



THE LOS ALTOS ACADEMY OF ENGINEERING

HYDROGEN FUEL CELL CAR

BUILDING A CLEANER, MORE FUEL EFFICIENT TOMORROW

HISTORY



Infusion, first designed and developed in 2001, is a one of a kind, student designed and built hydrogen fuel cell vehicle. With a goal of being able to travel 40 miles per hour for one hour continuously driven by one student, Infusion is the first hydrogen fuel cell vehicle built by high school students in the United States. Infusion uses a complex system of regulators and valves to store ultra-pure hydrogen to run a Ballard fuel cell. The hydrogen in the vehicle is stored in metal-hydride tanks which contain pellets that react with hydrogen gas. Three metal-hydride tanks are used in Infusion. The tanks store hydrogen as a semi-solid slush at a low pressure. That allows students to fill the tanks on site. Another distinct feature of the car, besides the use of hydrogen fuel cell technology, is the body, which resembles the shape of a teardrop in order to minimize air resistance. Other elements of the vehicle, including the sheet aluminum cockpit and torsion bar suspension, produce an interesting mix of cutting-edge technology and time-tested machining methodology in Infusion.



INFUSION

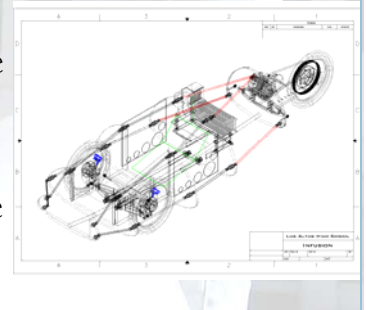
Hydrogen Technology

Infusion uses a complex system of regulators and valves to store ultra-pure hydrogen to run the Ballard fuel cell. The hydrogen in the vehicle is stored in metal-hydride tanks which contain pellets that react with hydrogen gas. Three metal-hydride tanks are used in *Infusion*. The tanks store hydrogen as a semi-solid slush at a low pressure. That allows the program to fill the tanks on site.



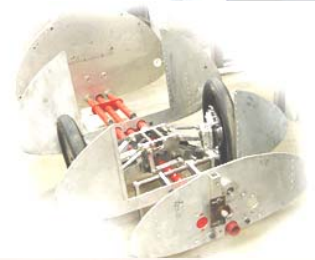
Design

The designers of *Infusion* intended the vehicle to be innovative in every way. In addition to the use of hydrogen fuel cell technology, the body of *Infusion* is unique in that it mimics the shape of a raindrop in order to minimize air resistance. Other elements of the vehicle, including the sheet aluminum cockpit and torsion bar suspension, produce an interesting mix of technology in *Infusion*. The primary programs used in its design were AutoCAD and Rhino. The program used to texture and rendered the car for display was 3Ds Max.



Mechanical

Infusion is a three-wheeled vehicle with a carbon-steel chassis and bulkheads made out of aluminum and Nomex honeycomb composite material. The front suspension of the vehicle is composed of dual A-arms wrapped around torsion bars. The rear suspension is composed of a swing-arm and dual Risse shocks. The rear wheel of the vehicle is driven by a belt from the motor.



Electrical

Infusion's electrical system consists of four main components: the fuel cell, the batteries, the motor, and the motor controller. A Ballard fuel cell is used with a back up system of a 24volt battery pack to power *Infusion*. The fuel cell puts out only 400 watts of power, similar to that of a hairdryer. It is connected to a 1.2 horsepower Scott motor, which in turn is hooked to a Curtis motor controller. If at any time the fuel cell fails, the batteries provide the needed power.



Composites

Infusion's body was constructed at Cerritos College by the LAEC composites team. The bottom half of the actual body was made using a wet lay up technique. The top half of the body was made using an environmentally-friendly state of the art technique called, coincidentally, infusion impregnation to produce an extremely light and strong body. Mr. Terry Price of the Cerritos Composite Program worked with our composites team to perfect this process. It took two years and four attempts to get a body that met the weight and structural requirements. The Air Craft windshield Company formed the canopy from molds made by the team.



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