ATech Educator News

Copyright ATech Training, Inc. March 2010

Alternate Conclusions

In two recent ATech newsletters, December 2009 and February 2010, we took a look at Alternate Vehicles and the advantages/disadvantages of each. For this edition, I'd like to put forth one person's perspective on the future design of cars and trucks and the role that Alternates will play in that future. First, however, we need to take into account the reasons that some variants were considered viable while others did not make the cut.

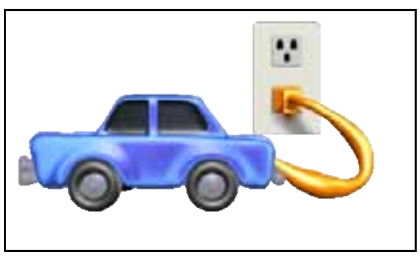
Point #1: There are currently some 600 million vehicles in the world today with another 60 million added annually. Future vehicles that affect only one, or a few countries will not solve our emissions problems. After all, there are 6+ billion of us and we still share the same air.

Point #2: Any Alternate Vehicle option that fails to move beyond niche status will have no impact on worldwide mileage improvement or emissions reduction. Real options will have to number in the tens of millions per year.

Point #3: Alternate Vehicles that people won't buy are of no value, and that willingness is most often a matter of price/cost. For instance, a $40,000 electric vehicle may do wonders for the environment but the vast majority of buyers will opt for the $20,000 conventional choice. Pocketbook issues always win out over ideology…my apologies to the environmentalists, but that is just the way it is.

Point #4: Drivers, especially Americans, are going to buy whatever they want rather than what might be the most environmentally friendly. Recall recently when gas went over $4.00 per gallon, the sale of pick-up trucks suffered very little, unlike SUVs and other vehicles. A person that wants/needs a truck isn't going to opt for a Smart instead.

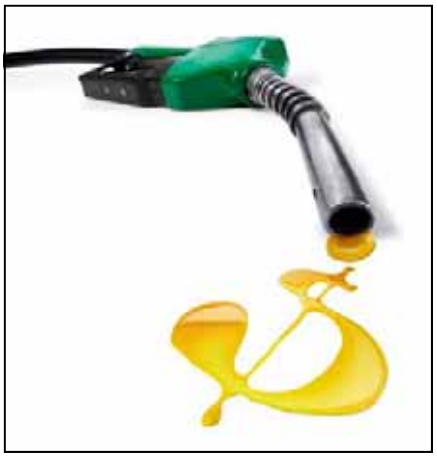
Point #5: Future vehicles must work off of one technology/infrastructure. Even if numerous Alternate options come to market simultaneously e.g. Electric, CNG, Fuel Cell, etc, the market will eventually migrate toward one of those technologies and away from the others. It is kind of like Microsoft; many people believe that other computer Operating Systems are superior to Microsoft's but since it is the largest and most well known, the majority of the market migrates to it, almost by default. In addition, no automotive manufacturer wants to produce numerous variants of a single vehicle type. A production system such as that would sacrifice the benefits of economies-of-scale manufacturing and result in increased costs for all.



Point #6: The total costs and emissions of any platform must be considered from inception to scrapping/recycling.

Point #7: Short term solutions are likely different from longer term ones. In fact, just one technological change/discovery could dramatically change things almost overnight and alter long term viabilities.

Point #8: World wide oil supplies aren't nearly as limited or as easily disrupted as some would have us believe. Case in point, ExxonMobil recently tapped a new oil patch in the Gulf of Mexico (a domestic source) that has a known capacity of billions of barrels. Some now believe that Gulf sources could ultimately exceed those of Saudi Arabia. Also, for all of the fear mongering that surrounds the political stability of oil, remember that 40% of our consumption comes from the U.S. while another 37% is from Canada and Mexico (friendly countries). Less than 20% comes from the Middle East.



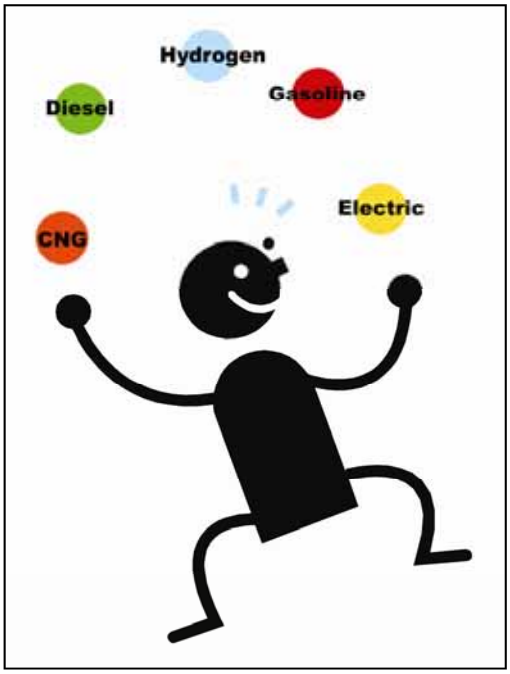
So with those criteria in mind, which configurations make the grade and which don't? First, those that don't…

1. Current, conventional gasoline-powered vehicles – The most efficient conventional vehicles operating on our streets today have an overall efficiency of about 25%. That means that ¾ of every gallon of gasoline is wasted in the forms of heat loss, friction loss, poor aerodynamic performance, etc. There are also large losses that result from the sheer weight of our drive systems. Consider this…a typical vehicle requires 20-50 horsepower to maintain a constant road speed but the engine of that vehicle is likely rated somewhere between 200-300 horsepower. Why is that? Well, that's because we use our engines for acceleration instead of running them at a constant speed. During acceleration is the time when vehicles run the richest mixtures and thus use the most fuel. Transmissions, which only exist because of the limited operating range of engines, also contribute to the

Alternate Conclusions Continued on Page 2...

accel/decel cycle problem in addition to adding significant weight and mechanical loss penalties. Acceleration and transmissions both must be eliminated as much as possible.

2. Electric Vehicles – As much hope as some people put in the future of electric vehicles, there appears to be three seemingly insurmountable obstacles to their adoption as mass-produced future vehicles. Those obstacles include an inadequate power grid for recharging millions of vehicles, a precarious situation involving the Lithium source for the desired Lithium-ion batteries, and an extended charge time requirement. The situation pertaining to the Lithium is that 50% of the world's supply is located high in the Andes mountains of landlocked Bolivia…a socialist country with an insufficient infrastructure and no direct access to ocean ports. Acquiring large supplies of Lithium will most likely present greater political problems than the current ones surrounding oil supplies. As such, EVs will most likely remain a niche vehicle for tinkerers with local recharging options such as solar cells or a windmill.
3. Alternate Fuels – Compressed Natural Gas, Propane, and Hydrogen all have high pressure storage tank requirements, a limited infrastructure, and a too-limited supply for a tens-of-millions-a-year need. Methanol is too caustic, Ethanol and Bio-diesel require too many acres of corn and soybeans, and bio-mass Methane is still too time consuming and difficult to capture to make a significant difference. Also, the use of coal at any point in the process is not going to pass environmental muster as a future power source. No good option exists among these.



4. Parallel Hybrids – Regardless of the benefits that these vehicles provide now, they still run on direct engine power at times (the acceleration and oversized engine problems again), they have heavy power-robbing transmissions, they have extra weight due to the hybrid components, and there is the additional cost factor. Even though they have achieved a level of public acceptance, 200,000 vehicles, or even a couple of million a year isn't a permanent solution.
5. Start/Stop engines – The fuel saved during idle shutdown doesn't compensate for the fuel wasted due to acceleration and the potential damage resulting from repeated no-oil-pressure starts. This option is a non-starter.

So, what does the vehicle of the future look like? Oddly enough, a lot like the vehicles of today and at the same time a lot different, for the next 10 to 20 years anyway. Specifically I believe that future light-duty transportation will be broken down into two torque-related categories; trucks and cars. Their respective configurations will be as follows:

Trucks – As utility vehicles they have a need for greater torque availability (which is why there won't be large numbers of truck hybrids). As such, I believe all trucks will eventually transition away from gasoline and into diesel engines of varied sizes. For instance, a ½ ton pickup may use an I4 turbodiesel while the ¾ variant will have an I5 turbodiesel and of course the 1 ton will be the big I6 (common bores and strokes will provide economies of scale). Everyone is already aware of the mileage benefits of diesels and their new emissions systems will insure that they are every bit as clean as their gasoline counterparts. There is also new research currently being conducted in the area of two-cycle diesels which would further decrease weight and (hopefully) fuel consumption. A diesel transition will also ultimately bring about the end of V-configuration Powerplants.

Cars, on the other hand, will lend themselves quite easily to Electric-Drive Series Hybrid platforms that use electric motors, smaller engines, and supercapacitors instead of batteries. Why Series instead of Parallel? Because the engine on a Series Hybrid can run at a constant speed to operate a generator, it doesn't suffer rapid acceleration/deceleration cycles (thus using less fuel than a Parallel), and the engine can be better designed for single speed operation. The use of supercapacitors, which charge and discharge faster than batteries, will provide power to the electric motor during acceleration while the control systems gradually (efficiently) increase the output of the generator to match changing demand. Recent and ongoing advances in drive motors and motor controllers are also increasing the high vehicle speed capability of Series Hybrids which has traditionally been one of their shortcomings.

So, there you have it. After much research, my findings have pretty much brought my perspective on Alternate Vehicles back to square one. The bottom line as I see it is that we can go off in a dozen different directions chasing new and sometimes exotic answers to our problems, or we can make real mileage and emissions changes worldwide by continuing to improve what we already have. Of course, that's just my opinion, I've been wrong before. 'Til next time…

David Mitchell, Instructor/ Program Developer

3600 Series

The 3600 series introduces students to the fundamentals of Engine Control components. Using structured skill development, students progress by learning how components function in systems. The 3600 series is the only product that actually teaches students how to troubleshoot. Skills are strengthened with troubleshooting practice.

3610 CBI
Engine Control Fundamentals

- This program consists of 21 student activities with over 60 animations—designed to present the fundamentals of engine control components. Includes "hands-on" digital voltmeter use.

3620 CBI
Engine Control Systems Operation

- This program consists of 14 student activities with over 60 animations—designed to present "closed loop" emission control systems. Includes "hands-on" voltmeter and oscilloscope use.

3630 CBI
Engine Control Diagnostic Fundamentals

- This program consists of 16 student activities with over 45 animations. This course includes a troubleshooting section which consists of 5 automotive circuits to choose from (Fuel Pump Relay, ECT, Fuel Injector, IAT, TPS) and more than 60 faults (at least 12 per circuit). It also has instructor fault insertion capabilities.

Brochures, Specifications and Demonstration Software Available.

Call Now to Place your Order (Press 1 for Sales)

ATech Training, Inc.
12290 Chandler Drive, Walton, KY 41094
Ph: (859) 485-7229 Fax: (859) 485-7299
E-mail: sales@atechtraining.com

ATech
Automotive Technology

ATech Training Inc.
12290 Chandler Drive
Walton, KY 41094
(859) 485-7229
www.atechtraining.com
sales@atechtraining.com

ATech Training, Inc.

A Veteran Owned and Operated American Company

CAT 2010 Spring Conference

California Automotive Teachers

April 23rd and 24th, 2010

Hosted by:

Yuba College

2088 North Beale Road • Marysville, CA 95901

If you have any questions,
please contact Don Schumacher.
Ph: 530-741-6700
E-mail: dschumac@yccd.edu
www.calautoteachers.com/conferences.html

We will see you there!

Inside this issue:

ATech Training is a member of:

North American Council of Automotive Teachers

California Automotive Teachers

Scholarships Available

and Actively Supports:

NATEF