Remanufacture: An Alternative to Rising Equipment Replacement Costs

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The cost of new replacement equipment and vehicles is a significant portion of the annual budget of most transportation authorities, municipalities, and fleet operators. An additional large expenditure of this budget is the ongoing maintenance costs of aging fleets of equipment/vehicles that are not scheduled for new replacement due to budget constraints or extended equipment life cycles. An additional complication to this scenario is the extended delivery times of new replacement equipment. A solution to this continuing and escalating problem is the use of a sophisticated outsourced remanufacturing program.

This paper reviews the increasing problems that high-priced, complex new equipment has with escalation of maintenance costs and presents a viable solution. This solution, remanufacturing, has been used successfully for approximately 20 years. This proven solution has not been widely employed by the transportation authorities, state fleets, and public works throughout the nation.

INTRODUCTION

The primary missions of all of the transportation authorities, state fleets, and municipal and public works sectors do not include maintenance, repair, and procurement of equipment and vehicles. The primary missions of these entities are the services that each particular authority provides. Unfortunately, the equipment that is utilized to provide these services consumes a large amount of financial, administrative, and labor assets. The efficiency of these authorities can be greatly enhanced if use of these assets (financial, administrative, and labor) is reduced to the lowest possible level. This would allow the authorities to use the majority of their assets for the primary mission of providing services rather than for insuring the availability of equipment and vehicles. Accomplishing more while using fewer assets is exactly what the U.S. Navy and the Department of Defense have done over the last 20 years. The proven concept of remanufacturing has helped the U.S. Navy save millions of dollars and has reduced maintenance costs and efforts to minimal levels. The remanufacturing concept allows for a vehicle or equipment item to be renewed with full warranty for a percentage of new acquisition costs. During this process of remanufacturing, upgrades and enhancements are added to the unit. In many cases, customization to enhance performance of the equipment takes place, which allows the unit to perform more effectively. An additional feature of the remanufacturing process is rapid turnaround of these vehicles and equipment. This turnaround time is becoming important, what with the extended delivery time of new equipment fleets. When implementation of the program occurs, a monthly schedule of product deliveries takes place, which ensures a constant flow of the disused vehicles and equipment back into service after remanufacture. Special attention is given to areas such as corrosion prevention, load capacity, and enhanced hydraulics.

A remanufacturing program is extremely cost effective for larger, more expensive vehicles and equipment. In some cases the large equipment items can be remanufactured for 45 to 50 percent of new acquisition costs. Quantities of lower-priced units also can offer substantial savings due to the numbers involved. In those cases, the smaller, less expensive units can be remanufactured for 55 to 65 percent of new acquisition costs. The following information will focus on the details of the process, and the added benefits and cost savings that can result.

REMANUFACTURING PROCESS DETAILS

A proper remanufacturing program renews the life cycle of the vehicle or equipment. The procedure begins with inspection of the remanufacture candidate. This is accomplished for the purpose of determining visual structural damage, if any, as well as any missing components. A record is kept for future reference and is categorized by vehicle serial number and tracking number. The process then begins, with a complete teardown to the lowest component of the equipment or vehicle. This results in the removal of all components, down to the basic frame structure. After complete disassembly, paint and corrosion are removed from the components by one of several methods, which would include sand blast, glass bead, chemical strip, or physical removal. This allows the metal components to start from a clean white metal condition, since all coatings and corrosion are removed. This process also allows for full inspection of all areas. At this point, all subassemblies are fully disassembled to the lowest component. Examples include complete cylinder disassembly and inspection, which will show any internal deficiencies or wear, and differential teardown, with all gears, components, and housings inspected. If non-conformities exist, the items are brought back to the original size requirements or replaced. Items are not merely disassembled and reassembled, but they are also inspected and remanufactured to ensure that all dimensions and configurations, as well as structural soundness, are brought back to the original specifications and standards. This process is accomplished on all components, including the main structural items such as main frames, chassis, and so forth.

As the remanufacturing process continues, a critical area of inspection and correction is performed, involving intense examination and repair of all welded areas. Welds are visually inspected and, if found defective, are completely removed and rewelded. In critical areas where structures are weakened, Non-Destructive Testing (NDT) by either magnetic particle or penetrant inspection is utilized for detection of cracks or defects. This allows for any hidden defects to be detected and corrected. All welding must be performed by certified welding operators in accordance with ASTM Specifications for compatibility and form.

At this time, the establishment of a 100-percent replacement list is compiled. Each vehicle/unit will have a unique replacement list made, but the general areas of this list are as follows: rubber hoses (hydraulic, fuel, vapor), rubber bushings, hydraulic packing (all types), bushings/bearings, oil and grease seals, electrical wiring, cables and small electrical components, most gauges, most hardware items, shock absorbers, brakes, and most non-electrical cables. This unique system has proved over time that the mandatory replacement of these items ensures a renewed vehicle/unit, which begins a new life cycle and a full-life extension (zero time).

All hydraulic components (pumps, valves, cylinders, and so forth) are chrome plated as required; reassembled completely, utilizing new packing; recalibrated; and performance proof tested to the correct working hydraulic pressure. At this stage all of the components and structural items will have been remanufactured and the painting and corrosive protection accomplished. Since all components and structures are in a white metal state, protective coatings can be applied as if the items were new. All metal components and structures are primed with highly-corrosion-resisting primer and finished with a variety of optional paint coatings (enamel, epoxy, polyurethane, fluorinated polyurethane [FPU]). The components—such as hydraulics, engines, transmissions, differentials, and so forth—have now been remanufactured and function-tested, and are ready for reassembly. The vehicle/unit is completely reassembled in accordance with manuals and work instructions to ensure conformity, reliability, supportability, and maintainability in fleet use. Complete reassembly now occurs, utilizing various hold points for critical inspection areas. Upon this approved and completed reassembly, the vehicle/unit experiences an extensive function and weight certification test procedure, including all phases of simulated and actual use. Only after strenuous and satisfactory on-site testing and inspection will the customer be notified for inspection. The units will then be delivered to the customer at the designated delivery point.

UPGRADES AND RETROFIT

In addition to the complete remanufacture of aged and disused vehicles and equipment, upgrades can be added to these units. Upgrades include engine conversions such as gasoline to diesel, as well as the environmentally popular conversions from diesel or gasoline to compressed natural gas (CNG). Transmission upgrades, air conditioning, and a zero-maintenance remote lubrication system controlled by a small onboard computer are also accomplished for the purpose of upgrading existing vehicles and equipment.

Units such as tow vehicles can have increased capacity added during the remanufacturing process. This allows some existing vehicles/equipment items to do more than the original units were able to do. These upgrades and retrofits are accomplished at minimum cost because of the fact that the units are in completely torn-down state and require little additional labor. Upgrading can now customize the units, in addition to renewing them for a full service life extension.

SUMMARY

Properly utilized, remanufacture programs can allow transportation authorities, municipalities, and fleets to save substantial dollars over new procurement, enabling them to have equipment or vehicles that are low maintenance, 100-percent available, and upgraded to support their primary mission. The turnaround times for the program items can be as short as 45 to 90 days after full implementation of the program. A strictly controlled remanufacturing process, if diligently pursued and utilized, will result in the same type of savings for transportation vehicles and equipment as the United States Department of Defense has seen.