

REM Vue[®]—500

— Performance, Reliability and Safety through System Integration —

REM Technology Inc. introduces a single solution for the management of Natural Gas engines and reciprocating compressors.

REM Technology Inc. was founded with the goal of providing owners of reciprocating engines and compressors with solutions for improved reliability, operating performance (*fuel, emissions and throughput*) and safety. The system called “**REMVue[®]**” incorporates a patented air-fuel control and optimization system, on-line compressor diagnostics and safety shutdown control in a single scalable package. It can be configured as a stand-alone system or in conjunction with other hardware or software systems. The package offers capabilities to effectively monitor and control key compressor and engine parameters resulting in reduced fuel costs with optimized horsepower, reduced engine emissions, reduced maintenance costs and increased uptime.



REM Technology Inc. representatives conduct an audit of the engine as a first line step to determine emissions levels and set-up criteria. This audit may include engine cylinder pressure and compressor cylinder analysis, if appropriate. A portable machinery analyzer system supplies detailed engine and compressor mechanical and performance analysis data to benchmark the machine performance parameters and provide information regarding machine health, both as a condition monitoring / troubleshooting service, and as a precursor to the **REMVue[®]** installation. Analysis on engine power cylinders provides detailed performance data for precisely tuning the air/fuel ratio control system, taking into account engine speed and loading. Further analysis provides information indicating valve or ring leaks, peak pressures and misfire frequency, as well as locating problem bearings. A report summarizing the results found and any immediate remedial action required is provided to the customer as part of the system package. The same detailed analysis for emissions, fuel consumption and engine/compressor health is also done post **REMVue[®]** installation and a report summarizing the mechanical, performance and financial benefits is also provided.

AIR-FUEL RATIO CONTROLLER

The **REMVue[®]** air / fuel ratio (AFR) controller has proven beneficial to customers in many fuel-injected and carbureted engine applications. This results in both daily and annual cost savings in the areas of fuel economy and engine maintenance. A key factor is the elimination of the need for operator adjustments, which ensures the engine is operated within its specifications.

Fuel savings of 15 to 20% have been identified in existing installations.

ENGINE OPTIMIZATION

Optimization of engine performance through the introduction of an electronic governor and air / fuel ratio control system yields benefits both in engine power, efficiency and fuel consumption, as well as long-term engine maintenance. Optimization of the engine is obtained by:

- Automating manifold pressure control valves with a microprocessor based controller;
- Measuring intake manifold pressures and temperatures to calculate the air set point (*based on REMVue®-generated engine speed curves*);
- Measuring air manifold temperature to provide exhaust temperature compensation;
- Monitoring fuel flow to provide indication of fuel consumption and engine performance;
- Measuring fuel flow or fuel pressure to calculate the correct amount of air for the engine; and
- Mapping engine at RPM increments and varying load to determine AFR curves.



Control of the engine speed, as well as the air pressure for air/fuel ratio is obtained through instrumentation contained in the REMVue® cabinet that can be mounted near the engine or compressor.

- **Controller** — The controller, contained in the REMVue® cabinet, is connected to the new and existing process instrumentation. The controller's user interface is used to control engine speed and gather data on the process.
- **Fuel Pressure or Fuel Flow** — This measurement is made using a pressure transmitter run directly into the REMVue® controller.
- **Valve Control** — Valve and valve control is obtained by using the latest technology from Fisher Controls.
- **Air** —
 - **Air Pressure:** Pressure measurements are made using either absolute or gauge pressure transmitters
 - **Temperature Sensors:** Thermocouples are added to the engine and information is sent to the REMVue® for performance and condition monitoring.
 - **Air Control:** A control valve that controls the amount of air reaching the intake manifold.
- **Speed** — Due to the requirement for rapid response to RPM changes, the REMVue® controller controls engine speed. This requires an additional magnetic speed pick-up mounted at the flywheel.
- **Exhaust** — Thermocouples are added to the inputs of the REMVue® to provide information for trouble-shooting.

Through the use of the REMVue® air / fuel ratio option, many installed sites have reported significant performance improvements that include:

- **Easier starting of the engine.** Users of the REMVue® have realized substantial reductions in starter motor wear and reduced operator time for engine start-up. Engines that were typically very difficult to start now start on first attempt.
- **Better speed control.** Through the removal of the lengthy mechanical linkages of the governor, and the introduction of microprocessor-based fuel valve control for speed, RPM set point hunting has been reduced, allowing operators to run the engines at higher speeds.
- **Reduced fuel cost.** As the combustion mixture is optimized, the amount of fuel required by an engine to produce the same horsepower is reduced, resulting in immediate, tangible savings. Typical cost savings for many installations is 15-to-20 per cent in fuel consumption.
- **Reduced downtime.** The system compensates for changing load conditions or the effects that manifold temperature and pressure have on the engine, thus eliminating many of the shut-downs caused by these conditions.
- **Reduced engine maintenance.** By consistently operating a unit in a condition of optimum combustion, the added stress associated with improper mixtures is substantially reduced, increasing the mean time between failures. For some clients, this has reduced the need for premature timing chain and cylinder head replacements and reduced the stress on ignition components.
- **Reduced engine emissions.** By maintaining control of all aspects of the combustion process, stack emissions can be substantially reduced.

ON-LINE COMPRESSOR DIAGNOSTICS

The REMVue® product incorporates proven portable analyzer technology that provides Online Compressor Performance and condition monitoring. REM Technology Inc has developed the REMVue® with the philosophy of providing information in a format that is easily understood by personnel who are not specialists in diagnostics. The REMVue® interprets the measured raw data and then delivers the key measures of compressor performance and mechanical condition in engineering units that are easily understood.

Each REMVue® is programmed specifically for the engine/compressor and environment it is to be implemented. The measured results it delivers can have varying levels of limits assigned to each measured unit, which then can be used to cause or direct a course of action. This is done through energizing discrete outputs or commuted by the communications ports using Modbus RTU protocol.

The REMVue® system is designed to be mounted on the compressor skid or close to the skid as a stand-alone system or can be integrated into the existing compressor control panel. The system is UL and CSA rated for Class 1, Division 2 Non Incendive, Groups A, B, C, D, T5.

The multiple communications ports of the REMVue® system provides the ability to deliver the information to a local off-the-shelf HMI (*Human Machine Interface*) local to the panel or communicated over RS422\485\232\Ethernet to host computer or control system.

The goal of REM Technology Inc is to provide a flexible system that can be integrated into existing infrastructure and provide useful information.

REMVue® Diagnostic Key Measures:

- Compressor Cylinder Power —Head And Crank Ends;
- Compressor Cylinder Temperatures;
- Suction And Discharge Compressor Flow;
- Compression Rod Loads;
- Tension Rod Loads;
- Flow Balances for Leak Notification;
- Rod Load Reversal Points;
- Suction Valve Loss;
- Discharge Valve Losses;
- Suction Volumetric Efficiency;
- Discharge Volumetric Efficiency;
- Cylinder End and Total Compressor Throughput;
- Compressor Efficiency;
- Flows And Balances; and
- Cross Head Vibration Impact.

Through the use of the REMVue® air / fuel ratio option, many installed sites have reported significant benefits that include:

- Reduce Maintenance Costs.
- Reduce Operation Costs.
- Increase Production/Throughput.

SAFETY SHUT-DOWN CONTROL

Safety shut-down is a mandatory requirement on any engine / compressor system. REMVue® combines the safety shutdown functions with the air-fuel ratio and compressor analysis functions to fully utilize the inputs not only for protection, but also for analysis and optimization. The integration of these functions reduces panel size, eliminates sensor duplication and provides ease of use for site personnel. All information regarding air-fuel ratio, compressor analysis and protection are displayed on one common interface located on the REMVue® panel.

The REMVue® safety shut-down system uses programmable technology to maximize functionality and flexibility to meet a wide range of applications and customer specific needs. As an integrated system, engine and compressor speed, temperature, pressure, flow, etc. are monitored and controlled with the REMVue® optimization / diagnostic system, making safety shutdown a logical addition to the package.

In summary, the REMVue® system, incorporating air-fuel ratio control, safety shutdown control and built-in diagnostics in an integrated package has been installed in over 400 systems in United States, Canada and the North Sea. Customers like BP and Chevron have embraced REMVue® technology and are installing systems to increase uptime, decrease fuel consumption, increase production and improve emission levels.