PURDUE UNIVERSITY

CAPSTONE EXPERIENCE 2011

Agricultural & Biological ENGINEERING

Austin Henderson (ASM), Aaron Harlow (ASM), Chris Myers (ASM)

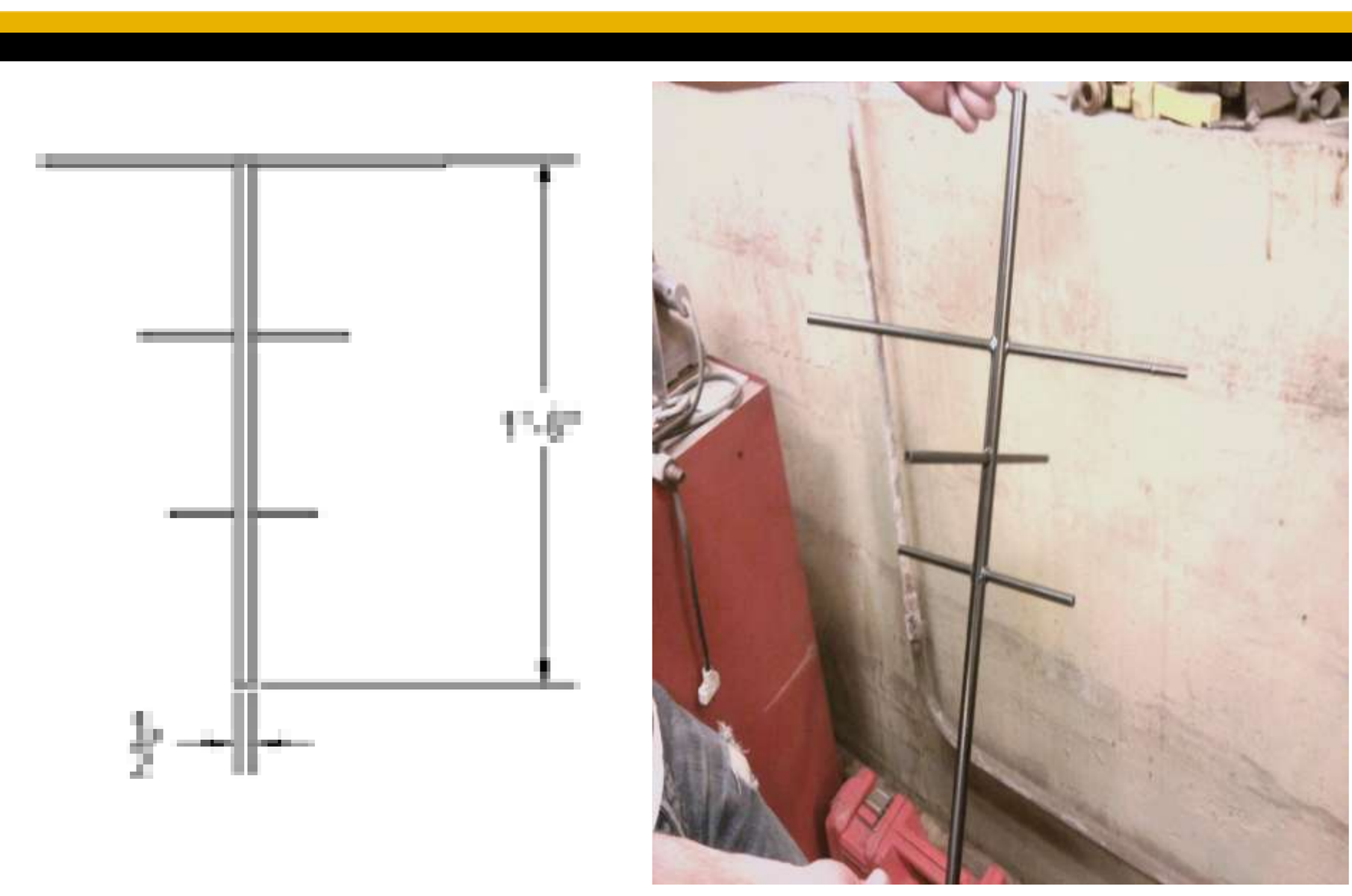
Push Type Compost Spreader

Objective: The current lawn and garden market does not have a multi-functioning compost and fertilizer spreader. This prototype currently solves the problem of spreading compost on the average homeowner's lawn. Deliverables consist of AutoCAD drawings, spreader prototype, assembly drawings, and a parts list for reproduction. This project has been picked to be reproduced by future ABE students. The spreader will be replicated and sold on the market as a money making tool for the future ABE students.

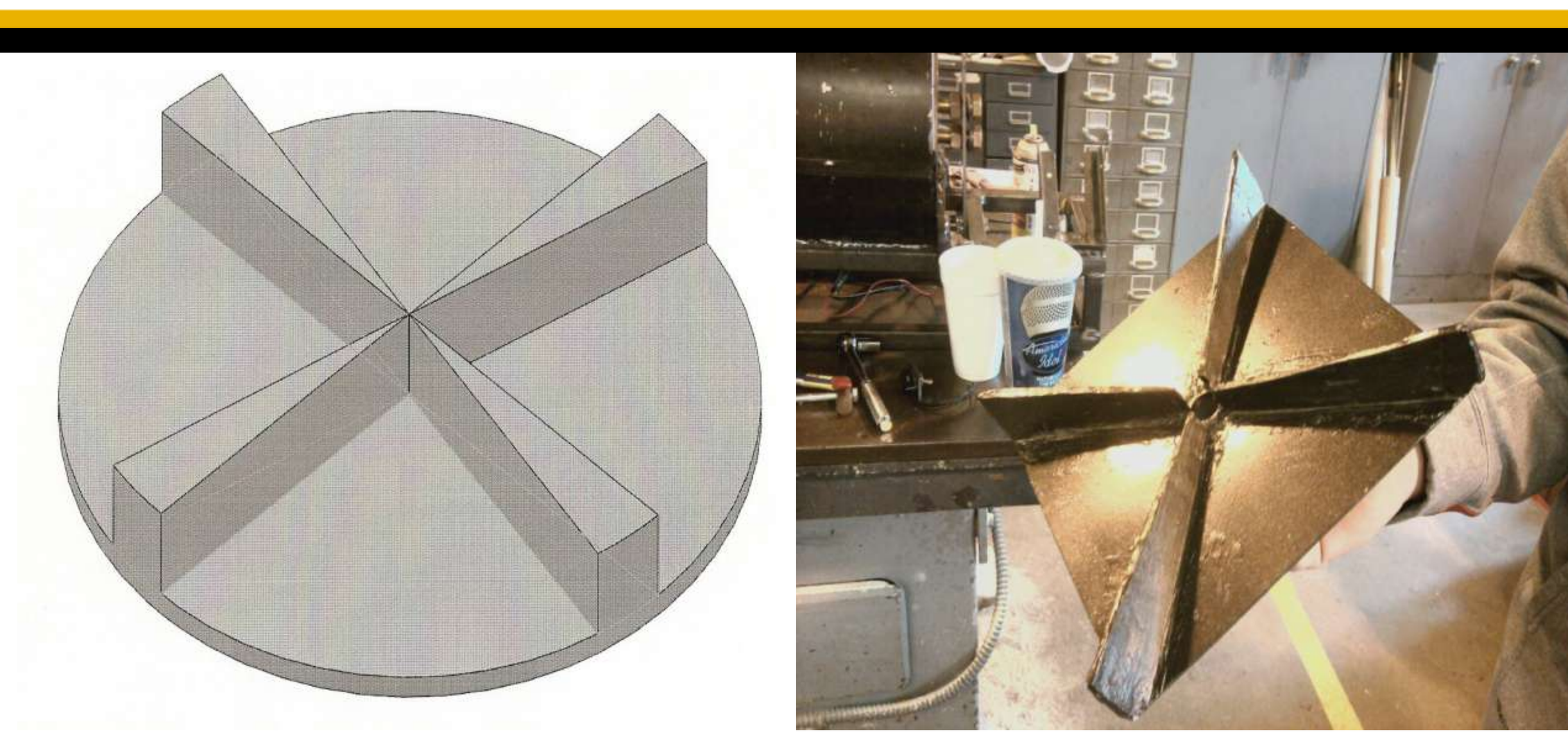
Statement Problem: The problem with a regular fertilizer spreader is that it is designed for small granular fertilizer with a uniform particle size. The typical fertilizer spreader will not spread compost because of the varying particle size and moisture content of compost. It would also have the ability to spread fertilizer on a yard, making it a dual purpose spreader.

Background: Spreading compost on a yard is a very beneficial process. Compost provides vital nutrients and fertilizer for a yard to stay green and grow. Compost can be cheaper, in some cases it is free, than granular fertilizer, and the homeowner can make their own. Currently, homeowners have not had the ability to spread compost on their yard due to the lack of a push type spreader on the market and the relatively small, average yard size.

Alternative Solutions: There are true compost spreaders on the market, but none truly solve the problem of the sponsor's desire to have an affordable solution. The vast difference in particle size of compost is the major reason why traditional spreaders will not work for compost. There are "drop" type spreaders that are very simple and roll across the ground. These spreaders are very bulky and they do not spread granular fertilizer either. There are also flail type spreaders but these are normally very large and expensive; not very practical for the typical homeowner. Flail type spreaders can be so large that they are self propelled with a small gasoline engine. The design of this prototype is what sets it apart from alternative solutions. The stirator for this spreader is a key design feature that allows the compost to flow through the tank evenly and without bridging.



Figures 1 & 2 show the original design of the stirator in AutoCAD. This key design concept allows for disruption of compost to prevent lodging inside the hopper. Figure 2 is the final product of the design.



Figures 3 & 4 show the original design for the spreading disc. A circular design was the original concept but to save manufacturing costs a square was decided to be the best option. The large fins allow for the larger particles of compost to spread evenly across the lawn. Figure 4 shows the final solution of the spreading disc.

Economics:

Figure 6 shows the completed spreader

Part	Cost per Unit	# of Units	Total Cost
10" pneumatic tire w/ rim	$ 19.00	2	$ 38.00
JD 3:1 Gear Box	$ 65.00	1	$ 65.00
17 gallon poly tank	$ 71.00	1	$ 71.00
1"OD x 1/8" wall steel tubing	$ 1.81	18	$ 32.58
Adjustable cable	$ 28.00	1	$ 28.00
Spray paint	$ 6.00	5	$ 30.00
Bag of compost	$ 4.68	4	$ 18.72
Caps	$ 0.98	3	$ 2.94
Wing Bolts/Nuts	$ 1.00	2	$ 2.00
Plastic Bearings	$ 2.00	4	$ 8.00
5/8"OD x .083" steel axle	$ 2.37	1	$ 2.37
Cushion Grip	$ 5.00	1	$ 5.00
1" x .125" Aluminum tubing	$ 10.89	7	$ 76.23
Total			**$ 379.84**

Table 1 contains the total budget for the prototype

- Original budget was $500 , therefore $120.16 under budget, with 75.97% of the total budget being used
  - This creates a good margin for profitability on the market
  - Production spreaders are expected to cost less to produce

Figure 5 shows the scale on the side of the poly tank. It is scaled in gallons

Application of Engineering / Management Principles

- Spreader was built to breaking point specifications
- As many "bolt-on" parts as possible for easy assembly and repair
- Limited amount of welding in manufacturing
- Parts that can be reproduced easily used

Our solution provides a relatively simple and cheap way to spread compost on a yard, while having multiple functions

The scale on the side of the polyurethane tank was purposely left unpainted to give a reference for the consumer on how much compost was left in the spreader:

Average compost weighs 1400 lb/cubic yard so $\frac{1400\text{lbs}}{1\text{ cubic yard}} \times \frac{1\text{ cubic yard}}{202\text{ gallons}} = 6.93$ lbs of compost/gallon

The tank was originally 17 gallons but it has been cut down to 12 gallons for functionality. This means the tank can hold up to 83.16 pounds of compost.

This is more than what was required of the spreader, but the tank met design specifications so for the prototype it works very well.

The reference guide on the tank is marked at every gallon so therefore the consumer can know how many pounds are left in the spreader.

Final Solution: The prototype was designed to provide a cheap multi-functional spreader for the average homeowner. This prototype was built to specifications laid out by the technical advisor and sponsor. It serves the purpose of being able to spread compost ,granular fertilizer, and ice melt for the consumer.

Sponsor and Technical Advisor: Dr. Patrick Murphy

PURDUE AGRICULTURE PURDUE UNIVERSITY

PURDUE ENGINEERING Think impact.