

# Innovated Soldering Iron with Desoldering Vacuum

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**Abstract:** The purpose of this research is to provide a specialized tool for Soldering and Desoldering process that works faster with less effort and is more convenient to use where the desoldering pump that is manually-operated device used to remove solder from a Printed Circuit Board is modified and made as an electrically-operated device which is connected to the soldering iron as a one hand tool for doing both soldering and desoldering process. Its potential was assessed using variables namely, user-friendliness of the project, productivity, design acceptability, uniqueness, reliability to project operation, and wellness of automation. Experimental method was used in the study and a survey questionnaire was distributed to the 96 respondents in Dasmariñas, Cavite. All technicians were considered as participants of the study. The results show that in terms of productivity, reliability to operation, and uniqueness, the participants agreed that it possessed high-quality operation and that it has a significant difference between the existing and proposed soldering iron with desoldering vacuum. Hence, it can be concluded that the developed Soldering iron with Desoldering vacuum really can help to lessen the time in removing soldering lead in a mass production than using the old way of heating first then removing the soldering lead which causes slow flow of work. It is recommended that the workspace should be designed for precision since the soldering iron with desoldering vacuum is used by all technicians because it is something that is appropriate for soldering on delicate system boards such as other various small repairs on electronics to solder and desoldering connections and small components on an electric panel to use soldering iron with desoldering vacuum to most electrical appliances.

**Keywords:** Soldering Iron, Desoldering Vacuum, Printed Circuit Board.

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## 1. INTRODUCTION

Throughout human history, mankind has seemingly always been able to solve problems. At the pace of civilization, people around the world are adopting different techniques and methods capable of providing better solutions in their problem, in their infrastructure, in their machineries and in their industrial technology.

At present, with this technology world circuit and components are developed that are very helpful in our modern living. Before a product has been made different electronic components need to be attached to form a circuit. In mounting a component into a PCB a process called soldering is required.

Various problems may arise in the soldering process which leads to joints which are non-functional either immediately or after a period of use.

When you encounter a problem in your soldering connection a solder sucker may be required. During soldering and desoldering two different tools are needed, the technician will be holding two different tools which will be more difficult for him/her.

### **Background of the Study:**

The researcher is a Bachelor of Science in Industrial Engineering student who find the technicians difficulties during desoldering of component mounted into a Printed Circuit Board, because they uses two different tools during this process. This is the reason why the researcher thinks of an alternative way of making the soldering and desoldering easier.

With the use of a vacuum as solder sucker, the work of the technician will be easier because he will only be holding only one tool and will only be switch on to make use of the vacuum.

#### **Objective of the Study:**

- To provide a specialized tool for soldering and desoldering purposes.
- To design, a soldering iron with solder sucker to be switch on during desoldering process.
- Developed a device that will also help the user in soldering and desoldering in simultaneously.
- To provide a project that more convenient to use in desoldering process than commonly use solder sucker separated to commonly use soldering iron.

#### **Scope and Limitations:**

This project was design with the same function as a simple soldering iron. As an additional a vacuum is attached into it to have a special tool to be use in desoldering lead into the PCB. This is an electrical tool with a switch on for sucking lead that has been heated by the soldering tip.

The vacuum attached into the soldering iron is specially designed for sucking of solder into the Circuit Board.

The project will only be used during soldering and desoldering process only.

## **2. REVIEW OF RELATED LITERATURE**

- Related studies
- Synthesis

#### **Related Studies:**

According to Frank C. Pendzich (Basic Soldering 2002), Soldering iron is a process of bonding together two or more metals by heating them, melting a tin-lead alloy called solders onto them, and letting it harden. The basic purpose of soldering, in electronics, is to provide a good electrical connection that is strong physically.

And to Allan Winstanley (*The Basic Electronics Soldering & Desoldering Guide*), the most fundamental skill needed to assemble any electronic project is that of *soldering*. It takes some practice to make the perfect joint, but, like riding a bicycle, once learned is never forgotten!

According also to Frank C. Pendzich (Basic Soldering 2002), there will undoubtedly come a time when you need to remove the solder from a joint: possibly to replace a faulty component or fix a dry joint.

The usual way is to use a desoldering pump which works like a small spring-loaded bicycle pump, only in reverse but It may take one or two attempts to clean up a joint this way, but a small desoldering pump is an invaluable tool especially for PCB work.

Moreover, L. Wyard-Scott stated at his journal that desoldering may be required for several reasons, which are; a component may have failed, a wrong part was installed, a design modification necessitates a change or if a board contains expensive components that can be salvaged.

Whatever the reason, there are three common techniques to remove solder from a joint using a desoldering pump, a desoldering wick, or desoldering iron.

#### **SYNTHESIS:**

Users of the equipment are having difficulties in removing the solder in joint when done in desoldering process. It needs a soldering sucker that will remove the unnecessary solder. If they cannot remove the solder, it will be unreliable and is likely to get worse in time.

The researchers investigate, planned and redesign a soldering iron that can make the work easier and simpler. The redesigned soldering iron has a solder sucker that is permanently attached to the equipment. Soldering iron and solder sucker is simultaneously working. While desoldering the solder to remove some part, the solder sucker is also working.

The automatic desoldering vacuum is designed to automatically remove the soldering lid simultaneously while soldering and it be controlled using a on and off switch to stop the flow of current. It has also a visible LED as an indicator if the desoldering vacuum is functioning or in on or off mode.

### 3. RESEARCH METHODOLOGY AND PROCEDURE

- Research Methodology
- Data Gathering
- Components Used
- Testing, Evaluation and Validation

#### Research Methodology:

The methods used to collect information and data for this research of Innovated Soldering Iron with Desoldering Vacuum includes internet searching, journals, testing, survey and observations.

Internet searching and journals were used to search for published data from reputable source. Testing was used to gather information and ideas about the current situation and process done. To understand the type of information that can be obtained from performance tests. Observations are important for understanding people's actions which allow facilitate to understand their difficulties over time.

Survey method approach most suited for gathering descriptive information. Close-ended question type of survey was used for the respondents to give them a choice of answer to select from to be used for the evaluation of the project. We indicate a four point scale on how satisfied or dissatisfied they are with the feature.

We also used an interview which will produce almost completely unstructured data, it allows subjects to respond freely and express shades of opinion rather than forcing them to have precoded opinions. The researcher asks direct questions about respondent's thoughts. From the response, the researcher may be able to discover some important factors to be considered in the research study. It may suggest factors of which the researcher is not consciously aware.

#### Data Gathering:

The construction of a research instrument or tool for data collection is the most important aspect of a research project because anything you say by way of findings or conclusions is based upon the type of information you collect, and the data you collect is entirely dependent upon the questions that you ask of your respondents.

Research is a process of collecting, analyzing and interpreting information to answer questions. The data for this research were collected through internet searching, journals, testing, survey and observations. Internet and journals were used to search for published data from reputable source.

#### Components Used:

| No. | Description     | Quantity | Unit |
|-----|-----------------|----------|------|
| 1   | Soldering iron  | 1        | Pc   |
| 2   | Pressure switch | 1        | Pc   |
| 3   | Hose            | 2        | M    |
| 4   | Hose connector  | 1        | Pc   |
| 5   | Vacuum motor    | 1        | Pc   |
| 6   | Wooden Board    | 1        | Pc   |

|    |                       |   |     |
|----|-----------------------|---|-----|
| 7  | Capacitor 2200 mf 16V | 1 | Pc  |
| 8  | Diode 3Amp            | 2 | Pcs |
| 9  | On/Off switch         | 2 | Pcs |
| 10 | LED                   | 2 | Pcs |
| 11 | Push Button Switch    | 2 | Pcs |
| 12 | Magnetic Switch       | 1 | Pc  |
| 13 | Exhaust Fan           | 1 | Pc  |
| 14 | Clamp                 | 3 | Pcs |
| 15 | Electrical cord       | 1 | M   |
| 16 | Outlet                | 1 | Pc  |

**Testing, Evaluation and Validation:**

The proponents conducted surveys to ninety six persons as their sample population. The survey is for the evaluation of the existing soldering iron on today’s market and propose soldering iron with desoldering vacuum. The result of same surveys of two different equipment will use for evaluation of both equipment. The researchers are focusing in desoldering process because of soldering process is not changed.

Testing of existing vacuum separated to soldering iron in desoldering process.

|   | Mean   |
|---|--------|
| <b>User-Friendliness of the project</b> | 2.8229 |
| <b>Productivity</b>                     | 2.0104 |
| <b>Design acceptability</b>             | 2.6563 |
| <b>Uniqueness</b>                       | 2.0625 |
| <b>Reliability to project operation</b> | 3.0729 |
| <b>Wellness of automation</b>           | 2.1146 |
| <b>Overall equipment</b>                | 2.2813 |

Testing of propose soldering iron with desoldering vacuum in desoldering process.

|   | Mean   |
|---|--------|
| <b>User-Friendliness of the project</b> | 3.0833 |
| <b>Productivity</b>                     | 4.0000 |
| <b>Design acceptability</b>             | 2.8021 |
| <b>Uniqueness</b>                       | 3.2083 |
| <b>Reliability to project operation</b> | 3.2700 |
| <b>Wellness of automation</b>           | 3.0625 |
| <b>Overall equipment</b>                | 3.0208 |

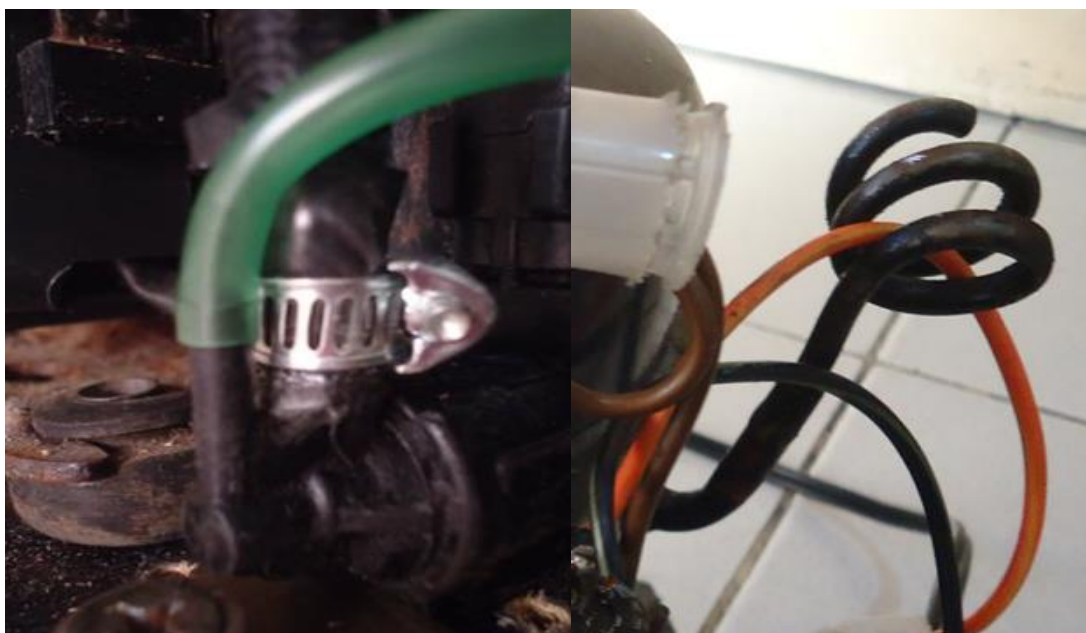
#### 4. PRESENTATION OF THE PROJECT

- Inside of the Project
- How to operate?

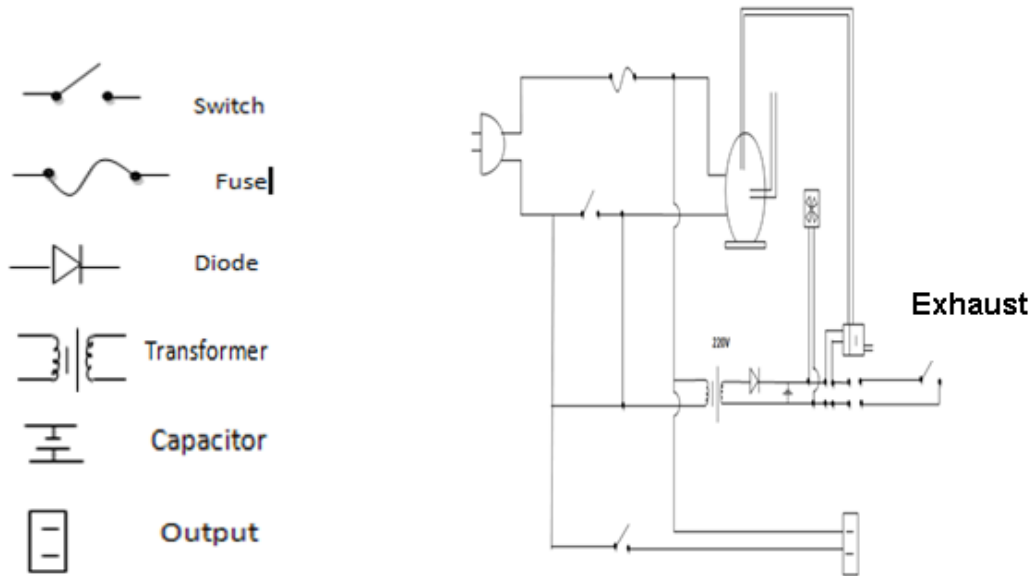


##### Inside of the project:

- Vacuum motor
- Transformer
- Capacitor
- Diode
- Vacuum switch



**Intake:**



**How to operate?**

First prepare the connector of the modified soldering iron. Soldering iron has a three connector and a hose.



Plug in the main plug of the project. Switch on the green switch for soldering process and when it needs troubleshooting and vacuum is needed, switch on the red switch to open the vacuum motor. For sipping the scrap soldering lead, press the push button switch that is located on the soldering iron handle. Unpressing the push button switch will stop to sip.



## 5. ANALYSIS AND INTERPRETATION OF DATA

### Results of Testing, Evaluation and Validation:

| Existing | Mean       | Significant Difference |
|----------|------------|------------------------|
| Propose  | 2.43155714 | 0.21                   |
|          | 3.20671429 |                        |

## 6. SUMMARY

The Soldering Iron with Desoldering Vacuum operates using a 220V electricity supply. It uses a vacuum pump to easily sip in soldering lead during desoldering process. It has a special soldering tip which also serves as the tip of the desoldering vacuum. The project has its push button switches for the soldering iron and for the desoldering vacuum.

The projects designed mainly has two important function which is for soldering of components in making a circuit and also a device for desoldering of unnecessary and or defective component or components into the PCB during troubleshooting. The project which has two functions in one device is of great help during troubleshooting because it eases the work of the technicians. The project has an extra tip which is more pointed in case it is needed.

## 7. CONCLUSION

As computed on the data gathered the researchers concluded that there is a significant difference between the existing soldering iron and propose soldering iron with desoldering vacuum.

Based on the research conducted and the actual testing on the performance, the researchers therefore conclude that the developed Soldering iron with Desoldering vacuum really can help to lessen the time in removing soldering lead in a mass production than using the old way of heating first then removing the soldering lead which causes slow flow of work.

## 8. RECOMMENDATION

- Develop a variety of tip dependent on its function in standard size.
- Develop a connector hose and motor that are lighter and much convenient to use.
- Improve the physical appearance of the pushed button switch.

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