



Design of a Quick Detachable Bed System For a Semi-tractor

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Project Participant and Sponsor:
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Introduction:

- The project stemmed from the need to have a low cost alternative to eliminate extra machinery on the farm and to aid the farm in becoming more efficient.
- The project mission was to develop a quick detachable bed system for a semi-tractor that would increase the versatility of the semi-tractor on the farm.
- The main aspect of the project was to design a detachable bed for a semi-tractor to reduce the need for multiple trucks that are present on the farm.
- There are currently 3 trucks that if reduced to 1 truck could save insurance, fuel and maintenance costs for the owner and manager of the farm.

Project Objectives:

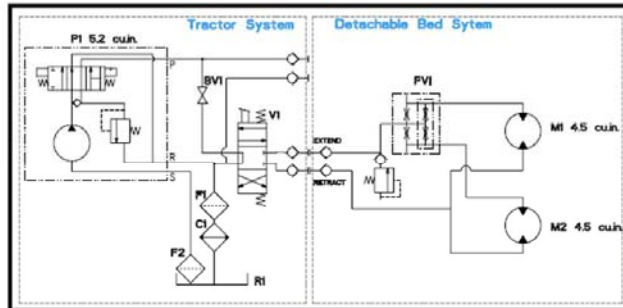
- To design a lift system for a detachable bed system that is integrated with a semi-tractor.
- To model the design in Pro/Engineer Solid Model and to analyze the design with general assumption to estimate where high stress was expected.
- To design the hydraulic system and analyze the circuit to ensure reliability.
- To determine stress concentrations on the design using finite element analysis (FEA).

Budget:

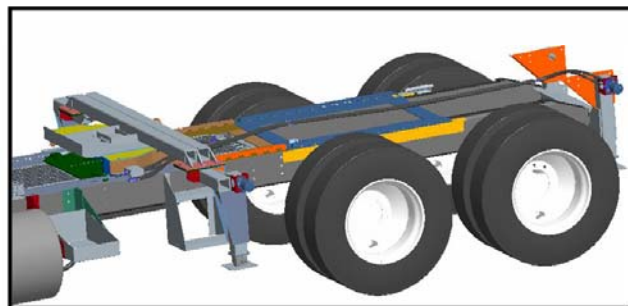
System	Component/Description	Expense
Structure	ESMW - fabrication	\$2,000.00
	Structural tubing	\$1,000.00
	bolts/nuts (misc. hardware)	\$100.00
	Welding supplies	\$150.00
Hydraulics	Cylinders	\$400.00
	hoses	\$500.00
	fittings	\$200.00
Misc.		\$200.00
	Total Expense	\$4,550.00

- The team was sponsored by Elpers farm's and from Curt Elpers.
- The major expense for the project was the facilitation of custom made pieces for our project.
- The parts were custom made at Evansville Sheet Metal Works (ESMW), which is located in southern Indiana near the city of Evansville, Indiana.
- Another major expense was the square tubing that was used to construct pieces of the design that were not going to be custom made by ESMW.
- The fabrication of these parts was constructed by Tony Elpers, who is the farm owner and manager.

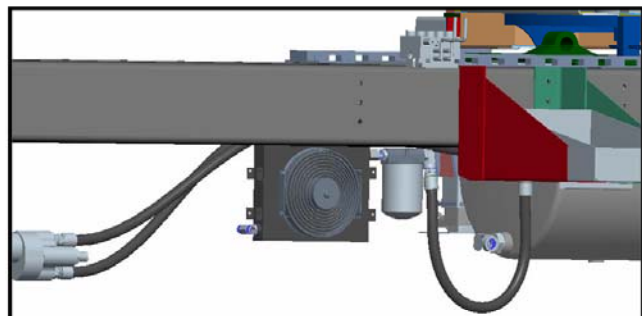
Hydraulic System:



- The team used hydraulic power to run the lift system so that it would make the detachable bed more versatile.
- The team used EASY 5 to model and test the flow rates and pressures that would lift the detachable bed under maximum loading conditions.
- If the detachable bed was not run by hydraulic power it would have to be run by a hand crank, which would be time consuming.
- The left side of the circuit is the hydraulic system that was installed on the semi-truck. The goal was to leave this circuit alone and to adapt a setup that would utilize what this system could produce.
- On the right side of the circuit are the hydraulic components that were assembled to lift the detachable bed when it is fully loaded.
- The maximum load that the detachable bed was designed was a total weight of 19,000 lbf and a raise and lower cycle time of 10 minutes.



A view of some of the hoses to be run with the current setup for the hydraulic circuit.



The hydraulic pump and reservoir were located in the front of the semi-tractor since it would be easier to have all the hydraulic components centrally located.