# John Deere Engine Works

## COMPANY BACKGROUND


John Deere (Deere & Company - NYSE: DE) is the world's leading provider of advanced products and services for agriculture and forestry and a major provider of advanced products and services for construction, lawn and turf care, landscaping and irrigation. John Deere also provides financial services worldwide and manufactures and markets engines used in heavy equipment. Since it was founded in 1837, the company has extended its heritage of integrity, quality, commitment and innovation around the globe.

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## PROJECT BACKGROUND

Two projects were undertaken: assessment and implementation of a process plastic recycling program, and assessment of the process wastewater treatment system. A recycling program had been in place in the past, but was shut down due to logistical and safety concerns. The wastewater treatment system is aging and in need of modification and improvement. Several process inefficiencies contribute to higher-than-necessary cost of operation.

## INCENTIVES TO CHANGE

Approximately 35 percent of the process solid waste stream is recyclable plastic. The majority of it is LDPE packaging film and bags that are light-weight but bulky. This results in inordinately high dumpster hauling fees, but low tipping fees. Recycling this plastic will produce revenue roughly equal to the current cost of landfilling the same material.

Improving the specified process inefficiencies in the wastewater treatment system will reduce the total cost of treatment by more than 50 percent. Installing new equipment (waste oil tank, filter press and an ultra-filter) would eliminate off-site treatment and road transportation of wastewater. This equipment would also improve oil segregation, increase waste oil revenue, reduce sludge production and produce cleaner effluent on-site.

## RESULTS

The solid waste stream was analyzed and quantified providing information for future changes to the existing system. A plastic recycling program has been designed and implemented. Currently low density polyethylene (LDPE) and high density polyethylene (HDPE) will be recycled and some plastic materials will be reused as much as possible. Implementaion of recommendations will result in a reduction of more than 43 tons of landfill contributions.

Recycling this material will (globally) prevent the release of more than 260 tons of CO2 and 10 tons of methane. Because the bulk of the material recycled will be LDPE films, the number of dumpsters hauled to the landfill every year will diminish also, resulting in even greater environmental benefits.

Recommendations also have been made regarding the wastewater treatment facility. Maintaining the segregation of waste oil will provide substantial financial benefits each year in off-site treatment costs and reduce over-the-road transportation of wastewater by about 30 percent. Installing a sludge press to treat final effluent would completely eliminate over the road transport of wastewater, and would further contribute to significant cost and risk reductions.



Preliminary research was conducted to evaluate the option of installing an ultra-filter to provide a means of mechanical separation of emulsified oil from the wastewater. Currently this separation is conducted purely by manual chemical means, which requires a significant investment of labor and money, and produces a relatively large amount of sludge. If an ultra-filter were installed, a small pore membrane could separate much of the emulsion with less chemicals and labor. This option would also dramatically reduce the total amount of sludge produced because the oils would be separated out physically (and could add to the sellable waste oil stream) leaving only heavy metals and minor remaining contaminants. The sludge press could then be smaller due to the reduced sludge production.


Similar facilities have been using ultra-filter technology with good results. This option is recommended and supported by the preliminary research, yet more information – including equipment specific quotes – should be gathered before proceeding. The combination of physical and chemical post-treatment offers the best scenario for optimizing operational cost, quality of effluent, and minimize total waste production.

**Air Pollutants Diverted in Tons**

| | Total for all sectors |
|---|---|
| **SO2** | 1.46 |
| **CO** | 2.12 |
| **NOX** | 0.84 |
| **VOC** | 0.17 |
| **PM** | 0.04 |

**Green House Gases Diverted in Tons (CO2 Equivalent)**

| | Total for all sectors |
|---|---|
| **CO2** | 297 |
| **CH4** | 11.2 |
| **N2O** | 0.56 |
| **CFCS** | 3.36 |

| Project | Annual Cost Savings | Environmental Results | Status |
|---|---|---|---|
| **PLASTIC RECYCLING** | $4,900 | 43 TONS DIVERTED | IMPLEMENTED |
| **PLASTIC RE-USE** | $7,500 | 4 TONS DIVERTED | RECOMMENDED |
| **WASTE OIL RECYCLING** | $93,520 | 66,000 GALLONS | IN PROGRESS |
| **INSTALL SLUDGE PRESS** | $20,500 | 32 TONS GHG REDUCTION (TRANSPORTATION EMISSIONS) | RECOMMENDED |
| **INSTALL ULTRA-FILTER** | TO BE DETERMINED | REDUCED SLUDGE INCREASED OIL RECOVERY | MORE RESEARCH NEEDED |