TELEMETRY

Lonely Sentinels in Dirty Jobs

by M. J. Walker

In the Ohio River Basin, up and down the Potomac, and hopefully on a score of other rivers in the foreseeable future, pollution control engineers are and will be monitoring their rivers without ever leaving their offices.

They will be drawing on the development over almost a century of lonely sentinels — the remote telemetering equipment military and space, oceanographic and meteorological researchers already rely on to monitor phenomena they can't get their hands on.

In polluted streams, as in other environments, the unflappable, unbiased army of automatic electronic sentinels for remote monitoring, is freeing scientists and engineers from drudgery.

This army is composed of individuals of various shapes and sizes, but all are of two basic types—wired and wireless (radio).

Wired sentinels employ a sensor or transducer at one end to monitor or measure any of hundreds of aspects of the environment (temperature, velocity, flow, position, etc.). The transducer converts this to an electrical signal which is then modulated and transmitted by wire or cable to the receiving end where the signal is recorded for later study or displayed.

Wireless sentinels, developed in the 1930s by weathermen using weather balloons, do the same things as the wired types. But the signal generated is broadcast through the airways.

The uniqueness of remote sentinels, however, is the fact that they can employ many transducers and monitor many aspects of the environment in many different localities simultaneously. Signals generated by transducers are modulated and then combined (multiplexed) into a single scrambled signal. At the receiver end, the signals are unscrambled.

Combined with television, telemetric equipment has enabled scientists to see close-up and clearly such things as the surfaces of Mars and the moon and gigantic cloud formations and storm patterns on earth from above the atmosphere. When used alone, the sentinels have enabled investigators to learn about such conditions as radiation, cosmic rays, and micrometeorites.

Space telemetry has advanced the state-of-the-art significantly in special packaging to enable the sentinels to operate under hostile conditions. Such innovations as integrated circuits and microelectronics have allowed reductions in size and greater reliability.

According to Henry B. Riblet of Johns Hopkins University's Applied Physics Laboratory, a pioneer of space telemetry, equally noteworthy achievements have been made in other fields.

For example, electric power companies use wired type sentinels to monitor power loads and other conditions in circuits.

The same advantages are offered to the petroleum industry which has far-flung operations through hot, dry, remote regions. The wired and wireless sentinels monitor pressure, flow, and other conditions in the pipelines, help regulate processes in refineries, and tell drillers what is present in bore holes.

Chemical processing plants, steel mills, cement plants, and a host of other industrial enterprises with a variety of extremely hot, toxic processes and operations also rely on the wired-type sentinels to monitor such things as temperature, pressure, speed of chemical reaction, and completeness of processing. In such plant operations, the information gathered is often fed directly to computers, which in turn trigger and operate automatic equipment controlling industrial processing and output of products.

Oceanography

In oceanography, both wired and wireless sentinels are employed to determine in complete darkness and under great pressures such things as salinity, current, pressures and depths of the oceans. Oceanographers, from the comfort and convenience of the ship, get a good clear picture of the conditions prevailing below the surface of the seas.

Equipped with cameras diving sentinels can explore and depict ocean bottoms in extremely good detail. The Naval Research Laboratory, for example, used a wired sentinel equipped with cameras to locate and photograph the remains of the submarine Thresher which dove too deep, collapsed, and then sank to the bottom of the Atlantic.

In atomic energy, remote equipment successfully withstands and defies some of the most hostile, unfavorable conditions that exist on earth—extreme radioactivity. The sentinels monitor carefully the condition of atomic fuel cores in reactors and feed information to scientists safely at work behind shields.

Seismic recorders, long in use in geophysics to help scientists determine the location of earthquakes, are a fairly old example of the work of both wired and wireless sentinels. Recently, however, geophysicists proposed a novel system of wired and wireless sentinels to monitor the very minute tremors in the earthquake belt of our western states and Alaska. The scientists believe that given such data, they will be able to devise an early warning system that will locate and determine the severity of quakes in the U.S. before they occur.

Meteorology

In weather prediction, weathermen rely on wireless sentinels to help them keep tabs on and track the movement of storms, temperature, wind and humidity. The sentinels are carried aloft in balloons and satellites.

Just coming into use in hospitals, particularly in intensive care wards, are small armies of wired sentinels to help nurses and doctors monitor swiftly and precisely the condition of patients. Such aspects as heart beat, temperature, respiration, and other bodily conditions are being measured and sent to the central location where nurses and doctors study and chart the condition of patients.

Reliable sentinels are also ideal for monitoring body conditions of persons in iron lungs and oxygen tents. The need to isolate patients with contagious diseases and to minimize their contact with hospital attendants results in a kind of inaccessibility that our fearless sentinels can handle expertly. Patients in transit from one part of the hospital to another (from surgery to recovery) also can be monitored.

Another developing ideal area for the wired and wireless sentinels is water pollution control where authorities now are over-joyed at the prospect of being able to remotely monitor, round-the-clock, such things as acidity, oxygen content and toxicity of streams and lakes in many areas. Remote offenders or those who dump their loads under cover of darkness will be reliably and remotely detected and pinpointed by pollution control authorities.

Similarly, in air pollution control, authorities will be able to monitor the movement and incidence of such things as toxic gases and will be able to determine remotely dangerous levels and areas of offenders.