

Background & Motivation

- Small scale farmers are in need of a system to control disease outbreaks on farms.
- Current vehicle wash systems are \$35,000 to \$70,000 and too expensive.



Figure 1. Pictured is the *Bold System* undercarriage carwash. This system was used as a benchmark.

Problem Definition

Project Scope: Design a low cost, open-source undercarriage wash system that washes and disinfects small cars and trucks.

Want/Constraints:

- Low cost
- Durability
- Open source
- Efficiency
- Minimize size
- Adjustable

Design Metrics

Rank	Metric	Target Value	Acceptable Value
1	Production Price	<250 USD	<500 USD
2	Cleaning Efficiency	> 70% coverage	>50% coverage
3	Load Capacity	>4,400 lbs	>3,000 lbs

*Coverage was determined by using a grid to model the vehicle undercarriage and measuring the percentage of fluid contact with the grid.

Concept Generation

Used excel surface plots to model fluid spray and select the design that provided the best coverage.

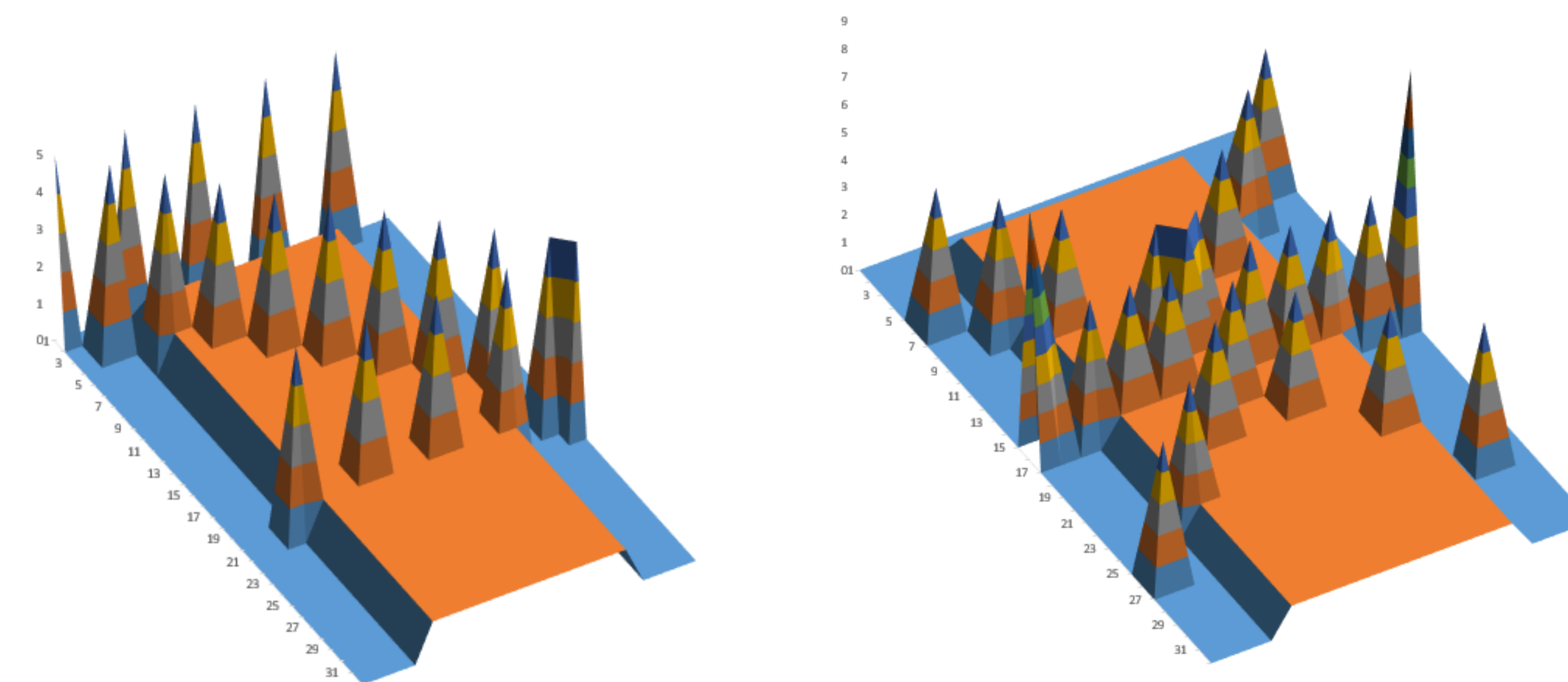


Figure 2: Design 2 fluid spray model.

Figure 3: Design 3 fluid spray model.

Final Concept

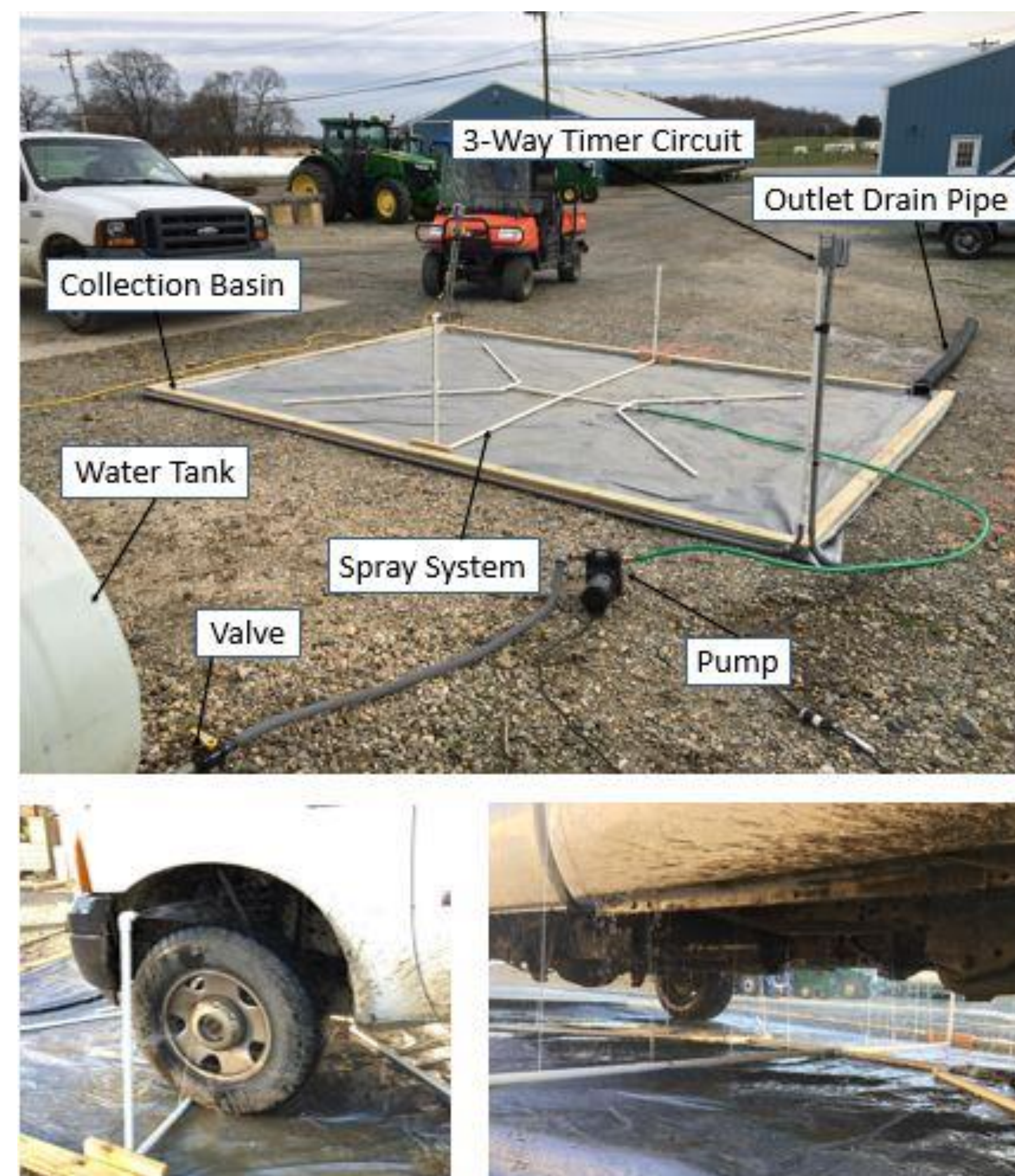


Figure 4: The top photograph shows a system view of the final concept with all parts labeled. The bottom two pictures show the system spraying the wheel wells and the undercarriage of a truck.

Concept Validation

- Tested fluid coverage and solids removal using a 1/8 in. thick layer of grime (composition adapted from USEPA methodology).
- Varied grime composition, use of detergent, and length of the piping system.

Results:

- Removing excess pipe and shortening the connection hose increased the pressure and solids removal. Presence of detergent did not have a significant effect on removal.



Figure 5: Grid before testing.



Figure 6: Grid after testing.

Performance Summary & Path Forward

- Our design is over 99% cheaper than current market competitors.
- Provided complete undercarriage coverage
- Portable and easily assembled
- Design recommendations for future iterations:
 - Increasing the water pressure to be able to increase number of holes
 - Metering in disinfectant/detergent using a dosage pump
 - Implementation of heated water source to further decontaminate

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