

Reduce Lifting Costs with SCADA Software

Microprocessor System

A microprocessor system can help solve the problem. With its own microprocessor, A/D converter, and memory, the system can monitor electronic signals from almost any sensor, monitor, gauge, or transducer used in the oil and gas industry. Also, with control outputs it can be connected to almost any device in the field for control purposes (both analog and digital). This combination makes the system intelligent. The system is incorporated into a single box of electronics. Having a single box with this capability allows the operator to invest less money in spare parts. Maintenance time also is reduced because all of the electronic modules are standard plug-in cards. Changing a bad card is fast and easy. Self-diagnosis is built into the system using LEDs (light emitting diodes) to alert the operator to the failure.

Communications

Last, but significantly useful, is the ability of the system to communicate with a host computer. It has a built-in capability to communicate by radio, hardwire, or telephone. Communication capability makes it possible for one or more computers to:

- * Retrieve data from a controller.
- * Obtain status of operations.
- * Issue control instructions.
- * Monitor for alarms.
- * Develop reports.

In summary, the system provides information, data, alarms, etc. when and where needed. The when and where capabilities allow problems or potential problems to be announced in time to reduce operating costs.

Software

Computer software, which is an integral part of the system, resides in the host computer. Basically, it serves several purposes:

- * Retrieves data from the system's controllers.
- * Displays data on computer monitors.
- * Generates reports.
- * Issues control instructions for the system's controllers to execute.
- * Reprograms input-output channels from host computer.

These functions are accomplished by the software, causing the host computer to communicate with controllers in the field. Many production optimization capabilities are standard in this system. Pump-off control, gas lift optimization, automatic well testing, compressor monitoring-control, trend analysis, and pump system analysis are a few examples. A system like this makes it possible to gather tremendous amounts of data. Different data and reports are needed in various parts of the company. Computers make it possible to share this information with or exclude it from access by any other computer or department.

Case History

During the last several years, many producers have installed successful pilot projects using the system described. Later, as new technology for the system has become available, operators have made new installations and expanded earlier pilot projects. The impact on users of these remote

monitoring and control systems has been significant. Typically, the system can pay for itself in 6 to 9 months. To help define the proper application and benefits of a computer production management system, interviews were conducted with the management and technical people responsible for one such system at a major oil company. Statistical data was supplied to backup results reported by the company. This particular project included 94 microprocessor controllers installed on pumping units, tank batteries, injection wells, and LACT units. Pumping unit motors varied from less than 20 hp to 75 hp. Some increases in run time are included in the net reduction. In those wells where fluid levels were above the pump, when placed on microprocessor controller, run times increased until the wells were pumped-off or running 24 hours/ day. In the latter case, pump capacity was increased to allow pump-off. Corresponding increases in production were recognized in direct proportion to the increase in run time. The significance of run time reductions is most obvious in the electric bill. However, reduced wear and tear on pumps, rods, tubing, gearboxes, etc. is often a greater factor in reducing lifting cost. Typically, a 1 to 3 b/d of oil per well increase was realized with corresponding decreased run time. The production increase was because of less down-time and ability to pump each well until pumped-off. The company found it was impossible to keep the wells pumped-off by using time clocks but not pounding fluid unnecessarily. The operator suspected this before installation of the microprocessor controllers, but the magnitude of lifting cost reduction using microprocessor controllers was surprising. The company originally selected wells producing 18 b/d of oil or more for microprocessor controller installation. As a result of the evaluation, wells producing 12 b/d of oil are now considered profitable candidates-and even lower producers could be possible profitable candidates for microprocessor monitor-control. The bottom line of any project is "What will computer production management do for us?" One major oil producer said the computer production management:

- * Reduces rod parts.
- * Reduces pumping wear from excessive fluid pound.
- * Extends pump life.
- * Utilizes electricity for only productive pumping.
- * Extends motor life.
- * Aids engineering to gather last minute data prior to making decision on well.
- * In most cases, reduces run time.
- * Reduces manpower needs. General benefits provided by the system are:
 - * Easy to recognize producers that are affected by injectors.
 - * Monitors injection well performance by changing pumping time.
 - * Stores and plots pump time trends.
- * Optimizes pump pulling. Future uses of the system include:
 - * Pollution control.
 - * Flow line pressure monitor and well shutdown.
 - * Injection line pressure monitor and valve closures on low pressure.
 - * Field shut down from office.
 - * Tank level monitor.
 - * LACT meter readings at same time daily.

At the time of this writing, many of the future applications have been incorporated successfully into the system. The study was performed in July 1987. The system described is being continuously improved. Software enhancements include multitasking, report generation, trends, and graphics at user control. New applications are found by system users limited only to the operator's imagination. Reservoir engineers are surprised to learn there is a way to monitor flood response on a minute to-minute basis. Lease operators are pleased to have their own report automatically produced every morning showing status of each well. With these systems, it is possible for an executive in the company's main office to know the pressure at the discharge of a compressor station in a small remote field. Also, all data collected by the central computer can be structured into files or reports for distribution or uploading to other computers. This feature provides selected information to be available to the person who needs it and can act on it. This

process takes place automatically and quickly. When needed, corrective action can be taken sooner to avoid expensive repairs, losses in production, or pollution to the environment.