Abstract — Dried Chilies Seeds Separating Machine (DCSSM) is designed to separate seeds from dried chilies in high volume particularly to help chili-based industries to optimize productions. Conventional method requires operators to cut chilies into small pieces and then squeeze manually by bare hands to remove the seeds. The chilies are boiled for 1 hour before undergoing grinding processes twice to make sure all chilies seeds are crushed appropriately. DCSSM can operate at 99% efficiency and eliminates 1 grinding process and reduces 40 minutes of boiling time and therefore it offers chilies seed separating process with lower cost and easy maintenance. DCSSM also assists people to obtain dried chilies without seeds instantly for several applications such as personal-home use, catering services as well as for reselling purposes. The design of this machine is simple but capable to separate seeds at the rate of 40-50kg per hour.

Index Term — Design and Development, Dried Chilies Seeds

I. INTRODUCTION

Nowadays, dried chilies become one of important ingredients especially in Asian dishes. Hot and spicy meals provided by dried chilies always make some people to feel spicy-but-delicious and therefore they become more desirable to be tasted. However, consumers face many problems or bad effects of the dried chilies especially concerning with its effects for human health. Consuming foods that contains chilies seeds for a certain period may cause appendicitis.

Appendicitis disease is generally caused by bacterial infection, but there are several possible factors originators who until now could not clearly know. Among the factors blockage (obstruction) in the lining of the channel (lumen) appendix by feces pile / hard fecal material (fekalit), hyperplasia (enlargement) lymphoid tissue, worm diseases, parasites, foreign bodies in the body, the primary cancer and stricture [1].

Chilies seeds cannot be digested in human feces and therefore they are slipped into a channel as salty things, nor hardening feces (constipation) in a very long time there may be the seeds stuck into channel appendices which eventually became the media germs / bacteria nest and breed as the infection that causes inflammation of the appendix [2]. Moreover, cooking with chilies seeds makes the dishes become yellowish and therefore reduces appetite.

As far as this issue is concerned, the chilies seeds need to be removed as much as possible before cooking. However, preparing unseeded chilies manually requires tedious steps and time-consuming in industries. For housewives, dried chilies are used in a small quantities normally ranges between 15 to 30 pieces per serving and therefore to undergo such tedious manual process of cutting, boiling, squeezing and blending which take more than 15 minutes is unreasonable if looking at the simple meals to be served daily. In addition, manual process using bare hands and this process leads to another uncomfortable situation where operators feel hot of the chilies on their hands due to direct contact with the dried chilies which are being processed.

II. DATA COLLECTION

Undergoing a survey is a must before executing any design projects. This method is agreed Karl T. Ulrich [3] and supported by David G. Ullman [4] and Robert L. Mott [5]. Therefore, to understand the problems as well as to make sure the product to be developed matches exactly with what customers need, a survey has been conducted to 50 respondents consisting of 25 restaurants owners and another 25 respondent’s are housewives from range 31-40 years old in Malaysia. This survey shows that 50% respondents used dried chilies in their cooking and 90% respondent realize the risk of consuming chilies seeds in their meals. 75% of them remove chilies seeds manually by bare hands and the rest admit that they just simply cook with seeds as shown in Fig. 1 and 2.

Currently restaurant workers and housewives cut chilies manually using scissors and remove the seeds using sieves as shown in Fig. 3.
Another survey has been made on a company producing dried chilies based products located at Pendang, Kedah in northern part of Malaysia. The company acknowledged that they are required to boil dried chilies for 1 hour to soften the texture of the chilies seeds before going to grinding processes. These grinding processes are done twice in ensuring the remaining seeds in the chilies are completely crunched.

This time-consuming and troublesome processes in separating dried chilies seeds are the main reason why DCSSM is introduced in which aimed to help separating the seeds at small scale quickly and effectively.

III. TECHNICAL DESCRIPTION OF DCSSM

DCSSM is invented in a small size with simple mechanism and easy to use. Fig. 5 shows the mechanism of DCSSM. It has 2 pairs of chilies rotating cutter with 3mm thickness and 54 teeth per row. The dried chilies are inserted through hopper and shredded into small pieces. Then due to gravitational concept, the chilies are dropped on a vibrating sieve with 3mm x 3mm size of hole. The sieve vibrates by 6 unbalancing motor surrounding the frame and the frame is made from aluminum 3cm x 3cm and all surfaces directly in contacts with chilies are made from stainless steel. Unneeded chilies seeds drop through the sieve and accumulated into a bin where the rest remain on the vibrating sieve to be directed to a specific container and ready to be collected.

IV. RESULT

The performance of this machine as shown in Figure 6 is very efficient since the percentage of chilies after processing observed is 99% and capable to separate between chilies and seeds at 40-50kg per hour rate. Figure 7a and 7b show the dried chilies before and after cleaning process respectively.
It can be seen clearly that almost 100% of dried chilies are free from seeds after processing. Dried chilies after processing have been tested in the same company producing chili-based products and the results in Table I shows the improvement of processing output before and after using DCSSM.

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce grinding process 50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(reduce from 2 cycles into 1 cycle)</td>
<td>150kg/8hour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150kg/4hour</td>
</tr>
<tr>
<td>2</td>
<td>Reduce 66% of boiling time</td>
<td>1 hour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 minutes</td>
</tr>
<tr>
<td>3</td>
<td>Eliminate 100% of chili seeds after grinding process</td>
<td>Have seeds</td>
</tr>
</tbody>
</table>

Table II shows the variable cost for Dried Chilies Seed Separating Machine. The total variable cost is MYR14.275/kg. Assuming that selling price for 1kg of dried chilies after processing is MYR16, Return of Investment (ROI) for DCSSM is after 580kg has been sold. The cost of this machine is MYR1000.00. The complete graph of ROI of DCSSM is shown in Figure 8.

With the simple design of the machine, operators can easily do maintenance on the machine. Another advantage of this machine is its portability so it can be moved anywhere wanted. By the help of this machine, manual cutting and the process of removing seeds (current practiced by restaurant workers and housewives) can be eliminated. This machine is also cost effective to be purchased so that new entrepreneurs can afford to create new business opportunity by selling chili without seeds.

Besides, this product has great potentials to be sold to owners of restaurants, catering services, hotels, retail shops and Small and Medium Enterprises (SME) everywhere. With its estimated price of MYR1000 (231 EUR) and production capacity 40-50kg per hour, it is definitely worthwhile.

V. CONCLUSION

It is suggested from the existing product, this chilies seeds separating machine can automatically function with an insertion of coins. A person who wishes to separate the chilies seed can simply leave the machine to operate automatically when coins are slotted. If this new ideas can be materialized, this suggestion will absolutely attract other designers to undergo further analysis and development of Dried Chilies Seed Separating Machine. From our research, it has shown there is a big demand on the dried chilies without seeds in the market. Therefore, in future, it is recommended that:

i. Research should be continued to incorporate the mechanism to separate chilies seed into a grinding machine as shown in Figure 4.
ii. Kitchen blender manufacturer could add values into their products by incorporating a mechanism to separate seeds in their kitchen blenders.

With continuous research about this matter will help people to avoid appendicitis disease.

REFERENCES