Go Green Environmental Initiative for Recycling Plastic Bottles with Progressive Entrepreneurship Partnership

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Plastic has been widely adopted by the global industry as the most common and adaptable material for marketing their products. Current levels of plastic usage and disposal is one of the biggest environmental challenge that we have to deal with. In addition, because of the durability of the polymers involved, large amounts of discarded end-of-life plastics are accumulating as debris in landfills and in natural habitats worldwide (Jefferson, et. Al., 2009). This paper discusses a promising environmental friendly solution for reducing pollution by recycling plastic bottles. A Progressive sustainable economic model of Entrepreneurship Partnership is presented for the developing economies.

INTRODUCTION

Plastic bottles find common use in a wide range of applications in our daily lives. As a result production and use of plastic bottles has increased remarkably over the years. The high demand of plastic bottles specially in the water and soft drink industry has brought with it severe environmental problems due to careless disposal of these bottles (Garry, S. H). Statistical data reveals that yearly upwards of 100 million tons of plastic are manufactured across the globe (Tom, S) and people add up to 8-9 million tons of plastic waste to our environment, which includes up to 40% Polyethylene Terephthalate (PET) the clear plastic used for water and soda bottle containers. PET is low priced and produced in enormous quantities. Amount of plastic waste discarded into Eastern Sea in Vietnam, about 0.28-0.73 million tons/year, ranks 4th in the world. This impacts ships safety routing and contaminate fisheries. Traditionally plastic waste is processed by burning or sending to land fill. The impact of burning one ton of hard waste creates about 62 cubic meter of methane equivalent to one ton CO2. The constant buildup of plastic waste in the landfills has become a major source of concern for many sectors of sustainable society. Massive pollution contaminate rivers and clogs drainage system, usually ending up in the oceans due to people's negligence. It needs 450 years to initiate the decomposition of PET. And it needs additional 50 - 80 years more for PET to completely decompose. CO2 gas pollutes environment, and plastic waste affects landmasses and oceans.

The Process

The process of recovering plastic waste and reprocessing it into useful products would be implemented in three stages:

Setup and Organize Ecosystem for Collecting Plastic Used for Water and Soda Bottles

A successful plastics recycling operation requires a dependable source of plastic waste and an efficient collection and separation system. One such system in Vietnam which has been in operation for 10 months has set up three stations to collect plastic bottles in rural areas (Hoa Vang dis/Da Nang city). To encourage participation in the process, the consumers are employed and involved in the process. This also strengthen and enhances a sense of community ownership and involvement. Each household is provided with a green bin for collecting plastic waste and paid cash amount for their effort.

Design and Manufacture of Production Line Components for Automatically Processing Plastic Bottles to Make Plastic Ribbon/Wire of Various Sizes

Artistic Rendering of Block Diagram Prototype of Machine for Cutting /Connecting Plastic Ribbon

The following set of machines have been designed that are available for converting the Polyethylene Terephthalate (PET) the clear plastic waste into plastic ribbons/wires. The ribbons/wires in turn are subsequently woven into scores of useful artifacts.

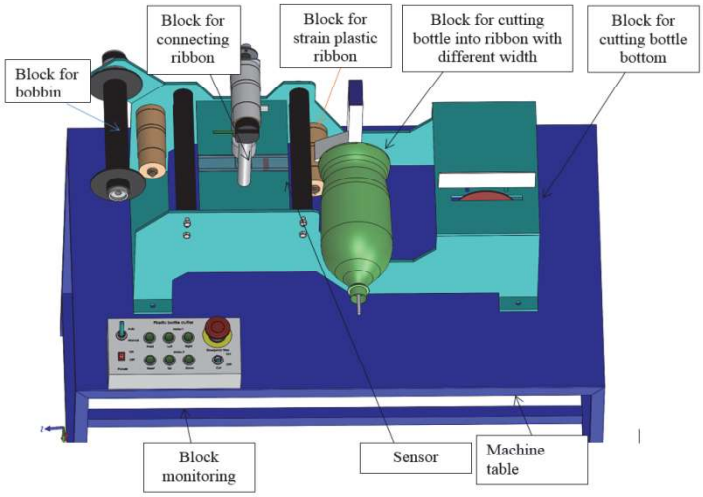
Mechanical Design Specification: Cutting Plastic (PET) Bottles into Ribbon with Different Widths, Connecting and Coiling.

General:

- Overall Dimensions: 700 mm x 300 mm x 300 mm
- Size of machine table : 820mm x 500mm x 500mm

The Ribbon Cutting Machine presented in Figure 1 is the block diagram representation of the prototype machine designed and developed for the purpose of shredding the recycled plastic bottles into respective widths of plastic ribbons.

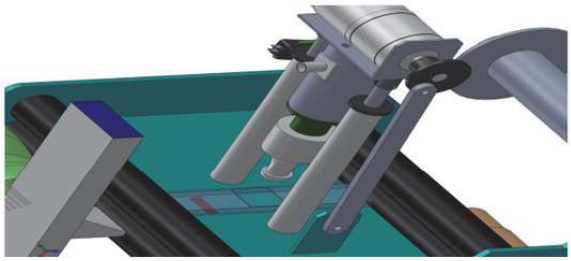
FIGURE 1
BLOCK DIAGRAM OF THE RIBBON CUTTING MACHINE



In Figure 2, the ribbon is continuously feeding and is adjusted for some overlap. At this juncture the ultrasound heater is utilized for connecting individual pieces into a continuous plastic ribbon. The quality

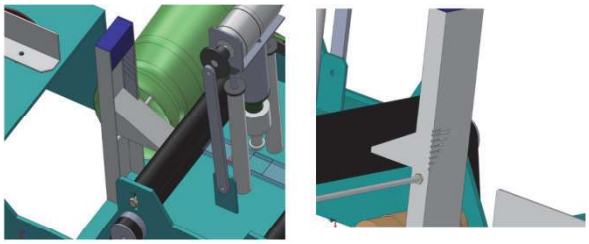
and appearance of the ribbon depends on welding parameters settings. The capacity of this machine is also a subject which is beyond the scope of this paper.

FIGURE 2
DEVICE FOR CONNECTING PLASTIC RIBBON



As we need different widths of ribbons for various end products, the machine (Figure 3) must have the ability to cut plastics into various widths. The machine accomplishes this requirement by adjusting (sliding the blade-knife) the position of the knife which in turn regulate the width of cutting ribbons.

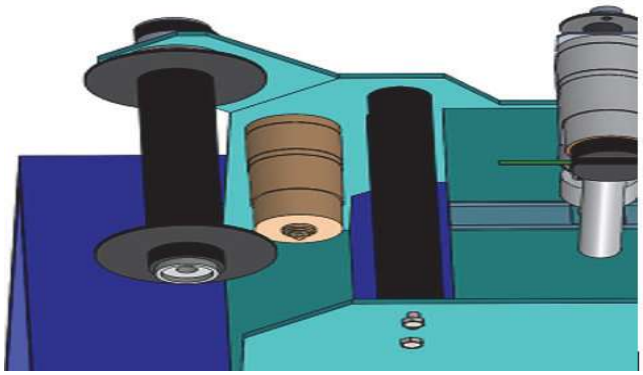
FIGURE 3
CUTTING BOTTLE INTO RIBBON WITH DIFFERENT WIDTHS



On this device (Figure 4), the bobbin is freely rotating and the ribbon is being wound. The diameter and width of the bobbin is calculated so that we can process about 20-30 bottles per lot. We will upgrade this device for the two scenarios:

- Automatic stopping the machine when the bobbin is full.
- Continuous recharging of the bobbin.

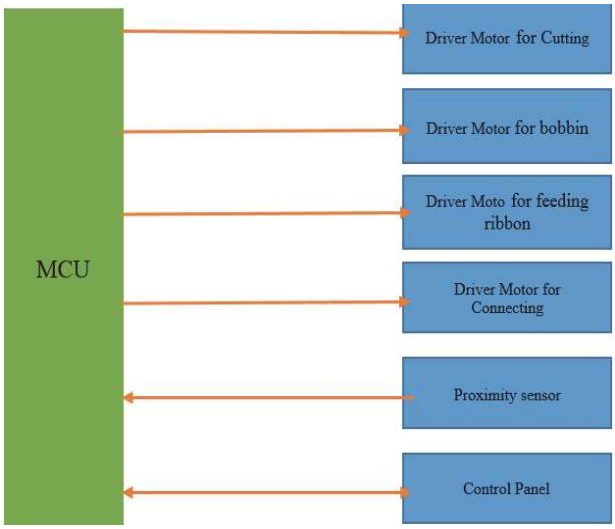
FIGURE 4
DEVICE FOR BOBBIN RIBBON



Microcontroller I/O Interface Schema for Sensing and Control

The overall schema for machine controlling system for the relevant hardware functionality is shown in Figure 5. Multiple inputs sought from the control panels and respective sensors are utilized as input to the processor. The respective output signals for controlling the two motors (cutting and bobbin/connecting) are being generated as per the algorithmic design for the machine.

FIGURE 5
SCHEMA FOR MACHINE CONTROLLING SYSTEM

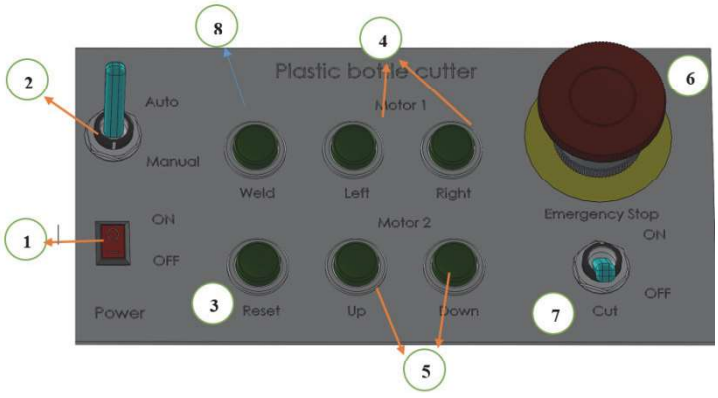


Control Panel

Control panel functionality (Figure 6) for the processor is depicted as follows:

1. Power switch for system.
2. Switch for automatic mode change – Auto/Manual.
3. Reset button for system.
4. Motor operating simultaneously for bobbin.
5. Motor for connecting up/down.
6. Emergency Stop Button.
7. Motor for cutting bottom of bottle (ON-OFF).
8. Button for connecting.

FIGURE 6
CONTROL PANEL



Extricate Plastic Machine for the Specificity of the Ribbon Pertaining to End Product Processing Requirement

As the structure of the bottles is circular, the resulting plastic ribbon is spiral and not flat. As such the ribbon does not meet the requirements for product processing stages. This require further flattening of the ribbon without changing its characteristics by applying continuous modulating and regulating the temperature under the algorithmic control. A top view of the extricate machine is shown in Figure 7 and 8.

FIGURE 7
EXTRICATE PLASTICS MACHINE

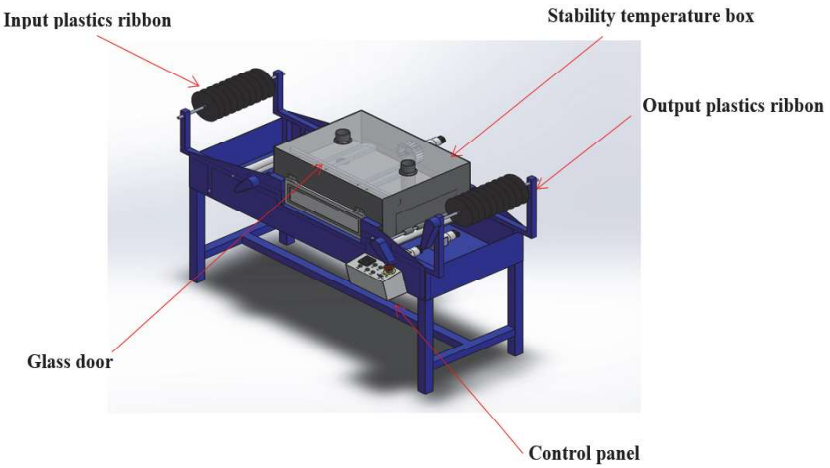
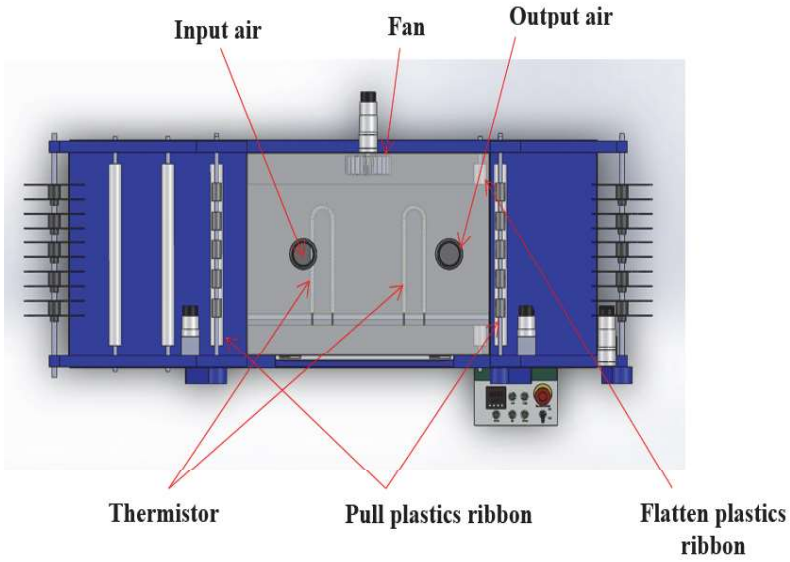


FIGURE 8
TOP VIEW OF EXTRICATE MACHINE



Plastic Knitting Machine

The Knitting Machine (Figure 9 and 10) is for knitting plastic Ribbon/wire. Depending on the specification of the end product the machine will regulates the knitting process.

FIGURE 9
PLASTIC KNITTING MACHINE

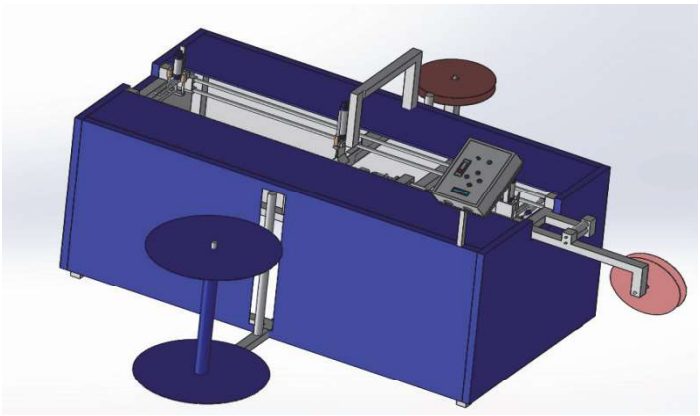
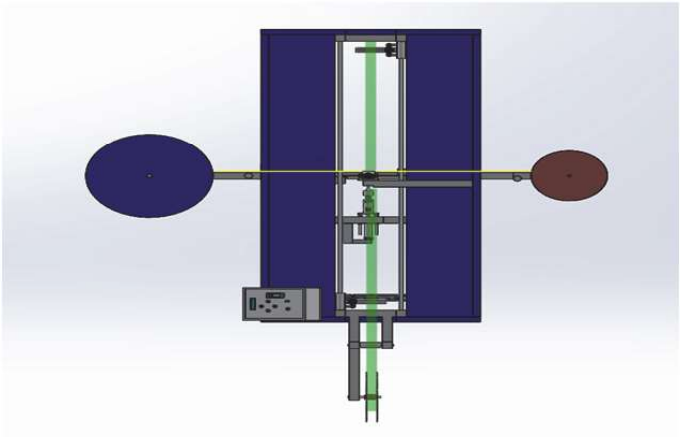


FIGURE 10
TOP VIEW OF KNITTING MACHINE



The following steps discuss the concept in a simplified manner.

- Two wires are being fed from the two side continuously.
- One strip of plastic runs horizontally through the machine with the help of tension in the strip generated by the output spool (yellow strip below)
- One strip of plastic is fed with the help of clamping mechanism, it will stop when the end of the journey reaches 140 centimeter (green strip below).
- Using pressing mechanism to fold plastic strip in half. Then an ultrasonic welder is used to achieve the desired fusion of plastic strips.
- After fusion the scissors would cut the plastic strip 1, then plastic strip 2 would advance some to continue.

Physical Porotypes of Machines Designed and Manufactured by Duy Tan University for Green Environment Initiative for Recycling Plastic Bottles

The machines shown in Figure 11 and 12, are manufactured, tested and ready for deployment for Green Environment Initiative for Recycling Plastic Bottles Entrepreneurship Partnership.

FIGURE 11
CUTTING BOTTLES INTO RIBBON/WIRE AND CONNECTING THEM CONTINUOUSLY

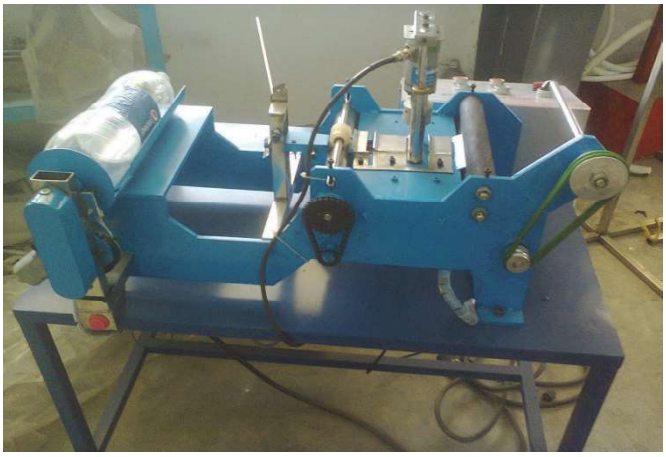


FIGURE 12
STRAITENING PLASTIC WIRE

Typical Products Made from Recycling Plastic Ribbon/Wire

The end product and artifacts shown above in Figure 13 and 14 have been tested as samples in the prototype machines shown in Figure 11 and Figure 12 and are ready for deployment for Green Environment Initiative for Recycling Plastic Bottles Entrepreneurship Partnership Program.

FIGURE 13
SOME PRODUCT MADE FROM RECYCLED PLASTIC RIBBON

FIGURE 14
SOME PRODUCT MADE FROM RECYCLED PLASTIC RIBBON

Roof **chair** **Broom** **Carpet**

CONCLUSIONS

The Relationship between Entrepreneurship and Economic Development for Developing Economies summarizes and updates the empirical evidence and presents the main lines of reasoning behind the relationship between economic development and entrepreneurship (Sander, et. Al., 2010). Given the scenario that even though a small percentage (in low teens) of success stories of entrepreneurship. This is a tremendous toll for the very high failure rates on the financial wellbeing of startup individuals. This is a big gamble with regard to scourging the hard earned wealth and wellbeing of the families present and future. This should give the policymakers of government agencies a pause for the developing economies, as weather this is the best path forward.

Unlike the western economies which probably can somehow bear the burden of low success rate, the developing economies have the choice of public and private partnership which has a very low failure rates as the policy to go forward.

In this case where most of the research was conducted in a University. The University, Government agencies and the private entrepreneur would form a three prong partnership which would have a very high probability of success. The two parties, namely governmental agencies could take care of financial burden in a partnership with the individual or joint entrepreneur in a (80 to 20) relationship. The individual or joint entrepreneur would be responsible for day to day management of the entity. The University, the third party would provide the technical and scientific backbone to the entrepreneurship as described here.

The authors feel the above described scenario would have high likelihood of success for economies like that of Vietnam. This will be a win-win situation for the individuals and society and would result in a clean and green environment.

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