Design of an artificial rain system by means of sea water vapor equipment heated by the sunlight

Hideyo Murakami *
Tohwa University, Japan

1. INTRODUCTION

An artificial rain technology of a seed augmentation method has been developed and applied in many countries to change existing clouds to rain. An amount, timing and an area of artificial rain can not be controlled by the existing artificial rain technology.

The author proposed Vapor Equipment and Vapor Temperature Control Equipment for a new artificial rain system. The Vapor Equipment and the Vapor Temperature Control Equipment are set in the sea or a lake. In many cases, the sea or a lake is large and more than 10 meters deep. Water of waves is moving and mixed. Therefore, temperature of surface water does not become high under the sunlight energy. However, if water film, which is made of the sea water or lake water, is set under the sunlight energy, then the water film becomes hot, and is changed to vapor efficiently. As the water film is produced continuously, vapor is also continuously made. When the Vapor Equipment is large, a huge amount of vapor is made and carried way in the sky, and could become clouds. These clouds are transported by means of wind such as the prevailing westerlies to any region which requires rain.

In Fukuoka prefecture of Japan, an experiment is done by the author. The experiment shows that some pieces of Vapor Equipment change about 0.8 kg of water to vapor per meter square per hour, with some data showing that the maximum energy of the sunlight in Fukuoka prefecture is about 800 watt per meter square. Therefore, we can understand that the Vapor Equipment (the width of 20 kilometers and the length of 36 kilometers) will produce about 1,440,000,000 kg vapor in 5 hours of the daytime. This vapor can make clouds, which can change to 1,440,000,000 kg of precipitation.

Wind has characteristics (direction, speed and so on) which depend on a region, season and so on. Therefore, the Vapor Temperature Control Equipment was also proposed by the author in order to get desirable wind. The Vapor Temperature Control Equipment floats on the sea, and for example its surface is colored black. The Vapor Temperature Control Equipment makes heat on its black surface when it receives the sunlight. Heat power of it is in proportion to the size of the surface of the Vapor Temperature Control Equipment. Then speed of wind is designed by the size of the surface of it, and a direction of wind is designed by setting position of the Vapor Temperature Control Equipment.

However, how to design or operate the Vapor Equipment and the Vapor Temperature Control Equipment is not described. This paper shows how to design, develop and operate Vapor Equipment and Vapor Temperature Control Equipment in detail. The new artificial rain system does not emit CO_2 nor affect environment much in the sea. The new artificial rain system can not be broken by fish because the Vapor Equipment and the Vapor Temperature Control Equipment are designed in a redundant way. When the new artificial rain system is developed based on this design, salt, which is made on the surface of the Vapor Equipment and the Vapor Temperature Control Equipment through the operation of the equipment, can be eliminated very easily. Furthermore, the Equipment can get away from the danger of storms.

2. A NEW ARTIFICIAL RAIN SYSTEM

A new artificial rain system is proposed in order to design and operate an amount, timing and an area of artificial rain. The new artificial rain system, which is shown Figure 1, is composed of vapor generation function, wind generation and control function, weather simulation function, and weather design and control function.

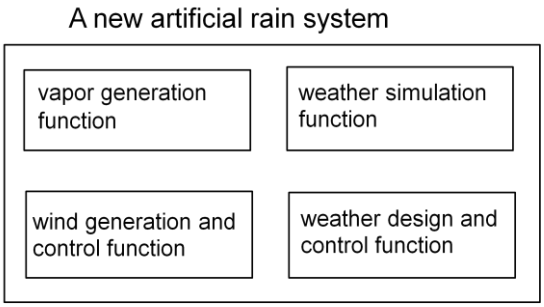

Figure 1 Function Block of a new artificial rain system

The vapor generation function is realized by the Vapor Equipment as described section 2.1. The wind generation and control function are realized by the Vapor Temperature Control Equipment as described in section 2.2. The weather simulation function is a weather simulator for artificial rain by means of a computer. The weather design and control functions design an amount, timing and an area of artificial rain

---

* *Corresponding author address:* Hideyo MURAKAMI, 4-2-4-1 Jigyou Tyuuou-ku Fukuoka-City, Japan;
e-mail: muroku@oregano.ocn.ne.jp

by operating the other three functions as described in section 3.

2.1 VAPOR EQUIPMENT

An example of the Advanced Vapor Equipment is shown in Figure 2. The Advanced Vapor Equipment is composed of floating material F and sheet S which has capillary action and continuously makes water film on the floating material F. The floating material F, which is made of three vinyl tubes in a redundant way, has capability of floating on water. Sheet S is made of cotton cloth.

Each of the three vinyl tubes has a gateway to input or output air by means of an air pump. When the three vinyl tubes are filled with air, the floating material F floats on the sea water. As the sheet S will have salt on the surface of it in one hour, capillary action is not effected. Therefore it is necessary to delete salt on the sheet S. When the air is released from three vinyl tubes, the floating material F sinks in the sea. In one minute salt on the sheet S is dissolved out in the sea. (This phenomenon is confirmed by an experiment). When air is inserted in three vinyl tubes, the floating material F will float on the sea water again. These operations are repeated every one hour. Thus the Advanced Vapor Equipment can continuously make vapor without salt disturbance.

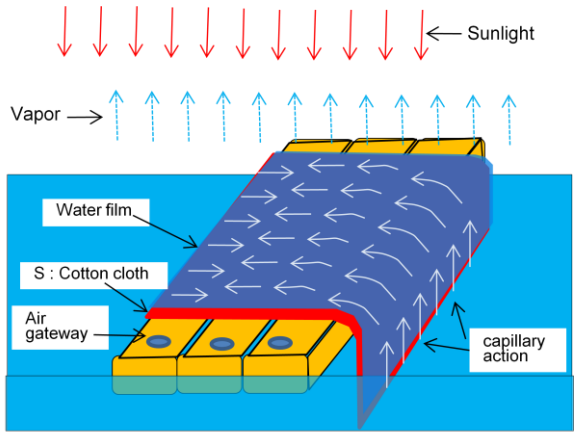

Figure 2 Advanced Vapor Equipment

The advanced Vapor Equipment uses the sunlight energy only, which makes water film hot and changes water to vapor. Necessary energy for changing 1kg water to 1kg Vapor is equal to about 630 watt x hour. A vapor amount per one meter square of the Advanced Vapor Equipment depends on power density of the sunlight energy. A total amount of vapor which is made by the Advanced Vapor Equipment group depends on the size of the Advanced Vapor Equipment group. Figure 3 shows an example of the Advanced Vapor Equipment group. The Advanced Vapor Equipment group has anchors, and sea current can not transport it. The Advanced Vapor Equipment group is set on the sea, which has about 100 meters in depth. In this example, the length of the Advanced Vapor Equipment group is 36,000 m, and the width of it is 1 m. This group consists of 10,000 sets of the Advanced Vapor Equipment. An interval between the Advanced Vapor Equipment is 1 m. The size of the Advanced Vapor Equipment group is 36,000 x 20,000 m square. If the Advanced Vapor Equipment group size is controlled daily, an amount of rain can be controlled by the size of the Advanced Vapor Equipment group under the sunlight.

In Fukuoka prefecture of Japan, the Advanced Vapor Equipment group changes about 0.8 kg of water to vapor per hour per one meter square. The maximum power of the sunlight energy in Fukuoka prefecture of Japan is about 800 watt per one meter square. So the Advanced Vapor Equipment group as shown in Figure 3, the size of which is 720 kilometer square, could make about 1,440,000,000 kg vapor per day (5 hours).

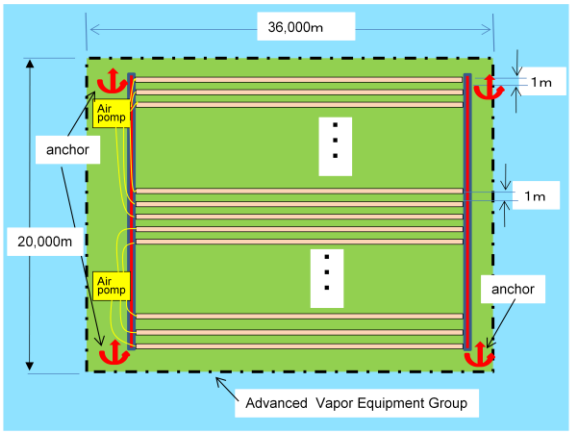

Figure 3 Setting Image of Advanced Vapor Equipment Group

This vapor can make clouds, which could change to 1,440,000,000 kg of precipitation. When a place and timing of the Advanced Vapor Equipment group setting are selected and designed, an area, an amount, timing of artificial rain could be controlled.

Figure 4 shows an image of vapor movement. When wind speed is 10 meter/sec, wind goes through 36,000 meter per hour on the Advanced Vapor Equipment group. It takes one hour for wind to go over the Advanced Vapor Equipment group. In one hour the Advanced Vapor Equipment group changes 0.8 kg water to vapor per one meter square. Therefore, an amount of vapor, which is accumulated at the end of the Advanced Vapor Equipment group, is 0.8 kg in one meter square.

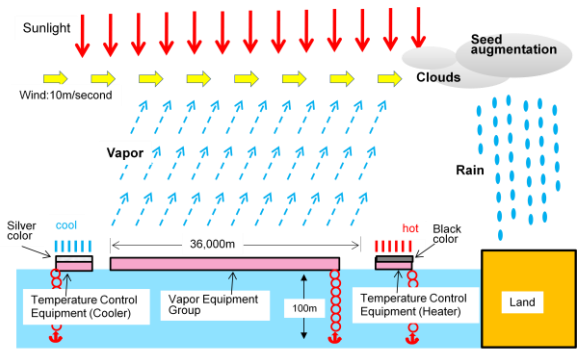

Figure 4 Image of Vapor Movement and a rain

In many regions, wind blows from the sea to land in the daytime. It is called sea breeze. Therefore, in many cases, vapor, which is made by the Advanced Vapor Equipment group, is transported to land by the sea breeze. The direction, the height or the speed of the sea breeze depends on a region. The prevailing westerly or trade wind constantly blows; the direction or the speed of them is constant in many cases. However this wind is changeable according to seasons.

Vapor is transported to land by this wind. Setting of the Advanced Vapor Equipment group is adjusted to characteristics of this wind on a case by case basis. If the direction and the speed of wind is designed and controlled, more precise design and control of an amount, timing and an area of rain by means of the new artificial rain technology could be done.

2.2 VAPOR TEMPERATURE CONTROL EQUIPMENT

The Vapor Temperature Control Equipment is proposed for a new artificial rain system. This Vapor Temperature Control Equipment supports design and control of wind which carries vapor to land. The Vapor Temperature Control Equipment is composed of only a floating body as shown in Figure1 and the surface of the body is colored. For example, the surface of the floating body is colored black. Then all of the sunlight energy could be changed to heat energy which heats surrounding air including vapor. If the sunlight energy is 1 kilowatt per 1 meter squire, then heat energy of the Vapor Temperature Control Equipment could be equal to 1 kilowatt per 1 meter squire. Total heat energy to be made by the Vapor Temperature Control Equipment depends on the size of the Vapor Temperature Control Equipment.

This energy mount is very large to heat surrounding air and increases air temperature by some degrees. High temperature air is lighter compared with surrounding air, and the speed of carrying up vapor is high. Wind blows from a cool temperature area to a hot temperature area. Therefore, not only setting position and an amount of the Vapor Temperature Control Equipment can be designed, but the direction and the speed of wind can also be designed and controlled. For another example, the surface of the floating body is colored silver. Then all of the sunlight energy could be reflected to the sky, and the surface of the floating body and surrounding air are cooled.

An example is shown in Figure 4. The Vapor Temperature Control Equipment is set between land and the Advanced Vapor Equipment group. Vapor is heated by the Vapor Temperature Control Equipment; its temperature depends on the size of the Vapor Temperature Control Equipment. Wind goes from the sea to land according to setting of the Vapor Temperature Control Equipment.

3. HOW TO DESIGN AND OPERATE THE NEW ARTIFICIAL RAIN SYSTEM

3.1 DESIGN AND OPERATION PARAMETER OF THE NEW ARTIFICIAL RAIN SYSTEM

The followings are the design and operation parameters of the new artificial rain system.

- A total size of the Advanced Vapor Equipment : which decides a total amount of artificial rain
- A setting location of the Advanced Vapor Equipment : which decides an artificial rain area
- Setting timing of the Advanced Vapor Equipment : which decides when to produce artificial rain
- The length of the Advanced Vapor Equipment : which decides an amount of artificial rain per meter square
- The width of the Advanced Vapor Equipment : which decides the width of an artificial rain area
- A total size of the Vapor Temperature Control Equipment : which decides how far an artificial rain area is from the sea
- A setting location of the Vapor Temperature Control Equipment : which decides the direction of wind flows
- A number of the new artificial rain system: which decides how many regions can have rain simultaneously, and decides how many hours it takes to transport clouds between a rain area and setting places.

The new artificial rain system is designed by taking into account of the following points:

(1) When the Advanced Vapor Equipment or the

Vapor Temperature Control Equipment is broken by fish, it is necessary that the Advanced Vapor Equipment or the Vapor Temperature Control Equipment does not give big effect on operation of them and can be repaired very easily.

(2) When the surface of the Advanced Vapor Equipment or the Vapor Temperature Control Equipment has salt, the Advanced Vapor Equipment or the Vapor Temperature Control Equipment can eliminate it very easily.

(3) When a storm comes to a setting place of the Advanced Vapor Equipment or the Vapor Temperature Control Equipment, it is necessary that the Advanced Vapor Equipment or the Vapor Temperature Control Equipment can get away from the danger of storms very easily.

The Vapor Temperature Control Equipment and the Vapor Temperature Control Equipment are designed in a redundant way as shown in Figure 2, which have three air separate tubes. Therefore, even if only one air tube of them is broken by fish, they can be operated during short time without giving any impact on their functionality. If two air tubes of them are broken, they should be repaired as soon as possible. Repair of them is easily done by applying a patch on a broken part.

When a storm comes to a setting place of the Advanced Vapor Equipment or the Vapor Temperature Control Equipment, air in three tubes of them is removed. The tubes sink by 50 meters deep in the sea along with anchors attached to them as shown in Figure 5. Big waves will be generated on the surface of the sea during the storm. If the tubes keep floating on the surface of the sea, they will move violently, and eventually be broken. However, if no wave is in the sea, the tubes are safe even during the storm. When the storm passes over the setting place of the tubes, three tubes of the Equipment are filled with air and they float again on the surface of the sea.

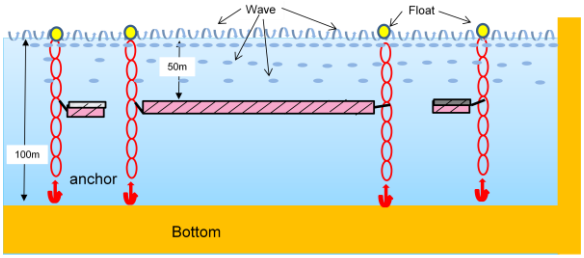

Figure 5 Safety Equipment in the sea during a storm

4. CONCLUSION

(1) The proposed artificial rain system using the Advanced Vapor Equipment group and the Vapor Temperature Control Equipment is effective in order to design, operate and get an amount, an area and timing of artificial rain, and is not dangerous. The proposed artificial rain technology could be implemented at lower cost and in an easier way..

(2) The proposed artificial rain system can provide a large amount of precipitation, and it may become one of the solutions to water shortage.

(3) The new artificial rain system does not produce CO_2, because it uses only the sunlight energy. Cost of the energy for operating the proposed artificial rain system is zero.

Acknowledgment

This author is grateful to Dr. Yosiaki WATANABE, Mr. Tadasi ASHIDA and Mr. Satosi YANO for kind advices.

Reference

Hideyo MURAKAMI, 2008: Consideration on artificial rain system by means of sea water vapor equipment heated by sunlight. *9ICSHMO* PT_Db7