



Case Study: Diesel-Powered Loaders Compared to Hybrid Loaders in Heavy Civil Construction



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With the construction industry constantly changing, the environmental impacts of greenhouses gases have become a huge concern. Many contractors are adapting and switching over to hybrid powered systems to allow for more energy saving methods for heavy equipment, an increase in productivity, and efficient construction equipment that comply with emission regulations. The goal for this paper is to analyze the feasibility of heavy civil construction companies switching over from conventional diesel-powered wheel loaders to hybrid wheel loaders. Due to the competitive and saturated market in roadwork construction, many contractors have already begun to invest into hybrid systems. This provides cost savings in fuel efficiency and operating costs over the conventional fueled loaders. Qualitative research was conducted for this report through semi-structured personal interviews with heavy equipment experts, and the usage of primary and secondary sources. Although the switch to operating with a hybrid system it will potential have a higher up-front cost, it will have fewer operating costs and environmental impacts in the future.

Key Words: Loaders, Heavy Civil Construction, Environmental, Fuel Efficiency

Research Objectives

- Analyze feasibility of heavy civil contractors switching over to hybrid powertrain wheel loaders
- Analyze the operating and ownerships costs of both hybrid and diesel wheel loaders
- Provide new knowledge to roadway contractors on purchasing costs of hybrid wheel loader



944k John Deere Hybrid Wheel Loader

Research Methodology

In order to ensure the best results, an extensive literature review was conducted through semi-structured interviews, as well as the usage of primary and secondary sources. This allowed me to obtain a better understanding of the complexities of the research topic. In addition, I will be able to provide contractors knowledge on the feasibility of switching over to a hybrid system in heavy civil construction, but specifically in the sector of roadway construction.

2017 John Deere 644k Hybrid Wheel Loader

Purchasing Cost: \$222,500 Operating Cost

- Fuel: \$1,560/Month
- Repairs: \$790/Month
- Maintenance: \$410/Month

Total Costs: \$2,760/Month

Ownership Costs

- Equipment Cost: \$3,739/Month
- Depreciation: \$880/Month

Total Costs: \$4,619/Month

Life Cycle Analysis Findings

Upon completion of my calculation on operating and ownership costs, it is quite evident that the conventional diesel 644k loader has a higher up-front cost, and monthly cost. There are in savings in any aspects associated with the conventional wheel loader. In comparison, the 644k hybrid wheel loader has some significant savings in both up-front costs and monthly ownership/operating costs. This yields to a saving of \$430 a month, which in turn saves you \$5,160 per year.

2017 John Deere 644k Diesel Wheel Loader

Purchasing Cost: \$225,000 Operating Cost

- Fuel: \$2,290/Month
- Repairs: \$530/Month
- Maintenance: \$278/Month

Total Costs: \$3,098/Month

Ownership Costs

- Equipment Cost: \$3,781/Month
- Depreciation: \$930/Month

Total Costs: \$4,711/Month