

SENIOR DESIGN PROJECT: BAJA CVT ELECTRICAL ABSTRACT

This group project was part of the ongoing effort by Tennessee Tech's Baja SAE team to remain competitive and retain their status as a strong contender in Baja SAE competitions. As part of this process, the team decided that designing an electronic continuously variable transmission (eCVT) for their competition cars would be beneficial due to the flexibility in the control of drive ratios and convenience in anticipated adaptation and optimization. This project was carried out simultaneously with a partner design group that focused on the design and manufacture of the mechanical systems of the eCVT. The focus of this team was an emphasis on accommodating the supporting hardware electrical requirements needed to adequately operate the eCVT under the conditions specified by the Baja SAE competition rule book, as well as the design criteria established by the partner team. This focus entailed improvements to existing electrical enclosures instated previously for similar purposes, plus the introduction and improvement of sensors involved in the control and operation of the eCVT.

The overall approach we selected to accomplish this objective can be largely grouped into two primary phases for each component and aspect addressed. Firstly, consideration of relevant design criteria for a given component as well as research into the functionality of the component's operation was carried out. Cost-performance evaluations were made for each component based on estimate design criteria sufficient for purchasing. Secondly, the hardware acquired from purchases or existing on-site availability was installed and evaluated through experimentation. This procedure allowed for flexibility in the timeline for installation so that avenues for evaluating the performance of components could be considered concurrently with the progress of the installation of the eCVT to accommodate for adjustments in design needs. The project concluded with the installation of all addressed hardware and electrical components and coincided with the successful implementation of the eCVT into the 2021 competition vehicle.