

## Developing a PET bottle microbarographic sensor

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### Introduction

Although the resolution of an atmospheric numerical model is becoming high by leaps and bounds with recent improvement of computer's operation speed, it is said that the resulted isobar anticipation of calculated pressure becomes rather notched. This is thought to be an expression that the physical phenomena which had not been calculated by coarse resolution until now can be calculated detail now. Since observation of actual atmospheric pressure is very coarse in meaning of resolution, no one even checked out that such spatial atmospheric pressure turbulence does exist. Thus, I started developing a microbarographic sensor for observing the two-dimensional detailed structure of such atmospheric pressure.

### Target Specification

Bearing in mind the target is under 100Pa (1hPa) pressure turbulence, the suitable sensitivity of pressure sensor is 100Pa at full-scale. Resolution will be set to 0.1Pa if the AD conversion is carried out by 10 bits. 0.1 Pa is the pressure of 1cm height of air, and higher resolution beyond this will turn meaningless considering dynamic pressure of the 1m/s wind is 0.5Pa. As the daily pressure change is above this measurement range enough for the sensor to scale out, I prepared an air chamber semibalances with outer atmosphere, thus making only change in small time scale will be caught. Its time constant may be dozens of minutes then. Furthermore, since many sensors will be needed in order to catch 2-dimensional structure, lower cost is required per piece as much as possible. One sensor unit costs hopefully less than 2000 yen.

### Structure of microbarographic sensor

A microbarographic sensor consists of a semiconductor sensor which detects difference of the atmospheric pressure and standard pressure which the air chamber holds for a fixed time. Since a semiconductor sensor remarkably lowers its unit price in recent years, costs about 1000 yen now, further cost cut needs making an air chamber at a low price. Then, I adopted a 500 ml PET bottle for the chamber itself and a ornamental braid for the capillary tube which connects the atmosphere and chamber (that is a vinyl tube containing thin fiber in it). Moreover, the sand is put in the air conditioner box of styrene foam for enlarging heat capacity, and the PET bottle chamber is buried in it since whole chamber must be maintained at a fixed temperature the time more than pressure relief time (Total cost of materials will be several hundred yen ?)

### Prototype

As I made an air chamber described above as an experiment, I realized the almost original target in meaning of pressure relief constant and homeothermy. So far a little expensive (about 10,000 yen) semiconductor sensor is used for performance evaluation, the targetted sensitivity is mostly obtained in this state. From now on, I will adjust the sensor by investigating the characteristic of the chamber in detail, to perform an examination by the cheaper semiconductor sensor, and to prepare the mass-production of the sensor for high resolution two-dimensional observation.