Methods of Gathering Electronic Gas Measurement (EGM) Data

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Introduction

This paper is to discuss the various methods of gathering electronic gas measurement (EGM) data. There are various options when it comes to collecting EGM data in the Natural Gas Industry. Devices such as RTU's, PLC's and EFM's are typically used to collect and store the data locally. The focus of this paper is on the various technologies used to remotely gather the information stored on these devices. Depending on each company's needs, these collection options could range from someone physically connecting to a device to collection via a satellite system. Spread spectrum networks became increasingly popular over the years, which as a result introduced realized interference due to the number of networks installed. Many companies are utilizing IP technologies versus serial in order to combine other networks and protocols. Licensed networks have been utilized for quite some time and are still used to meet reliability requirements. Cellular networks are often used when there is no infrastructure available in that area. Cellular networks will of course have a reoccurring cost associated with them. Satellite technology is required in some remote and/or saturated areas. Satellite communications can be costlier but is the only option available in some areas.

Data Collection Methods

Spread Spectrum Radio

Spread Spectrum Radio operates in the ISM (Industrial Scientific and Medical) band. Spread Spectrum radios share either the 900 MHz band (902 – 928 MHz) or the 2.4 GHz band (2.4 – 2.4835 GHz). These radios also use frequency hopping, direct sequence, or a combination of the two to achieve the necessary requirements. Radios are configured to use these techniques to limit the amount of interference from other radios using the same band. When using spread spectrum, the user must be sure to follow best practices as they relate to RF to achieve reliable communications. FCC regulations on spread spectrum limit the transmitter output power to 1 Watt and the maximum gain of the antenna may not exceed 6dB, thus limiting the equivalent output power to 4 Watts.

Licensed Radio

Licensed radios used in the oil and gas industry typically operate in the 330 – 520 MHz and 900 MHz ranges. Companies will pay a licensing fee to operate on assigned channels within that band and geographical area. One advantage of licensed frequencies is that users do not have to "share" that frequency with others in the same area. Because the user pays for the use of a licensed frequency, the FCC protects their signal. Another advantage of using licensed frequencies is the longer range due to higher powered transceivers available.

Cellular Modem

Cellular modems are devices that have been assigned a telephone number and IP address. These devices are also a popular option in the industry to quickly achieve remote communications. Cell modems do not require the user to have their own radio network, so the upfront cost can be low. However, there will be the reoccurring cost of the data plan as well as frequent equipment replacement.

Satellite Modem

Satellite systems are typically utilized in remote areas where no other option is available. Like cellular systems, satellite systems will have a reoccurring cost of the data plan. The cost of data plans on satellite networks are usually much higher than that of cellular networks. Satellite systems can also be affected by inclement weather.

Internet Protocol (IP)

The Oil and Gas industry has only recently began utilizing IP in the past few years, despite the technology being available for quite some time. Prior to utilizing IP, the data was typically collected via serial connections. The first uses of IP in the industry involved an IP radio device such as a cell modem located at a central point containing a serial radio. The SCADA system would connect to this point which would then route the requests throughout the serial backbone. This enabled the user to request data from serial devices while using IP technology. In recent years, more local end devices such as flow computers are being manufactured with IP technology on board. As a result, the industry is moving increasingly towards utilizing Ethernet communications across the board. Primary advantages of utilizing IP communications include the ability to communicate with multiple master radios simultaneously as well as the ability to consolidate multiple protocols.

Additional Remote Data and Consolidation

Wireless technology is also used to bring additional data points in to be collected along with the gas measurement data. Examples of these points include tank levels, wellhead pressures, temperatures etc. These additional devices also play a large role in safety especially spill prevention. These devices utilize the spread spectrum technology in the 900 MHz and 2.4 GHz bands. Some of these devices are self-contained, battery powered. Improvements in the drilling technology has introduced the industry to "super pads." These pads can have up to 40 wells on one location. Some locations may not have all the wells on one pad, but multiple pads in close proximity to each other. Spread spectrum radios can be utilized to consolidate the data from the multiple wells into one location where it can then be brought into SCADA

Data Storage

Once the data has been collected, it must be stored. Just as collection methods have evolved over the years, so too must the storage methods. In recent history storage mechanisms called floppy disks were used and had a storage limit of 1.44 MB. At that time, it could take multiple files to fill up that storage. Today, that is a drop in the bucket and considered a small file as most storage medias are classified by GB and Terabytes (TB). Access is another major factor to consider in addition to storage amount. The data collected is not of much use if nobody can access it. Within the last decade, the industry has been introduced to the CLOUD. The CLOUD is defined as a network of servers used to both deliver services and to store data. (1) These CLOUD services are typically provided by large companies such as Google and Microsoft among others. Users can purchase very large amounts of storage space for a very economical rages when compared to installing and maintaining an in-house system of servers. (2) The user does not have to worry about maintaining servers. Also, if more space is needed, it is just a matter of purchasing more storage from the provider. Many access options are available across multiple platforms. These options range from mobile applications to computer programs.

There are some disadvantages to the CLOUD. Security would be the primary point that most users would consider. The data is encrypted, but it is also eventually stored on public servers. Those servers could be subject to cyber-attacks. The user should weigh the advantages and disadvantages when deciding which information could be stored in the CLOUD versus information that should only reside on internal company servers.

Conclusion

There are many factors that the oil and gas companies need to consider when building out or keeping up with their communication networks. These factors include speed, amount of data, geographical location and of course cost. Options that are attractive today may not be sufficient tomorrow. Companies will need to be vigilant in their planning regarding expansion so as not to outgrow their network or become overwhelmed with cost.

References

(1) https://en.wikipedia.org/wiki/Spread_spectrum

(2) Kyle Bates – Methods of Gathering Electronic Gas Measurement