



■ A technician checks a 1050 hp FE650D-2 Energy Industries compressor package powered by a Caterpillar G3512TAW engine. This is a 2-throw, 2-stage unit with 16.5 in. (419 mm) and 11.25 in. (286 mm) cylinders in sweet natural gas compression service.

Analysis Tool Helps Boost Fleet Efficiencies

Analysis Software Makes Sense of Output from Compressor Monitoring Systems

A new software system for optimizing fleets of reciprocating compressors is now available in the U.S. market from Detection Technologies of Bainbridge Island, Washington, U.S.A. A number of natural gas producers in western Canada have been using the program, called Analysis and have reported dramatic increases in cash flow resulting from fleet

efficiencies that have improved by 5 to 10%.

In the past, it has been difficult to reach and maintain high efficiency levels without undue risk. Analysis developer Al Taylor has shown that the majority of compressors generally run in the 75% to 85% efficiency range. Taylor cites a number of causes for this, with the main one being the operator's lack of confidence

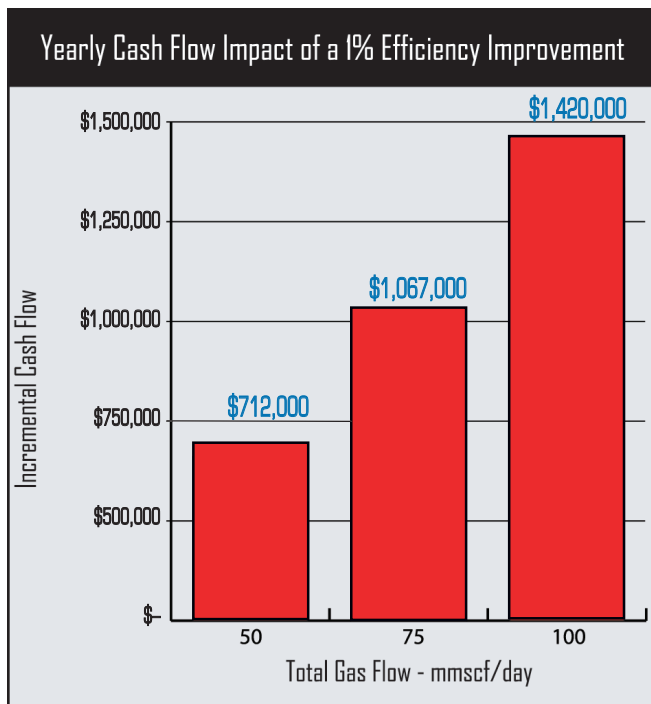
that in a dynamic operating environment it is safe to run the compressor at or near design capacity. Without access to current, reliable information that would support or confirm his judgment he is forced to act conservatively and back the machine off in an effort to 'keep it running.'

Fifteen years ago, Taylor,

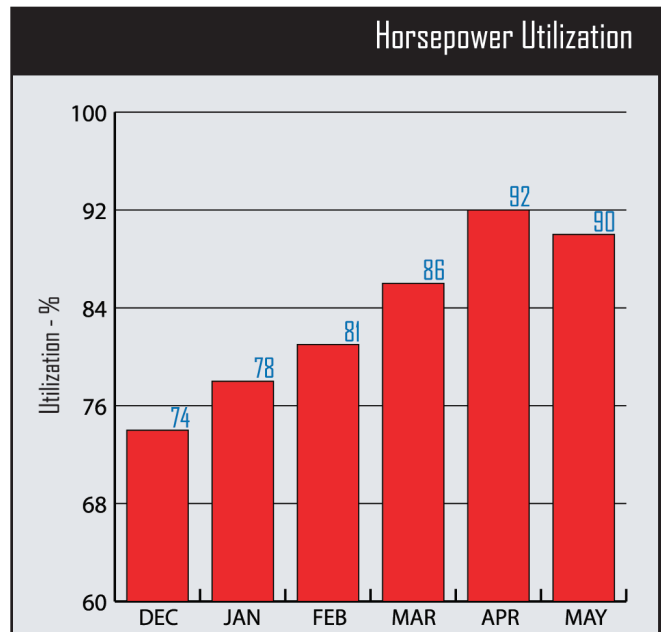
president of Energy Management Services in Calgary, Alberta, Canada, (and now also director of engineering at Detection Technologies), needed a diagnostic tool for his business. He began developing algorithms to create a reliable method for quickly and accurately analyzing compressors under actual, real-world operating conditions. Building on basic design theory, Taylor launched an exhaustive research and development effort and field-testing program to develop an effective compressor analysis tool. This series of modified algorithms and interrelated equations forms the basis of the Analysis software.

Analysis analyzes actual operating conditions for each compressor in a fleet and provides immediate diagnosis of existing and potential mechanical problems. In addition to detailed operating information, the Analysis report has a series of performance flags that identify high rod loads, low minimum degrees of rod reversal, high blow-by, low volumetric efficiency, high temperature and a number of other performance indicators not easily and quickly detected by other analytical methods.

The report includes clear,



■ Significant cash flow benefits can accrue from improvements in efficiencies. This bar graph illustrates the impact of a 1% improvement to a fleet of varying capacities. It assumes a gas price of about \$4/Mcf.



■ A medium-sized company in Western Canada had 12 Waukesha engines coupled to 4 throw, 3 stage Ariel compressors that were experiencing engine difficulties. When the Analysis system was applied to these compressors, the initial horsepower utilization was 74%. The company's target was to have all machines running at 90% of design horsepower and to see if better runtimes could be achieved. After five months working with Analysis, the goal was attained, runtimes were increased and the company saw a revenue increase of over \$2 million per month.



■ This Ajax DPC180 integral is performing better than ever thanks to the Analysis software package. This compressor is in sweet natural gas service, and is a single-throw, single-stage machine with one 10.5 in. (267 mm) cylinder and 171 hp derated for site elevation.

specific remedial action for correcting problems that could result in equipment failure and for adjusting operating parameters to increase throughput.

Analysis also calculates the "cash flow at risk," stated in dollar terms, for each compressor in the fleet. This calculation is the value of the available incremental production and the potential loss in throughput resulting from unscheduled downtime. Relying on this information and the recommended remedial action, companies attend first to those machines having the greatest financial impact. Companies using this system find they can quickly bring their entire fleet to maximum utilization of either horsepower or cylinder capacity.

Tim McKay, senior vice president of production at Canadian Natural Resources Limited, said "We saw the return immediately. With this program I am confident my operations are running smoothly and I'm seeing that value hit the bottom line. It's the first report I go through."

Once set up, the Analysis program becomes an important tool not only for senior managers like McKay but also for others in the organization. Wally Hasselman, senior maintenance technician at Petro-Canada Oil and Gas, said, "What I really like about the program is it increases my ability to troubleshoot problems. We can pick up a problem with a valve before it fails. We also can pick up cylinder wear or bad rings."

Casey McWhan is a production foreman with Canadian Natural Resources. He said that the Analysis software has

proven very reliable. "And we've put it to the test," he said. "Sometimes I've questioned occasional readings that come out, such as some of our blow bys. But, when we follow the directions and end up pulling a compressor — sure enough, we find a bad valve or we have bad packing just as predicted. This tool will pick it up before somebody with 20 years experience will pick it up."

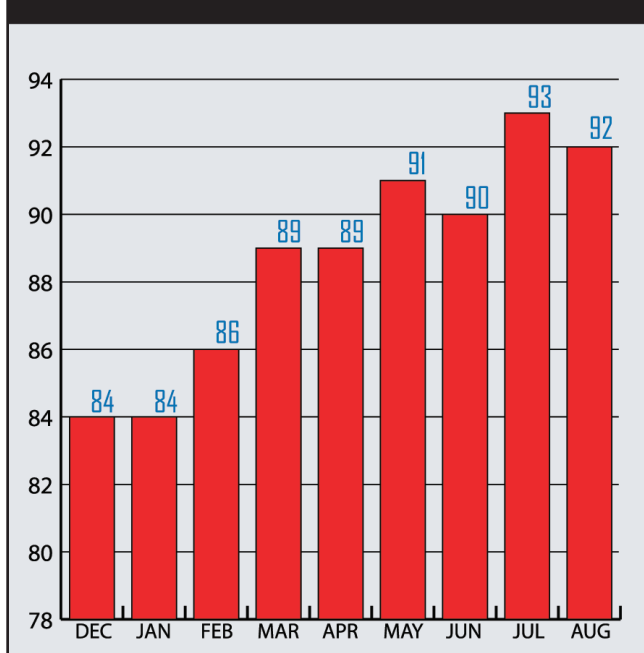
Grant Leslie, exploitation manager for Dominion Energy Canada, adds, "This software has allowed us to understand where we get the most benefit for the horsepower within the company. If we can get all the machines that we're operating up to 95 to 98% efficiency, it's a huge benefit for us."

Taylor said that a 1% increment can come from something as simple as a compressor running at 10 to 12 rpm less than a maximum rpm of 1000 to 1200, small amounts of added clearance (such as from a variable pocket open a fraction of an inch or leaking O-rings on the pocket piston); forgotten high clearance assembly under valves; blow-by due to leaking valves, rings or packing; bypass leaking or set point set too high or modification to the piston that would create more end clearance.

The chart shows the significant cash flow increments per year for a 1% improvement to a fleet of varying capacities. It assumes a gas price of about \$4/Mcf. For example, a 1% improvement on a fleet producing 50 MMscfd (1.4 x 10⁶ m³/d) results in an annual increase in cash flow of about \$700,000.

Analysis is simple to set up.

Overall Fleet Utilization



■ A client with 40 machines wanted to improve overall fleet performance. The initial performance review indicated 84% utilization for the entire fleet. Using the information provided by monthly Analysis reports, the company's operators and supervisors were able to increase their utilization to 92%, resulting in a monthly cash flow increase of more than \$1.5 million.

The software database, which is securely guarded with firewalls and password protection, is loaded with each compressor's characteristics, including design parameters, gas composition and environmental conditions.

Data is retrieved from the site, usually monthly but as often as the operator wishes, and sent to the Detection servers. As the name Analysis implies, the program receives field data and sends reports electronically. But Detection can deliver its service no matter what data acquisition and transmission methods the customer uses, whether it's with the most advanced satellite telemetry system from the most remote location, by password protected Internet transmission or simply by fax.

Andrew Lonseth, managing director of Detection, said that he thinks the Analysis package offers an exceptional value. "With millions of dollars of incremental throughput at stake, our customers are happy with our reasonable setup fee and nominal monthly charge for unlimited access," he said.

With hundreds of compressors using the program in Canada and an increasing number of new setups every month, Detection Technologies LLC is

looking forward to continued expansion in North America and, eventually, to worldwide distribution of Analysis.

Bill Carruthers, director of business development, said, "We are proud of our record in Canada. Our clients are very satisfied; every one has stayed on since we started the service. We will build on this record as we make Analysis available to compressor fleets worldwide."

The company believes that Analysis has proven to be a valuable tool for compressor operators. Its use, Carruthers said, has resulted in confident management of entire fleets and individual compressors, increased throughput, identification of unseen production potential within the fleet, enhanced preventative maintenance programs, reduced overall maintenance costs, avoidance of catastrophic failure and downtime and reduced operating costs.

Taylor will speak about Analysis and present case studies and field results at the European Forum on Reciprocating Compressors in the Netherlands in May, which will coincide with the company's planned launch of the Analysis program in Europe. ■