

# COST EFFECTIVE DIAPER AND SANITARY NAPKIN INCINERATOR USING INDUCTION HEATING

Navin Varghese<sup>1</sup>, Surya Narayanan<sup>2</sup>, Nivedhya Jiju<sup>3</sup>, Ashinlal KB<sup>4</sup>, Prof.Sijo George<sup>5</sup>,  
Dr.S.Subiramoniyan<sup>6</sup>

<sup>1</sup> Navin Varghese, dept. Electrical and Electronics Engineering, Adi Shankara Institute Of Engineering And Technology, Ernakulam, India

<sup>2</sup> Surya Narayanan, dept. Electrical and Electronics Engineering, Adi Shankara Institute Of Engineering And Technology, Ernakulam, India

<sup>3</sup> Nivedhya Jiju, dept. Electrical and Electronics Engineering, Adi Shankara Institute Of Engineering And Technology, Ernakulam, India

<sup>4</sup> Ashinlal KB, dept. Electrical and Electronics Engineering, Adi Shankara Institute Of Engineering And Technology, Ernakulam, India

<sup>5</sup> Prof.Sijo George, dept. Electrical and Electronics Engineering, Adi Shankara Institute Of Engineering And Technology, Ernakulam, India

<sup>6</sup> Dr.S.Subiramoniyan, dept. Electrical and Electronics Engineering, Adi Shankara Institute Of Engineering And Technology, Ernakulam, India

## ABSTRACT

Disposal of sanitary napkin and diapers is a headache for most of the people. A single sanitary pad takes about 500–800 years to decompose. And alone in India every year, around 1250crore (12.5 billion) hygienic pads are disposed of in various landfills and dumpsites across the country. People who live close to the water bodies throw these wastes into the water causing massive health and environmental hazards. Due to limited awareness some people dispose them by means of toilets thereby causing choking. Whereas some others throw these wastes directly into the public dustbins, which eventually end up in landfills. In rural areas people prefer to wash napkins and either bury them or burn them. In all these prior mentioned activities, pollution is a must thing. The improper management of these wastes may cause major environmental damages which leads to air, water and land pollution. Heaps of sanitary napkins with a large number of disease-causing bacteria on them pose a significant threat to the hygiene in the surrounding area. Young girls and even certain older women are not aware of the hygiene problems cause by improper disposal of Napkins. We can rely on Incinerators to solve these issues. But the present model incinerator has a major drawback, as it emits toxic gas directly into the atmosphere. Emission of such gases is highly dangerous. These Electrical incinerators consume high power. In the proposed model, incinerator is designed using induction heating which reduces the power consumption and also less smoke is produced by this method compared to other method, therefore it is eco-friendly. It is also an efficient heating method compared to other heating methods as the byproduct obtained is in the form of ash..

## 1. INTRODUCTION

Diapers and sanitary napkins constitute a large chunk of the non-biodegradable waste across the world. That they cannot even be recycled, unlike the rest of the plastic waste, make them the most dangerous form of plastic waste. According to World Census, 50.8 percentage of the world population includes female and 24 percentage of children.

At the same time, it is estimated that 432 million sanitary pads are already been disposed of every month in the country and this is expected to grow multi-fold in the coming years and diapers generate 7.6 billion pounds of garbage each year. It is quite difficult and unhygienic for women and girls to go out and dig it into the sand and burn it because of social problems. Even though most women living in urban areas dispose sanitary napkin in a dustbin which eventually piles up in landfills, whereas women in rural areas prefer to wash napkins and bury in a pit. It is also highly dependent on whether it is being disposed at home or at work place/school. In public washrooms, often due to poor infrastructure, sanitary napkins are flushed or are left in corners or other open areas. Napkins thrown to bathroom dustbins leads to embarrassing visuals and smells and the used napkins are flushed into the drain. The flushing in drain results to clogging in drain. Furthermore, disposable diapers that contain absorbent chemicals are thrown away after use and this take half a millennium to completely decompose. Improper dispensation of nitrogenous waste is a major cause in the spread of infectious diseases. The dumping of one used diaper is an issue of great concern with regards to solid municipal waste management. On the other hand, there is no convenient system of movement of garbage in rural India. At this instance, the lack of concern for sanitary waste management in our country leads to a drastic environmental issue.

### **1.1 Design and Development of Semiautomatic Electrical Incinerator Using Arduino**

A model that can overcome the tremendous hazard of disposal of the sanitary wastes. The incinerator uses electricity to heat the heating coil which in turn will lit up the sanitary napkins when dumped into the incinerator. The principle of heat being generated when current is passed through a resistance is employed in various household appliances like electric iron, water heaters. The proposed device has the same principle of operation, here the heat produced is used to burn the sanitary napkin which is dumped into the incinerator. For this purpose, the most commonly used heating coil made up of nichrome alloy is used. The sanitary napkins primarily surrounded by papers will have an ignition temperature of around 250 to 300°C. When the sanitary napkin burns, it is reduced to ashes. The burnt ashes will be collected at the removable ash collector being rigidly tightened to the upper part of the incinerator. The incinerator is surrounded by a refractive material, primarily silicon-di- oxide. The outer most layer of the incinerator is made up of Bakelite for easy handling. The disclosed device is scalable in all aspects because the materials preferred for this investigation is easily reachable in the marketplace. This device can be used in all schools, colleges, hospitals and offices etc. This design is uncomplicated, secure and cost effective. The incinerator incinerates the wastes like soiled fabric, cotton waste, sanitary napkins, paper towels etc. The waste gets rehabilitated into ash and other non-hazardous dregs. The incinerator is consumer responsive and manually operated.

a model that can overcome the tremendous hazard of disposal of the sanitary wastes. The incinerator uses electricity to heat the heating coil which in turn will lit up the sanitary napkins when dumped into the incinerator. The principle of heat being generated when current is passed through a resistance is employed in various household appliances like electric iron, water heaters. The proposed device has the same principle of operation, here the heat produced is used to burn the sanitary napkin which is dumped into the incinerator. For this purpose, the most commonly used heating coil made up of nichrome alloy is used. The sanitary napkins primarily surrounded by papers will have an ignition temperature of around 250 to 300°C. When the sanitary napkin burns, it is reduced to ashes. The burnt ashes will be collected at the removable ash collector being rigidly tightened to the upper part of the incinerator. The incinerator is surrounded by a refractive material, primarily silicon-di- oxide. The outer most layer of the incinerator is made up of Bakelite for easy handling. The disclosed device is scalable in all aspects because the materials preferred for this investigation is easily reachable in the marketplace. This device can be used in all schools, colleges, hospitals and offices etc. This design is uncomplicated, secure and cost effective. The incinerator incinerates the wastes like soiled fabric, cotton waste, sanitary napkins, paper towels etc. The waste gets rehabilitated into ash and other non-hazardous dregs. The incinerator is consumer responsive and manually operated.

### **1.2 Sanitary Napkin's Disposal System**

This study's aim is to analyze challenges and opportunities linked to wellness goods and its advertising and marketing challenges in Indian Context. Additionally, this paper examines the prospects within this section, in addition to the initiatives taken by several organizations in the Industry for creating affordability and awareness in this direction. Present Challenges in Market: Design and Develop a Smart, Cost Effective, Efficient Sanitary Napkins Incinerator Machine which will automatically burn the sanitary napkins thrown inside the machine and Portable Sanitary Napkin Incinerator comprising a chamber, having there in, a heating unit arranged in grid fashion for supporting the sanitary napkin. The proposed work focuses on to reduce the time cycle required to burn the napkin, so as to save power and reduce production cost. Final in-house testing is to done with testing program. It

was observed that the system was successful in this regard. After burning of sanitary napkins, testing is done if that napkin is completely burned or not, by observing. The performance of developed incinerator machine will be done in terms of time required to burn, type of napkins, number of napkins and total cost of machine. This project gives a solution for destroying napkin waste in a very hygienic way. This is portable system to destroy napkin waste, using Incinerator. Napkin disposer too can be fabricated and integrated with the vending machine, so that dispensing and disposing can be achieved in a single unit.

## 2. PROPOSED SYSTEM

As discussed in the above session most of the incinerators available in the market have many drawbacks. The point we are taking into consideration is that, they consist of an insulated chamber within which there is an electric coil. The sanitary pads are dropped into a chamber which is heated to high temperatures in the presence of forced or natural air draft. The high temperatures ignite the sanitary pads (which are made of polymers materials) and the fumes are carried out of the setup through a chimney. The problem here is that the designs often do not ensure that the fumes from the sanitary pads catch fire and large pockets of unburned hydrocarbon (from the polymers) gases are emitted as white smoke. These problems must be solved to obtain an efficient and environment friendly incinerator. Our proposed idea is using induction heating for incineration. By using induction heating we have two advantages. As the waste is burned at a temperature of  $1500^{\circ}\text{C}$  the production of dioxin is impossible and also the by product that we receive is in the form of ash so, we need not think about method for further disposal. And by using induction heating power can be consumed too. It is also an efficient method as it will not leave any traces of the wastes that are burned. It can be installed in school lavatories, hospitals or even in our households. Further details regarding the circuit and working will be discussed in the last part of this chapter along with circuit and coil designs.

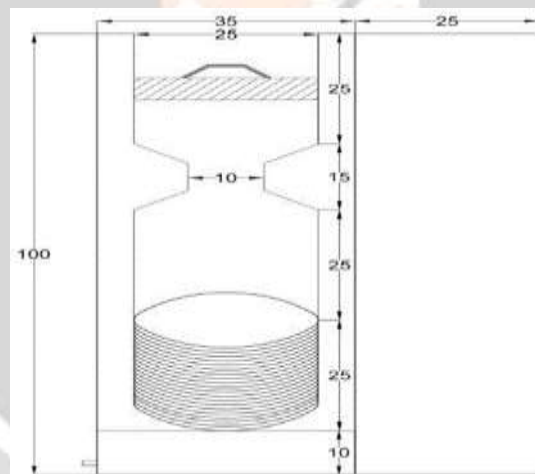


Fig -1 Burning Chamber

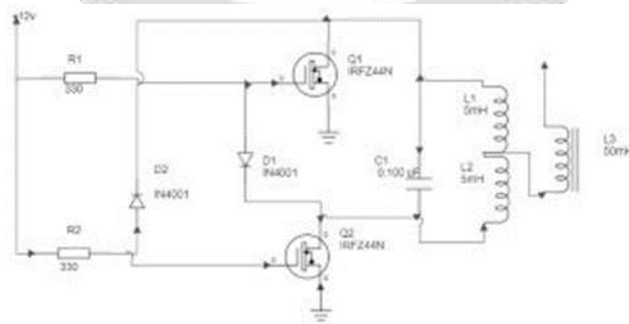


Fig -2 Circuit Diagram

## 2.1 System Working

Open the lid at the top and throw the used sanitary napkins and diaper into it. Heating method used is induction heating. The waste is received by the chamber where the burning occurs. Then close the lid and switch on the power supply so that the 230 volt and 15 Amps current passes through the cylinder, the frequency provided is 25kHz along with sufficient amount of air. The switch is then depressed which activates the cylinder and temperature rises to 1500°C. The heat supplied by the cylinder burns the sanitary napkin to ash which falls, by gravity, through the cylinder into the removable tray where the debris is collected. The heat supplied by the cylinder is reflected by the angularly positioned heat reflecting surfaces and concentrated at a central point within the heating chamber. By this technique the sanitary napkin is efficiently burned. Air passing inside the chamber also aids in both the combustion of the waste and the conveyance of the undesirable fumes and odours. The fumes and odours, circulated by the incoming air, thereby get treated well before they are pushed to the atmosphere. The simulated model of both will be discussed in the simulation result chapter. Below shown table gives details regarding various properties, material used and the sizes of the cylinder.

## 3. SIMULATION

The simulation is done using PROTEUS

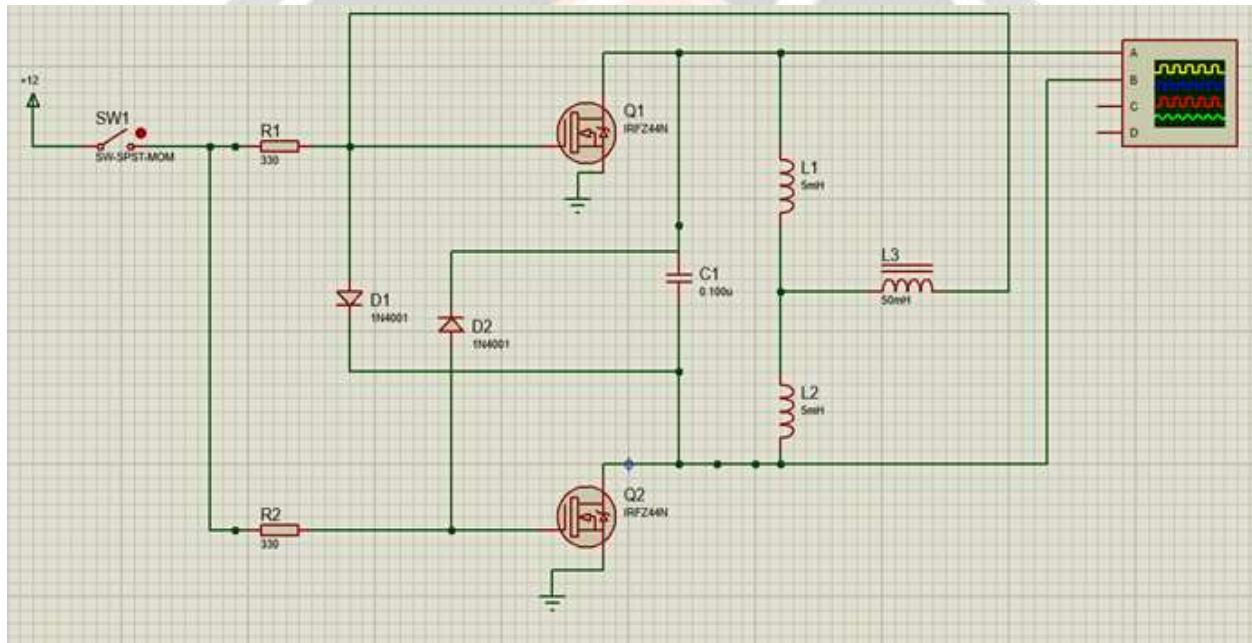


Fig -3 Simulation Circuit

### 3.1 Simulation Results

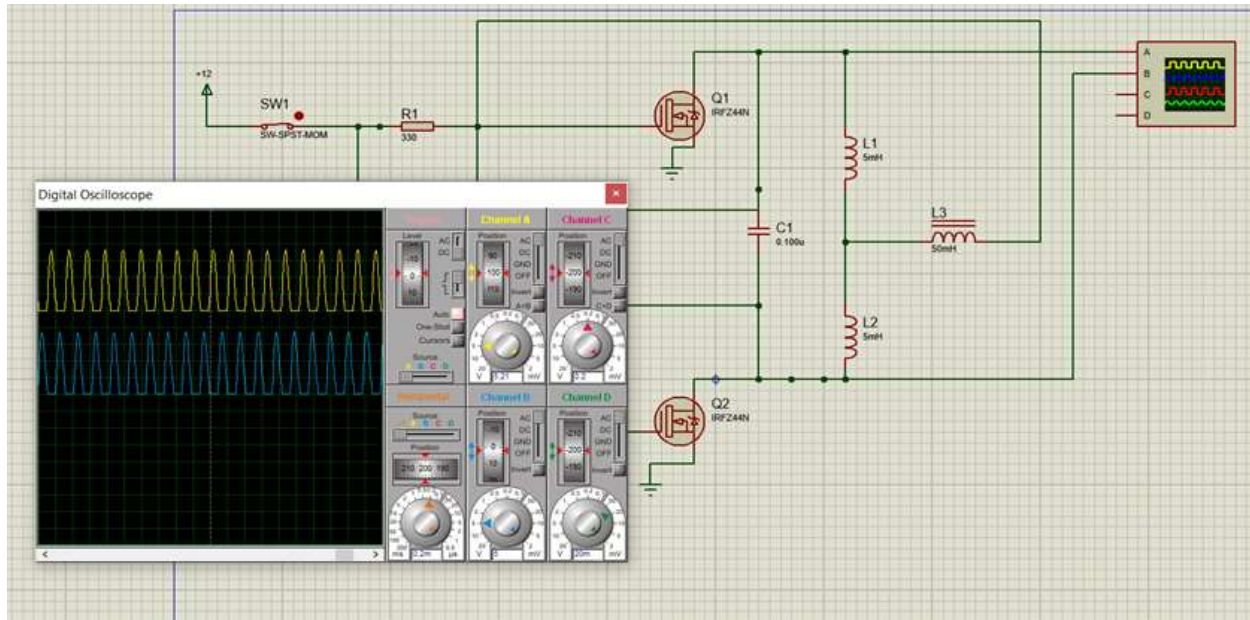


Fig -4 Simulation Result

#### 4. CONCLUSIONS

Nowadays, sanitary products are being used in more and more households which in turn results in growing mountains of these wastes. A survey study shows that allotting 12 napkins to a women per month it is found that this added up to 432 million soiled pads enough to cover a land fill spread over 24 hectares. Also, diapers generate 7.6 billion pounds of garbage each year. Disposable diapers are the 3rd largest consumer item in landfills, and represents 30 percentage of non-biodegradable waste [1]. To manage these wastes initiatives should be taken to install incinerators across the country to burn sanitary waste. Still there are many village women in India are suffer a lot because of this problem even some will omit schools during those menstruation days. And there is no proper solution for the disposal of those wastes. The improper disposal of menstrual waste in open environmental condition will affect the health of the surrounding population in a great manner. With the intention that, this proposed setup is to overcome the tremendous hazard of disposal of these wastes. As a responsible citizen of our country is to maintain the environment neatly, taking it in mind the model has been designed and also ensures the performance of it. The proposed method using induction heating helps to resolve the problem faced by the existing incinerators. As we are using clean energy for the development the process is environmental friendly too. Temperature generated is sufficient to destroy the toxic gases and avoids it's penetration to the atmosphere. The byproduct obtained is in the form of ash. This will help to reduce the environmental hazards thus making the product Eco friendly. As it is portable it can be easily installed in lavatory or households.

#### 5. REFERENCES

- [1]. Sharika C, Chithra Chandran Adumbil, Daina Joy, Elizabeth Jose Paul, Ashly Thomas, "Sanitary Waste Disposer", International Research Journal of Innovations in Engineering and Technology (IRJIET) ISSN (online): 2581-3048 Volume 3, Issue 9, pp 28-31, September – 2019
- [2]. Bhagawat, Chourasia, Satish, Mali, Jamdadeamar, Tamboli, Shabanam, 2019/05/29, Manufacturing of Cost Efficient Sanitary Napkins Incinerator Machine VL - 9, DO - 10.24247/ijmperdjun201989, International Journal of Mechanical and Production Engineering Research and Development

[3]. Somnath Wategaonkar, Shreyash K. Narayane, Anoop R. Shetty, Prajesh S. Shirsolkar, Shivraj B. Yadav, "Smart Sanitary Napkin Disposal Machine", International Journal of Future Generation Communication and Networking Vol. 13, No. 3s, (2020), pp. 600–604

[4]. Madheswaran Subramaniyan, Anandha Moorthy Appusamy, Prakash Eswaran, Karthik Shanmugavel, Santhana Kumar Sadaippan, Maheshwaran Periyasamy, "Design of Domestic Incinerator for the Safe Disposal of Menstrual Waste in the Rural Areas", International Journal of Research in Engineering, Science and Management Volume-2, Issue-3, March-2019, ISSN (Online): 2581-5792

