

From Mercury to Digital Barometer

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Atmospheric pressure is one of the most important elements in ship weather observations. Observations of atmospheric pressure together with its change and tendency are vital to weather forecasters in analyzing and predicting weather systems over the seas.

Measurement of atmospheric pressure on board of ships has been carried out since the 17th century using a mercury barometer (Figure 1) invented by Evangelista Torricelli of Italy. The mercury barometer is accurate but it is bulky and not easily portable. Moreover, correction for the temperature is required and the mercury column may be affected by the ship's movements and wind gusts. Leakage of highly toxic mercury is a potential hazard in case the mercury column is damaged or broken.



Figure 1 - A mercury barometer.

With the development of the aneroid barometer in the 19th century, the mercury barometer has been gradually phased out. The aneroid barometer measures the changes in dimensions of a partially evacuated capsule which is magnified by a system of levers and indicated on a dial from which the pressure readings are obtained (Figure 2). A barograph is used to help recording the

atmospheric pressure readings measured by an aneroid barometer in a continuous manner. In the old days, the barograph recorded the atmospheric pressure readings mechanically and continuously using a pen plotting the changes against a clock-driven rotating drum (Figure 3). Compared with mercury barometers, aneroid barometers are more portable. The advanced version of aneroid barometers is also temperature-compensated and not affected by the 'pumping' over the seas. However, it has the disadvantage that the readings will drift in time due to changes in the elasticity of the metal of the vacuum chamber, and regular calibrations of aneroid barometers carried on board of ships by Port Meteorological Officers are required to ensure accuracy.



Figure 2 - A typical aneroid barometer.



Figure 3 - A barograph for continuous recording of atmospheric pressure.

With the advancement of electronics and data processing technology, digital barometers (Figure 4) are now the state-of-art equipment for measuring and recording atmospheric pressure, and they can also be connected to a computer to facilitate data processing and display. They are now commonly deployed in

automatic weather observing systems operated in land-based weather stations as well as on board of marine vessels. Two Hong Kong Voluntary Observing Ships have been installed with shipborne automatic weather observing systems equipped with digital barometers to provide automatic hourly observations of atmospheric pressure and other weather elements over the seas (Figure 5).



Figure 4 - A digital barometer.

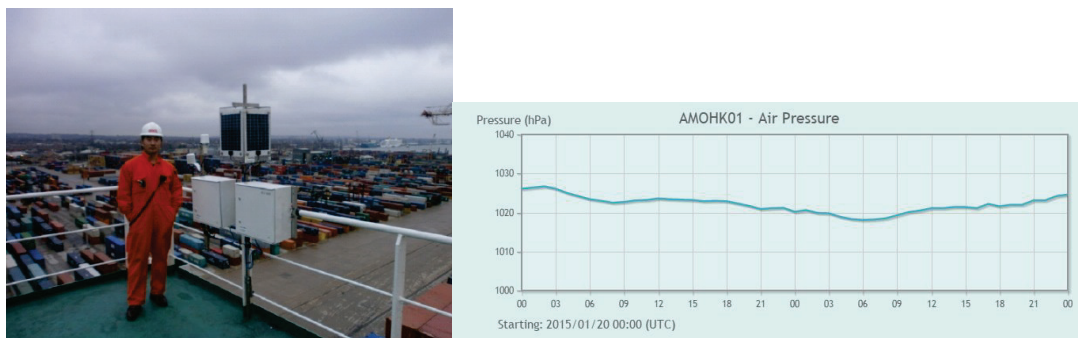


Figure 5 - Time series of hourly atmospheric pressure readings (right) as measured by the shipborne automatic weather observing system (left) installed with digital barometer on board a Hong Kong Voluntary Observing Ship.