Creating One of a Kind Product - Splash Proof and Oil Proof Fans -

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1. Introduction

In recent years, brushless DC fans are being used in extreme environments, such as mobile phone base stations, outdoor equipment such as cogeneration systems, or environments where a process machine or other device scatters cutting oil into a mist.

In our company, one of the main products of the Cooling Systems Division is the splash proof and oil proof fan, which has adequate capabilities even in these types of inadequate working environments. This document explains the transition to splash proof and oil proof fans, and introduces the development and manufacturing of these products.

2. History of the Splash Proof and Oil Proof Fan: Beginning

The Sanyo Denki splash proof fan was born in 1996. At this time, public was moving on from pagers, and mobile phones and PHS were rapidly spreading. As these products began to gain popularity, mobile phone base stations began to spring up one after the other, and the splash proof fan was developed for cooling in these base stations. A long life fan had already been achieved as part of the durable fan series for fields related to communication. However, the new fan had to be used with outdoor equipment, and therefore a fan needed to be developed that could withstand rain and other types of moisture. Therefore, development began on a fan based on the long life fan, but with added levels of water protection.

In order to protect the electrically active parts from water, the splash proof fan was constructed by entirely shielding motor areas or electronic components that had built-in PWB with coating material (Fig. 1).

However, unlike cooling products that came before it, this construction added new processes such as filling and drying the coating material, so new knowledge and equipment and tools for inserting the coating material were required.

Fig. 1 Coating state

In order to establish methods for the design and adjustment of these equipment and tools and methods for the insertion and drying processes, various processes were tested around the clock, and as a result, mass production of splash proof fans was achieved.

In particular, the coating material that covered the electrically active parts, which was the key point in splash proof fans, used two types of liquids, and it was very difficult to manage the blending ratio. If the blending ratio was off even slightly, the coating material faced a problem where it would fail to harden. In order to solve this problem, adjustments, refinement, and testing of the equipment were performed repeatedly until a stable product could finally be created.

In this way, the industry's first splash proof fan, the “San Ace W” Series, was introduced to the world.

3. History of the Splash Proof and Oil Proof Fan: Further Improvements

Several years after the splash proof fan “San Ace W” Series was introduced to the world, just as the requests for our company's splash proof fans were increasing, the next problem occurred.

The problem was that the coating material took an extremely long time to dry. Therefore, there was a long lead time until the products were shipped, which meant that not all of the customers' requested deadlines could be met.

Fig. 2 Splash proof fan lineup

In order to correct this problem, a coating material with a short drying time had to be found as quickly as possible.

Various types of resin were investigated and evaluated, until a new type was selected. Compared to the conventional coating, the drying time could be made 1/50 shorter in order to dramatically improve the production efficiency.

Furthermore, the blending ratio was easier to manage than for the conventional coating material, so stability was improved for product manufacturing.

The resulting product was the second generation splash proof fan, “San Ace W” Series-U.

A majority of the Sanyo Denki splash proof fans on the market are this type. Products that use this coating material to protect the electrically active parts, including “San Ace W” WG type,“San Ace W” WB type, and “San Ace W” WE type, have been added to the lineup one after the other.

4. History of the Splash Proof and Oil Proof Fan: Attempting Oil Proofing

As the splash proof fan “San Ace W” Series-U lineup progressed and the market for splash proof fans smoothly began to expand, requests were received for the development of cooling fans that could be used for control areas of machine tools employed in processes such as work cutting. In other words, a fan was needed that could withstand an environment where cutting oil formed a mist around the machine tool.

The splash proof fan “San Ace W” Series-U was immediately evaluated while immersed in cutting oil, but the coating material swelled in the cutting oil, indicating that the fan could not withstand the requested operation environment.

Fig. 3 Oil proof fan manufacturing site

From this, Sanyo Denki began attempting an oil proof fan. The first step was selecting a coating material that was resistant to cutting oil. The selected material was used as the third type of coating material. The coating material that was selected was a possible candidate during the inspections for coating material for the splash proof fan, but use was suspended because it became very hard after hardening and there were concerns that it would affect the electronic components. However, this coating material was the only thing that could achieve stable oil proof capabilities at a reasonable price, and the ability to clear this problem was the key to developing the oil proof fan.

For a long time afterwards, investigation, testing, and evaluation were repeated daily. Furthermore, during this time, the specifications changed and the standards for evaluation became more strict, so the desired reliability was higher than initially needed. The fan was finally completed four years after the initial request. This became the

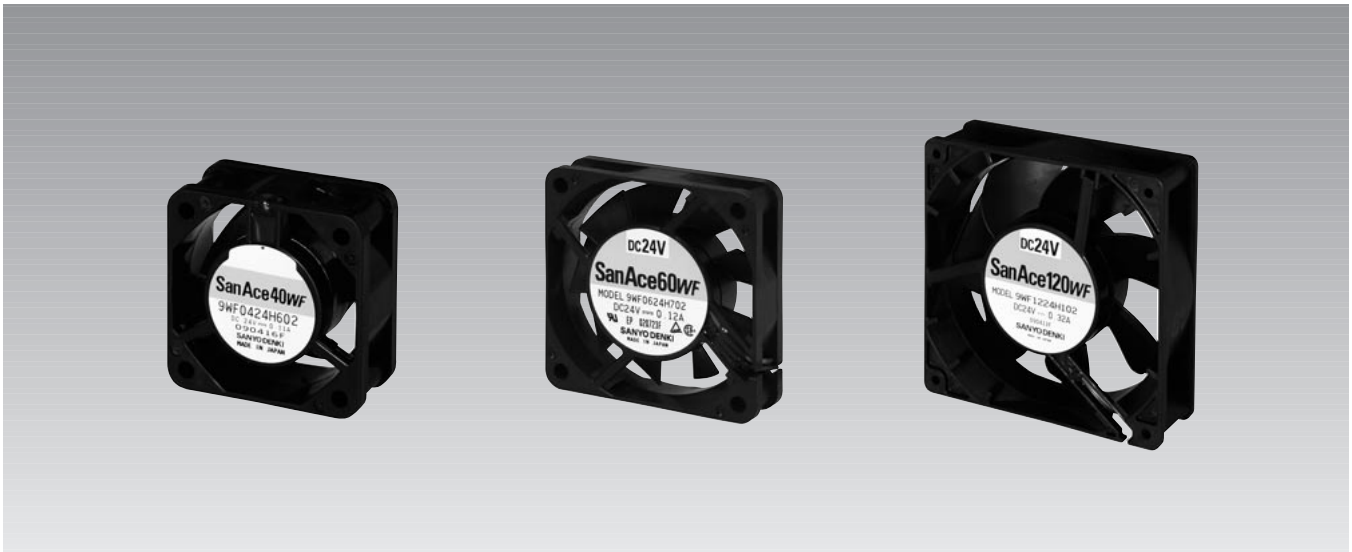

Fig. 4 Oil proof fan lineup

industry first oil proof fan “San Ace WF” Series.

Currently, this third coating material and processes are used on the third generation splash proof fan “San Ace W” Series WP type, and the development of this fan further expands the lineup.

5. Conclusion

The history of splash proof and oil proof fans can also be called the history of coating materials. Changes in the coating built up the development and manufacturing knowledge and formed a foundation for the next development. Like the coating material, each type of fan is slightly different, but the most important thing is to create the best product that fulfills the quality of each.

It is likely that the fans will continue to change and advance according to requirements in the market. No matter how difficult these problems facing us are, we are sure to solve them by utilizing all of our new technology and knowledge, just like we did with previous developments.

We believe that our company can successfully create unique products if we have the willpower to absorb new technology, accumulate and use knowledge, and finally achieve our goals.

Reference

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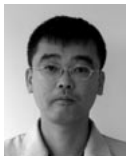

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