

2008 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Engineering

PROJECT : Automated Traffic Light

AWARDS : Engineering Third Award

SCHOOL : CETIS#18

**FINALISTS : Enrique Alberto Gomez Ramirez
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COUNTRY : Mexico

ABSTRACT OF EXHIBIT

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CATEGORY: Engineering

TITLE: Automated Traffic Light

NAME: Enrique A. Gomez Ramirez, José Gutierrez Martinez

COUNTRY: Mexico

This Project is inspired by the situation incurred by pedestrians, which for the most part are students who need a crossway in order to obtain public transportation or to get to the school; the difficulties that are faced by the personnel to exit the parking lot as well as the students who have a vehicle and to help those parents who drop and pick up their children at the school.

At the same time, we would like to reduce the amount of contaminated gas emissions that are emanated into our environment.

As consequence of the emission of toxic substances, the air contamination can cause side effects such as the burning of eyes or ears, throat irritation and itching and or respiratory problems. Under determined circumstances, some chemical substances that are found in the contaminated air can produce cancer, congenital malformation, brain damage and disorders to the nervous system, as well as, pulmonary damage and harm to the respiratory tract.

For the present investigation it has been suggested as a primary goal: The development of a device, in this case a traffic light, which has the objective to reduce the previously mentioned traffic/security problems that arise upon entering and exiting the institution. The secondary goal is to have a friendly ecological impact within our community.

This device was built and tested during a month to obtain figures and demonstrate benefits reported.

The device should be low maintenance, it should have a long lifetime and, be simple enough to be operated by those who use it.

Among the benefits found, the safety of the students, the prevention of accidents such as: car crashes and run overs, etc.

Our studies indicate that per week it is consumed an average of 2,020.16 liters of gasoline, in schedules of 13 hours (from 7:00 AM to 8:00 PM) to lessen this figure would have a good ecological impact since all the hydrocarbon emission are harmful to health.

Automated Traffic Light

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INTRODUCTION

A current problem at the entrance or exit of CETIS 18 educational institution is the risk students, teachers, parents, and local traffic run when entering or leaving the facilities due to the lack of traffic order.

PROBLEM STATEMENT

Up to now, there has just been an attempt to solve the problem by using a portable stop sign which is insufficient for the following main reasons:

- ❑ Majority of drivers simply ignore the stop sign.
- ❑ On occasion, the school security guard forgets to bring out the portable stop sign, making its use undependable at times when it is mostly needed.
- ❑ The stop sign is not quite visible and this causes the drivers to miss it or just pass by it.
- ❑ There is a need for an appropriate device to respond to the different situations in the best possible way. We do not wish to hinder traffic but we do want to find a solution to the current problem. For this reason, we opted for the use of a PLC device.

OBJECTIVE

To protect the school population, help the traffic flow, and reduce the contamination of our city through the use of a PLC device in an automated traffic light controlled by two push buttons for pedestrians and two weight sensors for traffic.

JUSTIFICATION

This Project was inspired by the difficulties faced by students and personnel who come and go by car and those who need a crosswalk to get public transportation, as well as by those parents who drop off and pick up their children at school.

ENGINEERING GOALS

- ❑ The development of a device, in this case a traffic light, which has the objective of alleviating the problems that arise upon entering and exiting the school. The secondary goal is to have a friendly ecological impact within our community.
- ❑ This device should also be of little or no maintenance, long life, and simple enough to be operated by those who will use it.

THEORETICAL BACKGROUND

The PLC was initially introduced in 1970 and it has since been refined with new electronic components such as high-velocity micro processors, adding special functions in order to control more complex processes.

ENVIRONMENTAL IMPACT

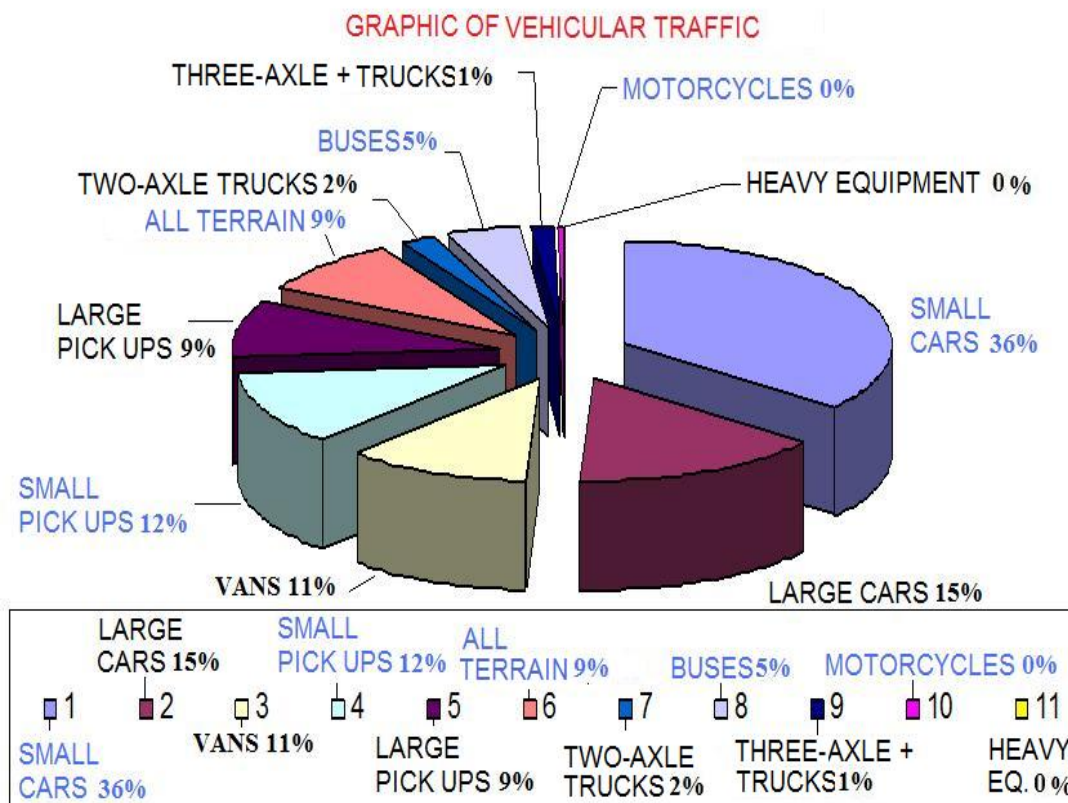
The energy required to move an automobile is obtained by burning fuel.

Automobile contamination derives from secondary products of the combustion process expelled through the exhaust pipe, and from fuel evaporation.

The Main Gases of Contamination

Carbon Monoxide (CO): It is an odorless and colorless gas. When inhaled, its molecules enter the blood stream where they inhibit the distribution of oxygen. In low concentrations it can produce dizziness, headache and fatigue, while those in great concentrations can be fatal.

Carbon Dioxide (CO₂): It is the main gas causing the greenhouse effect. It originates from combustion of carbon, petroleum and natural gas. In its liquid or solid state it can cause burns, freezing of tissues and blindness. Its inhalation is toxic; in high concentrations it can cause an increase of the respiratory rhythm, fainting, or even death.



Conclusions

- ❑ The traffic light has an initial investment of US\$10,517. There is an annual expense of US\$73,460 total in automobile fuel, compared to a similar run without stops. Therefore, the initial investment would be recovered in six weeks.
- ❑ Among the benefits found we have the safety of the students, and the prevention of accidents such as car crashes and runs-over.
- ❑ Our studies indicate a weekly average consumption of 2,020 liters of gasoline, in schedules of 13 hours (from 7:00 to 20:00 hours). Reducing this figure would have a positive ecological impact since all hydrocarbon emissions are harmful to one's health.
- ❑ The automobile is the most common source of contamination today; however, an automobile in good condition does not alone contaminate. The problem resides in the greater numbers; in other words, it is the combination of all cars burning fuel at the same time.
- ❑ Between 15 and 25% of suspended particles attributed to traffic comes from the wear and tear of such components as brakes, clutches and tires.
- ❑ As part of the usual traffic driving by the school there are diesel fuel vehicles which cause four times more environmental contamination than the rest, since they emanate higher levels of nitrogen dioxide (NO₂) and suspended particles.
- ❑ By preventing these vehicles from stopping unnecessarily, we can fight sicknesses like asthma and cancer because the particles emitted by burning diesel represent a factor of toxicity linked to lung cancer.
- ❑ This Project was especially designed for the entrance and exit of CETIS 18 educational institution. It would not be feasible to mass produce it, but taking in consideration the reprogrammable characteristics of the PLC, it could be adapted to other schools or public places provided they carry out an investigation of their own necessities.

評語

- 1) 本作品嘗試研發停車場及校車出入口之街燈裝設，以期維護交通之安全，並透過對有毒排放氣之監控，取締超時停車未熄火車輛。
- 2) 本作品以 PLC 作為燈號及排氣監控之調控工具，對於程式參數的調變及工程彈性化之設計，若能善加改良，功能性將能提昇，更能 adapt to 環境變遷。