Design of Compact Tractor
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Abstract
The project is focused towards aesthetic enhancement of a Compact Tractor for the United States market. The intended users are American male and female. The targeted segments are sundown farmers, Hobby farmers, Retired persons and Contractors. The escalating growth of automotive industries resulting in parallel growth of manufacturing possibilities and technologies has resulted in the change of customer’s perspective towards agricultural equipment like “tractor”. Hence it becomes important to make considerations, which satisfies the need of such customers who seek the touch and feel of modern automobiles in this product.

To ideate these requirements user interviews were conducted seeking their lifestyles and to study the trend. Parallel effort has been given to study competitor’s products and benchmarks were set. Based on these mood boards and theme boards have been generated which in turn helped generate concepts. Using Gestalt principles the concepts were completed. Sketching tools like markers and pastels have been extensively used for giving initial shape to the ideas. For CAS (computer aided styling) advanced styling software Alias and Photoshop have been used.

Keywords Compact tractor, Styling

1. INTRODUCTION
Compact utility tractors (also called “compact tractors” or “grounds maintenance tractors”) are designed for homeowners with small acreage as well as for small farms, landscaping and very light construction (as shown in figure 1). The American Society of Agricultural Engineers (ASAE) defines a compact utility tractor as: “A small agricultural tractor equipped with a 540- rpm PTO (Power Take Off) and a three-point hitch designed for Category 1 implements only.”

![](image1)

Figure 1 Parts to be designed

1.1 Tractor Styling Trend
By the end of World War I, the tractor was generally accepted as being a practical agricultural machine: Britain and the United States were exporting machines around the world to countries as distant as Russia, South America and Australia. Henry Ford’s mass produced Fordson Tractors, launched in 1917, established themselves commercially; they were initially manufactured in the United States for sale in Britain and beyond. The end of the war brought irreversible socio-economic changes and this meant that the agriculture became increasingly mechanized as the 20th century progressed. [John Carroll (2002)] The mass produced tractor Fordson produced by Ford achieved 75 percent of the market as it was cheap to produce, by 1921 there were an estimated 186 tractor companies in the United States and production totalled 70,000 machines. Acceptance of the fact that small tractors were practical changed the emphasis of the industry. The following points specify the major changes that took place to give tractors the appearance it has today.

•Introduction if Pneumatic Wheels (1930s)
•Case LA tractors debut in 1939 with increased emphasis on styling
•Post war rounded features became more sharp and angular in the 1960s
•The Case introduced enclosed chains instead of heavy gears in 1972
•Ferguson tractors and the 3-point linkage were the two most significant landmarks in the development of tractors [John Carroll (2002)]

![](image2)

Figure 2 The Case LA tractor

•The McCormic and Dreering international merger resulted in this Farmall Series of tractors. The Farmall model M row crop tractor shown in the
figure 8 made its debut in 1939 having been compressively styled by the noted industrial designer Raymond Loewy.

The advent of V-8 [John Carroll (2002)]

1.2 Problem Statement
To design the exteriors of a compact tractor for the United States Market. The intended users are American male and female. The targeted segments are sundown farmer, Hobby farmer and Retired persons.

2. PRODUCT BENCHMARKING
Customer specified products for benchmarking were the most popular Kubota and Kioti Tractors.

2.2 Requirements of the Client
1. External Panel in red / chassis, cladding, plastic parts and steering in grey color.
2. To design a completely modern styled compact tractor for U.S. market. The new design should look trendy in line with new technology.
3. Bonnet is in SMC / Sheet metal
4. New vehicle should have good visibility at front and rear in day / night condition. Front tyre should be always visible.
5. Platform and Fenders are in sheet metal.
6. Hand holds and foot steps in sheet metal / plastics.
7. Front Grill in SMC / Sheet Metal on ensuring sufficient air flow radiators in front grill and side panel styling.
8. Wrap around clear lens lamp with new technology. Tiltable steering wheel for better ergonomics and comfort along with newly designed instrument cluster for better visual ergonomics.
9. Unique features like can holder and lunch box enhances the utility.
10. New fender design should accommodate all tire sizes required for 4WD/3cylinder/4cylinder/Power steering/suspended pedal/Different tire sizes.

2.3 Key words from user survey
Style
Macho, Powerful, Strong
Companion, friendly, easy
Sleek and good looking, hi tech

These keywords were further explored for application in styling.

2.4 Theme generation
Theme boards are prepared based on the study of requirements by the customer. These theme boards help generate forms and style based on certain cues that these boards reflect in terms of words and images. These help designers to sketch sticking to the basic appeal that the product has to show. The following were the themes for the concepts to be generated:

Muscular – representing the massive power of the tractor, strength and durability in all conditions. The feeling of the product being muscular is to be attained visually by means of styling cues and features developed.

Style – representing the possibilities of combining the looks of the latest products and automobiles in to the tractor visually with the consideration of latest manufacturing technologies.

Sleek – A feeling that gives the neat look and definition on the product appealing that it does the job what its meant for and is user friendly and attractive.
Playful – representing the image of a companion that serves as a friend in all times and helps the user in all tasks in the field. A soft looking finish that generates and emotion of friendly attitude towards the product.

2.5 Theme boards

![Figure 5 Theme Boards]

2.6 Concepts

Following the concept generation there was an internal presentation to the jury for selection of one concept for further development. The jury consisted of Industry experts in the domain of automotive and farm equipment design. The jury selection was based on the considerations of Feasibility, Theme representation, Form and appearance.

The selected concepts were then taken for virtual mock-up in advanced styling software Alias – Auto Studio. The sake of realization of the from by means of photorealistic renderings.

![Figure 6 Constrained Sketches]

![Figure 7 Detailed Concept Sketches]

2.6 Selected Concepts for Detailed illustrations:

![Figure 8 Selected concept for Muscular Theme]

![Figure 9 Selected concept for Style Theme]
2.9 Mock-up Building

The selected concept was physically modeled by hand to 1:5 scale out of Polyurethane Foam and Finished using automotive paints. The development images are shown here.

Fig. 14 Mockup 1:5 Scale

2.10 Design Validation

The mock-up helped in visualizing the concept in real time and was well accepted and finalized.

3.0 CONCLUSION

A defined work procedure and design methodology helps in designing better products. The form and styling features play an important role in dictating the market share of the product. Moreover the user not only needs the performance of the product but the pleasure of owning the product also plays a significant role for which the product is purchased.

REFERENCES

