PROJECT FOR GOOGLE SCIENCE FAIR 2014

“How to make roads out of plastic”

By Arjun Randhawa

SUMMARY

I chose this idea because it deals with the excessive amount of plastics being used these days. I researched a lot about plastics waste being thrown here and there in the countryside and also its harms. Thus I wanted a way out of it. Then I got to know that plastic can be used for road laying by processing it in a certain way.

It is an easy process without any new machinery.

1.Simple process without any industry involvement.
2.In situ process.
3.Use of lesser % of bitumen and thus savings on bitumen resource.
4.Use of plastics waste for a safe and eco-friendly process.
5.Both Mini Hot Mix Pland and Central Mixing Plant can be used.
6.Only aggregate is polymer coated and bitumen is not modified.
7.Use of 60/70 and 80/90 bitumen is possible.
8.No evolution of any toxic gases like dioxin.
9.Fly ash can also be used to give a better performance.

ABOUT ME

I live in New Delhi and I go to a nearby Christian Senior Secondary School called '*Faith Academy*". I love Science and doing research work on websites like Wikipedia. My main interest is in the field of Biology. When I was young, I used to play with. Papier-mâché and make new items which got me interested in recycling and hence Science. Gradually I started studying Environmental Studies in junior classes and finally Science. In science, I love going to the lab and performing experiments and observing items under the microscope. The first slide I ever made was of the *Onion Peel Cell*. I also started admiring scientists such as Robert Hooke. When I grow up, I want to study Biology (abroad). I want to get admission in maybe Oxford University and also get an M.B.B.S. Degree. Winning in the Google Science Fair would be the biggest achievement of my life. I would be able to get admission in any university due to my merit and this achievement.

QUESTION/PROPOSAL

The primary question I was investigating is, **"How to make a real good use of Plastic?**" I started with getting to know how is the plastic actually disposed. Its answer was landfills, dump yards, burning it,

and dumping it outside the city. This was actually very disappointing. Then I surfed around the web to get the data about how is and how it can be Reduced, Reused and Recycled. I got to know that people just melt it and sell it to the junk seller. But just then I came to know about another way through which we can actually convert it into such a useful item which can be used in constructing roads. In India, (of a large part) road construction goes on largely because the roads tend to get broken and have bumps. Thus, a lot of money is being spent by the government. In such a situation, this method would be like a God gift.

RESEARCH

In this field, people have invented many ways through which Plastic, a Non-Biodegradable substance can be recycled and made helpful. Almost most of them have been not so much innovative and creative.

METHOD

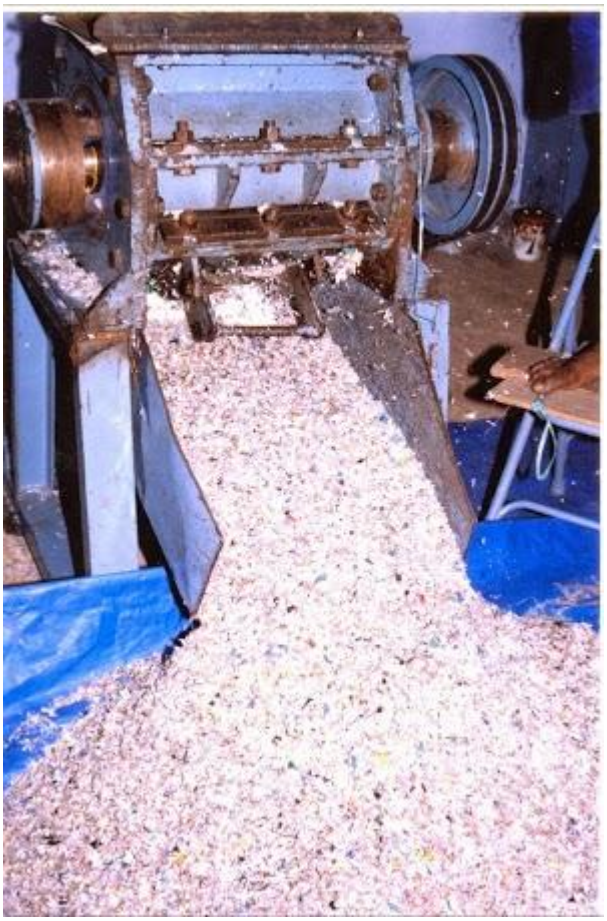
Plastic Wastes used in process:

The following types of waste plastic can be used in the construction of rural roads:

- Films (Carry Bags, Cups) thickness up to 60micron (PE, PP and PS)
- Hard foams (PS) any thickness
- Soft Foams (PE and PP) any thickness.
- Laminated Plastics thickness up to 60 micron (Aluminum coated also) packing materials used for biscuits, chocolates, etc.,
- Poly Vinyl Chloride (PVC) sheets or Flux sheets should not be used in any case.

Process Step 1:

Plastics waste (bags,cups,thermocole) made out of PE,PP and PS cut into a size between 2.36mm and 4.75mm using shredding machine, (PVC waste should be eliminated).



Process Step 2 a:

The aggregate mix is heated to 165°c (as per the HRS specification) and transferred to mixing chamber.

Process Step 2 b:

Similarly the bitumen is to be heated up to a maximum of 160°c (HRS Specification) to have good binding and to prevent weak bonding. (Monitoring the temperature is very important).

Process Step 3:

At the mixing chamber, the shredded plastics waste is to be added. It get coated uniformly over the aggregate within 30 to 60 seconds, giving an oily look.


Process Step 4:

The plastics waste coated aggregate is mixed with got bitumen and the resulted mix is used for road construction. The road laying temperature is between 110°c to 120°c. The roller used is 8-ton capacity.


RESULTS

Characteristics of the process:

- Easy process without any new machinery
- Simple process without any industry involvement
- In situ process
- Use of lesser % of bitumen and thus savings on bitumen resource
- Use of plastics waste for a safe and eco-friendly process
- Both Mini Hot Mix Pland and Central Mixing Plant can be used
- Only aggregate is polymer coated and bitumen is not modified
- Use of 60/70 and 80/90 bitumen is possible
- No evolution of any toxic gases like dioxin
- Fly ash can also be used to give a better performance.

This procedure has proved that plastics can be used for road construction.

CONCLUSION

My conclusion was that this is an absolutely innovative new method of not only recycling plastics, but also to save money and resources spent on the construction of roads in rural areas. Maybe, there would be various other ways in which this method can be improved. All of my doubts whether plastic can actually be recycled in a useful way for the people also are cleared.

ACKNOWLEDGMENTS

I would like to thank firstly God, to whom I prayed day and night. Then the TV show where this plastic road thing was talked about and which lead me to go on the Internet, searching through Google more data on this topic. My parents who gave the consent form to allow me also. But lastly, my potential... :)