

CHAPTER

2

AUTOMATED FILTER CLEANER SYSTEM FOR DOMESTIC AIR CONDITIONER

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2.1 INTRODUCTION

An air conditioner (AC) was invented to create a better environment to comfort the occupants in temperatures and air humidity. The need for the device increases with time. The main problem of the current AC model is a dirty filter. As the air circulates via the filter, dust and mold would accumulate. As result, the efficiency of the AC would decrease, the energy consumption would increase, and thus the cost to operate the system will increase. To avoid this problem, users need to clean up the filter regularly.

Presently, users clean up the filter by using a vacuum cleaner or by washing the filter. There is a need for a mechanism to clean up the AC filter to ensure the filter is always in good condition.

2.1.1 Problem Statement

A dirty AC filter decreases the performance and increases the operating cost of the AC which urges the user to perform the cleaning by using a conventional approach such as vacuuming or washing the filter. This

process is not easy because the AC itself is bulky and is normally installed at a high place. Therefore, this creates a need for a system that can clean up the AC filter that can operate automatically.

2.1.2 Objective

The objectives of this study are:

- (1) To develop a solution of an automated filter cleaning system by using automated system operation for split system AC.
- (2) To minimise the human intervention to clean the AC filter.

2.1.3 Scope

The scope of this study is focusing on:

- (1) the Daikin AC model; FTK-Q Series.
- (2) the system which is operating once a day when the AC not operating.
- (3) the system which only can be activated when the AC not operating.
- (4) this study focuses on the mechanical part of the design.

2.2 DESIGN PROCESS

The methods used in this study are problem identification, product design specification (PDS), functional analysis, concept generation, concept selection, and concept design development.

2.2.1 Problem Identification

Problems are identified by performing critical background research and by understanding concepts from similar products. The focus is on the historical development of AC, the Daikin AC technologies, and customers' feedback.

2.2.2 Product Design Specification

To get the best solution for the automated filter cleaner (AFC), product design specification (PDS) needs to be constructed to be a guideline for the design specification of the AFC. All the specifications need to be suitable to implement in the FTKG-Q model. Table 2.1 shows the PDS for this study.

Table 2.1 Product design specification

Specification	Description
Size	Need to be small to fit the limited space between the AC filter and the AC filter cover.
Mechanism	Fully automated device.
Energy consumption	The reduction range of energy consumption is 1–5% from original AC.
Noise	AFC noise limit is only up to 5 decibels.
Easy installation	The installation of AFC must be as simple as possible.
Production cost	The cost of the production is between RM100 to RM150.
Material	Rust resistance as the air conditioner may filter the water vapor.
Device weight	The weight of the cleaning part not exceeding 0.5 kg
Maintenance	Yearly maintenance.
Cleaner efficiency	The device cleans 90–100% of dust from the filter.
Time taken for cleaning	One cleaning process takes less than 2 minutes.

2.2.3 Functional Analysis

Figure 2.1 shows the functional block for the AFC system. This functional block is developed based on background studies and will guide the development of the solution. First, energy is needed to power up the cleaning system as the system will use automated system operations to operate the system. Then, as the dust and air pass through the filter, the dust will be trapped by the filter. The AFC system will collect the trapped dust at the filter. Finally, the collected dust is ready to be thrown away.