

The Energy Contest Cover Page
Rutgers New Brunswick Undergraduate Students
Sponsored by The Rutgers Energy Institute

Cover pages should be submitted along with the proposals **on or before April 1, 2011** to via email to bea@marine.rutgers.edu.

Proposal Title: *Small individual changes can add up to make an enormous difference*

Total number of pages (not counting cover pages): 10

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200 word (maximum) summary of the proposal or video:

Small individual changes can add up to make an enormous difference. This simple idea is the real focus of the project. I propose that the "small individual change" of having the correct tire pressure in the tires of commuters, faculty, and everyday drivers here on campus, will "make an enormous difference". This difference will be seen in reduced energy use and thus reduced cost, less pollution, reduced dependence on foreign oil, longer lasting tires, improved gas mileage per gallon, and - most importantly - increased safety. The following is an easily implementable plan, which with the proper execution can make every driver on the Newark, Camden, and New Brunswick campuses more aware about smarter eco friendly practices that reduce their energy consumption. Considering just how many students, faculty, and workers use cars throughout the Rutgers community, the possibilities of the combined environmental benefits and economic savings are to great too ignore.

RUTGERS ENERGY COMPETITION

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The plan:

According to the U.S. Department of Energy, Properly inflated tires can improve fuel efficiency by 3.3 percent and save \$.06 a gallon at the pump. U.S. motorists driving on under inflated tires waste approximately 1.2 billion gallons of fuel each year. (RMA) By having volunteer students that have been trained to be Tire Checkers (TCs) in teams of 2-4 students checking and adjusting tire pressures in cars parked around the campuses, they can help reduce this enormous waste of fuel each year.

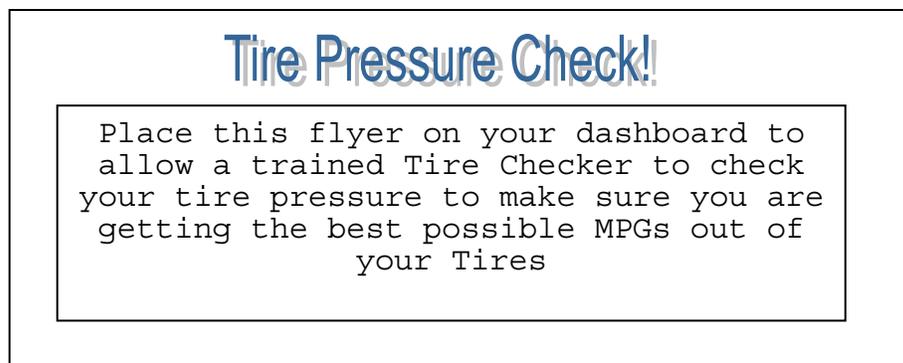
Getting the word out

This project would have to be advertised to commuters and Rutgers students as a whole. The way of doing so would be a Targum recycled paper insert explaining the opportunity to get ones tires properly inflated. Included in the advertisement there would be educational material

explaining all the benefits of having your car's tire properly inflated. In addition to the Targum advertising emailing list, Rutgers TV commercials, Youtube, Facebook, all forms of social networking, posters/flyers, and in class announcements are all forms of media that will be used to educate the students about the importance of having the proper air pressure in their tires.

Indicating permission to work on the vehicle

The operators of the vehicle will need to give permission to allow Tire checkers to inspect and work on the vehicles themselves. To indicate this the car operator will leave a paper slip that will show that they wish their vehicle's tires to be checked. Here is an example of what it might look like:



Tire Checkers Duties

All the volunteers will have to be educated and trained to work on car tires. This will ensure that there will not be any confusion or grievances against the program. The necessary training for this project's volunteers will be taught by approved members of the auto industry who would be knowledgeable and proficient at instructing the volunteers.

The TCs will be equipped with:

- Digital tire pressure gauge
- Portable Air compressor
- Stamp
- PDA (personal digital assistant)

The process Tire Checkers would use for checking tires:

(1) Starting at one end of the parking lot and working their way down to the other end, while the commuters and faculty are in classes, the TCs will work in groups of 2-4 people and travel from car to car checking individual car tires.

(2) After first observing the slip on the dashboard of the vehicle, one TC will use a PDA to run a program dedicated to calculating the optimal gas saving tire pressure for that particular vehicle and tire brand.

(3) The other TCs will then use their Digital tire pressure gauges to check all four tires to see how much, if any, air is needed.

(4) Once the correct tire pressure is calculated the TCs can then use their portable air compressor to properly inflate the tires.

(5) To indicate that the TCs have finished working on the tires of the vehicle, they can stamp the tires with a special logo or leave a slip of recycled paper under the windshield wiper blade confirming that the vehicle's tires are now inflated properly.

PDA Tire Pressure Calculator

In order for this project to work efficiently, the TCs will need to have an index to reference the proper tire inflation pressure for all the different makes, models, and tire sizes of vehicles on the road. Additional data that will factor into the calculation for the best miles per gallon pressure will be air temperature.

If there is no program already existing, it will not take much effort to create it. All one would need is a few data sets containing: types of cars, tires, tire sizes and best tire pressures for the said data sets. Then incorporate a user-friendly interface that can be downloaded to a portable computer device such as an iPhone, laptop, or PDA.

Analysis of Cost & Energy Savings

-Depending on the size, power and power source of the air compressor, it can cost anywhere from \$200-\$2,000



- Low End: Electric Craftsman 20 Gallon Portable Vertical Air Compressor with Hose and 9PC Accessory Kit
- High End: 30 Gallon 5 HP Electric Motor 230 Volt Two Stage Wheeled Portable Air Compressor Air Line Filter
- Gas powered option: Campbell Hausfeld Service Truck Series Air Compressor - 13 HP Honda GX390 Engine, 30 Gallon Tank

- Digital tire gauge \$ 5 - \$ 10



1. Campbell Hausfeld - Professional 99 PSI Digital Tire Gauge
2. Accutire MS-4021B Standard Digital Tire Gauge

PDA \$200 - \$350



1. HP iPAQ 110 Classic Handheld
2. Apple iPad Wifi - 16GB

Totals: High end: \$2,360
 Lower end: \$405

Energy Savings: At \$3.00 a gallon

Per person Annually: *144 gallons of gasoline*

\$432 at the pump

1.4 Tons of CO2

In 2010, 8,600 commuter Permits issued.

Annual Totals: *1,238,400 gallons of gasoline*

\$3,715,200 at the pump

12,012.48 Tons of CO2

Timeline for Implementation

Given the time to properly educate and train the Tire Checkers, get appropriate funding, get Rutgers University approval, acquire the equipment, and initiate an advertising campaign.

Ambitious estimate: 1-2 months

Conservative estimate: 3-4 months

How Costs & Energy Savings Were Calculated

Based on a study done by eight students in 2003 from Carnegie Mellon's sustainable Earth Club, which measured the tire pressures of 81 cars in their parking lots, we are able to use their

findings to calculate the annual fuel savings of the entire New Brunswick campuses. The Carnegie Mellon students found that each car burned an extra 144 gallons of gas due to improper tire inflation. At \$3.00 a gallon, each car owner was over paying \$432 for gas each year due to having the incorrect tire pressures.

By using this figure and applying it to all the Rutgers University students that applied for commuter parking permits in 2010 (over 8600 of them according to Rutgers DOT), the total annual savings that properly inflated tires would have been for Rutgers commuting students \$ 3,715,200. Another way to look at it is that with each car using an extra 144 gallons of gasoline, combined that with all 8,600 commuters, the total amount of wasted gas would be 1,238,400 gallons. Imagine that, by simply having the correct tire pressure 29,485.7 barrels of gasoline could have saved.

According to the EPA, for every one-gallon of gasoline burned 19.4 pounds of Carbon dioxide (CO₂) is emitted. By that logic, since each car used an extra 144 gallons of fuel due to improper tire inflation, and there are 8600 commuters, that means that 24,024,960 pounds of CO₂ went into the atmosphere or 12,012.48 tons due to improper tire inflation. The implementation of this project would stop this unnecessary waste of energy and pollution of Carbon Dioxide into the atmosphere

“ CO₂ emissions from a gallon of gasoline = 2,421 grams x 0.99 x (44/12) = 8,788 grams = 8.8 kg/gallon = 19.4 pounds/gallon”

Why Rutgers Campuses need this

In New Jersey, it is illegal to pump one's own gas. This is seen as a major convenience for many drivers. Why get out of the car and pump your own gas, when someone else is getting paid to do it for you? This practice comes with a down side. No longer are the days when one had time and desire to make sure one's car is operating at peak performance. These days we only wish to get in the car and go, and not be bothered with the small routine maintenance details that come with owning a car.

In this respect, it makes sense to have Tire Checkers, especially in colder weather, when the wish to keep up with one's tire pressure is least desirable. The colder weather is when it's most important to check ones tire pressure because the extreme air temperature changes the volume of air in the tires.

It has been proven that most people (students and teachers alike) do not regularly check that their tires are properly inflated. The Rubber Manufacturers Association (RMA) reported that nearly one in five vehicles had at least one significantly under inflated tire that can compromise safety and waste gas This fact alone is reason enough to initiate this program in the Rutgers communities.

“In addition to the tire pressure survey, RMA commissioned a poll of registered drivers to gauge their knowledge of proper tire maintenance.

While a strong majority of drivers rate checking tire pressure as one of the top actions they can take to save fuel, 82 percent do not know how to properly check tires.

- 44 percent of drivers wrongly believe that the correct inflation pressure is printed on the tire sidewall. Another 14 percent do not know where to find the correct pressure.
- 20 percent of drivers wrongly believe that the best time to check their tires is when they are warm after being driven for at least a few miles.

- Nearly 2 out of 3 drivers do not know how to tell if their tires are bald.

To properly check tire pressure, motorists should check once each month; check tires when cold – before the vehicle is driven and; use the vehicle manufacturer’s recommended pressure found on a label located on the driver’s door or door post or check the owner’s manual.” (Rubber Manufacturers Association)

Other benefits, increase Safety

Unfortunately ignorance and forgetfulness play a part in the lack of proper car maintenance. The National Highway Traffic Safety Administration (NHTSA) estimates that under inflated tires contribute to more than 600 fatalities and 33,000 injuries each year. (RMA) Simple safety observations go unnoticed by many students throughout the campus community. For instance, checking to make sure the age of the tire is not beyond its maximum lifetime is a major factor in safe driving. Most people are unaware that tires even have a maximum life. This can cause tire blowouts while driving at high speeds! Another benefit to having a second pair of eyes looking to make sure ones car is not a safety hazard is to check tire tread wear.

“According to most states' laws, tires are legally worn out when they have worn down to 2/32" of remaining tread depth. However, as a tire wears, it's important to realize that the tire's ability to perform in rain and snow is reduced. With 2/32" of remaining tread depth, resistance to hydroplaning in the rain at highway speeds has been significantly reduced, and traction in snow has been virtually eliminated” (tirerack.com). Obviously no car should get this low. Lastly, assessing the type of tire wear can give further information on other potential car vulnerabilities. For instance the condition of an improperly wearing tire can convey that the wheels are out of alignment or that steering/suspension parts are worn. (aa1car) This can also be very hazardous.

In these scenarios a TC can inspect a worn tire and advise the driver to obtain new tires as soon as possible or to visit a certified mechanic that can fix the cause of the improper tire wearing. TCs will inform, what they deem advisable, by leaving a recommendation under the driver's windshield wiper.

Summation

Abhir Adhate, the project manager of The Rutgers Formula Racing Team has this to say about racing a the importance of tire pressures "Basically even if our data logging system is not working for some reason we ALWAYS check tire pressures after a stint... So I'd say its one of the most important data points we could collect."

President Obama is also a supporter of keeping tire pressure. "You can inflate your tires to the proper levels and that if everybody in America inflated their tires to the proper level we would actually probably save more oil than all the oil that we'd get from John McCain drilling right below his feet there." (cbsnews)

I have proposed that the "small individual change" of having the correct tire pressure in the tires of commuters, faculty, and everyday drivers here on campus, will "make an enormous difference". This difference will be seen in reduced energy use and thus reduced cost, less pollution, reduced dependence on foreign oil, longer lasting tires, improved gas mileage per gallon, increased safety and - most importantly – *Showing that Rutgers and its community is serious about saving energy and practicing being environmentally friendly.*

Reference List

Bruce Gerson. September 21, 2005. Carnegie Mellon Today. Save Gas, Money and the Environment with Properly Inflated Tires

http://www.cmu.edu/cmnews/extra/050921_tire.html

Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel February 2005

<http://www.epa.gov/oms/climate/420f05001.htm>

Measuring Tire Tread Depth with a Coin

<http://www.tirerack.com/tires/tiretech/techpage.jsp?techid=51>

MILLIONS OF DRIVERS WASTING GAS, RISKING SAFETY

<http://www.rma.org/newsroom/release.cfm?ID=269>

Obama Camp Hits Back At "Tire Gauge" Rhetoric August 4, 2008

http://www.cbsnews.com/8301-502163_162-4319530-502163.html

Rutges DOT

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Tire Wear

http://www.aalcar.com/library/tire_wear.htm