

ASSET AND OPERATIONS MANAGEMENT – INTEGRATED SOLUTIONS FOR EFFECTIVE LOW COST MONITORING



Paper Presented by:

Colin Davies

Author:

Colin Davies, Managing Director,

Carbon Based Environmental Pty Ltd



*6th Annual WIOA NSW Water Industry Engineers & Operators
Conference*

*Tamworth Regional Entertainment & Conference Centre,
27 to 29 March, 2012*

ASSET AND OPERATIONS MANAGEMENT – INTEGRATED SOLUTIONS FOR EFFECTIVE LOW COST MONITORING

Colin Davies, *Managing Director*, Carbon Based Environmental Pty Ltd

ABSTRACT

There is an emerging paradigm in asset, environmental and operations management in which the “drivers” include the need for effective low cost monitoring, and management at municipal facilities, civil developments, farms, irrigation schemes, mines, CSG operations and industrial sites. At all these sites the challenge increasingly is to provide comprehensive monitoring, telemetry and remote data access including alerts and alarms, solar power and demonstrated interoperability with third party devices.

This represents a significant change from a traditional monitoring model which is characterized by narrow or limited: monitoring ability and connectivity.

This paper investigates the current or emerging model of monitoring and the demand and availability of new integrated monitoring solutions.

1.0 INTRODUCTION

The evolution of monitoring is occurring at an exponentially increasing rate. Where once it was satisfactory to log data and manually download for interpretation at a later date, the demand now is for broad and flexible monitoring systems, telemetry ready, smart packaged and ability to use latest networking and data display solutions. The push is coming from the community, regulators and corporate management and may expand to all areas of monitoring and process control. The message is to be prepared now or get left behind in an evolving and more complex monitoring environment.

Monitoring history may be simplistically broken into two models in order to help explain the current scenario. The first is the traditional model and the second is the emerging model. Of course, these are not separate distinct systems but the new emerging model has evolved from our historical monitoring past and technological advances in electronics miniaturisation and computer networks including the internet.

1.1 Traditional Monitoring Model

The Traditional Model for environmental monitoring systems is characterised by narrow or limited monitoring. This may have involved dedicated systems to monitor a set parameter or a limited set of quality criteria, for example water flow, pH, and turbidity measurement. Access to data may have been limited, for example only at site control systems or manual downloading of data via a laptop or proprietary device at the monitoring site. Some devices may have been telemetry ready such as radio connections or modem links, some may have been able to work in remote non-mains-powered sites by solar power, however options were limited and remote visualization of the data was basic in design. Value-adding options like monitoring co-located sensors and secondary devices may have been available however the systems were generally disparate and unconnected.

1.2 Emerging Monitoring Model

The new Emerging Model for environmental monitoring systems is applicable to all monitoring such as water, noise, blast, air quality, meteorological parameters, process control and while dedicated expensive PLC systems will continue to operate at many industrial facilities, lower cost emerging model systems are expected to dominate in the future for more geographically disperse or remote location markets.

New emerging model systems may also include value adding tools for municipal authorities, miners and industry, for example multiple environmental sensors and critical plant and asset condition monitors across large geographical areas, and for farmers and irrigation scheme managers for example direct control of monitoring pumps and motors by mobile internet based technology.

There is currently a technological revolution in the design and engineering of individual sensors, and wireless digital management components. Low cost digital sensors utilising RS232, RS485 or SDI-12 connections and wireless transmission systems are now widely available and the latest trend is for digital sensors to interface directly to data management components that contain the latest wireless based monitoring systems for direct display on internet visualisation systems.

The emerging model of monitoring utilises wireless network interfaces that can be easily incorporated into site IT infrastructure and the internet allowing real time and remote access to monitoring equipment. By utilising network interfaces, direct equipment control is easily achievable and affordable to provide economical networked I/O solutions. The main methods of data transmission are wireless networks and NextG wireless transmission to IP/Server/database systems.

Both systems utilise similar structure but allow transmission of data via radio networks, Cellular or satellite communications to remote visualisation systems. These digital systems also allow full two way SMS based access for alarming and control, and email messaging for direct communication of alarm conditions from the monitoring location. Figure 1 provides a simple schematic of the wireless network monitoring system.

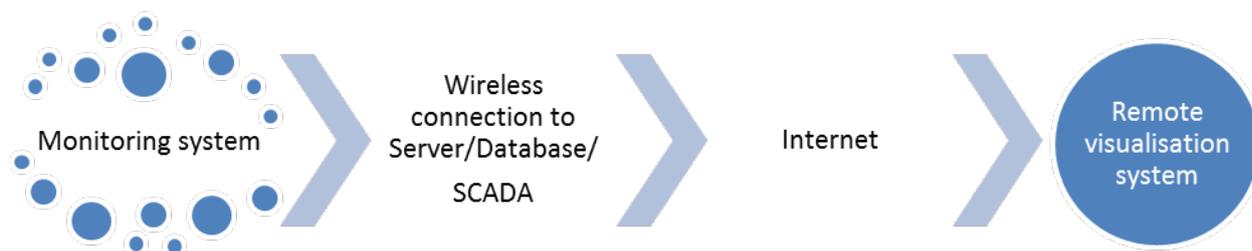


Figure 1: General scheme of wireless network monitoring system

Direct digital sensor networks allow real time data visualisation and analysis and integration with other client IT systems.

The new emerging monitoring systems allow low power options, suitable for efficient solar powered solutions, scalability where one to hundreds of monitors may be added as the monitoring system grows and generally include low data transmission costs and software licence fees. Low cost database solutions and mobile smart applications for the data visualisation are available.

Additionally, there are retrofit capabilities to allow traditional monitoring sensors to connect to the emerging monitoring systems.

1.3 Emerging Trends in Environmental Monitoring

In the NSW mining sector, recent trends in Development Approvals and companies environmental management documentation indicate prescriptive inclusion for real time environmental management across many parameters including air quality (particulates), meteorology, noise, blast and water management.

Latest developments include real time networks using network/IP solutions and web database storage with SMS and email notifications. Network access provides remote interaction with the equipment and data streaming capabilities direct to database and third party visualisation systems.

- Meteorology and air quality (particulates) systems with server database and internet display, direct SMS to monitors for instant data updates and alarm messaging;
- A web based system for blast management provides a dedicated system where data is transmitted to a central data server. Results are sent direct from monitoring sites to site personnel by SMS and the system provides a secure web database for blast result management and system interrogation;
- Real time noise monitoring including high quality audio streaming, transmission of noise statistics, directional noise filtering for impact assessment. Sites are networked to facilities IT system or server database systems. Users have remote access via third party software interaction.
- Radio networks are utilised for ground water piezometers or vibrating wire transducers and surface water quality monitoring stations. Short range radio systems transmit multiple monitoring sites to centralised smart receivers for Network/IP data transmission.
- Video streaming across the site network for air quality and site water management.

The latest trend is for third party software interfaces to model future impacts from monitored results to allow proactive management of facility operations.

2.0 CONCLUSION

The emerging model for monitoring, especially systems without expensive PLCs, is one where an array of sensors, assets and equipment can be monitored and managed remotely.

Continuous improvements in electronic miniturisation and improved networks now allow

integrated monitoring solutions to be low cost, telemetry-ready and provide full functionality and broad flexibility to effectively manage monitoring requirements.

3.0 REFERENCES

E State Automation viewed February 11 2012, <http://www.estateautomation.com.au>.

Windmill Software Limited viewed February 22 2012, <http://windmill.com.uk>

Industrial Networking, Building the Business Case for Industrial Ethernet (2012). Nuris Ismail and Mathew Littlefield. The Aberdeen Group.

Prnewswire, Environmental Sensing and Monitoring Technologies viewed 26 February 2012, <http://prnewswire.com>.

Measuring and Control Equipment viewed 10 February 2012, <http://macemeters.com.au>.

Datataker, viewed 10 February 2012, <http://datataker.com>.