Surface Meteorological Measurements in Egypt Achievements and Current Status

BY

MOHAMED ELSAYED - CAIRO RIC

E- Mail : mohamedelsayed50@yahoo.com

Tel. : 00202- 6846596 Fax. 00202- 6846596

ABSTRACT

The Egyptian Meteorological Authority is planning now to modernize its national surface observing network that consists of 112 surface observing stations and also is planning to upgrade its regional instrument centre that used for calibrating the different measuring instruments of these mentioned stations .

The objective is to increase the data of the national surface observing network In time and space as well as to improve the quality of these data.

It has become a necessity to obtain more reliable and real time continuous data and transfer these real time data to those who are concerned in many sectors, such as Aviation; Transportation; Tourism; Agriculture; … etc

The surface observing network (the meteorological stations) is a very important component of the Egyptian observational system. The data provided by this network is used directly by the forecasters (they receive hourly reports from all meteorological stations), part of this data is used in climatologically studies, part serves as an input for NWP and part of this data is introduced in the international meteorological data flow (GTS).

The network that consists of approximately 112 meteorological stations performs various types of observations (synoptic, climatologic, agro meteorological etc.).

Data coming from 30 stations out of these 112 stations is representing the EMA contribution to the international data flow.

The paper presents the current design and status of these stations and the achievements that happened during the last few years.

The operational experience of maintaining and operating of 30 automatic weather stations in some of these mentioned 112 stations is being discussed.

Introduction: -

Egyptian Meteorological Authority has been operating a network of 112 surface observing stations.

Meteorological parameters such as dry bulb temperature, wind speed, wind direction, relative humidity, barometric pressure, sun shine duration, radiation and rainfall are being measured.

Observation of weather data plays a major role in the field of meteorology. The Automatic Weather Systems

(AWOS) provide meteorological observations to users in real-time basis by gathering data from a network of automatic weather stations through various communication channels.

Availability of real-time meteorological data is an essential tool for daily weather forecasting. The reliability of weather forecasting mainly depends on the amount of data received for analysis. With the advancement of information technology and electronics and also the growing demand for meteorological information, it becomes more essential to disseminate the meteorological information, through
Network means, to meteorological community.

The data of the AWOS was tested in various weather conditions. The data obtained from these AWOS was acceptable and its accuracy matches with the WMO standards and requirments.

It is important to note the fact that the number and the locations for the meteorological stations in EMA are slightly varying from
One year to another depending on various conditions (new needs for meteorological information in a specific area, degradation, from meteorological standpoints, of some locations, administrative problems -like budget cuttings etc.

Until the beginning of 90s, all the meteorological stations were using classic instruments for measuring the various parameters. Starting with 1995, EMA acquired the first automatic surface observation stations (AWOS), but, due to the fact that these AWOS were very few, it can not be considered the start for the modernization of the network. This modernization happened only in 1996 when a number of 11 AWOS were installed in 11 important locations.

The modernization continued, in the present, the national network contains a number of 30 fixed location AWOS. By the end of 2006 another 10 AWOS will be installed, and other infrastructure modernization projects are in progress.

For the surface observation network, it is obvious that, over the next year, the atomization of the surface observations will become a priority for all meteorological stations.

Another direction of modernization is to up-grade the existing AWOS with new sensors or to up-date the existing sensors;

Another aspect of the network modernization is the data collection method. Before 2003 the collection and validation of the data was done manually, using phones and radio communication devices. In 2003 another communication concept was introduced in some stations, where GSM was used. Some stations were provided with GSM modems and some observers started reporting to the collecting centre using GSM service. Later on, in the frame of the Egyptian – French protocol, a complex application (concentrator) for data collection, transmission and validation will be implemented. This application has three components, one for each level of collection and validation: local (station site), regional and national.

<u>Types of surface Meteorological stations in EMA:</u>

1- Synoptic stations	**28**	**stations**
2- Aeronautical stations	**6**	**stations**
3- Agro met stations	**9**	**stations**

4- Radiation stations 12 stations
5- Climatologically stations 112 stations
6- Ozone stations 5 stations
7- Air pollution stations 6 stations
8- Military stations 42 stations

Before implementation of the modernisation program, most of the stations were unautomated and using manual observing instruments.

Some of the different types of manual surface observation instruments used in these above surface meteorological stations are shown in the following table:

Name of Instrument	Name of Company
Ordinary thermometer	Short & masion – Lonon
Min. thermometer	S&M - LONDON
MAX. thermometer	Casella - LONDON
Soil thermometer	Short&Masion - London
Dry&wet temp.recorder	Muller - Germany
Dry&wet temp. thermograph	S&M - London
Hygrothermograph	C.F. - Casella
Mercury barometer	Fuess
Digital barometer	Mayyar
Electric Anemometer	R.W. Munro LTD LONDON
Fuess Anemograph	Fuess
Dines Anemograph	R.W. Munro LTD LONDON
Sun Shine Recorder	C.F. Casella
Pyranometer(global radiation)	Eppley – Kipp & Zonen
Pyrheliometr(direct radiation)	Eppley – Kipp & Zonen
Tilting Siphon rain recorder	C.F. Casella
Check rain guage	C.F. Casella
Evaporation Pan class A	C.F. Casella

MODERNIZATION PROGRAM & ACHIEVEMENTS:

In general many types of modernisations have been made in EMA especially in the communication systems and upper air observing systems, but this presentation covers only the surface observing network

In the beginning of 1995, EMA started in the modernization plan of its own surface observing network and in the present the national surface observing network contain a number of 30 AWOS . This modernization happened only in 1996 when a number of 11 AWOS were installed in 11 important locations.

The modernization continued, and By the end of 2006 another 10 AWOS will be installed, and other infrastructure modernization projects are in progress.

For the surface observation network, it is obvious that, over the next year, the atomization of the surface observations will become a priority for all meteorological stations.

Another direction of modernization is to up-grade the existing AWOS with new sensors or to up-date the existing sensors in some stations

The table below summarizes the type and manufacturers for some of the automatic sensors that used in these automatic surface observing stations included in EMA network:-

Parameter	Sensor	manufacturer
Wind speed	wind transmitter 4.3303.22	THIES CLIMA
Wind direction	wind transmitter 4.3120.22	THIES CLIMA
Temperature&Humidity	Hygrometer MP106A	Rotronic
Pressure	Barometric transducer Cetra 270	Cetra
Wind speed	Wind transmitter 4034	Friedrichs
Wind direction	Wind transmitter 4122	Friedrichs
Temperature&Humidity	Tem. & Hum. Prope 3030	Rotronic
Pressure	Barotransmitter 5002	Vaisala
Wind speed	Micro response Anemometer 2030	Qualimetrics
Wind direction	Micro response vane	Qualimetrics
Temperature&Humidity	Tem.&Hum. Prope 5190	Qualimetrics
Pressure	Dual digital barometer 7190	Qualimetrics
Horizontal visibility	Forward scatter visibility sensor 8369	Qualimetrics
Precipitation	Tipping bucket rain guage 6011 - A	Qualimetrics
Height of cloud	Ceilometers 8329 - A	Qualimetrics
Wind speed	Anemometer WAA 151	Vaisala
Wind direction	Wind vane WAV 151	Vaisala
Temperature&Humidity	HMP35D	Vaisala
Precipitation	Rain guage IPG 01	Vaisala
Horizontal visibility(MOR) & background luminance	Forward scatter visibility Sensor and / or present weather FD12	Vaisala
Cloud Height	Ceilometers CT 25 K	Vaisala

<u>Advantages of automated observing systems used in EMA:</u>

Advantages of automated observing systems that felt in EMA after acquisition of AWOS can be summarised as follows:

- **Standardisation of observations**
- **Continuous measuring of parameters for 24 Hours**
- **More accurate, more reliable, higher resolution**
- **Collection of great volume of data**
- **Adjustable sampling interval for different parameters**
- **Free from subjectivity & from errors**
- **Continuous QC in both collection and reporting stages**
- **Ability for message generation and transmission**
- **Permanent monitoring of meteorological data**
- **Ability for access of archived data locally or remotely**

- **Ability to collect Data from harsh environments**
- **Supporting a vast range of data communication options**
- **Managing all communication protocols for the various Sensors and other data communication equipment**
- **Storing all relevant data for subsequent retrieval as Required**
- **Ability for manual input of additional information that Unable to be automatically measured**
- **Quality Control on both data measurements And message generation**
- **Ability for authorised users to access remotely for any Tasks to be performed**
- **The AWOS network is capable of Collecting, processing And displaying meteorological data**
- **Performing automated generation and transmission of Meteorological reports such as SYNOP, METAR, SPECI,**
- **Can be configured to support a wide range of Sensor configurations**

CONCLUSION:-

- **EMA has decided to upgrade its national observing network As well as the calibration laboratory that used for calibrating the Different instruments and measuring sensors of this network and In a very near future, EMA will be operating an observation Network consisting of 112 automated stations AWOS**

- **The most important process after the installation of such systems Is regular maintenance of the network systems**

- **It is necessary to calibrate the new automatic observing systems To maintain the quality of Data and to make sure it matches with The WMO requirements.**

- **This calibration laboratory is proposed to be of sufficient Standard and staffing to act as the country's national standard For meteorological observations and to possess linkages to The WMO Regional Instrument Centre and other National laboratories.**

- **The Technicians and maintenance team should have basic Knowledge of meteorology with the knowledge of related science.**

- **Such systems require periodic maintenance and Technical service to maintain the system in operation properly.**

- **Observers in the field should be trained on how to properly use And maintain the AWOS.**

- **National Meteorological services all over the world should share Their experiences.**

- **EMA has planned to upgrade its instrument laboratory To support its own observing network.**