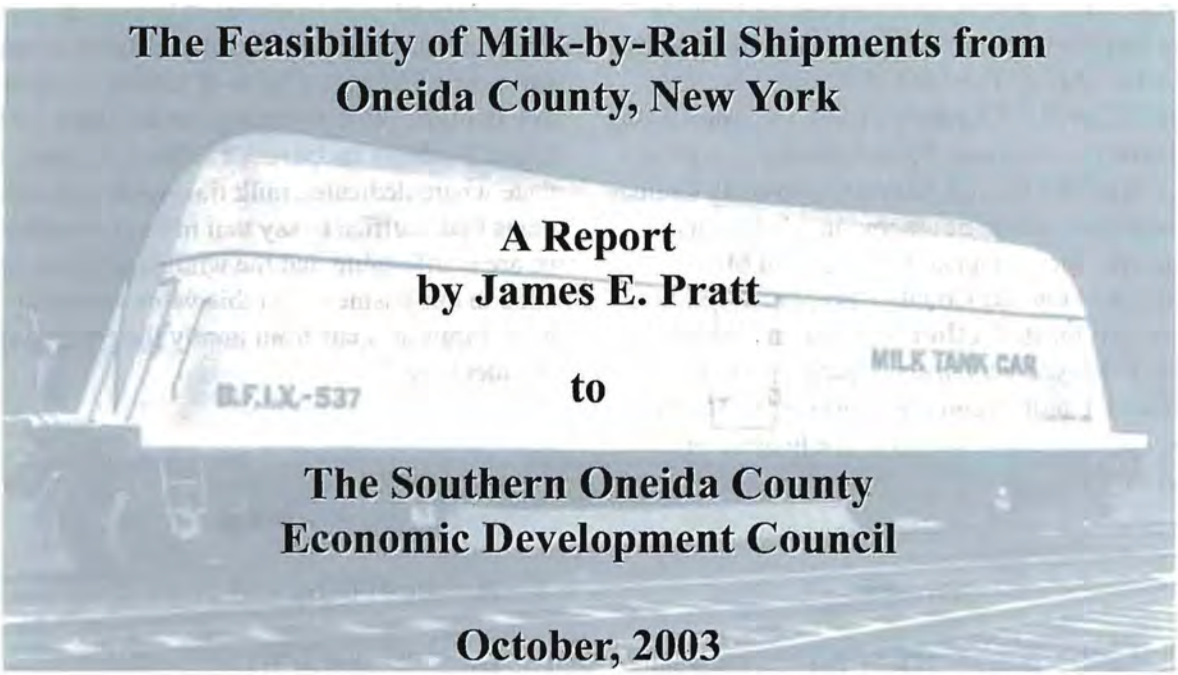
SOUTHERN ONEIDA COUNTY ECONOMIC DEVELOPMENT COUNCIL

The Feasibility of Milk-by-Rail Shipments from Oneida County, New York



A Report
by James E. Pratt

to

The Southern Oneida County Economic Development Council

October, 2003

Processed and edited by
Wendy Barrett

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Summary

The shipment of milk by rail has had a long and distinguished history in New York and the Northeast. Long before motor vehicles appeared on the scene, regularly scheduled milk trains were traveling from over 400 miles distance from New York City to deliver milk to that city's rapidly expanding dairy markets. The development of the dense system of 'up-country' assembly plants and trackage, the specially designed railway equipment, and the highly articulated train schedules were legitimately described by logisticians as a 'wonder'.

There were bumps along the way. The practice of discriminatory pricing by the railroads led to animosity between dairy producers in different locations and contentious court battles. The 'Depression' brought an abrupt halt to what had been up to that point a ninety-year expansion in the demand for dairy products. And, the development of tank trucks and the improvements made to roads eventually led to the total disappearance of milk-by-rail.

Is there a place for milk-by-rail today? Is it even feasible? I conclude that there is a place for milk-by-rail, but that any evolving system would necessarily have to be designed to provide service characteristics that are currently difficult or expensive to provide, given the milk logistics system now in place. The transportation manager for the largest producer cooperative in New Zealand, a place where dedicated milk trains still run, comments that "suffice to say that in our own situation we are comfortable that the whole operation adds value to our business, but this value comes in many forms as apart from purely the cents/km/litre consideration."

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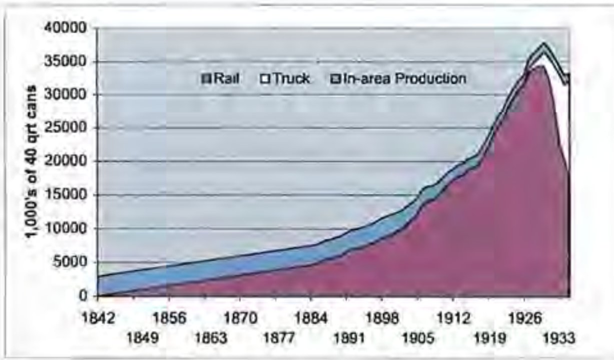
I. Historic Milk-by-Rail

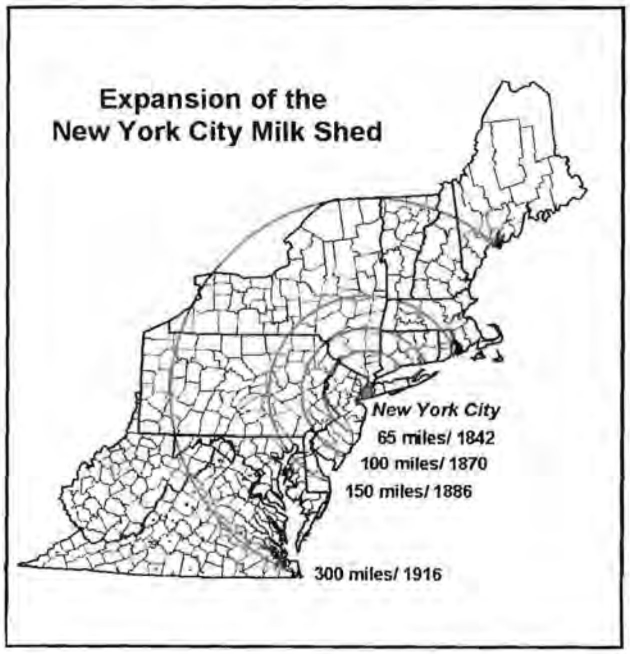
The first fully documented movement of milk from 'up-country' farms to New York City occurred in the spring of 1842 on the New York and Erie Railroad. This first shipment consisted of 240 quarts (the equivalent of six forty-quart milk cans or 516 lbs) from Chester, New York, in Orange County, 75 miles from New York City. There may have been earlier, undocumented shipments into Boston in 1839 on the Boston & Worcester Railroad and into Baltimore in 1840 from Frederick, MD on the Baltimore & Ohio. Thomas Selleck, the stationmaster who arranged for the first Chester shipment paid Philo Gregory, a local Orange county farmer, two cents per quart for the milk and the railroad collected nearly one-half cent per quart (23 cents per cwt.) for the transportation. On the morning of the shipment, Gregory poured the 240 quarts of milk into blue pyramid milk churns, drove to the Chester station and loaded the milk into the baggage car. Selleck had preceded the train to New York City and notified families in the vicinity of the Erie station that the milk would be arriving. When the milk arrived, the local residents lined-up with containers and the milk was ladled-out to them. Reportedly Selleck was able to sell the milk at four cents per quart, two cents a quart less than the prevailing six cents per quart then paid for locally produced 'swill' milk, milk from cows fed principally on brewery refuse and garbage from hotels and restaurants. That summer saw some setbacks with milk that went sour due to heat exposure, but some early innovation with cooling overcame these problems and by 1844 the New York and Erie Railroad moved 6,138,840 quarts (the equivalent of 153,471 cans or 13.2 million pounds) of milk to New York City. The New York City metropolitan area, as well as Boston to the north and Philadelphia to the south, became major milk consuming centers as their populations grew rapidly and as local health authorities and nutrition advocates espoused the benefits of 'nature's perfect food' and city residents increased their consumption of 'fresh, wholesome, country' milk. Evidence suggests that daily per capita milk consumption grew from 2/3 pint in 1885 to 1 1/3 pint by 1929. In the grip of the depression in 1933 with its impact on income, per capita milk consumption actually fell to 1 pint.



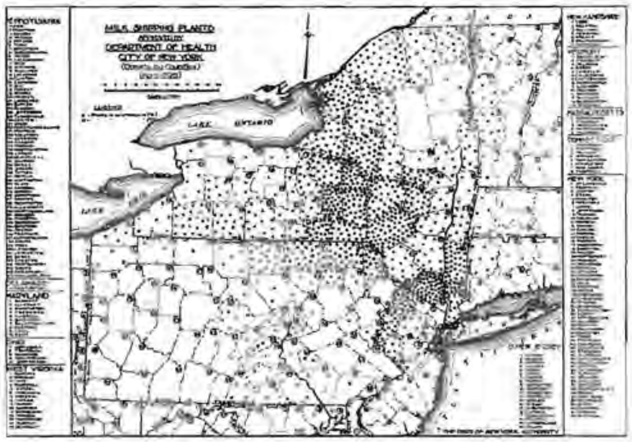
In order to meet the rapidly expanding demand for milk generated by the growth of population and per capita consumption in the Northeastern metropolitan areas, the milksheds served by rail service expanded further distances from the cities and distance related problems became ever-increasing obstacles to be overcome. While being enormous achievements for their time, those early shipments of milk-by-rail were of relatively modest distances by today's standards, Chester being about 75 miles from New York City. As the demand for milk in New York City grew, it became necessary to reach out further and further distances to obtain a supply. By 1870, several other railroads had entered the milk transportation business and most had procurement areas reaching nearly 100 miles out from New York City. Between 1875 and 1882, several railroads extended their milk-hauling service to even more distant places.

"According to one well-informed writer, in 1879 milk trains ran regularly between New York and points more than 250 miles distant. He said that stations in Vermont located 210-250 miles out were shipping 400,000 gallons of milk a year to New York; also, that milk held in a cooling tank for eight hours at Rutland, Vermont, 240 miles from New York, was being shipped at night and delivered to New York consumers by daybreak the next morning." Spencer and Blandford, p.69

By 1886, the milk shed for New York City was being extended substantially past what was then called the 'theoretical' 80 to 100-mile limit. The Erie was out 135 miles and the Ontario & Western was out 195 miles. By 1916, this continued expansion resulted in milk-hauling services for the New York Central out 469 miles, the Erie 488 miles, the Ontario & Western 325 miles, and the furthest milk train service of the Pennsylvania being 503 miles distant from New York City.



A system of country milk receiving stations (creameries) and transportation networks needed to be developed which reached ever more distant from these metropolitan areas into the potential milk producing areas of New York, Pennsylvania, and New England. The predominant mode of transportation from these distant receiving stations to the metropolitan areas was rail.



In the 1840's and 1850's, all the milk deliveries were made via mixed trains, that is, trains that delivered milk in combination with other freight and passengers. By 1871, the business had grown to such a proportion that the operation of dedicated milk trains with the occasional passenger car or two, was inaugurated in daily runs, the first of which was operated by the New York, Ontario and Western. By the late 1920's, seven different railways (NYC 45%, Erie 15%, D L & W 14%, NYO&W 9%, LV 8%, PRR 5% NYNH&H 1%) accounted for 100% of New York City's burgeoning milk needs.

Unlike other, later developing milk markets in the South, Midwest, and West Coast, such as Atlanta, Chicago, Detroit, and San Francisco, in those early years, rail was essentially the only viable long distance means of transportation for the large quantities of milk needed in the three Northeastern metropolitan areas. Into the 1920's and 1930's, rail remained an important mode of delivery as shown in this 1937 data.


FIGURE 12. LOADING CANS INTO A CAR

From that first shipment of milk in a baggage car, the rail equipment used to transport milk in the three metropolitan markets experienced a remarkable evolution. Because milk was delivered in cans from milk producers, the first major development was to devise a system that could accommodate the cans in an environment that could keep the milk cool and promote the maintenance of its quality throughout the entire year.

Ice, being the major source of cooling of the day, was used in specially modified railcars to carry cans from the locations of milk production to the metropolitan destinations. The procurement of ice during the winter months for the purpose of cooling milk at the farms and at the assembly points became a major enterprise for dairymen of the time. Large 'ice-houses' became salient features of the assembly points.

Milk was delivered in cans to pick-up points located on the rail lines, usually via horse and wagon, by local farmers. The milk, as well as ice, was loaded into cars positioned at these points and when the train arrived, the loaded cars were attached. By 1875, an elaborate system of 'milk trains' had evolved to move the milk in cans from places more than 100 miles distance from New York City and by the 1880's this distance had more than doubled. The milk cars used on these runs were built on frames designed for passenger service and equipped with brakes and carriages so that they could be utilized at the faster passenger train speeds compared to the slower general freight trains. Milk receiving points in the metropolitan areas had rail service so that the cans could be offloaded directly into the plants.

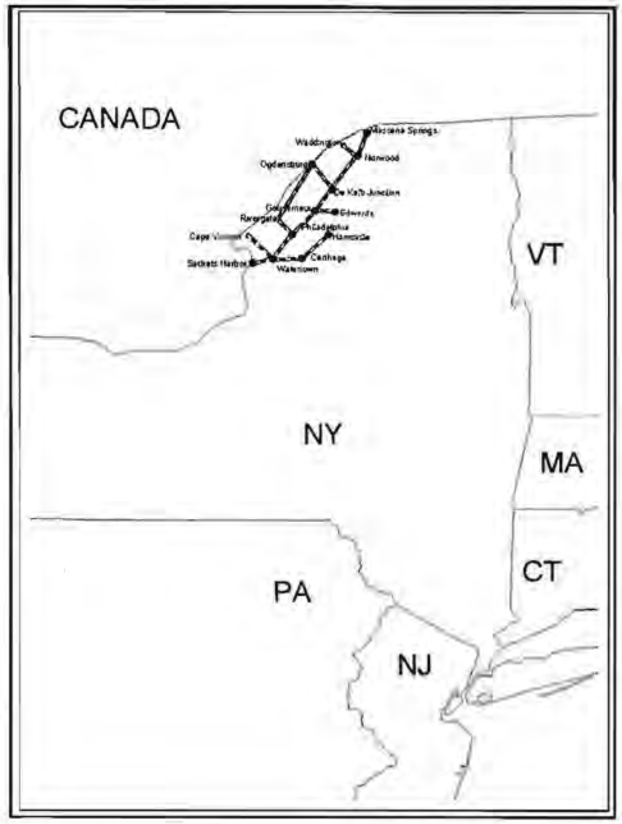
At the apex of milk deliveries by rail, the system of country milk plants, connecting rail

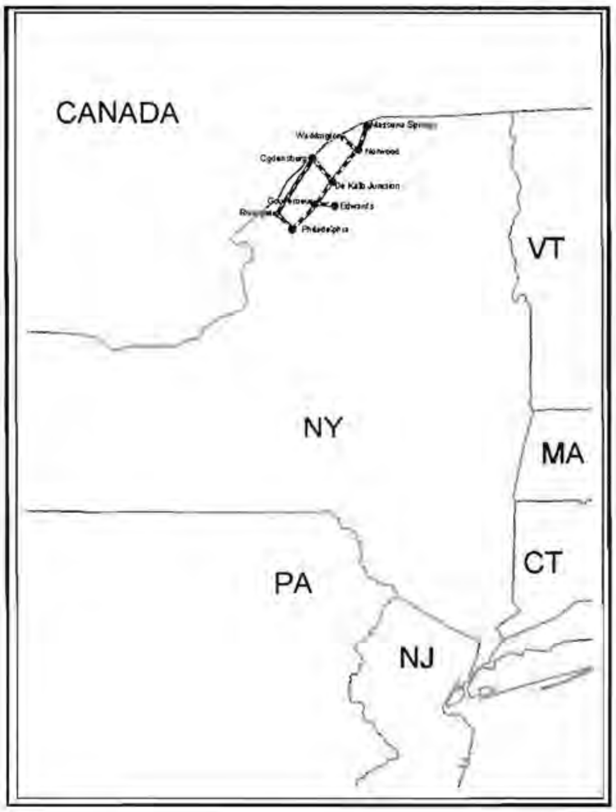
lines, and train service had matured into an intricate logistics web, as a look at only the New York Central milk train system in 1927 reveals.

Let's look at just one of the New York Central's routes in its Northern District that went through Utica in 1929; Milk Train # 184. (B. M. Price)

Train number 70 leaves Ogdensburg at 9:30 am and moves south through Oakville, Redwood, and Rivergate to Philadelphia. It arrives at this junction with about nine cars.

Train number 16 originates at Massena Springs, near the Canadian border, at 8:00 am. At Norwood it picks up milk carried from Waddington and also local freight from Ogdensburg at 9:25 am and from DeKalb Junction at 10:27. At Gouverneur it takes on milk that leaves Edwards at 9:30 am. It arrives at Philadelphia with sixteen cars.



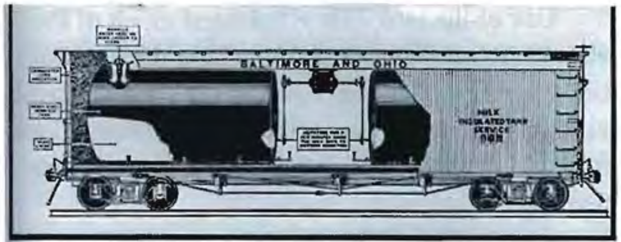


After picking up the sixteen cars from Number 16, train Number 70 continues from Philadelphia to Watertown where it picks up about two cars from a special service for movement of milk from Cape Vincent and Sacketts Harbor and combines with shipments from Harrisville, Natural Bridge, and Carthage.

Train Number 70 leaves Watertown at 12:40 pm and preserves its identity as far as Utica where it becomes Number 184, leaving at 4:35 pm, arriving at New York City's 33rd Street Station at 12:50 am, normally with about 6,650 cans of milk.

The handling of milk cans was a very labor-intensive process, not only for transportation, but also in the handling at the milk collection points.

By 1903, the idea of bulk milk shipments had matured and was being used to move milk from the assembly points to the metropolitan bottling plants. Cans were still being used to move the milk from producers to the assembly points, but the assembly points now began to become more involved in the processing of the milk by sometimes separating the cream and/or condensing the milk using heat and in a few cases, they bottled the milk for shipment in crates. Metal bulk tanks were already being used for oils and other refinery products. Because of the corrosive nature of milk and the necessity to maintain a healthy consumable product, commonly available materials of the day (steel, tin, copper, and nickel) were not suitable for construction of bulk tanks. An early innovation (1921 by the Baltimore & Ohio Railroad and Harmony Creamery of Pittsburgh) was to line a steel tank with glass, the 'glass-lined' tank. These were placed in especially designed boxcars,and eventually streamlined tank cars appeared.



Above: Cut-away drawing of a 1921 standard refrigerator car assigned by the Baltimore & Ohio Railroad Co. to Thomas P. Otto of the then Harmony Creamery Company, Pittsburgh, Pa. Illustration shows position of 2,500-gallon glass-lined tanks and space in center to accommodate 100 40-quart cans. Note granulated cork insulation. Three of these cars were reconditioned and put into service in August, 1921 between West Farmington, Ohio, and Pittsburgh. Below: Today, construction has changed: insulation has been applied direct to the tanks; fittings, manholes and interiors have been refined; but principles of the modern tank car are essentially the same today as in 1921.

Use of the tank cars eliminated much of the labor of moving cans and of packing the cars with ice. Instead, pre-cooled milk was pumped into the rail car tanks at the up-country milk stations. This milk was then pumped into trucks or directly into plants at the receiving points.

Courtesy of H. P. Hood & Sons

FIG. 8.3. INTERIOR OF A RAILROAD MILK TANK CAR WHERE THE OPERATOR IS SHOWN TAKING A SAMPLE OF MILK FOR TESTING

FIG. 50.—Semi-trailer drop-frame tank truck. This type of equipment is used for transporting milk from tank cars at the railroad terminal to the city plant. The tank holds 3,140 gallons. (*Courtesy of Borden's Farm Products Company.*)

As the technology needed to construct bulk tanks of other materials matured, the bulk milk cars began to replace the can cars. During this same time period, the use of stainless steel in the fabrication of storage tanks was pioneered by dairy industry entrepreneurs. This material eventually became the material of choice for bulk movement of milk, both rail and motorized.

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As motorized vehicles replaced horses in the general population, the same development occurred in milk transportation. At first, farmers delivered their cans to the assembly points in their own cars and trucks.

FIGURE 4. THREE TYPES OF VEHICLES USED IN DELIVERING MILK TO COUNTRY PLANTS
Some dairymen like to haul their own milk because of the opportunity it affords to visit with other farmers. In many cases such visits are very costly

Soon, specialized milk haulers emerged to take-on this job for a fee for other farmers. Often these haulers were farmers themselves who either did the milk hauling as auxiliary employment or grew their hauling businesses to a size whereby they discontinued farming.

The earliest milk haulers operated stake-bodied trucks or flat bed, horse-drawn wagons to accommodate the 10 gallon/40 quart milk cans. These vehicles were versatile and allowed haulers to transport other goods such as ice, eggs, freight, building supplies and even furniture.

As stainless steel bulk milk hauling technology matured, motorized bulk milk hauling also emerged. The first milk truck equipped with a stainless steel tank was assembled by the Heil Company in 1927.

This first milk truck equipped with a stainless steel tank was in use in 1927.

Bulk tank and can systems coexisted into the 1950's, when most states passed health regulations that essentially required the use of bulk tanks on farms and in transportation. The use of bulk transportation technology forced milk haulers to specialize. Diversified hauling businesses evolved into hauling operations that concentrated exclusively on milk in order to take full advantage of size efficiencies of using the specialized milk hauling equipment.

While the Midwest and West Coast milk markets were almost exclusively serviced by horses and motorized vehicles from their earliest development, motorized delivery of bulk milk directly from very distant farms or assembly points to metropolitan bottling facilities was 'tested' in the New York City market in 1931.

AMERICAN CREAMERY AND POULTRY PRODUCE REVIEW

November 25, 1931

TEST LONG-HAUL MILK TRUCKING

Sheffield Farms Co., Inc., Inagurate Experiments With Long Distance Tank Truck Shipments

Early last week the traffic department of the Sheffield Farms Co., Inc., began a series of experiments with long distance milk transportation by motor tank truck from country points to New York City for the purpose of comparing from a standpoint of economy and efficiency shipments by this means and by rail.

The tests were inaugurated on Tuesday of last week when a tank truck left Lowville, N. Y., with 2,350 gallons of milk at 8 o'clock in the morning and effected delivery at one of Sheffield's New York City plants at 10:25 p.m., a total elapsed time of about fourteen and one-half hours for the 300-mile trip. This run is believed to be the longest commercial milk haul by truck in this territory. Another test run will be made from Richmondville, N. Y., to this city, a distance of about 190 miles, next week. So far the longest regular truck haul of the Sheffield organization is 162 miles, and the present tests are being conducted to determine the feasibility of increasing the length of the regular runs.

The trucks used in the experiments are, as stated above, of 2,350 gallon capacity, the tanks being lined with Allegheny steel.

In 1931, the milk-rail system had been in place for nearly 90 years and much had been invested in optimizing the system to function well, not to mention the 'bricks and mortar' in place at assembly points located on rail lines. By the beginning of the 1930's, truck transport of milk directly to bottling plants began to rapidly replace the use of rail. Over the next 30 years, motorized bulk milk movements completely replaced rail shipments. In the early years of motorized transport, numerous attempts were made to marry the two systems, using some very innovative specialized equipment ranging from tanks that slid from trucks to rail cars, to experimental truck trailers that were 'piggy-backed' on rail cars.

Fig. 5: Tractor, semi-trailer with milk tank in place for transit through city streets.

(1) Milk may be handled in semi-trailer tank trucks mounted on a flatcar. Detached, they are hauled off by tractors. (2) These handy tanks are easily transported by train or truck and serve other useful purposes.

In the end, the rail movement of milk, even in the Northeast, disappeared.

Metropolitan areas in the Midwest and West Coast, where milk markets developed at a later date than on the East Coast, never fully developed milk train systems. These areas developed totally along motorized systems.

Undoubtedly, the increased use of trucks for direct delivery to NYC plants that began in the 1930's and eventually totally displaced rail movements was fundamentally a question of rates. In a study of rail rates vs truck costs in 1932-1933 (Varney #308 P 19), at all distances less than 200 miles, truck costs ranged from 50% to 75% of rail rates for cans and tanks. For distances greater than 200 miles, tank by train rates narrowly beat the truck costs. As trucks became more powerful and more dependable and road surfaces and bridges were improved, the slight advantages of rail for even the longest distances were eliminated. By the 1930's, truck service had also become very dependable and timely. The use of modern, insulated stainless steel tanks allowed trucks to make long distance runs without the milk suffering unacceptable temperature increases.

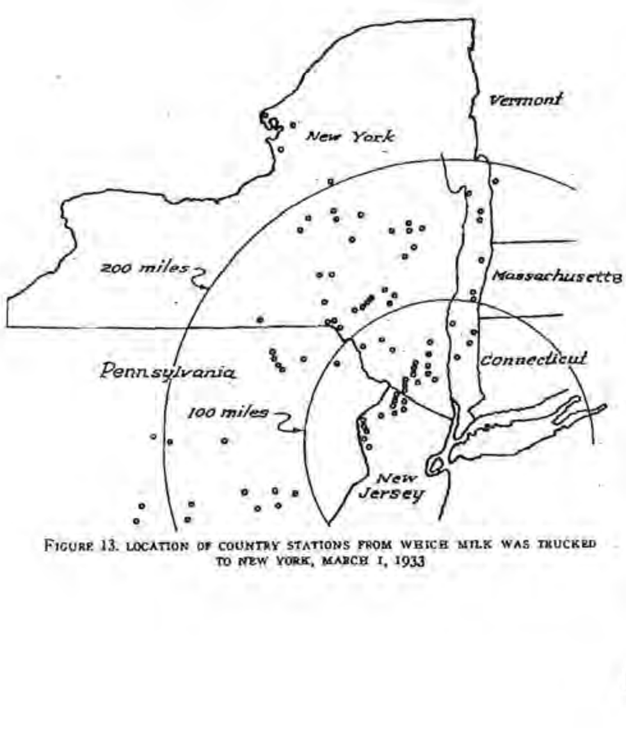


FIGURE 13. LOCATION OF COUNTRY STATIONS FROM WHICH MILK WAS TRUCKED TO NEW YORK, MARCH 1, 1933

As Harry Varney, a Cornell researcher, described this situation in 1934:

> "The history of the milk business in New York City shows not only a tremendous growth in size during the past ninety years but two periods of rapid changes in the methods of transportation. The first one came from 1842 to 1860 with the introduction of rail transportation. In comparatively few years this new method of transportation took over practically all of the milk traffic. The second period of rapid change in transportation methods has been taking place during the past four or five years, with the shift from rail to truck transportation." Varney #308 p22

Having worked with and studied milk transportation and dairy industry spatial economics for thirty years, the more detailed reading of the historical development of milk shipments in the Northeast has given me an appreciation for the scope and scale of the historic advances made in delivering milk to New York City and Boston that I had not had previously. The men and women involved in meeting the challenge of serving a rapidly emerging dairy sector were bold innovators and entrepreneurs. Thomas Selleck and Philo Gregory were laughed at by fellow railroaders and farmers before their first successful shipment of milk. Their initial shipment grew 17,000 times by the next year. Benjamin F. Fitch, a renowned innovator in inter-modal freight movements, worked very closely with railroad companies that operating milk trains so that he could test and perfect his ideas. Companies such as D.H.Burrell, Glascote, and The Heil Company (still important manufacturers of dairy and transportation equipment), pioneered developments important to improved milk transportation equipment. Advances in the use of stainless steel spilled-over into other applications and stainless steel tank designs remain standard equipment in many dairy and nondairy food applications.

From the vantage point of Harry Varney, looking back at these advances in dairy transportation technology and organization, the prior 90 years looked quite incredible:

> "Whether the future will show a larger proportion of milk trucked or even a shift to transportation of milk by airplane, no one can tell. It would be, however, no greater stretch of the imagination to visualize New York City being supplied with milk by airplane in the future than it would have been for the farmers in Orange County ninety years ago to have visualized the present milk business in New York City." Varney #308 p22, 1934.

But..."The future ain't what it used to be." Yogi Berra.

I don't think any one of us envisions the shipment of milk by airplane anywhere, so Dr. Varney's view of the potential progression may have been a little off with respect to the potential direction of change, but I would content that he would also have been surprised to see the lack of innovation and entrepreneurial change from 1934 to 2004. Milk assembly and transportation is essentially (with some minor modifications and improvements), what it was in 1934. Farms are larger and have their own bulk tanks, practically eliminating the need for country collection points, trucks are larger and terminate these direct farm pick-ups with deliveries directly at processing plants, and roads are wider accommodating the larger vehicles at faster speeds. These marginal changes have not, however, been of the order of magnitude of those early innovations.

New Zealand, one of our main international competitors utilizes a milk train system not too dissimilar from our 1930's system.

Farm milk transportation by rail in the US has experienced the occasional flicker of activity since the total demise of rail shipments in the 1950's. The 1960's saw a experiment of milk movements by rail conducted by Dairylea from central NY.

PIONEERING—Discussing merits of Dairymen's League plan to trans- some milk by rail are Barry Vreeland, left, traffic specialist, and E. L. Sh- buck, Middletown transportation division manager. They are standing railroad car loaded with two tanks.

The late 1970's and early 1980's the Central Vermont Railway, through its owner the Canadian National Railway, endeavored to establish milk by rail service from the heavy milk production regions in northern VT to locations in MA and CT in order to generate new sources of revenues. This effort was part of a larger project named the 'Rocket' that established an express piggyback (TOFC) train service on the CV's line.

It began in 1978 and ended unsuccessfully in 1986, never having generated the 40-50 trailers per day of traffic volume needed to make the service profitable.

The general consensus among today's transportation economists is that rail movements of commodities are only economically competitive with trucks for large volumes, over long distances. Even the large volume of movements of milk to the northeastern metropolitan areas is likely to be insufficient to carry the day. Our task at this point is to take a closer look at this subject and to rephrase the question to 'under what circumstances would milk-by-rail become competitive'.

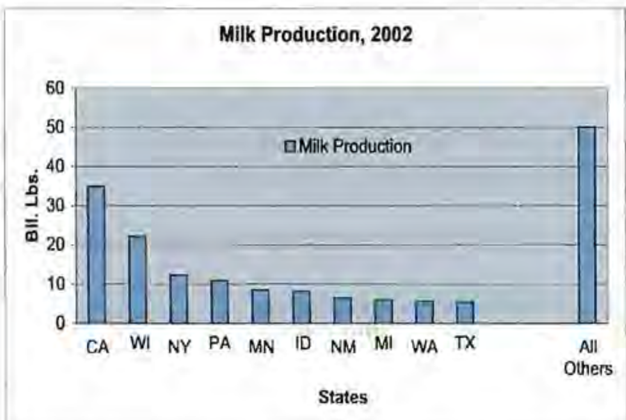
Transportation theory tells us that railroads move lower valued 'commodity' cargos over longer distances than trucks, which move higher valued specialized cargos over relatively short distances.

But...

"In theory there is no difference between theory and practice."
" In practice there is." Yoggi Berra

II. Dairy Markets in the Northeast and Oneida County

Let's put today's Northeastern milk marketing area into some perspective. Most of you know that currently, New York is the third largest milk producing state in the US, behind number one California and number two Wisconsin.



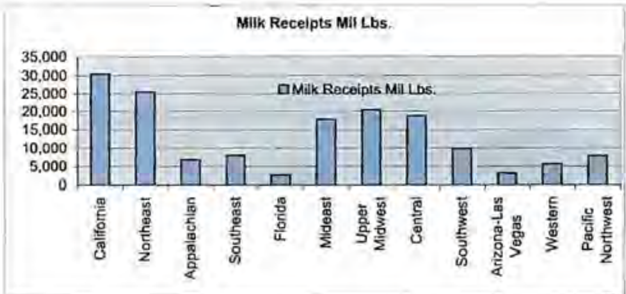
Many of you know that it was 1993 when Wisconsin, the largest milk-producing state at that time ('America's Dairyland'), was surpassed by California.

Probably few of you know that prior to 1910, New York was the largest milk producing state, at which time it was surpassed by Wisconsin.

While state comparisons are interesting, for meaningful milk market statistics, Federal Milk Marketing Order (FMMO) data is probably best (most data are gathered through mandatory reports that are audited, while most other agricultural data is collected through voluntary surveys) and they are readily available (see http://www.ams.usda.gov/dairy/orders.htm). I will use FMMO statistics (with the exception of California which is not part of the FMMO system) for the summary statistics that follow.

Today, there are 11 FMMO geographic areas specified by the Agricultural Marketing Service of USDA. FMMO's began in the 1930's and at the apex of their numbers in the 1960's, there were over 60 separate order areas. This was at a time when milk markets were generally small and geographically distinct. Today, with highly integrated dairy markets, the USDA has consolidated the marketing areas to eleven. The major purpose of FMMO's is to regulate the terms of trade between milk buyers (processors) and milk sellers (farmers and their organizations). FMMO's were not created to subsidize farmers' incomes nor to insure cheap milk to consumers. Their overriding purpose is to insure that the transactions between farmers selling milk and processors buying milk are conducted on a 'level playing field'. In support of this process, FMMO's collect a large amount of dairy market data for each of the marketing areas. This data is considered very attractive by dairy researchers because it is meticulously defined, collected, checked, and audited.

In terms of milk receipts at processing plants, we can see that the Northeast Milk Marketing Order, which covers the metropolitan areas from Baltimore-Washington to Boston and extends inland over much of NY, PA, and New England, is by far the largest FMMO area in the US, but still smaller than the state of California.

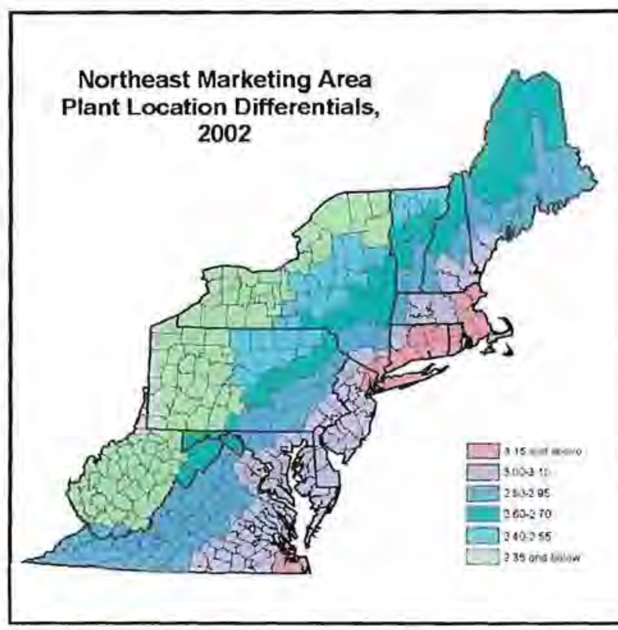


The Northeast Marketing Order receives more milk than the Upper Midwest FMMO that includes both WI and MN. The story to be revealed in the FMMO data, however, is not so much one of total milk production, but the breakdown of how that milk is used. Milk that is used to produce manufactured dairy products such as cheese, butter, and powdered milk, usually moves short distances to nearby plants that are located in the milk producing areas. Milk destined for use in fluid milk products (called 'Class I' products in FMMO nomenclature), must usually travel from the milk producing areas to the milk consuming areas for processing at plants located near consumers. All of those 'milk train' movements we discussed earlier were of the Class I variety.

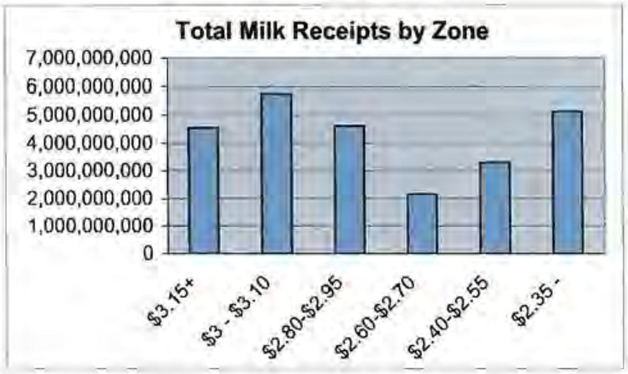
Looking at Class I utilization in FMMO's and CA, we see a somewhat different picture than for total milk receipts. The Northeast FMMO is by far the largest Class I market in the U.S., surpassing even California by a substantial margin.

When it comes to Class I products, the Northeast, with of its large, concentrated population and their relatively high per capita consumption, is the 800 lb. gorilla. The consolidation of the processing of Class I products into fewer and fewer plants has also resulted in the Northeast having some of the largest fluid milk processing plants in the country.

As part of that 'field leveling' function within the Northeast FMMO, the USDA has set different pricing zones for the purpose of establishing the minimum prices that plants located in these zones must pay to producers for their milk that is delivered to these plants. These zones are most often referred to by the 'differential' that is applicable within each zone. The differential specifies the minimum amount above the 'basic' price that a plant in a particular zone must pay for its milk deliveries. These differentials reflect the relative value of milk at a particular location within the FMMO system and generally increase with proximity to population centers, usually increasing with distance from major milk producing areas in the direction of population centers.



All locations within the FMMO system have designated Class I differentials. For example, the Class I differential in Dade County, FL (Miami) is \$4.30, while it is \$1.80 in Cook County, IL (Chicago), \$2.35 in Maricopa County, AZ (Phoenix), \$3.25 in Boston, and \$3.15 in NYC. The FMMO office in Albany, NY publicly reports the deliveries of milk to plants located in these pricing zones for the Northeast Order.



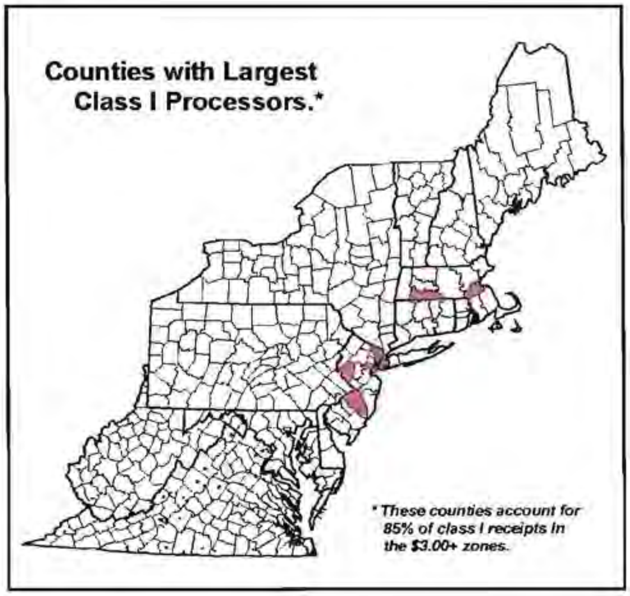
If we look at total milk delivered to plants in the Northeast FMMO by differential zones, we see a somewhat U-shaped pattern; large volumes of deliveries of milk to plants in the first two zones falling with distance from metropolitan areas and then increasing with even greater distances.

While total deliveries to plants in the different zones follow a U-shaped distribution across the six zones, Class I deliveries show a much different pattern. Seventy percent (70%) of Class I deliveries are made to plants in the first two (highest priced) zones. This is not surprising, given the tendency of bottling (Class I) plants to locate near metropolitan centers. As we move further away from the metropolitan areas, to lower differential zones, we see significantly less Class I milk receipts.

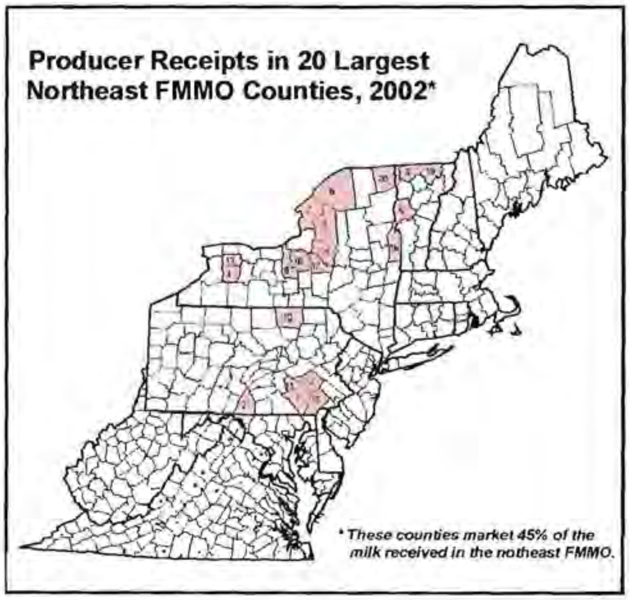
Using an average of 50,000 pounds per tank, the 7 billion pounds of Class I milk delivered to the $3.00 and above zones in 2002 amounts to approximately 140,000 tanker loads of milk. That's 11,667 per month, 2,692 per week, or 384 per day. The deliveries to the much smaller $3.15 and above zone (which includes Northern NJ, NYC-CT-RI-Boston, and the Tide Water area of VA) is just over half of this total, or almost 200 tanker loads per day. There is no publicly available data on the source/destination pairings of these shipments within the FMMO. However, the FMMO office in Albany was able to breakout the zoned receipts for some of the large plants in NYC and Eastern MA for this study.

2002 Region	Predominant Differential	Milk Receipts
Boston/Eastern Massachusetts	$3.25	2,035,038,584
New York City/ Northern New Jersey	$3.15	3,933,662,794
		5,968,701,378

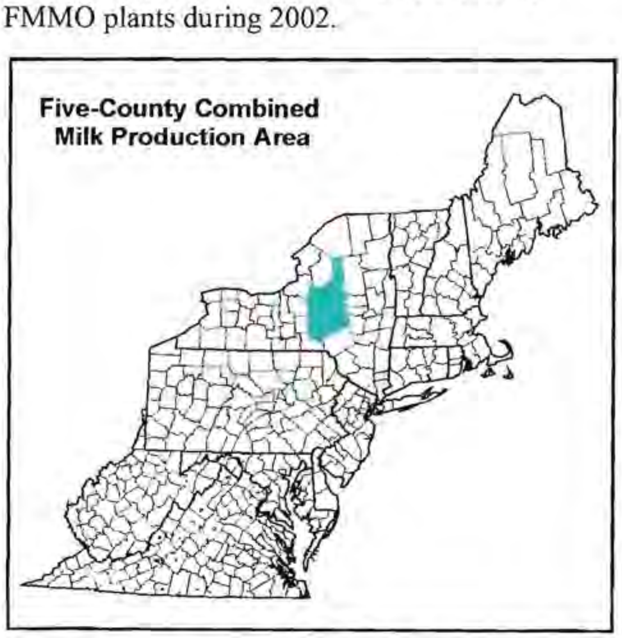
These large plants are concentrated in seven counties and account for 85% of the Class I deliveries into the $3.00+ zones, two thirds of which terminate in the NYC metro area (an estimated 218 loads) and one-third (an estimated 109 loads) in Boston. A large proportion of Class I deliveries terminate at a relatively small number of locations.



Let's take a look at Oneida County. At 402,690,000 pounds of milk delivered to FMMO plants during 2002, Oneida County ranked number 7 among NY counties in Northeast FMMO milk deliveries and 14th among all counties delivering milk to the Northeast FMMO. The top 20 counties accounted for 45% of all milk receipts in the Northeast FMMO.



If we consider a larger milk production area encompassing the five counties of Chenango, Herkimer, Madison,Oneida, and Otsego, there were 1,612,472,000 lbs. of milk delivered to FMMO plants during 2002.

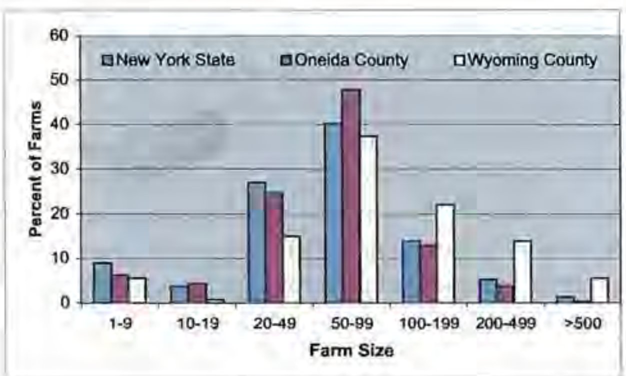


This five-county combined milk production total would place the area behind only Lancaster County, PA in terms of milk production and would account for almost 6.5 percent of all milk receipts in the Northeast FMMO.

Indications are that about one-third of producer milk in Oneida County, about 135 million lbs per year, goes to NYC and Northern NJ, with the remainder being delivered to local manufacturing plants. Using a 50,000 lb. tank trailer, I would estimate that about 2,700 tank trailers of milk per year (225 per month or 7 per day) originate from Oneida county milk destined for the Northern NJ-NYC metropolitan area Class I plants.

For the five-county area, evidence suggests that slightly more than one-third of the producer milk, about 630 million pounds per year goes to NYC and Northern NJ. Again using 50,000 pounds, it is estimated that about 12,600 tank trailers of milk per year (1,050 per month or 35 per day) originating from the combined area and move to the NYC/Northern NJ area.

One of the potential milk-by-rail options would likely require the installation of pumps on farms to move milk from the producer's milk tank to the truck. While indications are that several dozen dairy farms in the state of New York have now installed such pumps, it is typical for the milk hauling truck to have an on-board pump with which to pump the milk from the producers' milk tank to the truck. The cost of installation for these tanks ranges from $3,500 to $5,000, depending on the number and age of storage tanks currently on the farm. Because the size of individual farm operations would be an important determinant of the cost per unit of milk for this additional equipment, the size distribution of Oneida County farms may be a variable of interest. Recent data (2001) is available on the makeup of the US dairy herd by size of operation. The number of operations with more than 500 head grew from 2,336 in 1997 to 2,795 in 2001, while the number of operations with less than 500 head declined from 121,364 to 94,765. Operations with more than 500 head accounted for 39 percent of all milk produced and 35 percent of milk cow inventory in 2001, up from 29 and 24 percent respectively in 1997. (U.S. Dairy Herd Structure, NASS Da 1-1 (9-02) released September 26, 2002) Data from the 1997 Census of Agriculture for New York State indicate that there were 109 farms with more than 500 milk cows and 461 farms with 200 to 499 milk cows. The average farm size in New York State was 80 cows. In Oneida County, the 1997 census reports the average dairy farm size to be 69 cows, with one farm with more than 500 cows and 15 with 200 to 499 cows. Looking at the farm size distribution for the State of New York, Oneida County, and Wyoming County, a county that has seen expanding dairy production in recent years, we see that 6.5 percent of dairy farms in New York State have more than 200 cows, while only 4 percent of dairy farms in Oneida County. In Wyoming County, which is on the large farm end of the New York spectrum with an average farm size of 157 cows, over 19 percent of the dairy farms have more than 200 cows.



The 1997 census reported that there were 4,210 cows on Oneida County farms in the 200 to 499 size range. If we conservatively add 500 from the one farm in the 500+ cow range, these 4,710 cows would produce about 264,760 lbs per day on average at 56 lbs per day per cow, (NASS's 2001 estimate of production per cow for farms with more than 500 cows). This would be slightly more than five 50,000 lb. tankers per day coming from the 16 farms with 200 or more cows per farm and would involve installation of on-farm pumps on any of those 16 farms that do not currently have pumps.

For the five-county area, there are 16,000 cows in the 200-499 farm size range. If we conservatively add 2,000 cows from the four farms in the five-county area with 500+ cows, these 18,000 cows would produce over 1 million lbs. of milk per day. This would be equivalent to twenty 50,000 lb. tankers or seventeen 60,000 lb. tankers per day coming from the 64 farms with 200 or more cows per farm.

The Minnesota ImPlan Group (MIG) (http://www.implan.com/index.html) constructs interindustry (I/O) models for states and counties in the U.S. I will be using ImPlan's I/O model for Oneida County to gauge the impact of the dairy farm sector in Oneida county on the economic health of the remainder of the county. ImPlan estimates that in 1998 the dairy farm sector of Oneida County had total outputs valued at $61.7 million or .6 percent of the total output of Oneida County. It also employed 322 full-time employees or 2.4% of Oneida County's total. Later in this report we will use MIG's analysis of economic activity in Oneida County to estimate the impact on output and employment of dairy farm activity in Oneida County.

Oneida County is located on the New York City side of a large milk producing area. Milk in Oneida County goes both to local processors and to distant fluid milk plants and it serves as a 'swing' production area. Because of the large amount of transportation service needed to move milk from this area and south to NYC, relative large milk hauling operations have developed to meet this need.

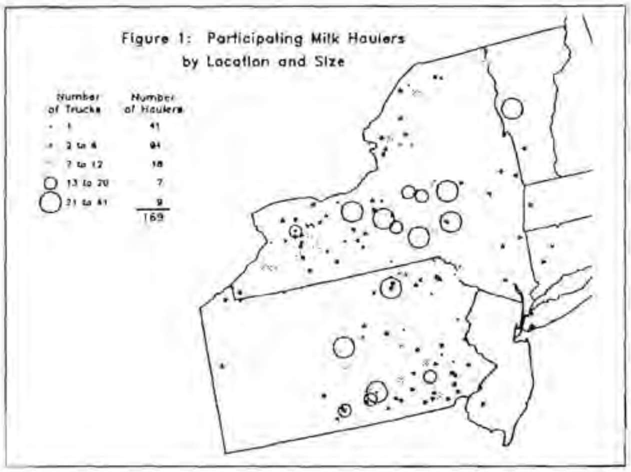


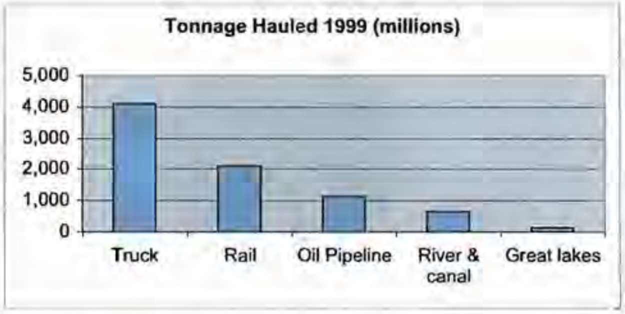
Figure 1: Participating Milk Haulers by Location and Size

In these days of exclusive motorized vehicle milk assembly, a route consists of a set of farms whose milk is picked up on a specified schedule then delivered to a designated location. In the Northeast, routes are generally not "owned" by the hauler, although in some parts of the country, namely in the Midwest, some milk routes are still considered an asset of the milk hauler's business. In these other areas, producers exhibit a high degree of loyalty to their haulers and occasionally terminate their membership in a cooperative or rescind their contract with a proprietary handler if any attempt is made to alter the existing hauling routes. In the Northeast, cooperative and proprietary milk handlers have great latitude in designing milk routes, especially with respect to delivery locations. Stability of designated locations for delivery ranges from very consistent to somewhat erratic. Some haulers routinely deliver to the same plant day after day; some deliver to 2, 3, or 4 different customers in a week. When milk production is not unusually high or low, changes to specified delivery points are uncommon, but a local surplus or shortage of milk or a temporary closure at a plant can ripple through the system like a power outage to cause dramatic changes in time and distance to delivery points. During the fall months, when milk production is at the seasonally low point of the year and consumption is high, special attention to the fluid milk plants near large metropolitan centers may be warranted in order to maintain a constant supply of milk for fluid consumption. During the flush, when milk production is at its highest point of the year and consumption of milk is low, haulers may be requested to deliver their loads to a different location in order to balance the milk supply with the capabilities of the plants in the region. These re-designations may need to be made on a weekly or even a daily basis.

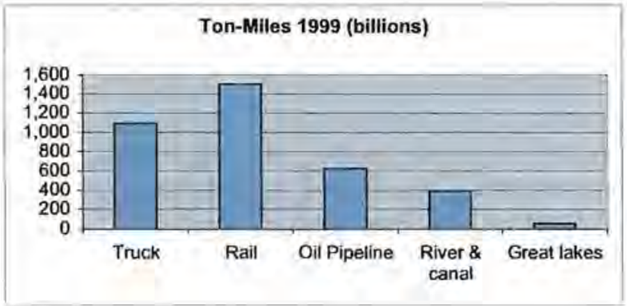
Written contracts between haulers and milk cooperatives or proprietary handlers are rare. Most contracts are verbal, and there are surprisingly few problems with negotiating the route details and hauling rate verbally. Throughout the Northeast, hauling rate negotiations for a particular route do not generally involve producers. In other parts of country, it is not uncommon for producers to deal directly with haulers. When contracting with milk haulers for service to a route, milk cooperatives and proprietary handlers may contact several milk haulers to find the best available hauling rate. Cornell University has had a long history of helping milk haulers determine their costs precisely so that they can make intelligent bids for routes. However, hauling rate is not the sole determinant of which business will be offered a route contract. A hauler's reputation and his relationship with producers are also important considerations in addition to a hauler's performance in timely deliveries, accurate milk weights and proper milk sampling techniques. Open bidding on routes is not a usual practice, but cooperatives and proprietary handlers can generate some degree of rate competition by employing several haulers at one time. Hauling rates are determined through negotiations and are priced in terms of dollars per hundredweight of milk and will vary with route characteristics. Route mileage, the number of farm stops to be made, farm locations, and the point of delivery are all important considerations in developing a hauling rate. These factors will be reflected in the agreed-upon rate.

III. Today's Railroad and Trucking Industries

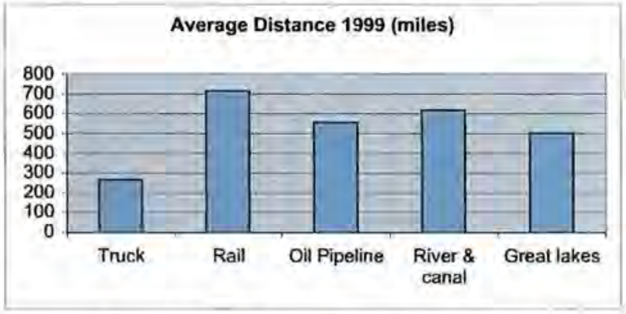
In terms of the national economy, tons of intercity freight traffic has been increasing steadily since 1950. While the total tonnage carried by railroads has been slowly increasing over that time period (more so in recent years), trucks' tonnage carried has been increasing at a much faster rate. As a result, the share of railroad freight tonnage in the national economy has been falling since 1950, while trucks' share has been increasing. Truck freight tonnage surpassed rail tonnage in 1961 and in 1999 it was nearly twice the rail tonnage. (Transportation in America: 2000, ENO Transportation Foundation)



The standard aggregator for reporting transportation activity across different commodities is ton-miles, the product of tonnage of shipments and the distance traveled.

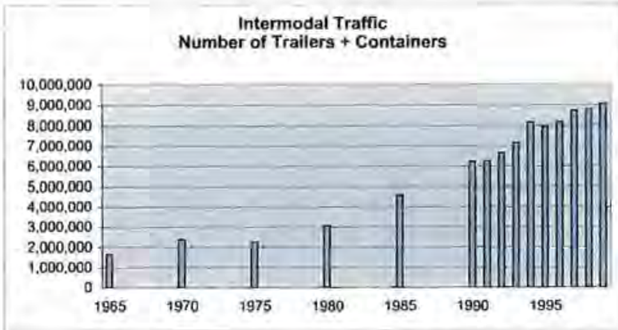


Interpreted as a simple measure of work, ton-miles indicate that, while railroads carry a significantly lower volume of freight than trucks, they carry this freight a much longer distance than trucks. Theoretical expectations are that railroads are more competitive than trucks for large volume, long distance, relatively low valued, commodity movements and the national data bear out this expectation.

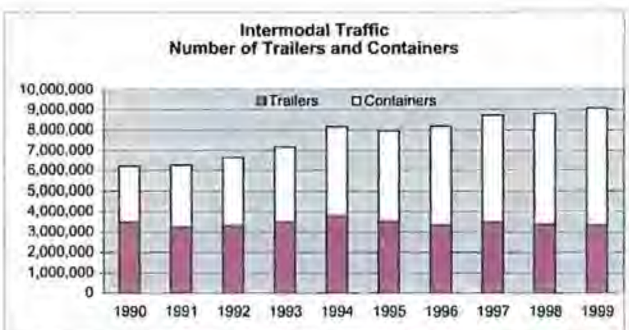


While modes of transportation differ in their average distance of shipments, they also differ with respect to the types of commodities they tend to carry. For the railroads, coal is by far the largest single commodity carried, with chemicals, motor vehicles, farm products, food and kindred products, and non-metallic minerals following (Railroad Facts 2000, Association of American Railroads). While each mode does find some specialized markets (such as trucks and fluid milk in our present case), none of the modes is significantly distinct from the others when it comes to commodities shipped. Much of this seeming specialization has to do with the location of economic activities and the specific distances of freight movement needed between locations. Some of the specialization, however, relates to the provision of other transportation service characteristics. These service characteristics, such as time in transit, reliability, equipment availability, shipment tracking, and even competence and courtesy of sales staff, are often lumped together into something referred to as 'quality'. Quality, however, could mean very different things to individual shippers.

One manifestation of this search for quality at low costs is the growth of intermodal freight traffic that allows shippers to seek the potential lower cost rail movements combined with the greater 'quality' characteristics of truck transport. We saw earlier that intermodal movements had their origins early in the 1900's and that milk trains were a very important part of intermodal development. This growth has continued since the 1960's and has accelerated since 1980.

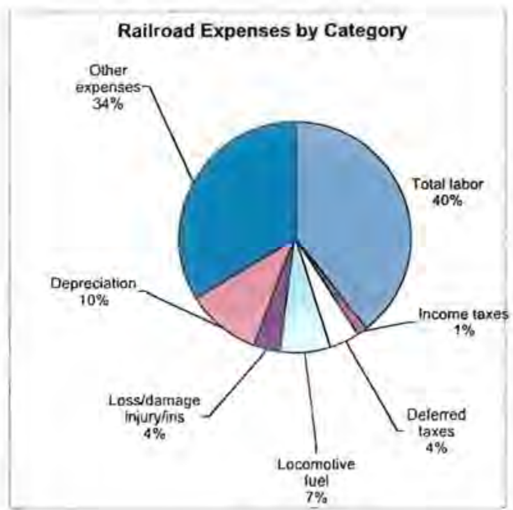


The major source for this recent growth has been the number of containers. Intermodal shipments of trailers on flat cars (TOFC) has be stagnant.



The cost of operating railroad services is notoriously difficult to compute. "Cost analyses of individual car movements are almost impossible to calculate accurately." (Boyer, p. 211) More than any other mode of transportation, railroad costs are not easily related to only a few traffic considerations, but require that account be taken of numerous variables. ("An Evaluation of Various Methods of Estimating Railway Costs", M.E. McBride, Logistics and Transportation Review, March 1983, Vol 19 No 1, p.60) It is common for railroad consultants to require hundreds of pages to describe the costs of simple movements. In order to calculate the costs of a single movement, it is necessary to detail train size, car type and size, grade of the track, speed limits, traffic density, train delays, car utilization, other train movements, and descriptions of all yards and terminals through which a train would pass.

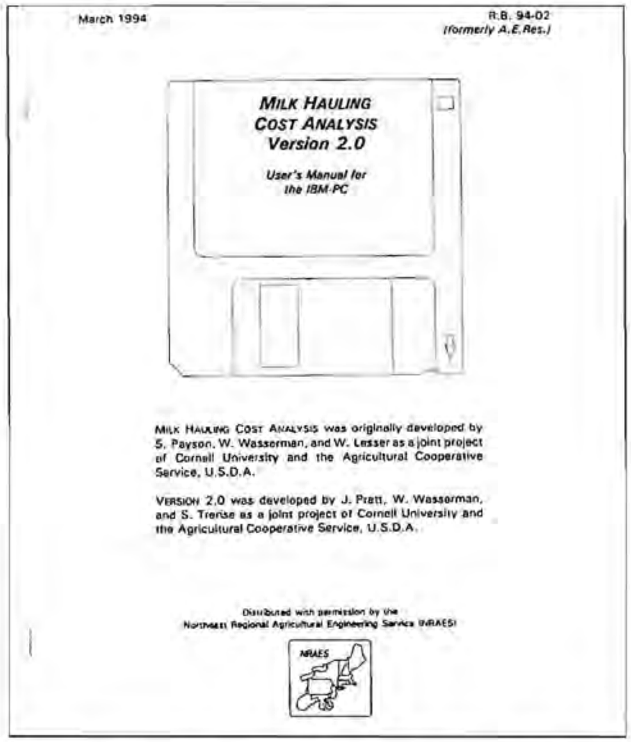
Using national data for railroad transportation expenses divided by revenue ton-miles in 1999 (Railroad Facts), it is calculated that average transportation expenses for railroads are .86 cents per ton-mile, while total expenses are 1.95 cents per ton mile. Looking at the cost categories for railroads, we see that while locomotive fuel makes-up only 7 percent of expenses, labor accounts for 40 percent.



The general perception that railroad traffic moves at less fuel costs than truck traffic is born-out by national statistics for the railroads. Railroads, on average, produced 386 ton-miles of revenue freight service per gallon of fuel consumed in 1999. (Railroad Facts) In contrast, an 80,000 pound milk hauling tractor and trailer (40 tons) achieving 5 miles per gallon would produce only 120 ton-miles of freight per gallon. A 100,000 pound loaded tractor and trailer unit (closer to the size of a milk hauling unit going to Northern New Jersey) would still produce only about 170 ton-miles of freight per gallon. Fuel costs on railroads are far less than any other mode of transportation.

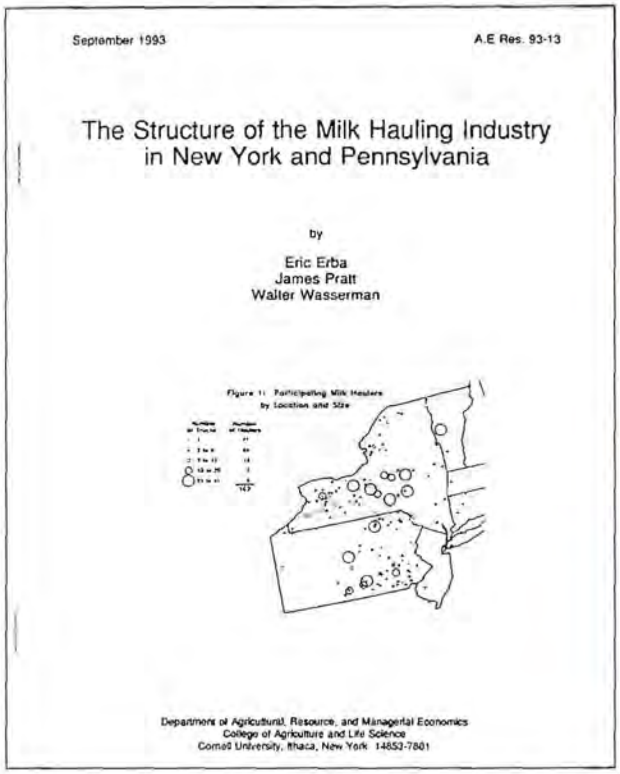
While most analysts are not surprised to see fuel as a small component of railroad expenses, they are surprised to see labor as such a large component. In fact, rail is one of the most labor intensive modes of transportation. While we see a small number of railroad employees actually riding freight trains, rail movements require many more directly accountable support personnel than do the other modes of transportation. Track and facility maintenance crews, equipment maintenance crews, traffic and sales staff, and executives are all required to keep the trains rolling. The actual train crews make-up only about 37 percent of total railroad employees. (Railroad Facts 2000)

While our knowledge about operating costs for specific railroad movements may be sparse, our ability to construct operating costs budgets for milk hauling operations is much more complete. Determining the cost of delivering a transportation service is, itself, a very difficult endeavor. Issues of fixed costs, external costs (pollution/road wear and tear/etc) make the determination of costs complex, but not impossible. Because all of the milk haulers providing the service for the Northeast are small entrepreneurs who have limited time and in-house resources for this type of task, Walt Wasserman and I constructed a computer program in 1994 to assist milk haulers and milk transportation managers calculator milk hauling costs (Milk Hauling Cost Analysis Version 2.0, R.B. 94-02).



Without good costs information, it is difficult for the milk haulers to make appropriate bids on milk collection routes. Even with good costs information, the allocation of these costs across the users of the transportation service is problematic. A milk hauler, as any other business, including the railroads, must eventually cover all of his cost or his business will be in trouble.

While I did not conduct a detailed milk hauling cost survey of the 170 milk haulers operating in the Federal Order 1 area as we did in 1993 and 1994 (A.E. Res. 93-13 and R.B. 94-03), I did canvass a few transportation managers and milk haulers to update some of the important figures needed for a cost calculation. For the basic route, I chose a route that would stop at one farm and pick-up 63,000 pounds of milk daily (equivalent to 1,125 cows). It would leave Utica and travel to North Bergen NJ, an approximate distance of 230 one-way miles, once each day. Based on the updated cost items, this very simple and low-cost route would cost approximately $550 each day, or $.87 per cwt., or $1.20 per two-way mile to operate.


September 1993 A.E. Res. 93-13

The Structure of the Milk Hauling Industry in New York and Pennsylvania

by

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James Pratt
Walter Wasserman

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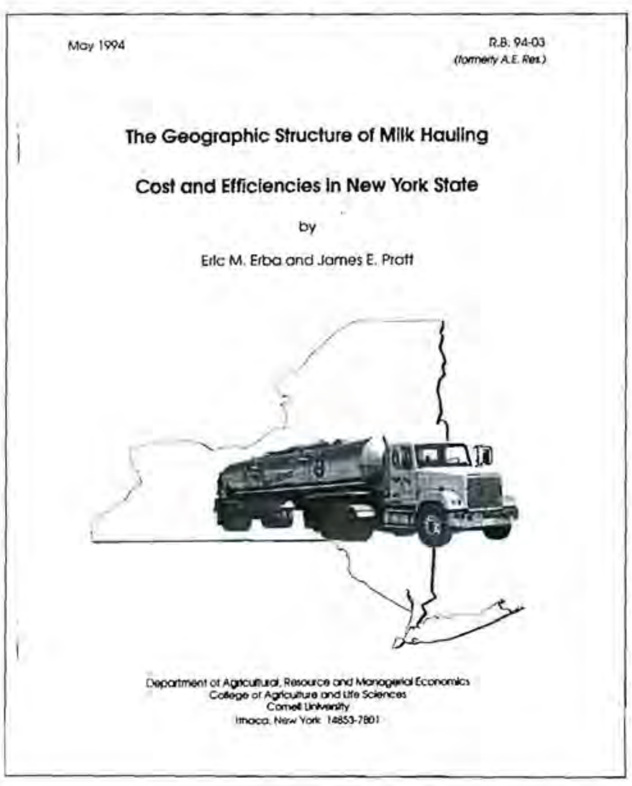
College of Agriculture and Life Science
Cornell University, Ithaca, New York 14853-7801

Complete assembly and over-the-road from Oneida County to Northern NJ.

Over-the-road tanker from Oneida County to Northern NJ.


May 1994 R.B. 94-03
(formerly A.E. Res.)

The Geographic Structure of Milk Hauling

Cost and Efficiencies in New York State

by

Eric M. Erba and James E. Pratt

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This route is very much an 'over the road' type of route and would not be comparable to a route that picked up multiple farms prior to starting its delivery to North Bergen. However, for our purposes, we are considering only the 'stem' or 'over the road' portion of milk deliveries, ie that part of the delivery that occurs after the milk is assembled. Anecdotal evidence from milk transportation managers indeed suggests that over the road shipment rates for milk do run between $2.00 and $2.50 per loaded mile (a range of 6 to 8 cents per ton mile), depending on the location within the region (mainly effecting labor rates) and the size of tank trailer being used.

In the end, however, neither the lack of specific rail cost information, nor the presence of specific milk hauling cost information has a tremendous bearing on the rates that might be charged to make a specific milk movement, especially in the case of the railroads. This is because transportation situations provide some of the classic examples of what economists call 'discriminatory' pricing; charging different rates for exactly the same service. Our culture has come to consider the word 'discriminatory' to have negative connotations; gender, age, race, religious discrimination all are considered to be anathema and we have promulgated laws to prevent such practices. In our economic uses of the word 'discriminatory', however, there are no such connotations. It is merely a descriptor of a particular situation. We've all seen the advertisements about air travelers sitting next to each other comparing tickets and discovering that they paid vastly different fares. This is mostly a result of discriminatory pricing.

In the case of milk hauling, the occurrence of discriminatory pricing is most likely to manifest itself in the converse form, where two producers in what appear to be different cost situations face essentially the same rate. The early years of milk-by-rail present some of the most interesting cases concerning discriminatory rate making (actual legal cases that went to the newly created Interstate Commerce Commission, *Milk Producers vs. Railroads – Milk Freight Rates*, Docket No. 4, Opinion No. 2 Sep. 1888 and *Milk Producers' Protective Association vs. Lackawanna Railway, et al., Docket No. 418, Opinion No. 198, March, 1897*). "… the Orange County farmers filed the first complaint against the Erie Railroad with reference to milk rates from Orange County points to New York City. Producers in that section shipping 28 to 87 miles objected to paying the same freight rate as was imposed on milk shipped 183 miles. The Commission decided against them. Ten years later the same rate was extended to points 417 miles from New York City. Complaints were again renewed, and the Interstate Commerce Commission reversed its decision and admitted the injustice of a single rate regardless of distance." (Seven Decades of Milk: A History of New York's Dairy Industry, John J. Dillon, Orange Judd Publishing Co. Inc. 1941, New York). The Interstate Commerce Commission (ICC) declared the uniform rates unreasonable and ordered into effect a four-zone system of graduated rates. In June of 1917, the ICC revised the decision and called for the railroads to significantly lower all of their rates and to establish 10-mile freight zones extending out to 400 miles from NYC. (Spencer, p. 86)

Even for the milk haulers of today, a discriminatory issue is typically present. Given that a number of farms are usually served on a single route, how are the costs of collecting and delivering the milk from farms on that route to be allocated among the farms? Over the years, various methods have been used ranging from flat per hundredweight charges to methods that include a fixed charge per stop plus a flat hundredweight charge (indirectly lowering the per hundredweight charge as the number of stops decreases and as volume per stop increases) to methods that directly decrease the hundredweight charge with increases in volume. In areas where producer cooperatives or marketing agencies contract for the hauler services, the charges made to producers for milk hauling are usually documented for public view. In areas where producers contract directly with haulers, no such sharing of the rate rules is usually mandated, but producers generally communicate this information among themselves. In both cases this generally results in pressures for essentially equal rates among producers on a specific route who otherwise have different sizes, different locations, and different other 'quality' demands. This may result from our cultural preference for 'equal' treatment, but is clearly a case of discriminatory pricing.

Let's consider one other important economic characteristic of milk transportation from farms to plants: *dairy farmers bear the burden of covering the rates charged for delivering their milk to processing plants*. This fact may not seem obvious because of the complex system of deductions, hauling subsidies, pooling of revenues, and governmentally regulated producer pay prices that are determined by delivery locations. Dairy producers, as a sector, pay for the movement of milk of their milk. This results because of what economists call 'inelastic' demand. Because of the biological *facts of nature* of milk production, 1)cows produce milk every day and cannot be turned on and off quickly and 2) milk is a fairly perishable product and cannot be easily stored on farms like some other crops, the dairy farmer finds himself in the position of having to move his product on a continual, consistent basis. His demand for milk transportation service is typically unresponsive to short-term changes in the economic environment around him. In the short-term, neither changes in the price of milk received by the farmer nor in the cost of hauling his milk induce the farmer to produce more or less milk. Of course, in the longer-run, he is likely to either expand or cease production in response to these changes. Dairy producers often astutely observe that they seem to pay the hauling charges for every input that comes to and every output that leaves their farm. This is true because of their typically small relative size and their inelastic demand. Consequently, any cost savings made in the milk transportation function will accrue mainly to dairy producers.

IV. The Potential Milk-by-Rail Equipment and System

The Railroads

While much of the vast infrastructure that supported the milk trains of the past has been abandoned, Oneida county is fortunate among New York counties in that there are at least two different railroads capable of serving Oneida county milk producers: CSX and NYS&W. Representatives from both of these organizations have cooperated in this study.

As we saw earlier, while intermodal carriage by the railroads has been increasing, especially in recent years, almost all of this growth has been in the shipment of containers. To increase railroad's competitiveness for the shorter hauls, Wabtec, a supplier of products, services and systems for the rail industry has developed the Ramp Car.

Each Ramp Car is 438 feet long and is capable of carrying truck trailers up to 57 feet long and weighing up to 90,000 pounds on each of seven articulated platforms. The Ramp Car features a pneumatically operated, folding ramp for "driveon" loading of highway trailers from any grade level surface, thus eliminating the need to invest in expensive intermodal terminals and equipment. Earlier this year, the first two prototype Ramp Cars were delivered to The Canadian National Railroad and put in revenue service between Toronto and Montreal. I had the opportunity to visit the Canadian National yard in Montreal in July and see one of the Ramp Cars that is in service there.

RoadRailer

RoadRailer is a state of the art transportation technology that delivers the flexibility of highway with the efficiency of rail. RoadRailer trailers are lightweight, dual-mode trailers sometimes described as a bi-modal rather than intermodal technology. The RoadRailer trailers can be built to any size and style. Currently, a ReeferRailer, a Heavy Haul Van, a Mail Van, an AutoRailer, and a PupRailer are available. The same RoadRailer rail bogie carries every type of trailer, and all trailers can be coupled together. The same CN yard in Montreal that serviced the Ramp Car also was a major terminal for CN RoadRailer service.

The Milk Trucks

As we saw earlier, the stainless steel tank and milk haulers have had a long history. In our 1993 survey of Northeast milk haulers, we found that nearly 70 percent of the tanks used in the Northeast were trailers and that the average capacity of these trailers was 6,200 gallons. Today's versions are highly developed in design and in New York some approach 8,000 gallons capacity. Most, but not all of these trailers have on-board pumps with which to pump the milk from the farmer's bulk tank into the trailer.

Special equipment

ISO tanks

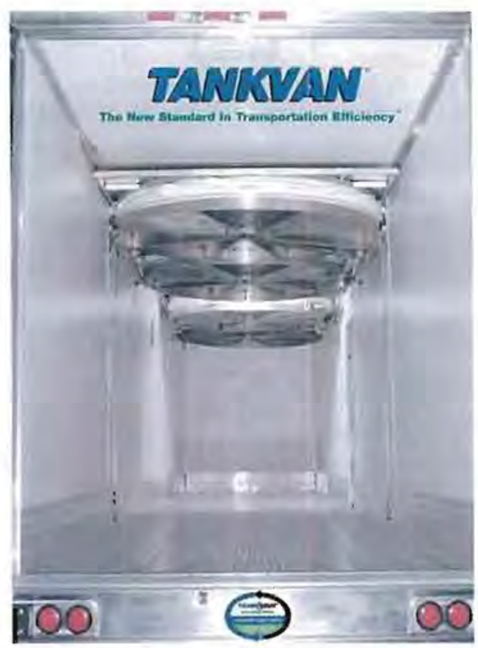
Agmark Foods is a bulk liquid foods transportation company located in Nashville, TN that uses super-insulated, stainless steel tank containers to ship temperature sensitive and perishable products across the United States, North America and the world. Agmark began its business by shipping raw milk from Wisconsin to Florida by rail. Agmark tanks are built in a variety of sizes (5300, 5800 and 6000 gallons). Tanks are 96" wide, 20' long, 8'6" high and stackable to 9 high. Tanks on chassis are 12'2" high on a single droop chassis or 11'2" with a specialized double drop chassis. These tanks have FDA 3A sanitary, USDA, and Wisconsin Dept. of Agriculture certification.

Agmark's loadings of edible food products, include fruit juices, sweeteners, vegetable oils and milk products. Agmark specializes in intermodal shipments involving both rail container cars and ships.

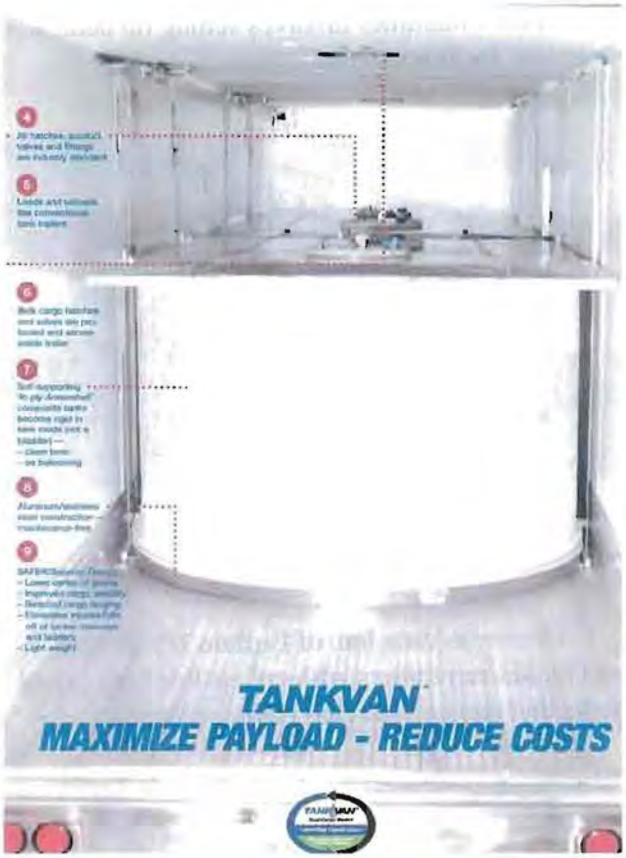
This sometimes involves setting up dedicated terminal facilities.

Tankvan

Converta-Vans Inc. of Buffalo NY designs and builds van trailers with collapsible bulk liquid tanks that can be extended from the van ceiling.



This design accommodates the movement of bulk liquids, palletized freight, or a combination of both.



By accommodating both bulk liquid and dry freight, the TankVan allows for maximum back haul potentials.

V. Technical Feasibility

There are numerous equipment compliments that would make a milk-by-rail movement from Oneida county technically feasible; loading the milk assembly tankers currently used in Oneida County on flatcars for shipment to North Bergen - using super insulated AgMark ISO tanks loaded on container cars for shipments to the same or even further locations - using RoadRailer versions of the TankVan or Wabtec RampCars- etc. Any one of these raw milk movements from farms to plants will necessarily involve an intermodal shipment. Milk will be assembled from farms by truck for the foreseeable future. Once assembled into a load, the question becomes 'does rail movement have any advantage, cost or quality, to offer for the stem haul?'.

Economic Feasibility

On the cost side, we have a good estimate of milk hauling costs, but very imprecise estimates of rail costs. The information that we do have suggests that over the road costs for average railroad freight movements are much lower than for milk trucks and that this cost advantage extends to general freight. However, in transportation as in most other economic venues, costs rarely translate directly into rates. For transportation in particular, cross subsidization and discriminatory incentives can often result in substantial divergence between costs and rates. For rates, we again have anecdotal evidence on over-the-road rates applicable for the Northeast, but there currently are no movements on either of Oneida County's railroads similar to what's being proposed, so we have no comparable railroad rates either. Railroads mainly transport bulk commodities over long distances but are experiencing growth in intermodal movements. Why then isn't milk moved by rail now? First, the intermodal character of milk movements involves the establishment of some type of intermodal facility on both ends of the carry. In the distant past, this involved the building of numerous upcountry milk plants to first receive the milk before it was shipped to New York City or Boston. Today, this would involve setting up a terminal facility to load flatcars (putting milk trailers on flatcars) or container cars (loading ISO tanks). An industry source estimates that it would take 50 to 100 loads per day to make such a terminal economically viable. Clearly, the Northern NJ/NYC milk volume needed at processing plants exceeds this level, but sourcing this much milk to a single terminal would involve a prohibitive amount of assembly costs. The same industry source estimates that the volume would have to come from an assembly area of no more than 10 to 35 miles to be feasible. The Ramp Car or RoadRailers significantly alter this calculus. By allowing loading at grade, terminal establishment costs are greatly reduced and the volume needed to sustain a siding would be much lower. Second, there is the significant issue of 'quality' referred to earlier, not the quality of the milk, but the quality of the transportation service. For milk, this is a significant issue. Time in transit for the equipment, the time of delivery, and flexible delivery scheduling are very important transportation characteristics in the dairy industry. To assemble the milk from upcountry farms and then make a 230 mile transit to Northern NJ requires the better part of a day. If the empty trailer is not returned soon enough to start the next day's run, then extra trailers would be necessary. The most optimistic rail schedules would require eight hours of transit time and would not return trailers in sufficient time to make one run per day. In addition, the biologically invariant nature of milk production, combined with daily fluctuation in the demand for milk and plant problems that might require temporary stoppages, often necessitate that fluid milk plants change their production schedule on very short notice. Given the perishability of raw milk, this means that a tanker load of milk destined for delivery to a city zone fluid plant be diverted from its normal city destination to an up country manufactured plant in nearly the opposite direction. This flexibility characteristic is a very important quality associated with the services provided by today's milk haulers. As in any situation involving equipment, tractors and trailers are subject to malfunctions. Milk haulers individually and collectively provide the backup equipment to ensure that transportation of this very time sensitive commodity is accomplished. While the costs of operating trucks in over-the-road service is higher than for railroads, milk haulers have offered service quality characteristics that typical, modern railroad operations have not.

Truck Size and Weight Limits

A number of concerns about truck size and weigh limits have been raised recently. Because of a grandfather provision to 1956 Federal Highway legislation, New York milk haulers currently can obtain special milk hauling permits that allow them to exceed the Federal gross vehicle weight (gvw) limit and individual axel limits. This allows New York haulers to go to 100,000 pounds gvw. Massachusetts and New Jersey also allow larger milk vehicles. Pennsylvania and Vermont, however, did not qualify for the grandfather provision and only allow these heavier vehicles on non-Federal portions of their roads, making it practically impossible for heavier milk hauling vehicles to operate in those states. As noted in the August, 2000 U.S. DOT "Comprehensive Truck Size and Weight Study Final Report", there are significantly conflicting views on the safety and economic efficacy of longer and heavier trucks. Proposals have been made to roll-back all weight limits to the Federal 80,000 pounds level, and these have met with strong resistance. Other proposals seek to freeze length and weight limits at their current levels. H.R. 551 the Safe Highways and Infrastructure Preservation Act, introduced in 1994 and again in 1997, would federalize some truck regulations that are now under state control. Specifically, it would phase out trailers longer than 53 ft., freeze state grandfather rights and freeze weight limits on non-interstate portions of the National Highway System. Several interest groups, including the Coalition Against Bigger Trucks (CABT, http://www.cabt.org/) are mounting efforts to freeze truck size and weight limits through the Safe Highways and Infrastructure Preservation Act (HR 2180 and S 1140).

Road Wear

The issue of road wear and highway user taxes is a subject of continual study and contention. The American Association of State Highway and Transportation Officials (AASHTO; AASHTO Guide for Design of Pavement Structures, Washington, 1986) makes estimates of the required pavement thickness depending on axle loads, types of soils, and weather conditions. There is little question about the fact that heavy trucks wear out pavement at a faster rate than automobiles. Government studies found that pavement damage rises with the fourth power of axel weight (The AASHO Road Test, Report 5: Pavement Research, Highway Research Board, Special Report No. 61E, 1962). This would mean that a typical 80,000 pound tractor trailer does the pavement damage equivalent to 5,000 automobiles. Other studies have found that the pavement damage rises with the third power of axel weight (Optimal Highway Durability, K. Small and C. Winston, the Am. Econ. Rev., Vol. 78 No. 3, June, 1988). This would mean that an 80,000 pound tractor trailer would do the damage of only 600 automobiles. A truck loaded to 100,000 pounds, the legal limit of milk transportation vehicles in New York with special milk hauling permits, would do between three and four times the damage done by an 80,000 pound load. Regardless of the rate of damage, the real question becomes one of how to pay for the repair of roads. The Federal Highway Administration estimated that "Passenger vehicles are expected to overpay Federal user fees by about 10 percent, while unit and combination trucks will underpay by about 10 percent in 2000. These averages, however, mask inequities among vehicles. For example, while automobiles pay their share of highway costs, pickups and vans overpay. In virtually all truck classes the lightest vehicles pay more than their share of highway costs and the heaviest vehicles pay considerably less than their share of costs." (1997 Federal Highway Cost Allocation Study Summary Report, August 1997 U.S. Department of Transportation, Federal Highway Administration) If, in the future, heavy trucks are required to pay fuel taxes or user fees that are more commensurate with their impacts on road design, construction, and repair costs, heavy truck operating costs will necessarily increase and dairy producers will bear the increased burden.

Cleaning

The stainless steel vessels being considered all have the necessary state and Federal approvals to be used in the movement of bulk raw milk. The TankVan has approval to move pasteurized dairy products. Its current dairy application is moving palletized cheese in van mode and whey, a product of cheese production, in tank mode. To be used in a raw milk application, several tests would need to be completed. The main concern would be the durability and cleanability of the fabric tanks. Beyond the reduction of 'surging', the smaller 1,500 gallon TankVan tanks may be more easily cleaned and inspected than the typical 6,000 to 8,000 gallon stainless steel tank.

Pumps

In the process of conducting interviews with plant managers who might eventually be on the receiving end of milk-by-rail shipments, it was determined that they had a concern about the type of pumps used in moving the milk from one storage vessel to another. All milk tank trucks currently use on board pumps to move milk from the farmer's bulk tank to the trailer. As farm sizes have grown, some large producers have decided to install their own on-farm pumps to move milk from their bulk tanks to trailers that are pre-positioned at their farms. These on-farm pumps are centrifugal. Under certain conditions, centrifugal pumps pose the possibility of 'shearing' the milk fat globules. This disturbance to the fat globules increases the possibility of lipase activity that can cause a rancid flavor in the milk. Some fluid plants regularly test for increased lipase activity with an "Acid Degree Value" test, but are concerned that the increased use of centrifugal pumps increases the potential for milk quality problems. Farmers install the centrifugal pumps because they are less expensive ($3,500-$5,000) than positive pumps and are easily maintained and operated and can be integrated into their own clean in place (cip) systems.

Backhauls

One of the most appealing aspects of the TankVan is the potential it offers for backhauls of palletized freight from Northern NJ or MA. For at least one of the railroads, this is the key element. Issues with respect to the maintenance, control, and ownership of the trailers becomes more critical as the number of parties involved in the use of equipment increases. Drayage firms could handle the movement of the trailers from the railroad terminal to the milk plants, then to other area locations for palletized loadings, and then back to the railroad terminal. It is possible that the upstate milk haulers themselves could complete the palletized deliveries of shipments back to the upstate area. Several of the large milk haulers operating in Central NY already have significant non-milk components of their businesses and milk-by-rail could provide synergies between these haulers' milk and nonmilk business and offer opportunities for growth.

Who Owns Equipment?

Historically, railroads have owned the equipment used to move milk. They leased the equipment back to the milk dealers or to the farmer's cooperative associations on a mileage basis. Given the multi-use nature of milk-by-rail with backhauls, it would seem that railroad ownership would again be necessary.

Benefits to Oneida County (MN Implan Group http://www.implan.com/~implan1/about.html)

Using a mathematical method called 'Input/Output' (I/O) or 'Interindustry' analysis, it is possible to study the interrelatedness of industries in Oneida County and estimate the economic multipliers associated with each. This method captures the respending effects of local economic activity. For example, if a dairy farm in Oneida County buys feed from a local feed dealer, that spending goes to the local feed dealer who would use some of it for the purchase of the feed itself, some for the energy and equipment to do the feed preparation, some for the truck and driver to transport the feed to the local farm, etc. In turn, the grain supplier would use his share to purchase inputs to grow the grain, the trucker would use some to purchase the truck and fuel, etc. Some of this spending does not stay in the local economy and 'leaks' outside. The grain may have come from Iowa or the transport truck may have been manufactured in Detroit or the oil used to produce the truck fuel came from Texas. I/O analysis mathematically captures the totality of these respending effects and expresses them as multipliers. Two types of multipliers are commonly used; output multipliers and employment multipliers. Output multipliers express the total economic activity that would be generated by an additional sale of one dollar of output to the outside world by the sector in question. That is, if a dairy farmer sells one dollar of output (milk, cows, hay, etc) to someone outside of the local economy, how much total economic respending would this sale generate? MIG's calculation for Oneida County Dairy Farm Products is an output multiplier of 1.345. A one dollar sale of milk by an Oneida County producer is estimated to generate an additional 34.5 cents in economic activity in Oneida County. Employment multipliers express the total employment activity that would be generated by the addition of one more employee by the sector in question. The employment multiplier for Oneida County Dairy Farm Producers is 1.92. Increasing Oneida County Dairy Farm employment by 1 person simulates the employment of an additional .92 persons. Similarly, keeping one dairy farmer in business in Oneida County preserves nearly one more nondairy farming job. For the larger five-county area, the dairy farm output multiplier is 1.44, that is a one dollar sale of dairy farm product to an outside buyer such as a fluid plant in New Jersey, results in an additional 44 cents of economic activity in the local area. The employment multiplier for the larger area is 2.37. Saving one dairy farmer in the five-county area preserves an additional 1.37 jobs in the local economy.

As should be expected, milk hauling rates vary widely across individual producers in the Northeast (see "Understand Your Milk Check First", by Craig Alexander, Smart Marketing, Cornell Coop. Ext, April, 2001 http://hortmgt.aem.cornell.edu/pdf/smart_marketing/alexander4-01.PDF). Hauling charges range between 4 and 15 percent of the pre-deduction price. In this situation, any reduction in the hauling charge, which is taken as a deduction directly off the producer's milk check, has a strong leverage affect on dairy farm net income.

A Proposal

While there are a large number of tank loads of milk moving to Northern NJ/NYC each day, these tanks originate from a very large geographic area. It seems very unlikely that milk-by-rail movements could become a majority of the movements to the delivery area because of the large area over which the milk would have to be assembled. However, significant blocks of milk on the distant extents of the milk shed could offer opportunities for a milk-by-rail service to find an economic niche. Oneida County, or the five-county area around Oneida County, offers such blocks of distant milk ranging from 7 to twenty tankers of available milk per day.

Two railroads have the capability of offering milk-by-rail movements from the study area to Northern NJ/NYC, CSX and NYS&W. Each would likely involve different originating locations in the area and both could deliver to similarly located points in Northern NJ. Use of the TankVan technology as a RoadRailer unit or on Wabtec RampCars would minimize the cost of establishing an originating terminal area when compared to the costs of handling containers. The TankVan would also open-up the economically necessary possibility of backhauls of palletized freight.

For 90 years, all of the milk needs of the New York City metropolitan area were met exclusively by the long-haul movement of milk-by-rail. From the earliest rail shipments, these movements were intermodal. Horse and wagons and then cars and trucks were used to assemble the milk at country receiving stations for the long haul to New York City. For milk plants not located on the rail lines, this meant another wagon or truck movement from the station to the plant. During a very short time period beginning with the Great Depression, the use of trucks for both the assembly and the long-haul portions of the movement completely replaced the use of milk trains. There are two complimentary factors; the rates charged and the service offered. For long-haul movements, trains had and still have a cost advantage. With improvements in trucks and roads, the rail rates in effect before 1929 generally favored the railroads at distances greater than 200 miles. Movements by trucks were favored at distances shorter than 200 miles. After 1929, as general prices began to drop (a 25 percent decline in the CPI between 1929 and 1934), truck costs and the rates they charged also followed the general price level down. The railroads, however, held their pre-depression rates in place until late 1933. Combined with the precipitous decline in the amount of milk needed for delivery to NYC (also a decline of 25% between 1930 and 1934), rail milk traffic suffered a 46 percent decline between 1930 and 1934, a catastrophic loss. Trucks, however, saw their milk traffic increase by over seven times during that same time period of lower total milk traffic demand. This loss to the railroads was mainly in the milk tank car shipments. Anecdotal evidence suggests that Intermodal milk movements actually increased. However, once the large traffic volume of milk was lost, railroads were not able to offer the daily, highly refined schedules that they had developed prior to the depression and their milk traffic slowly declined until the end in the 1950's.

So, what's changed? The first major difference to be considered is the use of the TankVan technology to make possible potential backhauls of palletized freight from one of the major manufacturing and port areas on the east coast to central New York. Milk tank trailers are specialized pieces of equipment that have limited backhaul potential. Additionally, milk hauler ownership of the tanks gives incentives for the haulers to keep those tanks in maximum service, by moving them directly back to central New York for immediate use in milk hauling.

Second, the railroads' advantage in long-haul cost have increased through gains in railroad operating efficiency and via increased relative fuel prices, railroads being much more fuel efficient than trucks.

Finally, the railroads have a quality characteristic that they can offer with a milk-by-rail service involving a number of milk tanks. Because of the daily schedule of milking activity, there is a natural tendency for the milk tank truck arrivals at Northern NJ/NYC plants to 'bunch up' during certain periods of the day. This causes increased costs for the haulers, because of increased driver waiting times and can create plant scheduling issues for those times when few tanks are being unloaded. If a significant amount of milk were to be pre-positioned at a nearby drayage facility and delivered 'on demand' by either a plant employee or by a drayage firm, a more even flow of milk into the plant receiving bays could be achieved relieving driver waits and smoothing plant receipts.

I suggest that SOCED proceed to arrange a 'test-run' using a TankVan in truck only mode. This test would be conducted in conjunction with New York State Agriculture and Markets milk inspectors and Cornell Food Science technicians. The Director of Dairy Industry Services in the New Department of Agriculture and Markets, Mr. William Francis, and his milk inspectors, Mr. Bill Fredericks and Mr. Jim Fitts, have agreed in principle to participate in a test of the TankVan when it is in actual raw milk service. Dr. Steve Murphy, a Food Science Extension Specialist at Cornell University, with responsibilities in milk quality for the State of New York, has also agreed to work with Agriculture and Markets to design and conduct this test. It would also be conducted in cooperation with DMS, an innovative milk hauler, and a cooperating fluid handler. If successful, SOCED should then pursue the intermodal aspects of milk-by-rail.

Bibliography

A Brief History of New York City's Milk Traffic and the Milk Business of the New York, Ontario & Western Railway Co., J.C. Anderson, Dec. 1902.

The Big Haul (The evolution of modern milk transportation), Association Quarterly, Dairy Industries Supply Association, May, 1939, Vol 2, no. 2.

Principles of Transportation Economics, K.D.Boyer , Addison-Wesley, 1997.

Various issues of 'DairyNews', the magazine of the Dairymen's League Cooperative Association (DairyLea).

Seven Decades of Milk-A History of New York's Dairy Industry, J.J. Dillon, Orange Judd Publishing, 1941. Chap VI, Milk Freight Rates.

The Story of a Milk Train, American Milk Review, Aug, 1947, by H. Doherty.

The Structure of the Milk Hauling Industry in New York and Pennsylvania, Cornell Res. Bul 93-13, E.Erba, J. Pratt and W. Wasserman.

The Geographic Structure of Milk Hauling Cost and Efficiencies in New York State, Cornell Res. Bul 94-03, E. Erba and J. Pratt.

The Potential Economic Benefits of Innovative Milk-Hauling Methods in Vermont, E. Karpoff and F.C. Webster, Prepared for George M. Dunsmore, Commissioner of Vermont Dept. of Ag., June, 1982.

New York, Ontario & Western Railway and the Dairy Industry in Central New York State: Milk Cans, Mixed Trains and Motor Cars, Robert E. Mohowski and Carl Ohlson (Artist), Jan, 1996.

State of New York, *Preliminary Report of the Joint Legislative Committee on Dairy Products, Live Stock and Poultry*, Feb. 15, 1917. Service Rendered by Milk Trains, pp 346-358.

Milk Hauling Cost Analysis Version 2.0, Cornell Research Bul 94-02, J. Pratt and W. Wasserman

Milk Supply of New York City with Special reference to an All-Rail Movement to Long Island, B.M. Price, The New York Food Marketing Research Council, May, 1929.

The Market-Milk Industry, C.L. Roadhouse and J.L. Henderson, First (1941) and Second edition (1950), McGraw Hill. Chap 9, The Transportation of Milk.

An Economic Study of the Collection of Milk at Country Plants in New York, L. Spencer, Bul. 486, Leland Spencer, Cornell Univ. Ag. Exp. Station, March 12, 1929.

An Economic History of Milk Marketing and Pricing, Volume I, L. Spencer and C. J. Blanford, 1977, Grid Inc. Chap X, Milk Supply and Transportation, 1880-1903 and Chap. XI, Milk Supply and Transportation, 1903-1916.

Transportation of Milk and Cream to the New York Market, A Thesis Presented to the Faculty of the Graduate School or Cornell University, by Harry Ross Varney, 1935.

The Transportation of Milk to the New York Market, Cornell Ext. Bul 308, H.R. Varney, Oct. 1934.