

## **Innovation of Washing Technology**

### **Introduction**

Living in an era when green products are becoming more and more popular, I have a feeling that there is a trend for consumer electronics to become green as well, especially appliances, or what the Europeans call “white goods”. Those items include air conditioner, dishwasher, clothes dryer, freezer, refrigerator, microwave oven, washing machine and etc. In this paper, I will examine an innovative washing machine from Sanyo with water-saving technology. Since this would be a comparison with traditional washing machines and both machines use similar materials, I will not tap into lifecycle analysis, but only discuss the technological improvement.

### **About Sanyo**

Sanyo is a Japanese electronics manufacturer who makes sustainability and green their priorities. They proposed an idea of “Think GAIA”. GAIA stands for "the living Earth." J.E. Lovelock who had participated in NASA's Mars exploration program in the 1960s, proposed the idea of earth as a living, green organism where mankind and all living things live in harmony. He used "Gaia," the name of the goddess Earth Mother in Greek mythology, to describe this living organism (Earth). In their statement, Sanyo views the Earth as an independent organic body and refer to it as Gaia. The product I am introducing in this paper is an innovation under the guidance of “Think GAIA”.

### **Washing Machines - AQUA**

Washing machine first appeared in 1691 and has been developing ever since then. By 1940, 60% of the 25,000,000 wired homes in the United States had an electric washing machine. Many of these machines featured a power wringer, although built-in spin dryers were not uncommon. Nowadays, electronic washing machines have become a common home appliance and manufacturers tried to push sales by spending money on making the machines more efficient and eco-friendly and technologically advanced in order to attract consumers.

In 2006, Sanyo released the first generation of AQUA washing machine. AQUA is the world's first washer/dryer to utilize ozone, thus providing a significant “reduction of water” and “recycling of water”. AQUA has broken away from conventional thinking offering a completely new cleaning technology with an impressive sales performance increase. Sanyo has been adding new technology to this washer/dryer

since its release. Now it incorporates "Air Wash Wide" function that disinfects and deodorizes with the power of air (ozone). Now, even heat-sensitive materials like leather and silk can be washed with air. This washer/dryer also uses their "Aqua Loop Wide" technology to recycle water with the power of air (ozone), which enables bath water to be reused in the entire laundry process from washing to drying.

### **"Air Wash Wide"**

This technology used to be called "Air Wash" when AQUA was first released in 2006. It has been improved a lot and Sanyo decided to give it a new name, "Air Wash Wide". The concept of "Air Wash Wide" is to clean the clothes without water. Oxygen in the air is converted to ozone, using an ozone creation device, and is sprayed on clothing inside the drum. Ozone has a strong oxidation action, which either destroys or disassembles the cell walls of bacteria. This allows for eliminating bacteria, odors, and dirt (organic matter). Sanyo's press release says "recently, sprays that eliminate bacteria and odor are popular, and the Air Wash does mostly the same thing... it just happens inside the washing machine."

Here is a description of how it works: AQUA injects air combined with Ozone on the articles inside the drum, and is able to disinfect & deodorize in a short time period. The Ozone that is injected inside the drum decomposes odors and bacteria and then goes back into the air. This washing machine is ideal for situations such as 1. Wanting to deodorize without washing; 2. Disinfect without washing; 3. Not wanting to wash the item right away; 4. Easily wash the item; 5. Cannot wash in water. Also it is shown to be effective for countering pollen and odors of pets. For clothing and small objects that would normally lose their shape with the tumbling action of the drum, this new washing machine enables operation by setting these items on a shelf inside the drum. With this washing machine, people can now dry clean their suits and sneakers at home.

This machine has several other cycles to vanquish dirt from clothes, like the "Zero Detergent Course" that washes out light dirt with ozone-injected water, "Ozone Steam Course" which eliminates bacteria and odors during drying by using steam that has ozone, and "Mold Guard," which prevents against the outbreak of black mold in the drum by using ozone water. Also available is "Shelf Dry," which can dry delicate clothing, stuffed animals, and shoes.

The "Air Wash" process shouldn't produce any negative environmental hazards based on statement from Sanyo. The machine only uses oxygen and electricity to produce ozone and after the washing process, ozone will be converted back to oxygen.

## **“Aqua Loop Direct”**

Same with “Air Wash Wide”, “Aqua Loop Direct” was first called “Aqua Loop”. It would infuse ozone in micro-bubble form (very fine air bubbles) through Venturi Tube into water after it passes the filter, disinfecting and cleaning the water. This thus allows the water to be reused without disposal. Furthermore, the purified water is also used for dehumidification when using the dryer function. Thus the large amount of tap water used during drying is not used at all. Hence the amount of water used for both washing and drying is the same as that used during washing alone.

Due to popular demand by customers, “Aqua Loop Direct” permits the recycling of bath water. That is a major difference from its predecessor “Aqua Loop”. By using ozone produced by the ozonator, the “Aqua Loop Wide” cleans the water. This purifying system functions by circulating the water that enters the Venturi Tube through the ozone resulting in a cleaning and disinfecting action. This water is again used either for the next washing or as dehumidification water. By reusing water, the washing machine has successfully achieved the industry-best water conservation of approximately 7 liters of fresh tap water from washing to drying 9 kg of clothes if bath water is used.

## **Comparison with Traditional Washing Machines**

### **1. Water Saving**

An average washing machine uses as much as 165 liters of water per wash cycle. By introducing “Air Wash Wide” and “Aqua Loop Direct”, the amount of water used in the washing process is significantly reduced. The Sanyo Aqua Loop water-saving technology uses 96% less water than an equivalent Sanyo washer from just a decade ago, while still working like a washing machine. Old Sanyo washer uses 174 liters of water, and the new technology will only need about 7 liters of water if bath water is reused. And the total standard water usage is between 20 to 32 liters. Manager Koji Nobuchi says the new Sanyo machines were designed to recognize the global wastewater management problem. The machine doesn’t need water to sterilize or deodorize clothes and recycles bath water, using a filtration system.

“By making a washing machine that can reuse bathwater and recycle it in Japan, customers not only save on their water bills, but they save water than needs to be used for drinking,” says Sanyo spokesman Aaron Fowles in an article published in

Digital World Tokyo last month. “That type of water makes up less than one per cent of the Earth’s water supply.”

## 2. Energy Saving

Although the energy saving function is not as stunning as its water saving function, AQUA still managed to save energy by using a steam dryer with ozone steam. For AQUA, a full cycle of air-wash uses about twice as much electricity as a regular wash but only one-fifth the energy of a comparable full cycle wash and dry - in part because the air wash doesn't need a drying system. AQUA, together with some other branded washers, has exceeded the Energy Star standard, and is described as standout of the Energy Star guidelines.

### **Features**

Traditional washers cannot handle items that need dry clean. For example, leather, silk, suits and stuffed animals. By using the air wash function of AQUA, all these items can now be washed at home. Considering the time it saves and the gasoline you can save by not going to a dry cleaner, it can be described as environmental friendly from another angle. AQUA also provides a rack, which you can put your sneakers on, and the machine will clean it without the inner drum agitating so the shape of the shoes won't change. New motor used in the machine is extremely quiet when it is running, with noise level between 29 to 39 dB. Steam Drying process will also reduce static by 99%.

### **Critics**

One major critic for this type of washers is that since it produces ozone, and ozone is a very unstable compound, many consumers are worried that using AQUA would create harmful compounds. However, as I stated early, ozone should react with water and the bacteria. Assuming there is no leak, it should become oxygen after the reaction and should be harmless.

Another critic is that using ozone to wash colored clothes might cause color degradation since ozone is a strong oxidizer. I haven't found any info on how AQUA is dealing with this problem. But it is true that ozone will cause degradation and I guess it is not a great idea to air wash clothes that are easy to degrade.

Other than the product itself, price is also another concern for consumers. AQUA costs about \$3000, while an average washer/dryer combo costs around \$1000. It might not be cost effective for most of the population.

### **Conclusion**

Overall, I still think AQUA is a very innovative product. It reduces water use by 96% and successfully incorporates a water filtration system to reuse rinsing water and bath water. Because there is no drying system, AQUA also successfully conserves energy. Considering both AQUA and traditional washer/dryer are made of similar materials and have similar lifecycles, AQUA is definitely a greener product than traditional washing machines. But using green product also means making some compromises: price might be the biggest one in this case. In addition, color degradation caused by the use of ozone might also affect consumers' choices.

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