CAPSTONE EXPERIENCE 2015
Hybrid Burden Carrier

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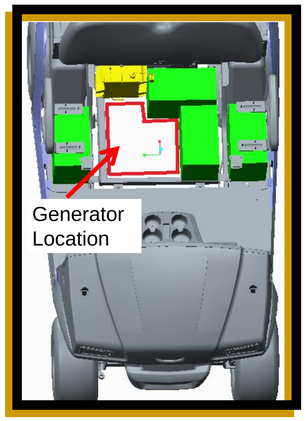
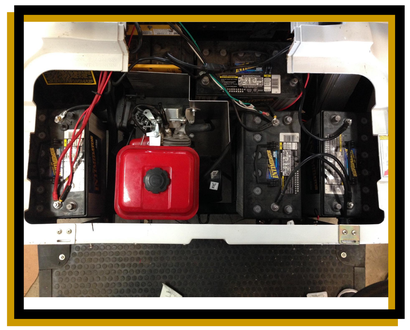
Objective:
Integrate a 48 VDC generator into a current production burden carrier for range extension. In many cases, the run-time on batteries alone is a major limiting factor. Introduction of this novel range extending capability gives Clark a competitive edge over other burden carrier producers.

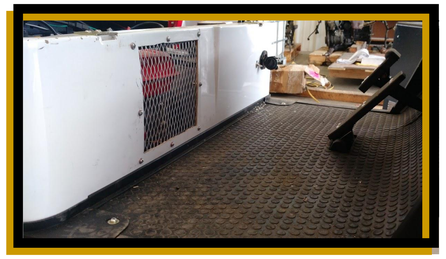
Problem & Background:
Clark Material Handling offers many different Burden Carriers with electric drive. The range that they currently have on these units falls between 10-30 hours. This run time limits a large market of users.

Alternative Solutions & Solution Evaluation:
A considered alternative was incorporation of regenerative braking. This would allow the operator to harness energy typically wasted as heat during braking. The solution that the team and sponsor decided to pursue was implementation of a 3kw, 48 VDC generator to charge onboard batteries while the burden carrier is in use. The unit would monitor system voltage and automatically start when the batteries needed charged. This generator would provide ample charging power to the unit in order to maintain use while the batteries are replenished.

Constraints:
Spatial constraints were a major concern in locating and mounting the batteries while still having ample room to mount the generator. Once mounted, the generator was required to produce ample power and current to charge the batteries while the burden carrier is in use. Heat dissipation and intake air constraints also provided challenges throughout the project.

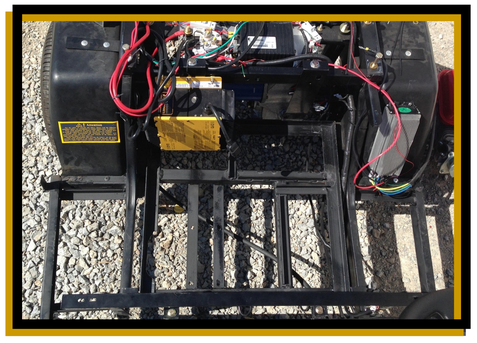






Budget:
Cost to the Purdue team was $100 since Clark provided the burden carrier and the generator which were the most expensive components. Total added cost to the customer is expected to be $1,000 once the unit is in full production. The customer must decide if this added cost is worthwhile in terms of range extension.

Solution Implementation:
Beginning stages of the prototype build required modification of the existing battery tray. Supporting cross-members and battery mounting brackets were welded to the original battery tray frame. Once the supports were in place, the generator and batteries were set into their locations. Concern of overheating the batteries lead to heat shielding being installed where the generator is closest to the batteries. A 10” x 10” cooling vent was fabricated in the front of the body to maximize airflow across the engine.



Global & Social Impact:
With range extension capability, end customers will be able to operate their burden carriers over long duty cycles without stopping at a recharging station. This allows users to increase productivity while decreasing equipment downtime.

Sponsor:
Clark Material Handling

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