Remanufacturing Fleet Vehicles

White Paper by Vehicle Reman

Abstract

This paper explores the next step change in fleet vehicle management. This step change saves fleet operators 50% of their purchase costs. These savings are realized through 'remanufacturing'. Currently, fleet vehicles are retired with too much latent value in the core. This represents a huge value mine in the operator's fleet. Vehicle Reman mines that value for its customers.

CONTENTS

INTRODUCTION

Assumptions

This white paper addresses the concept of remanufacturing automobiles and light trucks for private and government fleet operations. It assumes the reader is involved in managing, purchasing, operating or maintaining one or more vehicles. It is further assumed that the reader is interested in reducing the purchase cost of transportation assets.

Additionally, this white paper focuses on the history or context of vehicle remanufacturing and what it can and cannot influence in vehicle operations.

Overview

There are several reasons that vehicle remanufacturing has not developed until now. This paper explores the following major influences:

- Marketing pressures
- Fragmented industry
- Unchanged business model
- Fleet size
- Product quality

Each of these effects must be considered in the context of time:

1. Past
2. Present
3. Future

Before any discussion of the influences and their time-based context, it is helpful to define 'remanufacturing' and consider remanufacturing of passenger vehicles with remanufacturing of other equipment in the transportation sector.

WHAT IS REMANUFACTURING?

The Merriam-Webster definition:

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re·man·u·fac·ture
Pronunciation: (")rE-"ma-ny&-'fak-ch&r, -"ma-n&-
Function: transitive verb
: to manufacture into a new product
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Of course this now implies the need for a definition of manufacture. Once again Merriam-Webster:

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manufacture
Function: verb
1 to make into a product suitable for use
2 to make from raw materials by hand or by machinery
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When a vehicle is manufactured, it is assembled from raw materials into a useable product. When the product is remanufactured, that product is manufactured into a new product. The implication is that raw materials are not involved during remanufacturing and that something happened to the original, manufactured product.

For a vehicle to become unusable as a product, typically one of the following occurs: end of service life, major system / subsystem failure(s) or collision.

As one might expect, remanufacturing addresses each of these types of loss.

The vehicle does not require redesign, raw materials or new governmental requirements. The vehicle simply needs the necessary labor and material to, as Merrriam-Webster says, return it to 'a new product.'

End of economic life

When the current salvage value is greater than the economic value (less anticipated repair costs) it's time to dispose of the vehicle. It is here that remanufacturing makes a big difference.

If there was no consideration of the salvage value or anticipated repair costs, the fleet operator would use the vehicle until it failed to perform its mission.

Remanufacturing allows the fleet manager to ignore the salvage value or anticipated repair costs. Knowing that the remanufacturing safety net is in place, the entire service life is useable until the vehicle fails or becomes unsafe to operate. Since there is no concern about salvage value, the tradeoff between the possible salvage return and anticipated repair costs disappears.

This allows the fleet manager to capture or retain the intrinsic value in the core vehicle despite a failed system / subsystem.

End of service life

If a vehicle accumulates enough miles or is operated in harsh enough conditions, it will eventually reach a point where it does not make economic sense to operate the vehicle because repair costs and lack of service make it more expensive than a new vehicle. Recent improvements in initial product quality translate to a more valuable commodity at the end of the service life - that leaves more room for economically returning the product to a new condition. Again, technological advances influence the ability to remanufacture vehicles that have reached the end of their service life. Keep in mind that 'end of service life' is defined differently for every user and each operational environment.

System / subsystem failures

When one or more expensive systems or subsystems of a vehicle fail, it becomes, perhaps, the best candidate for remanufacture or repair. If the system failure is specialized or localized enough, a repair facility can restore the economic value of the vehicle. In more severe cases, or when the nature of the failure indicates that other systems / subsystems may be involved in the future, remanufacturing is the best option.

Without remanufacturing, the out-of-service time and repeated efforts to repair parts that fail as the vehicle gets older makes it uneconomical to choose repair over a new purchase.

Collision

Depending on the severity of the collision, it may not be economically feasible to return the vehicle to a new product. However, just as in most industries, recent technological advancements have made it easier to recover the value of a vehicle after a collision. Frame straightening machines, more precise measurement devices, modular components, standardized designs and even faster / higher quality paints are some of these advances.

WHY NO REMANUFACTURING UNTIL NOW?

The average age of the United States General Aviation (private aircraft) fleet is 27 years[1] Aircraft are regularly remanufactured, as the age of the fleet indicates.

A variety of governmental sources indicate the average age of the private boat fleet is about 21 years. Remanufacturing of private boats is a large industry.

The military has a long history of what it calls 'rebuild' programs for just about every wheeled vehicle in its inventory.

By contrast, the average age of a vehicle in the United States is 8.3 years.[2] Surprisingly, there is no production line environment, remanufacturing facility for automobiles and light trucks in the United States for passenger vehicles.

So with all this remanufacturing going on, why is there no remanufacturing of automobiles and light trucks?

The remainder of this section deals with this question.

Marketing pressures

According to the Bureau of Economic Analysis, the sales of domestic vehicles in 2003 were $485 Billion. A rule of thumb in the advertising industry is that 5% of sales are allocated to the ad budget. With an industry as competitive and flashy as the automobile industry, the percentage may be higher. In any event, 5% of $485 Billion is over $24 Billion. With so much money available telling the market how to buy automobiles, it is easy to see how the market can be influenced. Never mind that the prices are inflated to pay for all the attractive financing packages.

Fragmented industry

The idea here is that nothing has changed since 1895. Evolution of manufacturing and the requisite repairing has spawned many small repair centers (rightfully so, given cost structures, convenience, etc). This fragmented industry can and does reman onesies and twosies; but they can't and don't churn out several vehicles every day.

Unchanged business model

Once again the model is evolutionary. Only recently has there been a consolidation of retailers (e.g., Carmax, AutoNation). One aspect of business growth is consolidation to achieve economies of scale; that is what Vehicle Reman is proposing. Another factor is that for most of the past, Detroit has had a monopoly on vehicles; relatively recent pressures from Asia have forced the re-thinking of how vehicles (new and used) are made and sold.

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[1] Aircraft Owners and Pilots Association, 2004
[2] U.S. Department of Energy, 12/15/2004

Fleet size

As large multinationals have consolidated and grown, so have their fleets. We are now at a critical mass. If remanufacturing can be demonstrated to save 30-50%, which it will, then there is another cost area that fleet managers can mine to save costs.

Product quality

Asian manufacturers, first the Japanese, then the Koreans and now the Chinese, have consistently and incrementally lowered the real costs and increased the quality of vehicles. With a more valuable core, the more sense it makes to add value back into the car when it comes time to reman. Also, the drive to product quality has resulted in more and more common components shared between models - and even models that are exactly the same except for the brand (think Chevy & GMC trucks, Ford Taurus & Mercury Sable, Ford Crown Victoria & Mercury Grand Marquis to name a few). Common components make it easier to stock inventory and reduce model changes on the reman production line.

The Process

Without remanufacturing, it's easy to understand the logic used until now - use the asset until the possibility of major repairs increases and the salvage value decreases then sell it!

But, what if you could find a low-cost method to capture the intrinsic value of the asset? With remanufacturing, you can.

What makes repairs so costly is that they do not line up nicely. The really big-ticket failures (e.g. engine, transmission, air conditioning compressor) don't fail at once. So, if you were to repair these subsystems when they failed, you'd spend more time transporting and waiting on the repairs than the actual repairs themselves. You add up the lost time and lost productivity to the repair costs and it's just not worth the trouble.

Enter remanufacturing. If you don't worry about the salvage value, you can use the asset right up to the point of the first costly repair. At that point, you've enjoyed more value out of the vehicle than previously possible. After remanufacturing, redeploy the vehicle for another complete term of use. At the end of the redeployment, the salvage value is largely unchanged because the depreciation curve is so flat in the later years.

AN ECONOMIC VIEW

"If the only tool you have is a hammer, you tend to see every problem as a nail." - Abraham Maslow

Over the last several years best practices in fleet management have lowered total vehicle operational costs. Through a combination of several, innovative reporting, tracking and use policy initiatives fleet managers have gained control of fleet costs.

For the next big move in fleet savings, a new, innovative, mold-breaking, out-of-the-box idea is required.

Vehicle Reman is delivering that new tool to fleet operations in the form of vehicle remanufacturing, aka refurbishing, restoring.

The History, or Old Way

To better understand remanufacturing, we must look at the history of fleet vehicle manufacturing. Of course the driving force behind fleet management policies is depreciation.

Before getting to the details of an example, it is helpful to note there are two ways to depreciate a remanufactured vehicle. One way, is to take the cost and add it to the cost-basis of the vehicle and continue (or restart) the existing (or previous) depreciation. The other way is to sell the 'core' to Vehicle Reman, then Vehicle Reman sells the vehicle right back, thus starting a new depreciation event. Always seek tax advice for each situation; internet searches return many results to illustrate the first method and the second method is immediately obvious. What may not be so obvious, in the second method, is that subsequent vehicles can be counted as a 'trade-in'; the benefit in this approach is avoiding sales tax in favor of vehicle tax which is usually less (e.g., in Texas this might save 8.25% (sales) less 6.25% (vehicle) or 2% of the overall transaction).

Year	Total Depr %	Accum Depr %	Total Depr	Accum Depr	Undepr Balance	Vehicle Sale	Gain On Sale	Net Accum Depr	Accum Mileage
1	20.00%	20.00%	$10,045	$10,045	$40,178	$22,391	$0	$10,045	20,000
2	32.00%	52.00%	$16,071	$26,116	$24,107	$20,482	$0	$26,116	40,000
3	19.20%	71.20%	$9,643	$35,759	$14,464	$17,139	$0	$35,759	60,000
4	11.52%	82.72%	$5,786	$41,544	$8,679	$13,854	$0	$41,544	80,000
5	11.52%	94.24%	$5,786	$47,330	$2,893	$11,815	$0	$47,330	100,000
6	5.76%	100.00%	$2,893	$50,223	$0	$8,678	$8,678	$58,901	120,000

Table 1. "Standard" MACRS Depreciation Tax Law (20,000 Miles a Year).[3]

The table illustrates the rate of accounting depreciation allowed on a Ford 2017 F-250 truck ($50,223[4] for a crew cab in the Dallas, TX market discounted from the MSRP of $58,235) vehicle under the declining balance MACRS

[3] Internal revenue Service Publication 946
[4] Retrieved 08 Aug 2016; https://www.truecar.com/prices-new/ford/super-duty-f-250-srw-pricing/?zipcode=75201

Depreciation tax method. An average annual mileage rate of 20,000 is assumed in this example with a company policy of retiring vehicles at 120,000 miles. The “Net Accumulated Depreciation” column shows the allowable depreciation write-off in the six years of the vehicle’s life with the “Gain On Sale” reconciled into the sixth year. The source used to estimate “Vehicle Sale” is 100 percent of Edmunds Private Party, Average Condition valuation.[5]

From the earlier section, "The Process" and this table, it's easy to see why the vehicle is replaced. It is even easier to see in a graph.

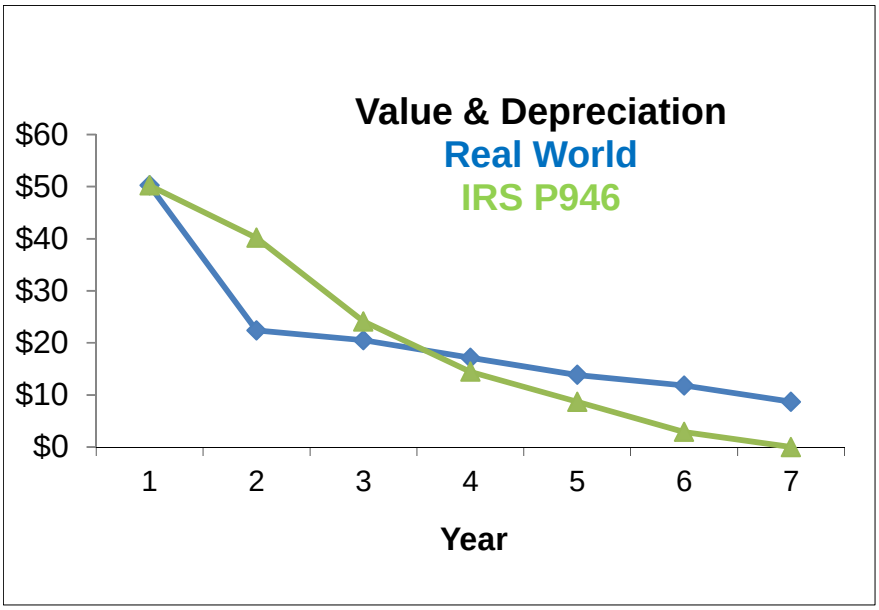


Figure 1. Real World Depreciation

If it were not for the steep depreciation, purchase costs would be manageable.

The Future or New Way

At the end of this vehicle's life, put $25,112 of remanufactured value back into the vehicle. The depreciation will depend on several factors - but the added depreciation opportunity is there. The table now looks like:

[5] Retrieved 08 Aug 2016; http://www.edmunds.com/ford/f-250-super-duty/2015/tmv-appraise-results.html

Year	Total Depr %	Accum Depr %	Total Depr	Accum Depr	Undepr Balance	Vehicle Sale	Gain On Sale	Net Accum Depr	Accum Mileage	Accum Cost	Cost per mile
1	20.00%	20.00%	$10,045	$10,045	$40,178	$22,391	$0	$10,045	20,000	$27,832	$1.39
2	32.00%	52.00%	$16,071	$26,116	$24,107	$20,482	$0	$26,116	40,000	$29,741	$0.74
3	19.20%	71.20%	$9,643	$35,759	$14,464	$17,139	$0	$35,759	60,000	$33,084	$0.55
4	11.52%	82.72%	$5,786	$41,544	$8,679	$13,854	$0	$41,544	80,000	$36,369	$0.45
5	11.52%	94.24%	$5,786	$47,330	$2,893	$11,815	$0	$47,330	100,000	$38,408	$0.38
6	5.76%	100.00%	$2,893	$50,223	$0	$8,678	$0	$50,223	120,000	$41,545	$0.35
7	20.00%	20.00%	$5,022	$5,022	$20,089	$26,031	$0	$55,245	140,000	$49,304	$0.35
8	32.00%	52.00%	$8,036	$13,058	$12,054	$15,199	$0	$63,281	160,000	$60,135	$0.38
9	19.20%	71.20%	$4,821	$17,879	$7,232	$7,582	$0	$68,102	180,000	$67,752	$0.38
10	11.52%	82.72%	$2,893	$20,772	$4,339	$4,339	$0	$70,995	200,000	$70,995	$0.35
11	11.52%	94.24%	$2,893	$23,665	$1,446	$1,446	$0	$73,888	220,000	$73,888	$0.34
12	5.76%	100.00%	$1,446	$25,112	$0	$0	$0	$75,335	240,000	$75,335	$0.31

Table 2. "Standard" MACRS Depreciation with Remanufacturing.

There is a lack of precedence for how to value the remanufacturing effort. Here, the previous valuation points were used to obtain a linear regression slope that was applied to the remaining value until it went to zero. After that point, the IRS depreciation was deducted from the remanufacturing cost to determine the residual value. This is an aggressive and conservative approach.

The new depreciation curve appears below:

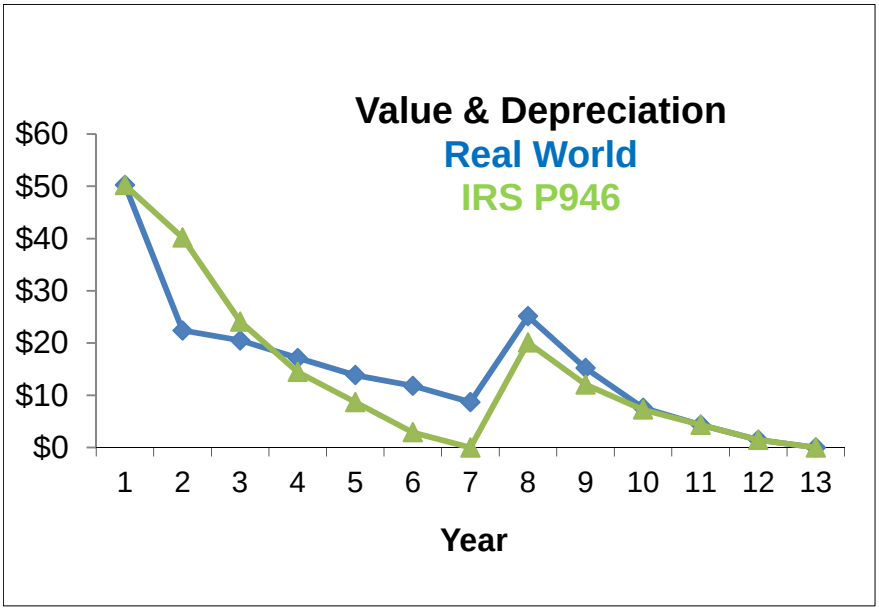


Figure 2. Depreciation with Remanufacturing.

Perhaps the most dramatic visualization is the cost per mile over the vehicle service life. Notice the flatness of the curve, even with the added costs of remanufacturing. The first three years of use carry an incredibly high cost of operation.

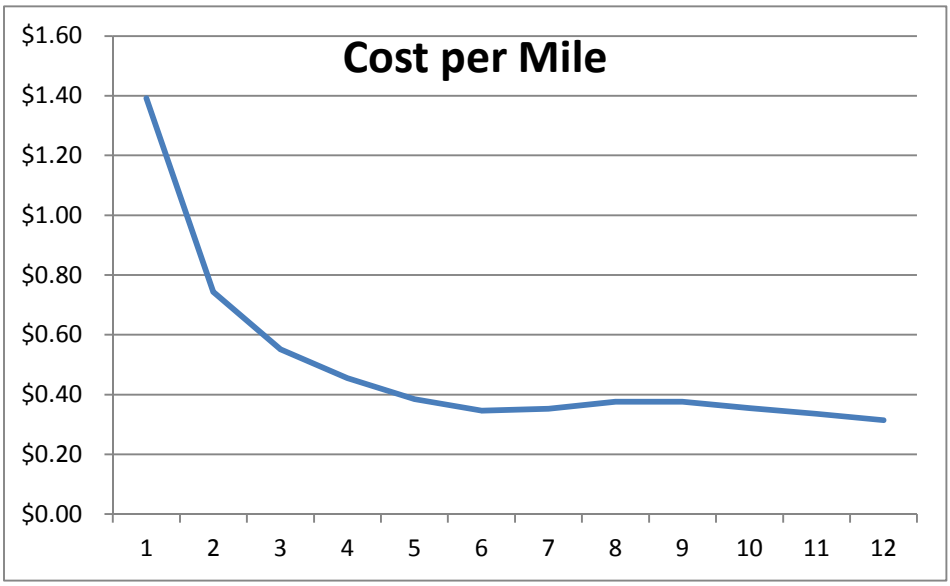


Figure 3. Cost-per-mile with Remanufacturing.

The Environment

Environmental considerations are becoming a more import component of corporate operations. It is hard to participate in a more environmentally-friendly process than remanufacturing.

It is not necessary to mine raw materials or process them. Even though the core (or carcass) is routinely recycled, remanufacturing significantly delays this process. Even the fluids in the vehicle are recycled where practical.

Many clients are able to use remanufacturing to demonstrate their commitment to the environment. Depending on governmental initiatives, remanufacturing may even qualify for tax or emission credits.

HOW IT WORKS

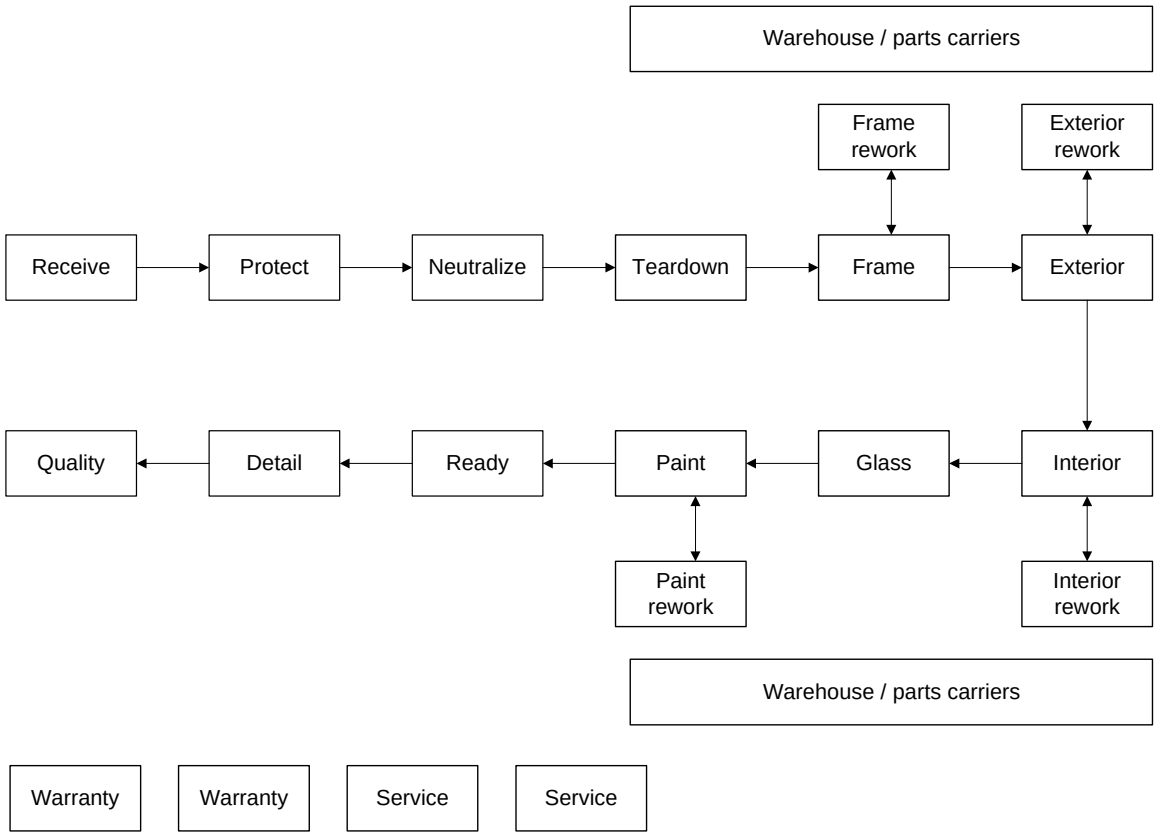
Remanufacturing is a well-choreographed dance between inbound material and rebuildable cores on the production line.

Steps involved

The production line is comprised of several stations that are used to address every vehicle deficiency.

These stations include:

Receive
Protect
Neutralize
Teardown
Frame (begin engine & transmission)
Exterior (finish engine & transmission)
Interior
Glass
Paint
Ready
Detail
Quality Assurance
Documentation



Material choreography

When the vehicle is processed (either at your facility or ours), a work order, complete with the required bill of materials and work procedures, is prepared. The availability of the line and the vehicle determines the release of the material order.

Warranty

A base warranty comes standard with the remanufacture operation. An extended warranty to guarantee a defined service lifetime is also available.

Financing

Facilities are in place to address a number of creative financing options.