities is a difficult task. This makes it difficult to ensure that repairs are meeting industry and company standards and expectations.

Potential for corruption: The possibility of repair facilities being dishonest with their customers must be considered. Dishonest actions can include unnecessary maintenance, using expired parts, or damaging the railcars.

Partner failing to provide expected workload: This threat was manifested in GMC’s failure to fulfill the maintenance contract. Repair prices in the market rose, forcing GMC to raise prices of their services to Brunswick Rail.

4.2 Numerical Analysis

Using the numerical method explained in Section 3.1.2, the calculated cost savings from the switch to outsourcing are shown here. This results section is a component of objective 1.

4.2.1 Cost Comparison

After analyzing the numbers provided by Brunswick Rail, costs of railcar repairs have been determined. Table 1 shows the prices of repair while insourcing and prices provided by GMC after the trial period. All cost values are quoted in Rubles.

Table 1: Cost Comparison of Insourcing and Outsourcing Maintenance

<u>Category</u>	<u>Insourcing Cost</u>	<u>Outsourcing Cost</u>	<u>% Change</u>
Depot repairs	63,250	55,500	-12%
Capital repairs	101,786	89,598	-11%
Steaming	8,569	6,500	-24%
Wheel set replacement	51,260	46,610	-9%

As shown above, the prices provided by GMC are significantly lower than what Brunswick Rail was spending while insourcing the maintenance. However, after a short period of working with Brunswick Rail with such low prices, GMC came to a conclusion that the contract is not sustainable given the current economic climate. The contract was renegotiated and the prices were adjusted. The updated prices are shown in the Table 2.

Table 2: Comparison of Insourcing Costs and Revised Outsourcing Costs

<u>Category</u>	<u>Insourcing Cost</u>	<u>New Outsourcing Cost</u>	<u>% Change</u>
Depot repairs	63,250	62,000	-2%
Capital repairs	101,786	97,400	-4%
Steaming	8,569	9,620	+11%
Wheel set replacement	51,260	48,563	-5 %

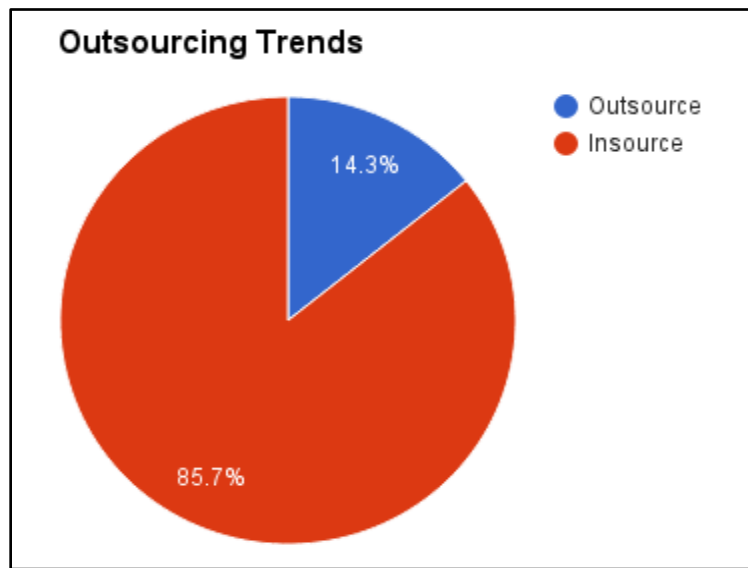
The price for steaming increased beyond the original insourcing value. However, even though steaming became more expensive than the insourcing option, the overall savings outweigh that price increase.

4.3 Best Practices in North American and European Markets

North American and European freight railcar leasing companies were researched. Their best practices were assembled into a spreadsheet. The spreadsheet is located in Appendix 8. A total of nine companies were researched from North America, Europe, and Russia. Three trends were gathered from the data.

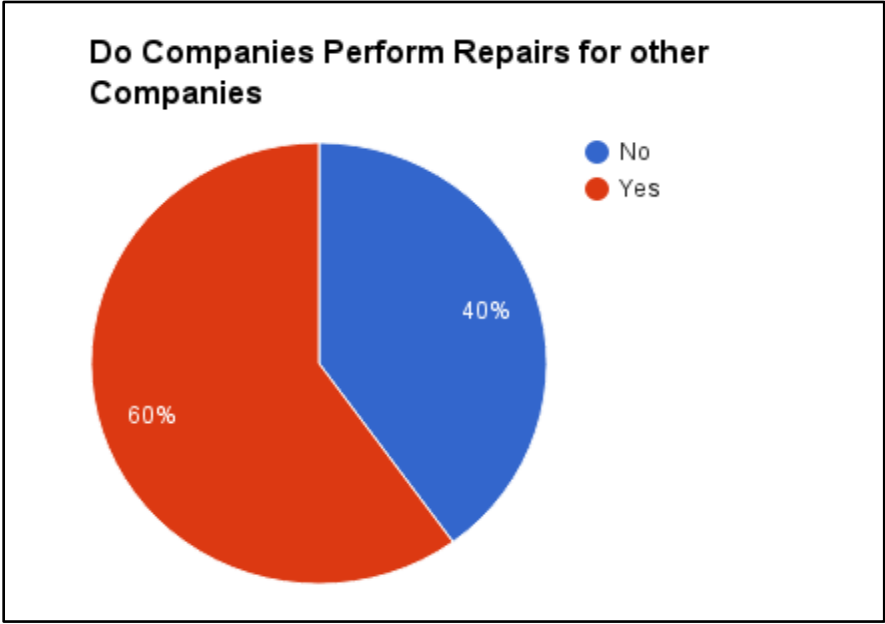
First of all, it was determined that maintenance outsourcing is not a common practice (Figure 6). However, the sample mainly consisted of large companies with big fleets of railcars. Brunswick Rail does not operate on that scale, so it is possible that the data does not apply directly to the company.

Figure 6: Distribution of Railcar Leasing Companies that Insource vs. Outsource Maintenance



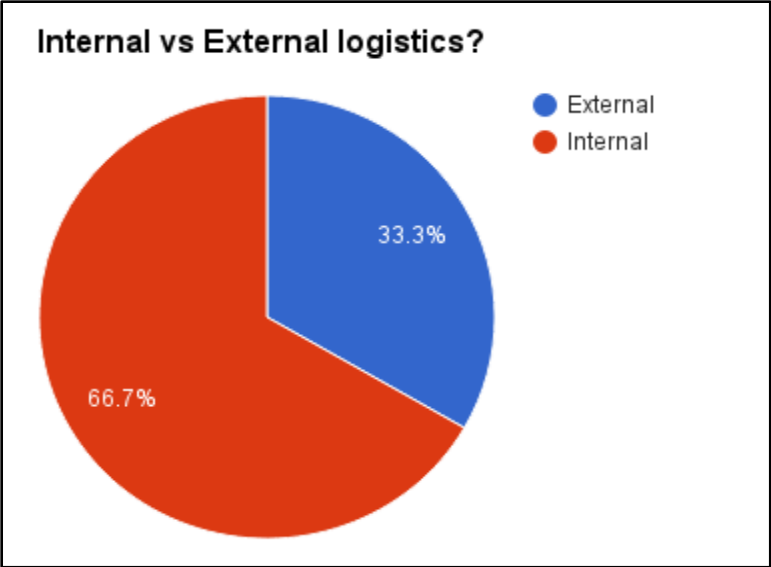
The second trend that the railcar leasing companies that do insource their maintenance also offer their repair services to other rail companies. Some larger companies, with more diversified core assets, not only insource maintenance, but also sell that service to other rail companies. In a sample of five companies that insource maintenance, three were found to offer their repair services to other companies. As Brunswick Rail increases its size and capabilities, the company could consider adopting this practice.

Figure 7: Distribution of companies that insource maintenance, who also performs repairs for other companies



The third trend is the prevalence of an internal maintenance logistics team in railcar leasing companies (Figure 8). Logistics refers to the scheduling the transfer of railcars to particular depots, when they need to be serviced.

Figure 8: Distribution of companies that utilize internal and external maintenance logistics



4.4 Validation of Recommendations

This section compares the maintenance practices of Brunswick Rail to maintenance practices in North America and Europe. The SCOPE analysis was used to determine if any recommendations could be successfully implemented by Brunswick Rail.

4.4.1 Recommended actions for when the maintenance contract expires

This section discusses whether the current contract should be renewed when it expires three years from May 2016. As discussed in Section 3.3, the SCOPE method was used to assess these hypothetical recommendations. Optimistic and pessimistic situations were considered.

Figure 9: SCOPE Chart of The decision process to renew the contract in an optimistic environment

<p><i>Situation:</i></p> <ul style="list-style-type: none">● May, 2019● Maintenance outsourcing contract has expired● Eurokit and the General Maintenance Company are willing to renew the contract
<p><i>Core Competencies:</i></p> <ul style="list-style-type: none">● Financial success from the current contract
<p><i>Obstacles:</i></p> <ul style="list-style-type: none">● Eurokit and GMC are demanding clauses to renegotiate pricing
<p><i>Prospects:</i></p> <ul style="list-style-type: none">● Brunswick Rail receives a financially favorable deal
<p><i>Expectations:</i></p> <ul style="list-style-type: none">● The prices are fixed for the length of the contract

Figure 10: SCOPE chart for the decision process to renew the contract in a pessimistic environment.

<p><i>Situation:</i></p> <ul style="list-style-type: none"> • May, 2019 • Maintenance outsourcing contract has expired • EuroKit and GMC are willing to renew the contract • Brunswick Rail still has debts to be repaid
<p><i>Core Competencies:</i></p> <ul style="list-style-type: none"> • Financial success from the current contract
<p><i>Obstacles:</i></p> <ul style="list-style-type: none"> • EuroKit and GMC are demanding higher prices. • GMC is demanding clauses to renegotiate pricing.
<p><i>Prospects:</i></p> <ul style="list-style-type: none"> • The prices are fixed for the length of the contract
<p><i>Expectations:</i></p> <ul style="list-style-type: none"> • Brunswick Rail would be fixed into a contract with higher than current prices.

4.4.2 Expanding Brunswick Rail’s core assets

This section analyzes the prospect of Brunswick Rail diversifying its offering beyond railcar leasing by expanding along the value chain. All of these examples would likely only take effect under more beneficial financial conditions. Examples include:

- **Expanding Fleet Size:** Brunswick Rail is currently a third tier rail company with a fleet size of just over 26,000 railcars. The company’s management has expressed interest in expanding its fleet to 40,000 railcars and becoming a second tier company. The first benefit is to increase profits. The second benefit concerns implementation of other expansions described in the following bullet points. However, expanding the fleet can only be undertaken when significant debts have been repaid, and when there is a market demand.
- **Constricting fleet composition:** Currently Brunswick Rail maintains a very diverse fleet of railcars, with quantities of each kind that reflect market demand. However, if financial circumstances become even worse, the company must reduce its expenditures. The

company could foreseeably tighten its focus by cutting the number of railcar types. (See Figure 2 in Section 2.2.2 for precise fleet composition).

- **Creating a maintenance/general purpose logistics department:** Brunswick Rail outsourced these operations last spring. This has provided a short term monetary gain by reducing fifteen employees from payroll. Once Brunswick Rail manages to expand its fleet to desirable size it is feasible that the company could return to their insourcing practices.
- **Joining an industry trade organization:** Currently, the majority of oversight in the Russian freight rail industry is through RZD. In North America, industry standards are set by AAR. The Russian rail industry is also becoming more privatized (M. Montenecourt, Personal Interview, September 6, 2016). Although RZD still sets regulations, it is only a matter of time before these decisions are placed in the hands of private companies. When this opportunity arises, Brunswick Rail should take advantage of it, to become one of the standard bearing members.
- **Owning repair depots:** Brunswick Rail uses GMC to work with the repair depots. There is an opportunity for the company to streamline this process by owning the repair depots themselves. That is not currently feasible. However, with an expanded fleet, and fewer internal debts, Brunswick may have this capability in the future.

Figure 11: A SCOPE chart for value chain expanding options

<p><i>Situation:</i></p> <ul style="list-style-type: none"> ● Railcar leasing is the only service Brunswick Rail currently offers. ● Other railcar companies in North America have diversified their offerings into such businesses of leasing marine equipment or logistics service.
<p><i>Core Competencies:</i></p> <ul style="list-style-type: none"> ● A strong market position in railcar leasing. ● A management philosophy that is willing to adopt ideas that oppose tradition Russian business practices.
<p><i>Obstacles:</i></p> <ul style="list-style-type: none"> ● There is often a high barrier of entry for new markets. ● Management has not specifically shown interest in this idea. ● Brunswick Rail does not possess the liquid assets necessary to start such a large undertaking.
<p><i>Prospects:</i></p> <ul style="list-style-type: none"> ● Monetary gains. ● Lower risk of company failure due to having stakes in multiple industries.
<p><i>Expectations:</i></p> <ul style="list-style-type: none"> ● Brunswick Rail does not have the assets to implement. A potential way to increase revenue down the line.

4.4.3 GMC's maintenance price increase

This section reflects a recent development in Brunswick Rail's maintenance outsourcing contract. The contract was negotiated at a fixed price. However, the cost of railcar repairs has increased by 20% since the contract was signed (Brunswick Rail, 2016). The GMC has implored Brunswick Rail to renegotiate the contract. The proposed changes are outlined in Figures 12, 13 and 14:

Three options were determined by Brunswick Rail management:

1. Terminate the contract with GMC, and switch back to insourcing with direct contracts with depots. This was not deemed a valid option. The main concerns are the need to hire more technical specialists, and expected price increases

Figure 12: SCOPE Chart of Option 1

<p><i>Situation:</i></p> <ul style="list-style-type: none"> ● GMC is contractually obligated to provide maintenance services at a fixed rate.
<p><i>Core Competencies:</i></p> <ul style="list-style-type: none"> ● GMC offered the best rate in a 3 month trial, so Brunswick Rail locked down that contract
<p><i>Obstacles:</i></p> <ul style="list-style-type: none"> ● Brunswick Rail would need to contract directly with the repair depots ● Additional personnel at Brunswick Rail would be required to manage these operations.
<p><i>Prospects:</i></p> <ul style="list-style-type: none"> ● Increased expenditures on maintenance from Brunswick Rail ● Significant opportunity costs in reverting to insourcing
<p><i>Expectations:</i></p> <ul style="list-style-type: none"> ● Increased expenditures on maintenance from Brunswick Rail ● Significant opportunity costs in reverting to insourcing

2. Terminate the contract with GMC, and sign a contract with a different company. This was not deemed a valid option as well. Even though the prices were raised, GMC offered a reasonable price. Finding an alternative with even lower prices would be extremely difficult.

Figure 13: SCOPE Chart for Option 2

<p><i>Situation:</i></p> <ul style="list-style-type: none">● GMC is contractually obligated to provide maintenance services at a fixed rate.
<p><i>Core Competencies:</i></p> <ul style="list-style-type: none">● GMC offered the best rate in a 3 month trial, so Brunswick Rail locked down a contract
<p><i>Obstacles:</i></p> <ul style="list-style-type: none">● It cannot be guaranteed that a new maintenance company would be able to contract with Brunswick Rail.
<p><i>Prospects:</i></p> <ul style="list-style-type: none">● It is known that GMC already offered the best price on the market
<p><i>Expectations:</i></p> <ul style="list-style-type: none">● Significant increase in expenditures.

3. Continue working with GMC and accept the increase in prices. Even with the renegotiated prices, GMC would still be providing Brunswick Rail with the best maintenance rates. **This is the recommended option.**

Figure 14: SCOPE Chart for Option 3

<p><i>Situation:</i></p> <ul style="list-style-type: none"> ● GMC is contractually obligated to provide maintenance services at a fixed rate.
<p><i>Core Competencies:</i></p> <ul style="list-style-type: none"> ● GMC offered the best rate in a 3 month trial, so Brunswick Rail locked down a contract with GMC
<p><i>Obstacles:</i></p> <ul style="list-style-type: none"> ● Setting a precedence that “fixed-rate” contracts can be adjusted when there is massive variation from spot prices
<p><i>Prospects:</i></p> <ul style="list-style-type: none"> ● Increased maintenance costs that are still the best deal in the market
<p><i>Expectations:</i></p> <ul style="list-style-type: none"> ● Increased maintenance costs that are still the best deal in the market

5. Recommendations

This section consists of the recommendations to Brunswick Rail. This includes: the situations with which it would be plausible to implement these recommendations, the projected risks, and projected outcomes.

The first recommendation for Brunswick Rail is to accept the proposed contract changes from GMC. It would be far more costly to revert to insourcing, or replace GMC with another maintenance company than to agree to the renewed prices.

It is also recommended that Brunswick Rail continues to outsource their maintenance. The economic climate is currently extremely volatile. In these conditions fixed prices are more beneficial and remove the risk of rapidly changing rates.

The last recommendation is that Brunswick Rail should seek to join an industry trade group. The Russian railway industry is on its way to privatization. As this happens it is likely that a similar organization to AAR would appear. In such case we would recommend Brunswick Rail join it as soon as possible to secure its place as a core member.

Conclusion

Brunswick Rail has implemented a maintenance outsourcing strategy to reduce operating expenses. A SWOT analysis and cost comparison was performed to determine the efficacy of switching to maintenance outsourcing. The maintenance contract was determined to be financially advantageous for Brunswick Rail. In the SWOT analysis, the risks of internal corruption are considered to be mitigated. The best practices of railcar leasing companies in North America and Europe were researched. The research was compiled into a spreadsheet, and the popular maintenance practices were determined by the percent occurrence within the industry. Using the most popular maintenance practices in North America and Europe, and the current practices of Brunswick Rail, recommendations were derived. The company should renew the maintenance contract when it expires, presuming that similar favorable conditions are met. At this time Brunswick Rail should stick to its business practice and continue to perform the sole service of railcar leasing. However, if more liquid assets become available, it would be advantageous for the company to diversify its offerings. Such ideas include acquisition of depots or offering logistics services to shippers.

For a number of reasons (See Appendix 6), Brunswick Rail is in a period of financial stagnation along with the Russian economy. Given the effective switch to outsourcing railcar maintenance, repaying the bond will be the most important task for Brunswick Rail for the coming months.

Appendix 1: Initial Interview with Richard Sultanov

On March 25, 2016, Richard Sultanov was interviewed over the phone. The WPI Team, Svetlana Nikitina and Thomas Balistreri were present. Richard Sultanov is the Director of Strategic Marketing, Development & Communications and assistant to the CEO at Brunswick Rail. He was able to clarify initial project objectives and provide information to the students about Brunswick Rail as background information.

Mr. Sultanov started by talking about Brunswick Rail's relationship with WPI and IQP projects. Brunswick Rail has collaborated as an IQP project sponsor with WPI for 2 years, and the project that was conducted by the group last year was a project about new generation railcars (NGR). He indicated that the report findings may be pertinent in financial restructuring discussions.

Mr. Sultanov then discussed Brunswick Rail as a company including information about their history, the services provided and the company's standing as it was in March 2016. He talked about how Brunswick Rail was founded in 2004. They are a railcar leasing company with a newer fleet, and they work with some of the largest clients in Russia. They lease railcars to shipping companies so that the client can use railcars without having to buy their own. Brunswick Rail is going through financial restructuring as a company, so they are looking for areas to cut costs and save money.

After a brief overview of the company, Mr. Sultanov described our project and gave background information about what tasks Brunswick Rail wanted us to complete. The project focuses on outsourcing railcar repairs for Brunswick Rail. They have a fleet of over 26,000 railcars and do not have maintenance or repair facilities of their own. Instead, they had a technical department that monitored and managed the logistics of the cost of maintenance, made sure the railcars received maintenance when it was required and monitored the amount of time the railcars were gone. Other companies outsource their maintenance completely, meaning that they had a contract with an outside company to manage their maintenance, when the cars needed to be maintained, cost logistics, etc.

Mr. Sultanov told us that at the time of the interview, Brunswick Rail had twelve companies interested in managing their maintenance that made the company offers. By switching to outsourcing, Brunswick Rail expected to have a 10% savings in this department, fixed prices for three years of service and better management of maintenance logistics. They would also only have to have two or three people at Brunswick Rail employed to provide quality control for the repaired railcars, making sure that everything was running smoothly and the repairs are up to standard and done correctly.

In terms of comparison, Mr. Sultanov expressed interest in research of what other companies in this market do for maintenance. Some of the examples he mentioned included

whether or not they perform maintenance at their own maintenance facility, bring the railcars to depots and manage logistics themselves or completely outsource their maintenance.

We then discussed maintenance standards in Russia in order to gain an understanding of the Russian market. Mr. Sultanov told us that safety of railcars is much regulated in Russia. Most of the maintenance is preventative because of these regulations. The regulations require every railcar to be inspected based on mileage and age. There are different types of repairs required called depot repairs, preventative maintenance and capital repairs, larger scale repairs.

Mr. Sultanov then detailed what the team should begin looking for in their research. He told us to focus on background research of Brunswick Rail and other railcar leasing companies in North America and Europe, that he would send in a list.

Finally, Mr. Sultanov discussed Brunswick Rail's trial with a maintenance outsourcing company. Of the twelve companies that offered bids, Brunswick Rail chose one company to do a four month trial of managing the logistics of their maintenance. They chose EuroKit for the trial, but at the time of the interview, did not think they would have a full contract with them because of EuroKit's pricing. After reviewing the offers, Brunswick Rail was considering the General Maintenance Company because they had the best pricing in terms of oil tanker repair and steaming and painting and better payment terms. Brunswick Rail was also interested to see if the new system of outsourcing maintenance really does work better than having a logistics department in house.

At the end of the interview, we thanked Mr. Sultanov for his time and established options for further contact if necessary.

Appendix 2: Interview with Pavel Gordievsky

On August 31, 2016 at the Brunswick Rail office in Moscow, Pavel Gordievsky was interviewed. The WPI team and Richard Sultanov were present. Pavel Gordievsky is Brunswick Rail's Technical Director and was able to answer questions the team had about the logistics of Brunswick Rail's maintenance, railcar parts, some information about leasing contracts and maintenance and the rail system's management. Since Mr. Gordievsky did not speak English, Nikolay Uvarov and Richard Sultanov conducted the interview and translated.

Mr. Gordievsky began by introducing himself and we introduced our group. We first asked him about how Brunswick Rail manages spare railcar parts. He told us that Brunswick Rail tries to recycle parts. The expired parts are taken off the railcars and can be sold as scrap metal for profit. The company has a system in place to manage this.

After asking about railcar parts, we asked Mr. Gordievsky about quality control procedures in the Russian rail industry. Russian Railways created the VRK maintenance companies in an effort to reform the railcar maintenance industry. He also told us about how there used to be issues in the industry with maintenance companies reusing old and expired railcar parts on railcars instead of completely replacing them, then charging for new parts. In August 2016, new rules and regulations were implemented to prevent this fraud. The system is very organized and as it stands, resistant to corruption. These new rules affected a company called GBS (ГБС) that stores all the information on railcar parts in Russia and CIS countries. This company has all of the serial numbers for every railcar part with the date made and other information stored in databases. After these new regulations, the system has become very hard to cheat. In the past, someone could enter false numbers into the database in order to reuse an old or expired railcar part. Now, access to this database has been restricted and only the facilities that manufacture the railcar parts can edit the database.

Mr. Gordievsky then spoke about some of the specifications of Brunswick Rail's railcar fleet. About 70% of Brunswick Rail's railcar fleet was made initially in Ukraine, as well as all spare parts. Ukraine has the same rail standards as Russia, but in the past there were issues with parts not being up to standard. One of Brunswick Rail's railcars derailed because of poorly made Ukrainian parts. Mr. Gordievsky discussed NGRs next. He believes that there is no infrastructure to maintain a large fleet of NGRs at this time. The parts are hard to find because there is not high demand for them.

The final topic we discussed was liability for certain maintenance issues. We had questions about who would be responsible for paying for damage caused by a shipper. Mr. Gordievsky informed us that if a railcar was damaged while being loaded or unloaded, the shipper is fully liable for repair. This is written into every contract so that Brunswick Rail would not have to pay for damage to a railcar that was done by the shipper.

At the end of the interview, we thanked Mr. Gordievsky for his time and established options for further contact if necessary.

Appendix 3: Interview with Roman Sidoruk and Aleksandr Kryukov

On August 31, 2016 at the Brunswick Rail office in Moscow, Roman Sidoruk and Aleksandr Kryukov were interviewed. The WPI team was present. Roman Sidoruk and Aleksandr Kryukov work under Pavel Gordievsky in the technical department. They were able to answer questions the team had about the logistics of Brunswick Rail's maintenance and the company itself. Since Mr. Sidoruk and Mr. Kryukov did not speak English, Nikolay Uvarov conducted the interview and translated.

Mr. Sidoruk and Mr. Kryukov began by introducing themselves to the team and briefly describing their positions at Brunswick Rail. They informed us that they work with Pavel Gordievsky in Brunswick Rail's technical department. They work on managing trains and deal with spare train parts.

After the interview with Pavel Gordievsky, we mainly had questions regarding spare parts for railcars and who manages where they go. We asked what they would do if a railcar needed parts for a certain repair to happen, and what they do with parts that are still good once they are removed from railcars. They then told us about the small stock of parts that they have at depots. There are parts waiting at different depots, so if a railcar needs a part at a certain depot, there is usually one already there. If a railcar needs a part that is at a different depot, the part usually is not shipped from one depot to another, a new part will be purchased at the depot where the railcar is being repaired. They have accumulated enough parts that they are even considering selling some of the stock of their viable parts.

At the end of the interview, we thanked Mr. Sidoruk and Mr. Kryukov for their time and established options for further contact if necessary.

Appendix 4: Interview with Marcus Montenecourt and Terry Ward

On September 6, 2016 at the Amsted Rail office in Moscow, Marcus Montenecourt and Terry Ward were interviewed. The WPI team, Richard Sultanov, Zarina Baytsaeva and Ivan Anosov were present. Marcus Montenecourt is the Vice President Commercial for Europe, Russia, CIS and Asia. Terry Ward is the Controller for Russia and CIS. Amsted Rail is a railcar part designing and manufacturing company with facilities all over the world. They were able to answer questions the team had about their company and rail industries around the world.

Mr. Montenecourt and Mr. Ward began by telling us about the company, Amsted Rail. Amsted Rail is a company that designs and produces railcar parts for the global market. They then spoke about the specific branch of the company in Russia and the technology in the Russian rail industry. The company makes cast steel wheels or any gauge for railcar manufacturers around the world. The technology of the Russian rail industry is similar to that of older North American technology. North America has made more advancements in their rail industry than Russia in recent years, including the creation of the Association of American Railroads (AAR). The AAR is the North American rail industry trade association. The set industry guidelines, and regulations, and mutually achieve what is best for the industry.

We then asked Mr. Ward and Mr. Montenecourt to give us information on Russian Railways. Russian Railways manages the rail industry in Russia. Russian Railways created the VRK-1, 2 and 3 maintenance companies in an effort to improve the privatization of the railcar maintenance industry. These companies perform more than half of all railcar repairs in Russia. There have been reports of issues with the quality of maintenance from the VRK companies.

We then discussed some aspects of the Russian rail industry that could use improvement. Russia currently has between 300,000 and 400,000 unused railcars sitting on tracks, not transporting goods. The pricing of railcars is 30% under 2013 prices, but the demand for railcars has decreased significantly. As far as maintenance goes, the industry has the capability to repair around 500,000 railcars per year, but the maintenance of railcars in Russia is too frequent because of older technology and regulations. Companies that own railcars, like Brunswick Rail, are forced to cope with this outdated and inefficient system.

At the end of the interview, we thanked Mr. Montenecourt and Mr. Ward for their time and established options for further contact if necessary.

Appendix 5: Interview with John Winner

On September 7, 2016 John Winner was interviewed over the phone. The WPI team, Richard Sultanov, Vladislav Shishporenok and Alexander Senatorov were present. John Winner is part of the Harral Winner Thompson Sharp Klein group, a management consulting firm. They specialize in the transportation industry. In 2015, the firm conducted an audit of Brunswick Rail. He was able to answer questions the team had about the rail industry in North America, metrics for the comparison and thoughts for the future in the rail industry.

The interview began with Mr. Winner introducing himself over the phone, and we introduced ourselves to him. We began by asking him about his history with Brunswick Rail and he informed us that he was one of the five authors on a due diligence report commissioned by Brunswick Rail in 2015. Since writing the report in 2015, he had only been in contact with Brunswick Rail to assist and answer questions on the IQP project that Brunswick Rail sponsored in 2015, and this IQP project.

After telling us about his involvement with Brunswick Rail and mentioning the 2015 IQP project, Mr. Winner spoke briefly about the previous project, mentioning his opinions about Brunswick Rail purchasing New Generation Railcars (NGRs), the focus of the 2015 project. He said that from a shipper's point of view, NGRs offer more benefits. He also believed that they would benefit Brunswick Rail in the long run because the company could charge higher lease rates to shippers and increase profit margins.

We asked Mr. Winner about his knowledge of the Russian rail industry, specifically in the areas of railcar maintenance. The industry in Russia is very technical and heavily driven by regulations for maintenance. He said that there are many changes being made in the market, and before hearing about this project, did not know that leasing companies had the option of outsourcing their maintenance to outside companies. Since the rail industry in Russia is so dynamic now, new services like outsourcing maintenance will present themselves as the market demands them.

Mr. Winner is very experienced with the rail industries of various countries, so we asked him for some background information on the rail industry in North America. He informed us that maintenance depots in North America have certain standards that must be met, and that ownership has been shifting to more third party owned. More railways in North America have begun to get out of business, and as more railways go out of business the number of maintenance depots fluctuates, ranging from as few as 10 to up to 40. This happens because the necessity of this service expands and contracts with the market. Private railroads usually handle their own maintenance which is another factor that contributes to the fluctuation in the number of depots. As far as governing bodies, North American railroads are managed by the Association of American Railroads (AAR). The AAR is a private association of North American Railways and maintenance suppliers, they set standards for the industry for maintenance practices and other aspects to the industry. They are responsible for inspecting railcar parts, and the AAR itself is responsible for making sure that there is no corruption in the industry. Manufacturers are very

involved in making rules and setting standards. The federal government gets involved with the AAR occasionally to set broad rules that have been suggested to them by the AAR.

After this information, we inquired about some of the key differences between the Russian rail industry and other industries around the world. Mr. Winner told us that the Russian industry is most similar to the North American industry. The North American industry is most similar to the Russian industry because the business of the industries are similar, and they each deal with more heavy haul long distance movements than the European rail industry. In terms of repairs, North American railcars go much longer between repairs than Russian railcars because in North America, maintenance is based on inspection rather than mileage like in Russia. North American railcars also have various specifications on their different components, which allows them to go a long time without repair.

Mr. Winner also made a point to note the Australian industry. In the Australian industry, there are many heavier haul railways than many other countries. Mr. Winner told us that in the future of the Russian rail industry, he expects that heavy haul railways and railways with capacities higher than 30 tons will be more in demand because of pressure from shippers and their popularity in other countries.

After discussing different rail industries, we asked Mr. Winner if he has any recommendations for metrics we could use to compare different railcar leasing companies. He suggested trying to obtain information about the cost per kilometer traveled by the railcar if we were able to find that information and the amount of days railcars spend in shops when they are sent out for maintenance.

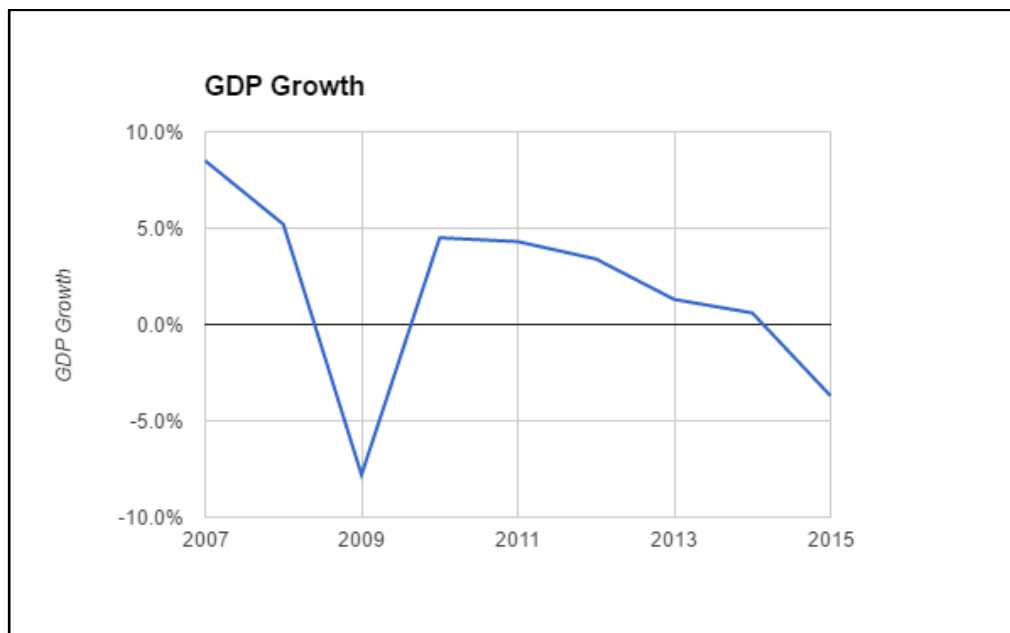
As the interview neared the end, we asked Mr. Winner a couple questions about Russian Railways, one of the main governing bodies for the railway system in Russia. We asked his opinion on them as a company, and he said that their standards used to be very conservative, making it very expensive because railcars required maintenance more often. After our interview with Pavel Gordievsky (Appendix 2), we learned about corruption that potentially took place in terms of reusing expired parts on railcars. We told him about this information and asked for his perspective on the issue. He said that this is a difficult problem to control, but mentioned the AAR, and reminded us that their main purpose was to prevent fraud and control the standards in the industry. He said that if Brunswick Rail had the opportunity to join a railcar owner's organization like that, there could be more protection on these types of fraud.

At the end of the interview, we thanked Mr. Winner for his time and established options for further contact if necessary.

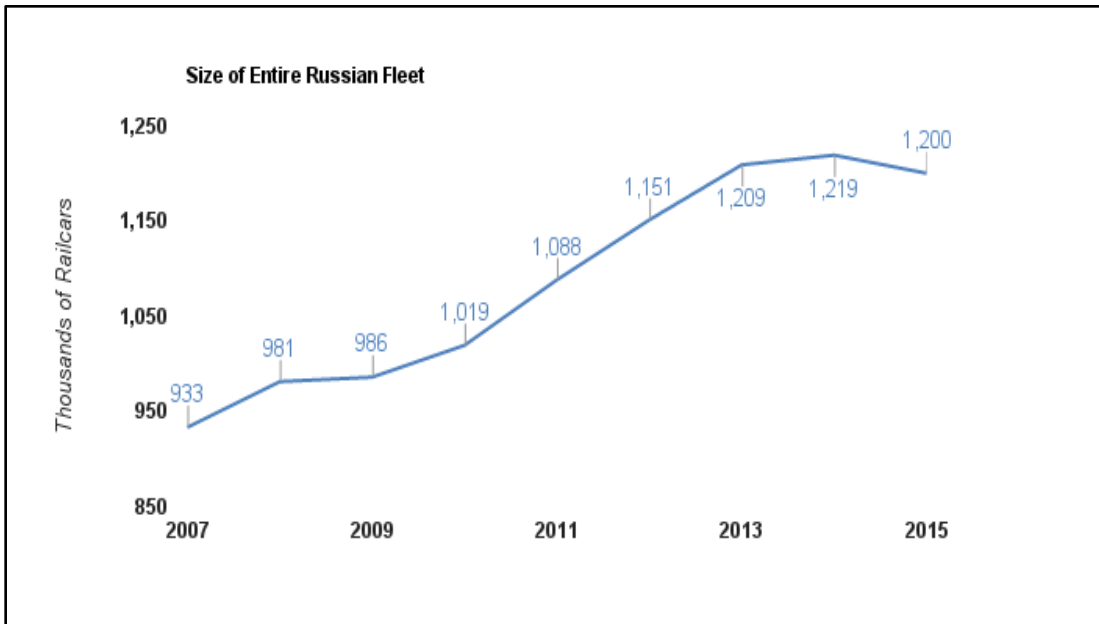
Appendix 6: Macroeconomic Overview

The following is an overview of Russian macroeconomic data of the 7 years leading up to this report. The compilation was performed by the Financial University students.

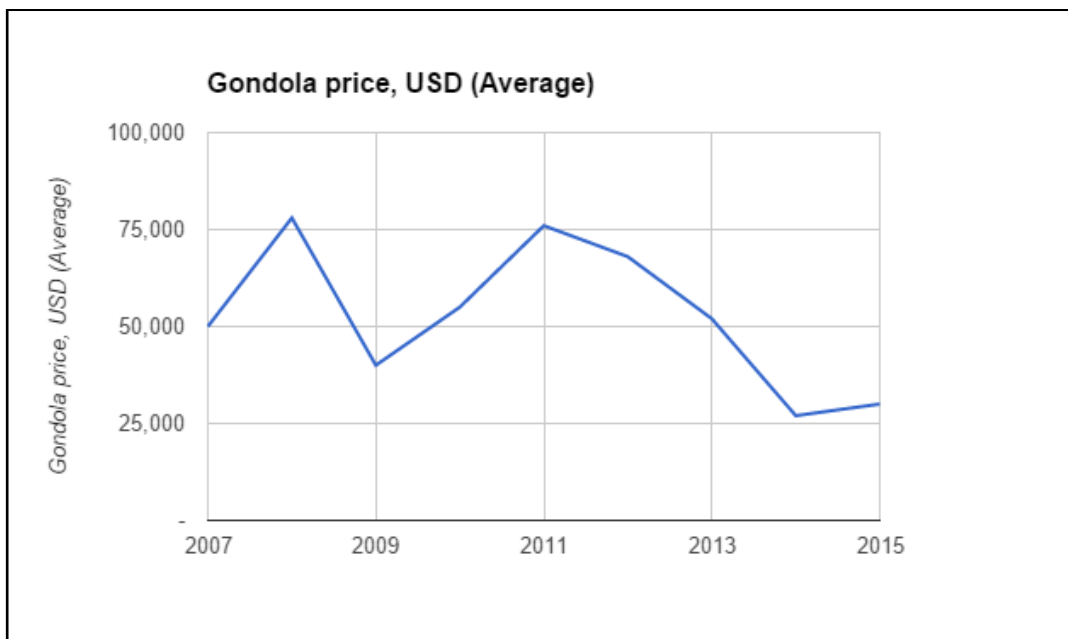
	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP Growth	8.5%	5.2%	-7.8%	4.5%	4.3%	3.4%	1.3%	0.6%	-3.7%
Fleet, ths railcars (EOP)	933	981	986	1,019	1,088	1,151	1,209	1,219	1,200
Gondola price, USD (Average)	50,000	78,000	40,000	55,000	76,000	68,000	52,000	27,000	30,000
Gondola daily lease rate, RUB (Average)	1,000	1,300	500	1,000	1,400	1,300	600	500	540
Transportation volumes, mln t	1,344.3	1,304.0	1,108.2	1,205.8	1,241.6	1,271.9	1,236.9	1,227.0	1,213.5
Railcar production (CIS)	71,500	73,120	38,081	90,729	114,650	121,738	87,640	64,896	30,000
Railcar production (Russia)	40,832	43,176	23,943	50,332	61,532	70,530	58,492	54,636	23,760
Railcar production (Rest of CIS)	30,668	29,944	14,138	40,397	53,118	51,208	29,148	10,260	6,240
<i>Sources: The World Bank, Brunswick Rail Management Presentation, Globaltrans Industry Overview</i>									



Russia recovered quite quickly from the 2008-2009 financial crisis. However, a drop in oil prices and other geopolitical events caused a second crisis in 2014. Russia has yet to fully recover.



After a period of economic growth past 2008, railcar production substantially increased. This caused a market bubble. With the 2014 financial crisis in Russia, the bubble broke, as distributors no longer needed more railcars.



Gondolas are the most common kind of railcar. Their price trends are similar to that of other kinds of railcars. Combined with the overabundance of railcars, and drop in demand due to the financial crisis, railcar prices bottomed out in 2014. As a railcar lessor, the low price of railcar leasing has negatively affected Brunswick Rail's profit margins.

Appendix 7: Company Comparison Criteria

This appendix lists the criteria used in the comparison of railcar leasing companies.

1. **Company Name:** The name of the company
2. **Market:** The geographical region(s) for which the company operates
3. **Operations Performed:** They practices that the company can perform
4. **Fleet Size:** The quantity of railcars under control of the company based on most recent metric
5. **Maintenance Practice:** Is the company outsourcing or insourcing railcar maintenance? How does their system work?
6. ***Do they perform repairs for other companies?:** Does the company sell its maintenance capabilities to other freight train operators.
7. **Do they own their own repair yards?:** Some companies do, some are owned by other corporations
8. ***Do they own ports?:** Some companies may expand within the value chain to include port ownership or management.
9. **Percent of Market Share:** The percent of their market that the company controls
10. **Tier:** Refers to the relative size of the company used by industry experts.
11. **Types of railcars in their fleet:** illustrates the diversity or lack thereof in the company's fleet
12. ***Do they have a logistics department?:** Do they insource logistics
13. ***Do they offer their logistics services to other companies?:** If they do insource their logistics, do they sell that service to other companies
14. **Do they offer mobile repair units?:** Does the company have the capability to move the “repair shop” or are all the repair facilities in static locations.
15. **Private or public:** Is the company privately operated, or does the state have any ownership in the company?
16. **Repair facilities layout:** How does the company manage to run all of their fleet through the available facilities.
17. **Does the company have manufacturing capabilities?:** Does the company manufacture railcars and or railcar parts? Do they have their own designs, or follow an OEM design.
18. **Are there specific divisions within the company?** Is the company one entity, or are their sub-divisions responsible for certain aspects?
19. **If they perform maintenance, are they qualified to recondition wheels:** In North America Wheels are refurbished sometimes as opposed to replaced. This is less expensive than a complete replacement. Maintenance companies must be certified to perform this operation.
20. **Who stores the parts?:** Does the company in question store their own parts? Or do they contract this out?
21. **Types of Leasing offered:** List the types of leasing that the company offers.

*The metrics with an asterisk are of particular interest to Brunswick Rail. They are practices the company would consider adopting, to expand the value chain.

Appendix 8: Company Comparison Spreadsheet

Number	Company Name	Source Numbers	Market(s)	Operations performed	Number of railcars	Number of locomotives
1	Brunswick Rail	see previous	Russia and CIS	Railcar leasing	26,700	0
2	Trinity Rail	1, 2, and 4 3, 5, and 6	USA and Canada North America, Europe and Asia	Railcar maintenance: inspections, renovations, cleaning, part production Full service leasing that includes maintenance, "Per Diem" leasing that is based on mileage, Net leases, Sale-leaseback, portfolio management	0 158000	0 600
3	GATX		7 North America	Wreck repairs, car scrapping, component reconditioning, Rule 88 rebuilding, AAR running repairs, Warranty/Repairs, Air Brake System testing and maintenance, preventative maintenance programs, extensive railcar modifications, painting and restenciling	0	0
4	TTX/Progressive Rail					
5	Progress Rail	16,17	North America			
6	VTG		3 Europe: Germany, Netherlands, Austria, Italy, Poland			
7	ERS Railways	18	Western 2/3s of America			19
8	Union Pacific	8,9,10,11		Tracks owner, locomotives owner		8,500
9	Greenbryer	12,13,14,15	North America, Europe, South America	Manufacturing whole railcars, maintenance and repair, railcar leasing, railcar management	260,000	

Number	Company Name	Number of locomotives	Insource/ Outsource Maintenance	Do they perform repairs for other companies?	Do they own their own repair yards?
1	Brunswick Rail	0	Outsource	No	No
2	Trinity Rail	0		Yes	Yes
3	GATX	600	Insource		
4	TTX/Progressive Rail	0	Insource		
5	Progress Rail		Insource	Yes	
6	VTG		Insource		
7	ERS Railways	19			
8	Union pacific	8,500	Insource	No	Yes
9	Greenbryer		Insource	Yes	

Number	Company Name	Do they own ports?	Percent of market share (and list type of market)	Size	Types of freight cars in fleet	Do they have a logistics department?
1	Brunswick Rail	No		3	Diverse, Mostly gondals, hoppers, and tanks	External
2	Trinity Rail	No			They claim to repair all types of railcars	
3	GATX				Wide variety: Biofuels, chemicals, construction material, food, forest products, metals, mining, petroleum products, and generic carts	Internal
4	TTX/Progressive Rail					
5	Progress Rail					External
6	VTG					Internal
7	ERS Railways					
8	Union pacific	Yes		Class 1	Agriculture, Coal, automotive, industrial, chemicals	Internal
9	Greenbryer	No		Large	Small/Mid/Lare Cube Covered Hoppers, Tank Cars, Pressure Tank Cars, Boxcars, Gondolas, Intermodal Cars, Auto Racks, Centerbeans	Internal

Number	Company Name	repair facility layout	Does the company manufacture?	Are their specific divisions within the company	If they perform maintenance, are they qualified to recondition wheels	Who stores the parts?	Types of Leasing offered
1	Brunswick Rail	NA	No				
2	Trinity Rail	Repair facilities all across USA and Canada	Yes, Trinity's parts and Components division, Manufacture OEM parts				
3	GATX			Rail North America, Rail International, American Steamship Company, and Portfolio Management			
4	TTX/Progressive Rail		Yes, for extensive repairs				
5	Progress Rail						
6	VTG						
7	ERS Railways						
8	Union pacific			Divided by kind of cargo			
9	Greenhyer		Yes, railcars and marine barges	50/50 joint venture between Watco Companies LLC and GBW Railcars Services LLC	Yes	Has a network of wholly owned subsidiaries that recondition and store parts	Usually for 20 year intervals, 5 Types: Full-Service Lease, Net Lease, Purchase - Leasebacks, Like Kind Exchange, Per Diem Lease

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