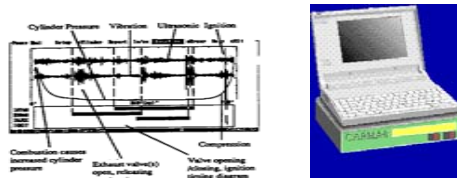


**CARMA®**

**COMPUTER ASSISTED RECIPROCATING MACHINERY ANALYSER**



THE ONLY PORTABLE ANALYZER WITH:

- REAL TIME DISPLAY - 4 CHANNELS
- UP TO EIGHT CHANNELS ACQUIRED
- PC COMPUTER & SOFTWARE BASED
- EXTENSIVE ANALYSIS / TRENDING
- VIBRATION/ULTRASOUND/PRESSURE

PERFORMANCE FEATURES:

- INDICATED POWER / BHP / KW
- PEAK PRESSURE / ANGLE
- VALVE EVENT & DIAGNOSTICS
- DIESEL CYCLE SIGNATURES
- REDUCED FUEL CONSUMPTION
- GAS COMPRESSOR DATA & PERFORMANCE SURVEYS

POWERFUL TOOL FOR OPTIMUM

MACHINERY OPERATIONS:

- MAINTENANCE WORK REDUCED
- SPARE PARTS SAVINGS
- EXTENDED OVERHAUL FREQUENCY
- REDUCED DOWNTIME

**TRAINING COURSES / PROGRAMS**

Many plants have a vibration analysis program and call that single program their "Predictive Maintenance Program". Vibration analysis is an important link in the chain of reliability centered maintenance. If a motor control center fails due to a high resistance joint on one of the electrical connections, the machine comes down and production stops just as surely as if a bearing had failed. The same reasoning holds true for all programs without proper training and support.



**ATT** will use the results of the On The Job Training / Audit in initial evaluation to develop a specific training program tailored to your facility. Training packages for the Vibration Institute®



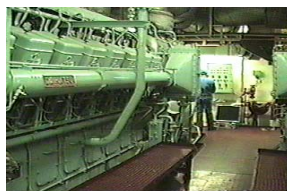
Machinery Vibration Analysis, CARMA™ Reciprocating Equipment Analysis, and an ASNT® Infrared Thermography Certification course. Training programs are directed to establishing a fundamental knowl-

edge base that will continue to grow with the personnel. This knowledge base will also bring a innovative and rewarding maintenance culture to the client's fleet and personnel.

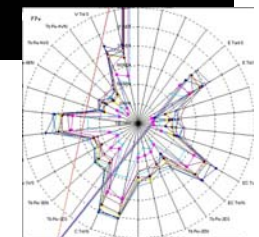
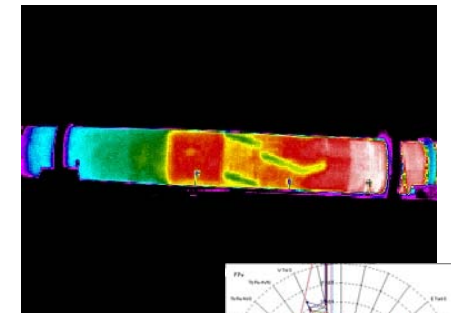


"It is impossible to solve significant problems with the same level of knowledge that created them "

Albert Einstein



- Infrared Inspection
- Vibration Analysis
- Laser Alignment & Balancing
- Motor Current Testing
- CARMA® Engine Analysis
- Training & Certification



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In business today, it's all about reaching for the next level of productivity, improving efficiency, maximizing yields, and building the skills of your staff. Tens of thousands of maintenance professionals around the world have learned that by applying more technology to their problems, they can be more effective.

**ATT** understands this and continues to pioneer the advancement of our technical expertise and field applications to better assist in solving our clients maintenance challenges. Our staff of professional engineers and technical personnel are experienced and certified for both industrial and marine solutions.

**ATT** offers a full range of on-site inspection services, condition monitoring, machine evaluation testing, program setup, as well as training with certification in infrared thermography and vibration analysis from our Level 3 ASNT-TC1A certified instructors.

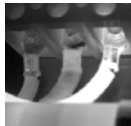


## Marine Application Examples

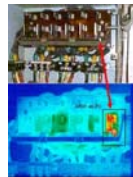
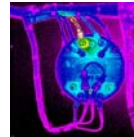
### Infrared Thermography:

#### The Basics

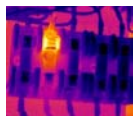
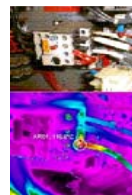
All matter above absolute zero, continuously emits energy to the environment in the form of infrared radiation. This emitted infrared energy is detectable and quantified as an object's temperature through the technique of infrared thermography. The human eye can "see" in a very narrow margin of the electromagnetic spectrum in the wavelength ranges from .4 to .7 microns. The infrared portion of the spectrum ranges from 1 to 100 microns and the amount of energy radiated at any given wavelength is dependent on the temperature. By applying the fundamental laws, the amount of energy radiated can be predicted and quantified. While the physics of thermography are well established, the interpretation of the thermal images are still to some degree qualitative.



In **Electrical Inspections** faulty electrical components almost always generate heat before failing and causing an open circuit or in a worst case scenario, fire. As a matter of interest, heat is generated from an electrical component directly proportional to the square of the current passing through it multiplied by the components resistance or  $P = I^2R$ . As the condition of the component deteriorates, it's resistance increases and generates more heat and as this temperature rises so then does the resistance. This self propagating process continues until the melting point of the weakest component is reached. Because heat loss is in direct proportion to current flow, overload conditions can also be identified and faulty components classified in order of severity.

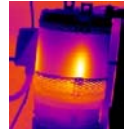
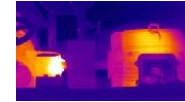


In **Electrical Distribution** main buss runs can have a critical impact on systems and equipment being supplied. Investigation of temperature rises associated with a main distribution buss is primary.

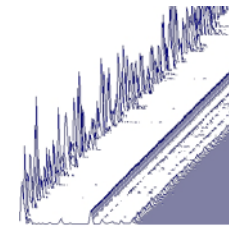


**Controller** inspections such as MCC connectors, breakers, fuses, transformers, and instrumentation can be identified quickly and effectively.

**Mechanical** inspections, can provide quick and accurate information on the condition of bearings, motor windings and valves.



### Vibration Analysis :



Vibration analysis monitoring & trending programs using time waveform & frequency spectrum information to evaluate condition of machines. Frequency plot identifies operating speed fault of machine components such as blade or vane pass on fans or pumps impellers. Magnitude

over time represents physical change in condition of machines. Waterfall analysis can graphically show transient vibration on start up or display frequency spectrums over time for trending vibration readings.



### Laser Alignment :

**ATT** is setting new standards for simplicity and precision in shaft alignment of coupled & uncoupled horizontal and vertical rotating machinery. Through the use of state of art technologies cost reductions in energy consumption, maintenance, prolonged life of bearings, gears, mechanical seals and couplings, reduced vibration and operating temperatures.



### Field Balancing :

Precision Balancing is another corrective techniques for vibration control, and extending the life of new or existing machinery installations. **ATT** provides this service in single or multi-plane applications.

