HIGHER EFFICIENCY, LOWER CARBON FOOTPRINT

A SMALL ENGINE DESIGN START-UP PARTNERS WITH CCET TO CREATE FULLY FUNCTIONAL PROTOTYPE.

HIGHLY DETAILED PROTOTYPING

PROJECT ESSENTIALS

Principal Investigator: Tianhao (David) Hu
Years Active: 2016
School: School of Mechanical Engineering Technologies
Students: Zane Wiens, Cameron Medri, Nikodem Karpienia

Support from:
NSERC Green Homes

Industry Partners:
Customachinery

A decade ago our 'carbon footprint' wasn't on the average consumer's radar; nowadays, it's a collective worry, with apps and online calculators able to calculate our daily impact on the environment. As public awareness shifts, Roberto Fanara, Founder and Director of Customachinery, is working towards an internal combustion engine that corners our desire to lower emissions and make responsible consumer choices.

Customachinery's mission is to engineer a rotary engine able to effectively control the Homogenous Charge Compression Ignition (HCCI) combustion mode, offering higher efficiency and significantly lower levels of pollutants. Roberto recalls that in 2013 "all major original equipment manufacturers (OEM) had been trying to implement HCCI combustion in their reciprocating engine designs but had problems controlling auto-ignition timing and avoiding engine knock at high loads." Other major players in the auto industry have also made promises: "Just recently Mazda announced its plan to commercialize an HCCI engine by 2018." Development of a working prototype represents a huge milestone for Customachinery and would provide a significant competitive advantage.

Roberto began designing a new rotary engine with variable compression ratio control, one of the most important parameters to control HCCI combustion. Once the basic concept was developed he embarked on finding the right partner to bring the prototype to life, ending his search with George Brown College. Roberto believes that "partnering with George Brown has been fundamental for the advancement of the technology because of their competencies and manufacturing capabilities, substantial funding through the NSERC program, and ability to increase the technology's visibility and credibility."

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> DAVID HU, INSTRUCTOR AND LAB TECHNICIAN

This project marks the second time Customachinery has collaborated with the college, this time with the purpose of creating a more sophisticated engine prototype to illustrate realistic movement and function to investors. David Hu, Instructor and Lab Technician for the Centre for Construction and Engineering Technologies, was brought on as principal investigator. Working at the Casa Loma campus, David put together a team of three George Brown students— Zane Wiens, Cameron Medri, and Nikodem Karpienia— to create a successful HCCI prototype. "This project was the most challenging machining project we've had to date. The tolerance of the parts involved was one-tenth of the diameter of a hair and exceeds the capability of some machines we have," says David. "To get those components delivered on time and within budget, we did lots of research and invented a few new machining techniques."

Roberto explains that developing the prototype with George Brown was essential for a small start-up without in-house R&D capacity. "The prototyping activities have provided invaluable feedback in terms of feasibility, development challenges and technological advancement strategy," he concludes. Customachinery was very happy with the final result. "Engine manufacturing is a mature and conservative market. Developing a new engine technology is an expensive undertaking and nearly impossible for a pre-revenue start-up without the support of valuable academic partners."