

Refuse Haulers, Off Road Vehicles, and Equipment

Refuse Haulers and off road vehicles and equipment are unique pieces of machinery that have different lubrication needs than automobile, and light truck vehicles. Other vehicles can travel at high rates of speed which will allow oil change intervals to be measured by miles traveled. Refuse haulers and off road equipment travel much smaller distances at low speeds and spend much of their operating life in stop-and-go and forward/backward motion, neither of which is conducive to measuring drain intervals by miles. That is the reason oil service life is measured by time, or "hours of operation" when considering their vehicles

The intense amount of weight involved with these trucks contributes to severe and demanding shock loads which the vehicle's lubricants are subjected to each time the hauler is put in drive. Getting "heavy metal" like this moving literally tears up the haulers lubricants!

Downtime, scheduled or unscheduled, will always be a part of the waste removal company's operational considerations. Unscheduled downtime is the enemy of this work truck. Refuse haulers take a lot of abuse on a daily basis, working in a stop-and-go environment. They can have up to three hundred stops in one day. In many parts of the country, they must operate in a wide variety of weather conditions.

Hours Versus Miles

We have already determined that these vehicles travel an average of 25,000 miles in a year. If we break that down by a standard work-year (the hauler will most likely have to be running each workday and every week of the year) it will average 12 mph. One must also consider the driving conditions of each hauler. This 15,000-lb. vehicle is constantly stopping and starting after each pick-up. It can also be running in every weather condition possible. Its weight alone, not considering the waste it is picking up along the way, is a very heavy load. By taking these factors into consideration, one can see why it is impractical to track the oil change and maintenance intervals by the mile. This is the reason why refuse haulers determine oil drain intervals on a set time period (every month for example) or a set number of operating hours.

Refuse Hauler Study

During the year 2000, the key management team for an upper-Midwest regional refuse hauling company approved and sanctioned an innovative lubricant and maintenance program trial evaluation to determine if cost savings could be achieved with an extended oil drain program. This program was to be coordinated and supported by AMSOIL INC. The data that was gathered through the trial period demonstrated that an AMSOIL extended oil drain program could

reduce fleet maintenance costs and deliver enhanced fleet performance, fleet reliability and dependability, as well as overall operating profitability.

The AMSOIL 3-X Program

The primary challenge was to develop a program that would allow for the safe and cost effective extension of engine oil drain intervals. In this case, the standard drain interval was 300 hours with inspections at 150-hour intervals where fluids were checked and an overall vehicle safety inspection took place. The AMSOIL goal was a threefold extension in oil service life. Of upmost concern was the need to not negatively impact the integrity of fleet performance and reliability while decreasing costs. Simply put: there was no tolerance for program initiatives that would result in truck downtime - whether it occurred in the shop or remotely when on the road.

Oil Analysis

A comprehensive oil analysis program was utilized to safely extend motor oil drain intervals and to continuously monitor equipment performance. Prior to switching any unit over to AMSOIL, a sample was taken from that like point and submitted for a baseline oil analysis. This helped the laboratory establish a baseline for each unit, as well as to obtain a general overall fleets condition assessment before going into the test

AMSOIL 3-X Program Guidelines

Every 450 Hours - Change full flow oil filter(s) and fuel filters. Sample oil for analysis.

Every 900 Hours - Change full flow oil filter(s), engine oil and fuel filters. Sample oil for analysis.

Every 6 Months - Sample gear oil and transmission fluids for analysis.

Every Two Years - Change gear oil in differentials. Change transmission fluid. Sample gear oil and transmission fluid for analysis.

Trucks Involved

At the onset of the AMSOIL-3X Program in 2000, 12 trucks were converted to AMSOIL AME SAE 15W-40 Synthetic Motor Oil. These trucks used engines from four primary engine OEM's: Volvo, International, Mack, and Caterpillar. Due to the success of the trial at its conclusion, a total of 172 trucks had been successfully integrated into the AMSOIL-3X Program. Which means that the data

collected in this fleet trial covers a statistically significant fleet size, over a statistically significant time period of five years.

Oil Drain Intervals Extended

- The AMSOIL-3X Program was successful in extending engine oil drain intervals from 300 hours to 900 hours, with an oil filter change occurring at 450 hours.
- This represents a 300% improvement, resulting in increased truck availability and reduced shop time.

Oil Filter Usage Extension

- Oil filter change intervals were extended from 300 hours to 450 hours, representing a 150% improvement.
- On an annual basis, the average truck will use 4.75 fewer oil filters thereby delivering a reduction in oil filter purchases and disposal costs.

Oil Usage Reductions

- The safe extension of engine oil drain intervals resulted in a savings of 55.8 gallons of engine oil per truck per year.

Fuel Filter Usage Extension

- Fuel filter change intervals were extended from 300 hours to 450 hours, representing a 150% improvement.
- On an annual basis, the average truck will use 4.75 fewer fuel filters thereby delivering a reduction in fuel filter purchases and disposal costs.

Labor Hours Saved

- Labor savings achieved by using the AMSOIL 3 X program result in savings of 4.38 hours per truck per year of maintenance expenses.
- Even greater savings are realized when these savings are applied to the entire fleet.

Oil Performance Summary

The AMSOIL-3X program uses advanced lubricants and technology to increase drain intervals to 900 hours or three times the normal engine oil drain interval.

The AMSOIL-3X program has demonstrated and delivered a threefold extension in engine oil drain intervals, thereby delivering the following agreed upon test objectives:

- Maximum truck availability for optimum fleet utilization
- Superior fleet performance
 - More available power
 - Improved fuel economy
 - Better emissions performance
- Significantly reduced overall engine oil costs
 - Reduced oil consumption
 - A 3X reduction in waste oil disposal costs
 - A 1.5 X reduction in oil filter disposal costs
- Lower oil filter costs
 - Better filter efficiency: 150% improved utilization
 - Lower filter disposal costs
 - Lower inventory requirements
- Improved cold weather performance
 - Improved productivity: Warm-up time reduced
 - Reduction or elimination of block heater usage
- Significant reductions in maintenance labor costs
- Saving per truck at over \$781 per year

Oil Analysis

Oil Monitoring is Critical

- Oil analysis samples were taken every 450 hours under the AMSOIL-3X program.
- The oil analysis program checks for abnormal engine wear

No Oil Problems

- Oil analysis primarily uncovers problems with oil breakdown. Due to superior product quality these problems did not materialize.
- Instead, the following mechanical problems were uncovered before leading to costly repair and downtime:
 - Fuel dilution

Coolant leaks
Excessive fuel soot

Easy Implementation

- Vehicles in the AMSOIL-3X program were equipped with a safe, easy to use sample valve making it very quickly and with ease to take a sample and minimize the possibility of contamination

Cost Analysis

This section quantifies the benefits of the AMSOIL-3X Program. Savings data is based on information obtained on the refuse hauling test fleet involved in the study. These savings are substantial. Many other benefits are intangible or have not been completely verified. Reasonable conclusions are outlined using the data presented.

Definitions

Labor Rate: The hourly payment to an employee.

Burdened Labor Rate: The labor rate plus benefits and burdened overhead costs on an hourly basis.

Mineral Oil: Traditional motor oils or gear lubes made from paraffinic or naphthenic base stocks refined from crude oil.

Synthetic Oil: Synthesized man-made base stocks without the impurities of mineral oil. Synthetics can be designed for performance in temperature extremes and may exhibit superior life over conventional mineral oils.

Transynd: Proprietary synthetic transmission fluid marketed jointly by Castrol and Allison. Other suppliers have been restricted from gaining approval from Allison.

Fleet Assumptions

Fleet Size	28,000
Fleet Mechanic Rate	Average: \$40.00 Burdened: \$65.00
Driver Labor Rate	Burdened: \$40.00
Average Hours Per Truck Pre Year (residential)	2,600
Number of Oil Changes Per Year at 300 Hours	9.66
Oil Change Labor Time	1 Hour
Oil Analysis and Filter Change Labor Time	0.5 Hour

Savings Analysis

Lube Cost Savings

Using the AMSOIL-3X program resulted in significant labor reductions for this waste refuse hauler. One standard man-year is defined as one worker working 52 weeks a year at 40 hours per week, or 2,080 hours. If you take the 122,640 hours the AMSOIL program saves the company, and then divide that by the 2,080 hours in a standard man-year, one finds an aggregate reduction of 58.96 men/year. Simply put, that is the equivalent of about 60 less mechanics in the organization.

At a burdened labor rate of \$65.00 per hour, the cost impact for the hauler company becomes even clearer. Just saving 4.38 hours per truck by using the AMSOIL program (as illustrated in the previous charts) is quite significant.

This equates to burdened labor savings of \$284.75 per truck or \$7,971,600 annually!

Oil Filter Cost Savings

Using the AMSOIL-3X program results in 2.88 less oil filter services per truck per year, or 80,640 fewer filter services fleet wide per year.

However, the savings are actually understated because approximately two-thirds of the fleet (66%) have engines with two filters. By calculating that approximately 18,840 trucks have two filters instead of just one actually makes the amount of oil filters used per truck total to 1.65 filters each.

The amount of filters used per truck can be determined by utilizing the following calculation: $(28000 \times 33\% \times 1 \text{ filter}) + (28000 \times 66\% \times 2 \text{ filters})$. Filter savings resulted due to the reduction of 133,056 filters used fleetwide, or 4.75 filters per truck. This accounts for filters purchased, inventoried, installed and disposed of by the company. Savings were based on estimated Fleetguard average national fleet filter pricing of \$17.00 per filter.

Oil filter efficiency established during the AMSOIL-3X program resulted in savings of \$80.78 per truck or \$2,261,592 annually!!

Fuel Filter Cost Savings

Fuel filter savings parallel oil filter savings in the previous analysis. Using the AMSOIL-3X program results in 2.88 less fuel filters per truck per year, or 80,640 less filter changes fleetwide per year.

Since approximately two-thirds of the fleet have engines with two filters, the number of filters saved per truck filter change has been calculated at 1.65. Filter savings result in 133,056 (4.75 per truck) fewer filters purchased, inventoried, installed and disposed of by the company. Savings are based on estimated national fleet fuel filter pricing of \$5.00.

Fuel filter cost reductions under the AMSOIL-3X program resulted in savings of \$23.76 per truck or \$665,280 annually!

Oil Filter Disposal Cost Savings

Using previously established oil filter analysis data, some oil disposal savings are realized. Using the AMSOIL-3X program results in 133,056 fuel and oil filters to dispose of at an average estimated cost for some locations of \$0.25 per filter. While this may not be a financially significant savings at only \$1.19 per truck, a reduction in the number of oil filters used exhibits strong environmental stewardship and could result in some savings as well.

Savings in reduced oil filter disposal costs: \$33,264 annually!

Oil Usage Savings

Using the AMSOIL-3X program had an extremely positive environmental and patriotic impact for the company. Maximizing oil life with AMSOIL AME resulted in a 57.8% reduction in lubricant usage. This is excellent for the environment, exhibits exceptional environmental commitment and demonstrates a reduction in America's dependence on foreign oil.

The study showed a reduction in lube oil consumption of 55.8 gallons per truck or 1,562,400 gallons fleetwide annually!

Oil Purchase Cost Increase

Based on market intelligence and usage of 96.6 gallons per year per truck, the oil acquisition costs for the competitive mineral product is \$8,817,648 (96.6 gallons x \$3.26 per gallon x 28,000 trucks). The cost for the AMSOIL product based on 40.8 gallons per truck is higher at \$11,949,504 (40.8 x \$10.46 per gallon x 28,000 trucks). This accounts for a net lubricant purchase increase of 3,131,856. This is based on the 2003 oil price for AMSOIL AME of \$10.46 per gallon compared to competitive mineral oil products priced at an average of \$3.26 per gallon. On a per truck basis the lubricant purchase cost for the mineral oil is \$314.92, while the synthetic oil purchase price is \$426.77. Other factors such as reduced inventory carrying costs, improved cash flow, improved emissions performance and improved fuel economy are not factored into this calculation.

Increase of \$3,131,856 or \$111.85 per unit.

Oil Analysis Savings

The AMSOIL-3X program utilizes a comprehensive oil analysis program that substantially reduced unscheduled downtime, identified problems that could be covered under warranty policies and resulted in catching problems that, if left unchecked, could have resulted in costly engine overhauls.

In the last year of the program, of the approximately 85 trucks under the AMSOIL oil analysis program, three engine coolant leaks and one potentially major fuel problem were uncovered. If undetected these problems would have resulted in engine overhauls at an internal cost of **\$8,000**. But due to manpower limitations

for heavy maintenance, the problems would have been outsourced for **\$12,000** each.

These findings support a problem rate of 4.7%. At that rate, such repairs would have cost the local fleet **\$48,000**. This scenario is also not unusual and could be applied to the entire fleet. The AMSOIL comprehensive program could catch 1,316 such problems annually in the entire fleet. This could potentially result in significant cost savings.

The cost for a comprehensive oil analysis program in 2003 was approximately \$9 per sample or \$1,708,560 for the 189,840 samples (sample volume is based on 450 hour oil analysis intervals for the entire fleet of 28,000 vehicles) taken over the course of a year. The return on investment would be approximately 9 to 1, which is not unusual for a well-managed program such as the AMSOIL-3X program.

Savings in repair cost: 1,316 problems caught at \$12,000 each = \$15,792,000
Oil Analysis Program cost: \$ 1,708,560

Savings Using the AMSOIL-3X Oil Analysis: \$14,083,440 or \$502.98 per unit

AMSOIL 3-X Program Cost Analysis Summary

Expense Area	Savings Per Truck	Fleet Savings
Labor Cost Savings	\$284.70	\$7,971,600.00
Oil Filters	\$80.78	\$2,261,592.00
Fuel Filters	\$23.76	\$665,280.00
Oil Filter Disposal	\$1.19	\$33,624.00
Subtotal	\$392.66	\$10,932,096.00
Oil Purchase Cost Increase	(\$111.85)	(\$3,131,856.00)
Net Savings	\$278.58	\$7,800,240.00
Oil Analysis Savings	\$502.98	\$14,083,440.00
TOTAL AMSOIL 3-X Savings	\$781.56	\$21,883,680.00

Totals used in the above table were found in previous examples.

Summary Fleet Trial Conclusions

The AMSOIL-3X program results demonstrate to owner/operators of refuse haulers and off road equipment that significant wear and cost saving benefits are available by switching their maintenance programs to include AMSOIL synthetics. Reducing the amount of downtime any "work" vehicle such as the refuse hauler or off road equipment experiences is the key point when discussing a maintenance program. Owners of these vehicles have made sizeable investments in their purchase, and it is essential to maximize the amount of time that they keep their rolling investments in service. All owner/operators plan for scheduled downtime for service and safety checks on the equipment, but unexpected and unscheduled downtime is not planned for. Unscheduled downtime is the enemy of the work truck and off road equipment. AMSOIL has demonstrated through the comprehensive AMSOIL-3X test program that the use of AMSOIL products will help to reduce unscheduled downtime. By extending oil drain intervals by utilizing oil analysis, the AMSOIL-3X program provides the following benefits:

- Premier engine protection with the finest synthetic motor oil available on the market.
- Extension of the service life of the vehicles and equipment.
- Cost savings realized by reduced oil/filter consumption.
- Problem identification through oil analysis to minimize the necessity of high cost repairs and overhauls, thus reducing unscheduled downtime.
- Maximize resource utilization through reduced unscheduled downtime via extended drain intervals.

The owner/operators of refuse services, contractors, construction companies service trucks, and hauling services are all good businesses that would benefit from an AMSOIL program. For these operations, vehicle and equipment availability is paramount. When you are working with fleets, downtime must be minimized. AMSOIL is your solution.

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