



VALORAZ

TRUSTED INDUSTRIAL TECHNOLOGY PROVIDER

SERVICES



RECIPROCATING MACHINERIES DIAGNOSTIC

www.valoraz.com.my



MONITORING & ANALYSIS FOR RECIPROCATING COMPRESSORS & ENGINES

Portable Analyzers : CA(Combustion), MA(Maintenance), DA(Diesel), PA(Performance) VA(Vibration)
 Online Monitoring : Windrock Platinum, On-Guard Products, AutoBalance™
 Technical Services : Analysis, Field Service, Consultation, Analyst & On-site Training
 Remote Monitoring : Real-time, Alarming, Performance Reporting, Trending

Windrock 6320 Portable Reciprocating Machinery Analyzers

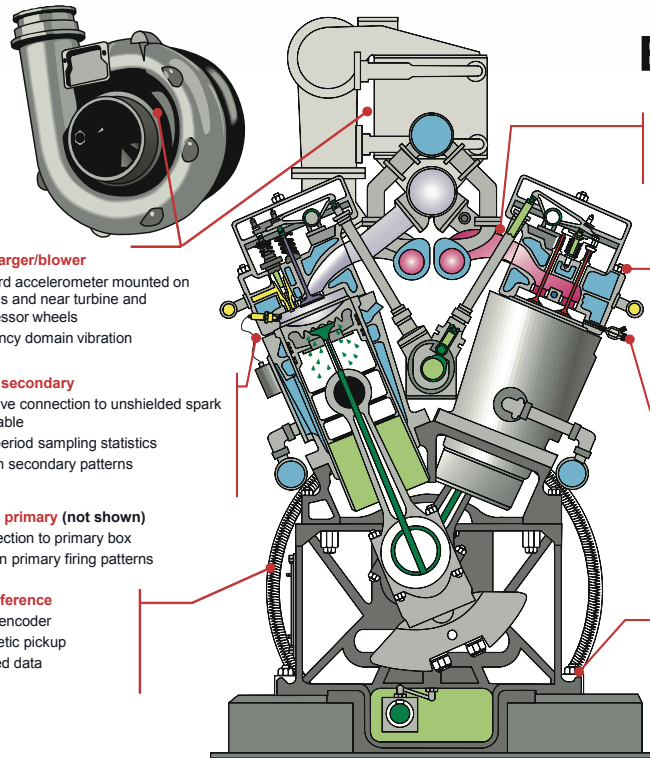
Detectable Malfunctions Using the 6320/PA

Engine

- Ignition System Deficiencies
- Peak Firing Pressure Imbalance
- Defective Fuel Injectors & Valves
- Leaking Valves and Rings
- Worn or Scored Liners
- Intake/Exhaust Port or Bridge Wear
- Worn or Defective Valve Train Components
- Damaged Connecting Rod & Wrist Pins
- Damaged Bearings
- Turbocharger Defects
- Jacket Water & Lube Oil Pump Faults
- Excessive Frame Vibration
- Foundation or Grout Damage
- Low Horsepower Output
- Poor Fuel Consumption
- Excessive Exhaust Emission Factors

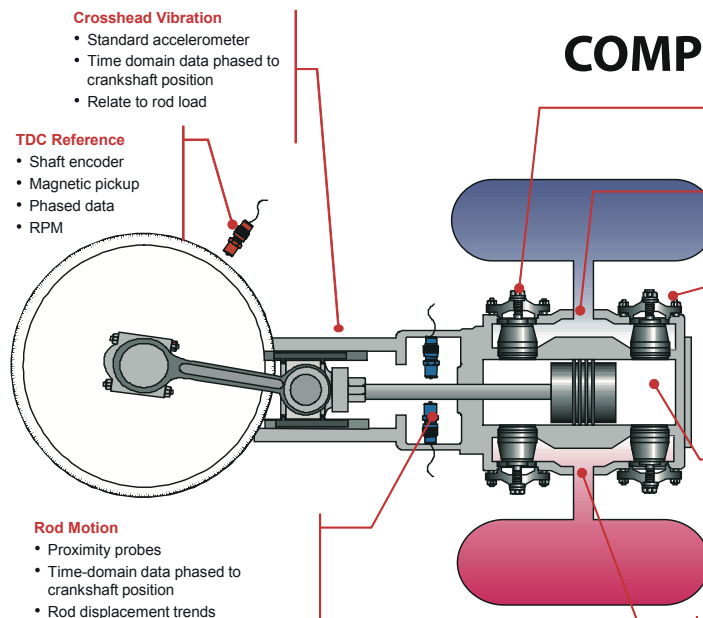
Compressor

- Mechanical Looseness on Piston & Nut, Cross Head Pin & Bushing
- Leaking Valves & Rings
- Cylinder & Piping Pulsations
- Passage Flow Restrictions
- Defective Unloaders
- Excessive Rod Loading
- Inadequate Rod Reversal
- Liner & Rider Band Wear
- Excessive Valve Losses & Deficiencies
- Low Capacity
- Poor Engine & Compressor Frame Condition
- Lack of Skid & Foundation Structural Integrity
- Malfunctions with Rotating Accessories



ENGINE DATA

- Turbocharger/blower**
 - Standard accelerometer mounted on bearings and near turbine and compressor wheels
 - Frequency domain vibration
- Ignition secondary**
 - Inductive connection to unshielded spark plug cable
 - Multi-period sampling statistics
 - Ignition secondary patterns
- Ignition primary (not shown)**
 - Connection to primary box
 - Ignition primary firing patterns
- TDC Reference**
 - Shaft encoder
 - Magnetic pickup
 - Phased data
 - RPM
- Cylinder exhaust temperatures**
 - Infrared temperature wand
 - pyrometer
- Cylinder, valve, wrist pin and bearing vibration**
 - Ultrasonic microphone
 - Standard accelerometer
 - Time domain data phased to crankshaft position
- Cylinder pressure**
 - Pressure transducer
 - Time domain data phased to crankshaft position
 - Peak pressure statistics
- Frame vibration (displacement)**
 - Tri-axial accelerometer (H, V, A) taken at opposite corners of engine frame
 - Frequency domain data



COMPRESSOR DATA

- Crosshead Vibration**
 - Standard accelerometer
 - Time domain data phased to crankshaft position
 - Relate to rod load
- TDC Reference**
 - Shaft encoder
 - Magnetic pickup
 - Phased data
 - RPM
- Rod Motion**
 - Proximity probes
 - Time-domain data phased to crankshaft position
 - Rod displacement trends
- Valve cap temperatures**
 - Infrared temperature wand
- Suction/discharge temperatures**
 - Infrared temperature wand
 - thermocouples, RTDs
- Suction/discharge valve vibration
Compressor ring leak vibration
Liner scoring**
 - Ultrasonic microphone
 - Standard accelerometer
 - Time domain data phased to crankshaft position
- Head/crank end pressure**
 - Pressure transducer
 - Time domain data phased to crankshaft position
 - Multi-period sampling statistics
- Suction/discharge nozzle pressure**
 - Pressure transducer
 - Time domain data phased to crankshaft position (valve/passage loss calculations)
 - Frequency domain (pulsation spectrum)
 - Multi-period sampling statistics
- Frame vibration (displacement)**
 - Tri-axial accelerometer (H, V, A) taken at opposite corners of engine frame
 - Frequency domain data

For inquiries please email us
at sales@valoraz.com.my



Diagnostic Activities - Scope Overview

Visual Inspection

- Review the operational and maintenance history of the unit
- Visually identify instrumentation and accessory deficiencies
- Using infrared equipment, record important temperatures where instrumentation is not available
- Using Ultrasonic translator equipment, identify all compression leaks around spark plugs, head gaskets, fuel valves and pre-combustion cells; fuel leaks; air and process leaks including packing, valve caps, unloaders, recycle, bypass and blow-down valves

The analyst will listen and look for abnormalities in the normal operation of the unit and use these notes to help focus and direct the analysis process. If conditions indicate, the analyst will use the spectral vibration capability of the analysis equipment to check for excessive skid, frame and cylinder movement.

Ignition System Analysis

The analyst will gather statistical data on the secondary ignition system to determine accurate timing and ionization voltage information and measure the secondary arc duration, arc voltage, rise time, ring-down voltage, arc slope, no combustion and no arc events.

The analyst will observe and record the real time expanded secondary patterns to determine if there are problems with the spark plug wires, connections, transformers and primary wiring.

Compressor End Analysis

If an accurate TDC reference is available and pressure indicator valves are installed, the analyst will measure the horsepower being consumed in each end of each cylinder, add the appropriate parasitic and accessory loads and provide the customer with a total BHP load and torque for the unit.

The suction and discharge volumetric efficiencies, flow rate, theoretical temperatures, clearances and horsepower will be measured or calculated as appropriate. The analyst will compare the measured data to these calculations and this comparison, along with measured valve cap temperatures, vibration and ultrasonic vs. crank-angle patterns, will allow the analyst to pin-point performance deficiencies related to design or mechanical deficiencies.

If indicator valves are installed in the cylinder suction and discharge cavities, valve power losses can be measured. Vibration vs. crank-angle testing will be used to evaluate the frame components including crosshead components and bearings. Pressure, vibration and ultrasonic vs. crank-angle will be used to evaluate rings, riders, valves and capacity control devices.

Static rod loads will also be measured. If detailed reciprocating weights are available, the dynamic rod loads will be measured and graphed with a calculation of available rod reversal in degrees of crankshaft rotation.

Power End Analysis

Ultrasonic and vibration vs. crank-angle will be used to determine all event angles and identify deficiencies related to intake, exhaust and fuel valves; pistons, liners, rings, wrist pins, bushings and bearings. Deficiencies will be identified related to valve timing, cam and actuating components, valve lash, etc.

If pressure indicator valves are installed, pressure will be measured at each degree of crankshaft rotation, developed horsepower will be measured and the unit balance will be measured. The pressure information is a valuable performance indicator and can add valuable information to the mechanical condition analysis process. Complete statistical information will be gathered.

Many high speed engines have no provisions for indicator valves. Small separation between cylinders and a high incidence of vibration cross-talk presents the opportunity to miss real problems and mistakenly identify a normal event as a deficiency.

To reduce this problem, we utilize state of the art digital, real time analysis equipment allowing our analysts to visually see these cross-talk relationships. In addition, our Technical Services analysts have more than 400 years of combined experience in testing and diagnostics.

REPORT

A Field Summary Report will be prepared and left on-site at the completion of the analysis visit. This report will include general performance information and a list of deficiencies that require the customer's attention prior to receiving the formal report.



The formal report will be prepared in pdf format in the analyst's office and will typically include the following:

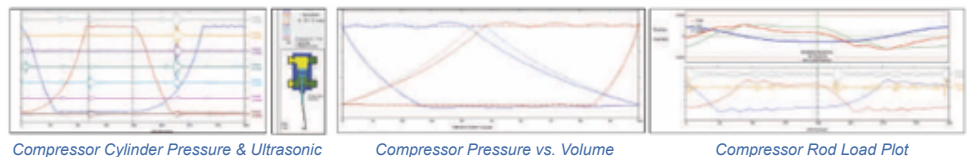
- Power Cylinder Performance Report (if indicator valves are present)
- Secondary Ignition Peak Voltage and Timing Report (unshielded only)
- Secondary Ignition Critical Parameters Report (unshielded only)
- Compressor Cylinder Performance Report (if indicator valves are present)
- Manual Panel and Temperature Report
- Vibration level report if FFT data was collected
- Plots of all data
- Priority coded Deficiency List with recommended corrective action.

Typical Workflow

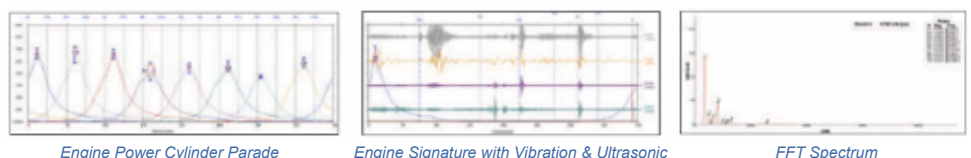
- Meeting and briefing with operators and field personnel.
- Shutdown and purging (if applicable) of reciprocating compressor / engine.
- Rotate crankshaft for the purpose of marking TDC on the #1 cylinder. Mark exposed shaft or coupling.
- Install pressure indicator valves.
- Install shaft encoder. Shaft encoder requires pulling-off the shaft inspection cover or the small compressor plug inline of the shaft, or,
- Install multi-event encoder. This requires setting up the optical pickup sensor and sticking a piece of reflective tape to the shaft.
- Restart the machine.
- Setting-up and staging of the equipment.
- Collect all internal pressure data from indicator valves using a pressure transducer.
- Collect all vibration and ultrasound data using accelerometers and ultrasonic transducer.
- Collect temperature data and gauge readings.
- Uninstall analyzer equipment setup and re-install safeguards.

Typical Graph Plot

Compressor



Engine



For inquiries please email us
at sales@valoraz.com.my