

CRITICAL MAINTENANCE TECHNIQUES YOUR FACILITY MAY BE OVERLOOKING

INFRARED TESTING / LASER ALIGNMENT / ULTRA SONIC GREASING /
VIBRATION ANALYSIS

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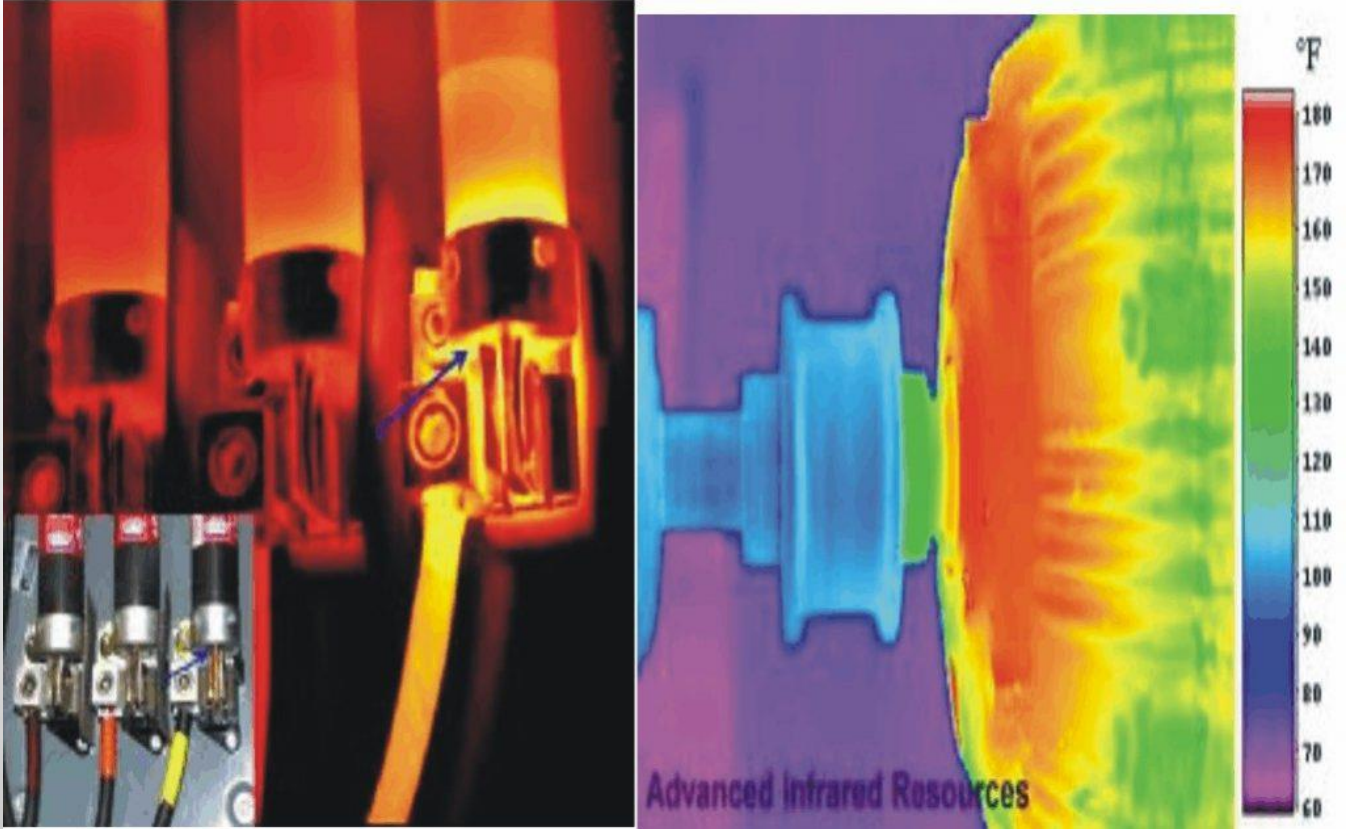
INFRARED TESTING / MECHANICAL AND ELECTRICAL

- **INFRARED ELECTRICAL AND MECHANICAL TESTING** INVOLVES THE USE OF INFRARED TECHNOLOGY TO DETECT ANOMALIES IN ELECTRICAL AND MECHANICAL SYSTEMS. INFRARED ELECTRICAL TESTING CAN IDENTIFY ISSUES SUCH AS LOOSE CONNECTIONS, OVERLOADED CIRCUITS, AND FAULTY EQUIPMENT BY DETECTING ABNORMAL HEAT PATTERNS. ON THE OTHER HAND, INFRARED MECHANICAL TESTING CAN BE USED TO IDENTIFY PROBLEMS IN MECHANICAL SYSTEMS SUCH AS BEARINGS, MOTORS, AND OTHER MOVING PARTS BY DETECTING TEMPERATURE VARIATIONS. THIS NON-INVASIVE METHOD OF TESTING ALLOWS FOR THE EARLY DETECTION OF POTENTIAL FAILURES, HELPING TO PREVENT COSTLY DOWNTIME AND REPAIRS.

PIPING HEAT



IDENTIFY ELECTRICAL / BEARING ISSUES



SWITCH GEAR ISSUES



INFRARED TESTING / MECHANICAL AND ELECTRICAL

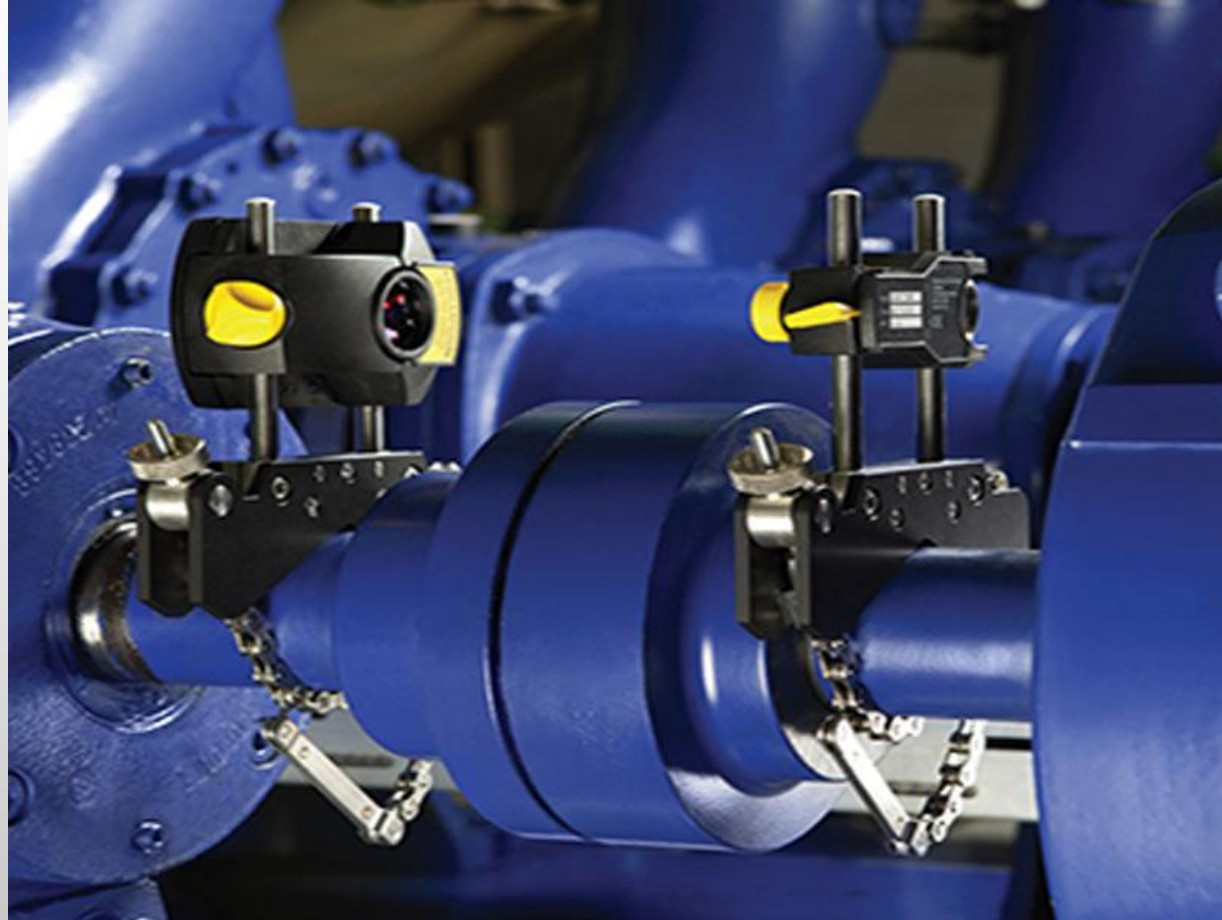
- LEVEL 1 AND LEVEL 2 ITC CERTIFICATIONS FOR THERMOGRAPHY



LASER ALIGNMENT

- **LASER ALIGNMENT** IS A PRECISION MAINTENANCE TECHNIQUE USED TO ALIGN MOTORS AND PUMPS. IT INVOLVES USING LASER TECHNOLOGY TO ACCURATELY ALIGN THE SHAFTS OF THE MOTOR AND PUMP, ENSURING THAT THEY ARE PERFECTLY ALIGNED . THIS PROCESS HELPS TO REDUCE WEAR AND TEAR ON THE EQUIPMENT, , INCREASE SEAL LIFE , DECREASE BEARING HEAT , DECREASE COUPLING PROBLEMS , IMPROVE ENERGY EFFICIENCY, AND PREVENT PREMATURE FAILURE.

LASER ALIGNMENT PUMPS AND MOTORS



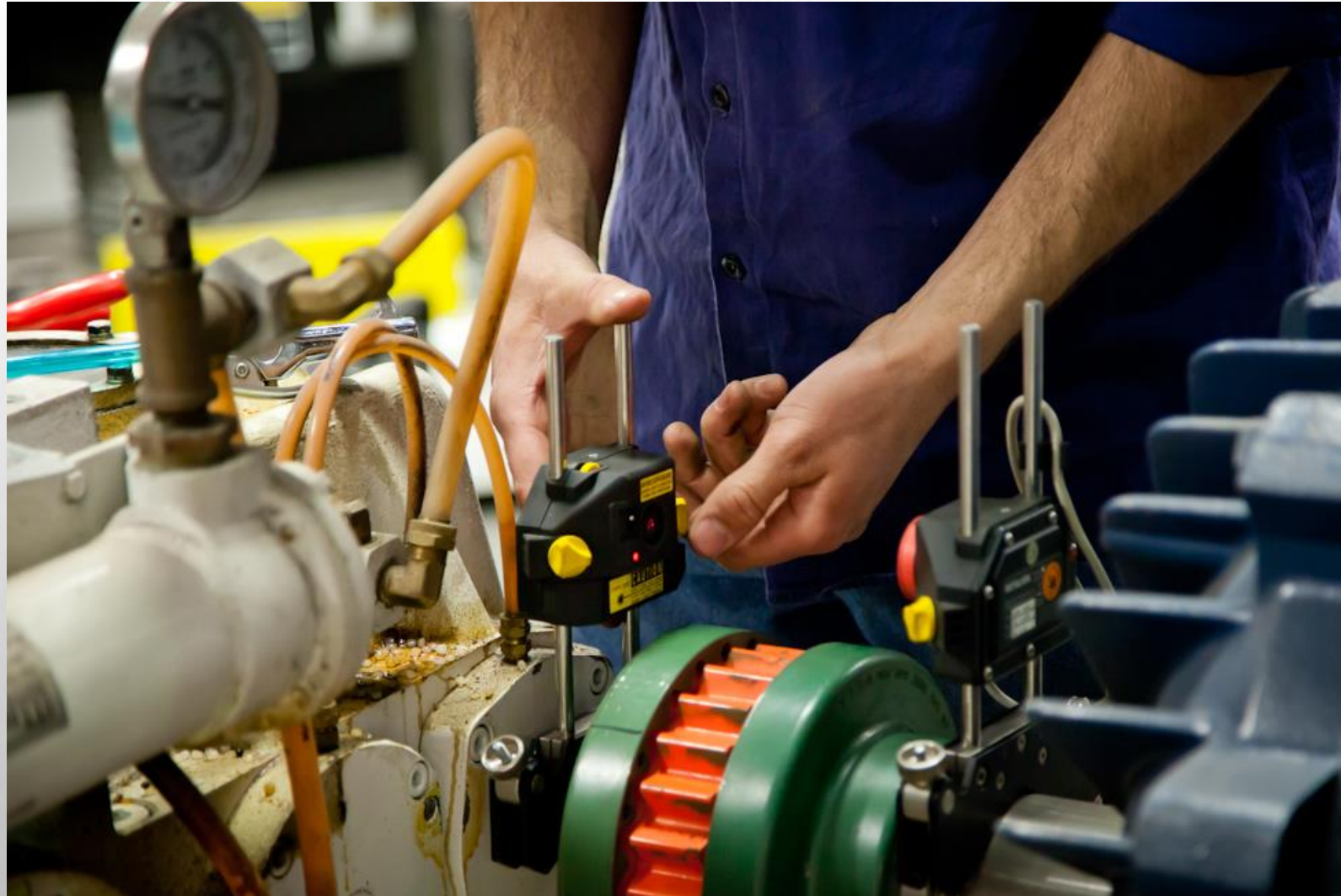
LASER ALIGNMENT TOOLS



EXAMPLE OF IMPROPER ALIGNMENT / VIDEO

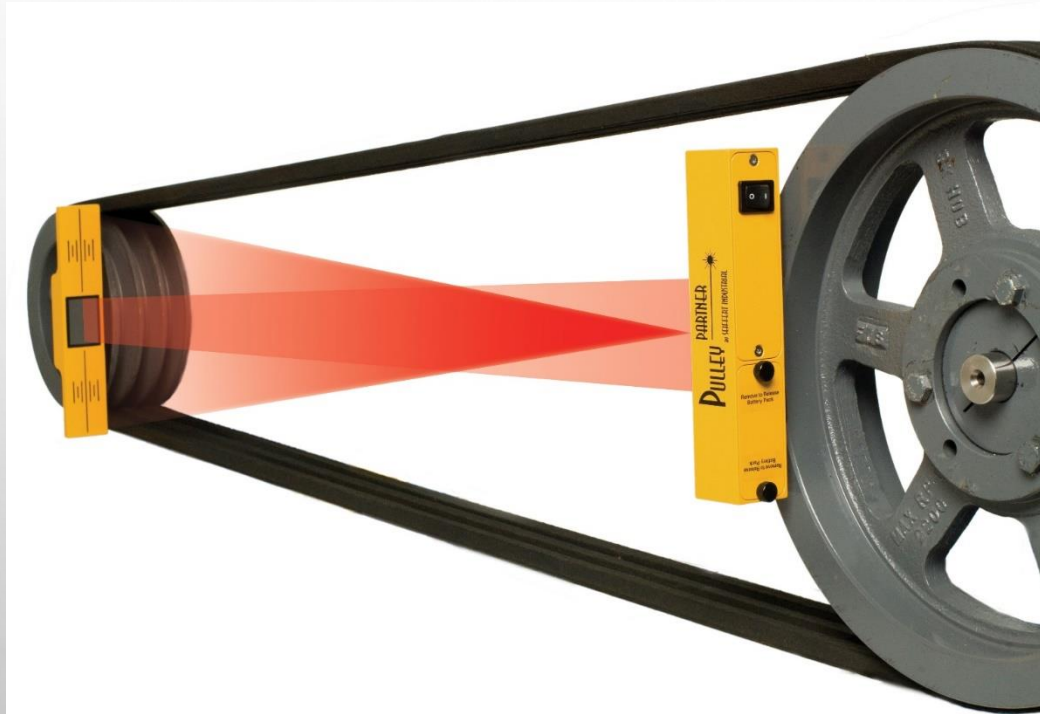
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LASER ALIGNMENT TOOLS



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LASER ALIGNMENT BELTS AND PULLEYS



ULTRASONIC GREASING OF MOTORS AND PUMPS

- ULTRA SONIC GREASING IS A METHOD USED TO LUBRICATE MOTORS AND PUMPS USING ULTRASONIC ENERGY TO APPLY THE GREASE. THIS TECHNIQUE ALLOWS FOR MORE EFFICIENT AND UNIFORM APPLICATION OF GREASE, REDUCING FRICTION AND WEAR ON THE EQUIPMENT, ULTIMATELY EXTENDING THEIR LIFESPAN AND IMPROVING PERFORMANCE . MORE MOTORS FAIL DUE TO OVER GREASING THAN UNDER GREASING . VERY EASY TO USE AND 100 PERCENT PROVEN EFFECTIVE .

IMPACTS OF IMPROPER GREASING

OVER-GREASING EQUIPMENT IN WATER AND WASTEWATER TREATMENT PLANTS CAN LEAD TO EXCESSIVE LUBRICANT CONSUMPTION, INCREASED OPERATING TEMPERATURES, AND POTENTIAL ENVIRONMENTAL CONTAMINATION. IT CAN ALSO CAUSE EQUIPMENT MALFUNCTION AND PREMATURE FAILURE. ON THE OTHER HAND, UNDER-GREASING CAN RESULT IN INCREASED FRICTION, WEAR, AND POTENTIAL DAMAGE TO THE EQUIPMENT COMPONENTS. PROPER GREASING PRACTICES ARE ESSENTIAL TO ENSURE OPTIMAL PERFORMANCE AND LONGEVITY OF THE EQUIPMENT IN WATER AND WASTEWATER TREATMENT PLANTS.

ULTRASONIC GREASE GUN



ULTRASONIC GREASE GUN



ULTRASONIC GREASE GUN



GREASE GUN METER



GREASE GUN METER



VIDEO OF ULTRASONIC GREASING

- [HTTPS://YOUTU.BE/UGSYE9NOM1I?SI=STM1E8V5A_HZVO0P](https://youtu.be/UGSYE9NOM1I?si=STM1E8V5A_HZVO0P)

TRAINING AND CERTIFICATION FOR ULTRASOUND

**COMPANY
PRESENTATION
UE SYSTEMS**

**WORLD LEADER
IN PROVIDING
ULTRASOUND
SOLUTIONS**



ue
SYSTEMS INC
The ultrasound approach



VIBRATION ANALYSIS FOR MOTORS AND PUMPS

- VIBRATION ANALYSIS IS A CRUCIAL TOOL FOR DIAGNOSING AND PREDICTING THE HEALTH OF MOTORS AND PUMPS. IT INVOLVES MEASURING THE VIBRATIONS PRODUCED BY THE EQUIPMENT AND ANALYZING THE DATA TO IDENTIFY ANY ABNORMALITIES OR POTENTIAL ISSUES.
- THERE ARE SEVERAL METHODS USED IN VIBRATION ANALYSIS, INCLUDING:
- TIME-DOMAIN ANALYSIS: THIS METHOD INVOLVES MEASURING THE VIBRATION OF THE EQUIPMENT OVER TIME AND ANALYZING THE DATA TO DETECT ANY CHANGES OR ANOMALIES.
- FREQUENCY-DOMAIN ANALYSIS: THIS METHOD INVOLVES MEASURING THE FREQUENCY CONTENT OF THE VIBRATIONS AND COMPARING IT TO EXPECTED FREQUENCIES TO DETECT ANY ISSUES.
- ORDER TRACKING ANALYSIS: THIS METHOD INVOLVES ANALYZING THE VIBRATION DATA TO DETERMINE THE ORDER OF THE VIBRATIONAL FREQUENCIES AND DETECT ANY CHANGES OR ANOMALIES.
- BY USING THESE METHODS, TECHNICIANS CAN IDENTIFY POTENTIAL ISSUES WITH MOTORS AND PUMPS, SUCH AS IMBALANCE, MISALIGNMENT, AND BEARING WEAR, BEFORE THEY BECOME MAJOR PROBLEMS. THIS CAN HELP PREVENT EQUIPMENT FAILURE AND COSTLY REPAIRS.



VIBRATION ANALYSIS

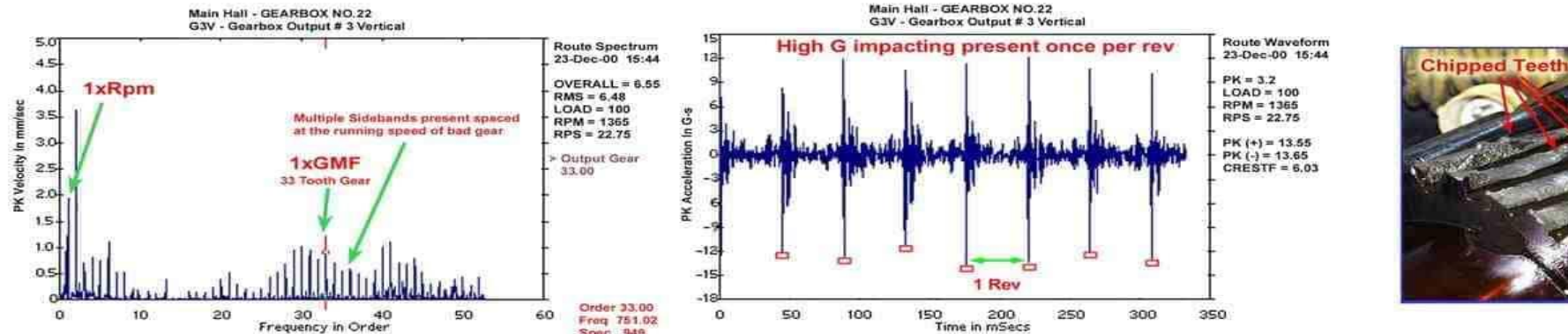
- **SUMMARY OF VIBRATION ANALYSIS RESULTS:** THE VIBRATION ANALYSIS RESULTS PROVIDE INSIGHTS INTO THE CONDITION OF MACHINERY OR STRUCTURES. THEY TYPICALLY INCLUDE MEASUREMENTS OF VIBRATION LEVELS, FREQUENCIES, AND PATTERNS. HIGH VIBRATION LEVELS MAY INDICATE POTENTIAL ISSUES SUCH AS MISALIGNMENT, UNBALANCE, OR BEARING FAULTS. THE FREQUENCY ANALYSIS HELPS IDENTIFY THE SOURCE OF VIBRATIONS, WHILE PATTERNS CAN REVEAL SPECIFIC TYPES OF FAULTS.
- **INTERPRETATION OF RESULTS:** HIGH VIBRATION LEVELS CAN SIGNIFY PROBLEMS LIKE MISALIGNMENT, UNBALANCE, OR BEARING FAULTS. FREQUENCY ANALYSIS HELPS PINPOINT THE SOURCE OF VIBRATIONS, SUCH AS ROTATIONAL SPEED OR NATURAL FREQUENCIES. PATTERNS IN THE DATA CAN INDICATE SPECIFIC TYPES OF FAULTS, LIKE GEAR MESH PROBLEMS OR SHAFT MISALIGNMENT.

VIBRATION ANALYSIS



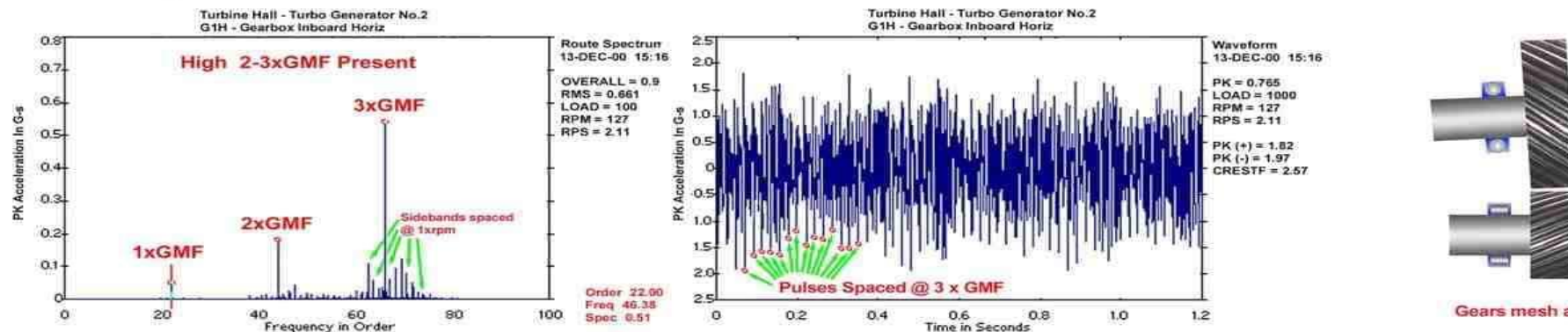
VIBRATION ANALYSIS / IDENTIFYING PROBLEMS

Chipped / Broken Gear Teeth



A single chipped or broken gear tooth will produce a 1xRPM vibration. It is difficult to identify this problem using spectral data alone, as the characteristic frequency can easily be confused with other problems occurring at 1xRPM. The key of identifying this problem is by using the time domain, where a once per revolution (1xRPM) impact will be generated for every revolution of the gear. The time waveform taken in acceleration, ensuring that the time period set-up captures as many shaft revolutions as possible.

Misaligned Gears



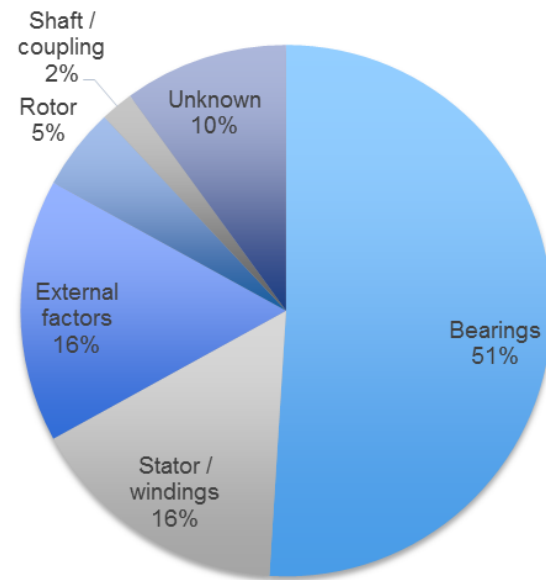
Misaligned gears will generally produce raised vibration amplitudes at 2xGMF and 3xGMF, which will typically be sidebands spaced at 1xRPM or 2xRPM. Therefore, it is essential to always capture at least 3.5xGMF when either troubleshooting or taking routine data. In general terms viewing both the time waveform and spectral data in acceleration provides the best representation of the problem.



BEARING FAILURE CAUSES



MAIN CAUSE OF MOTORS FAILURES



The five reasons why motors fail. Bearings cause more than half of motor failures.

FLUTING ON MOTOR BEARINGS

- **FLUTING ON MOTOR BEARINGS** OCCURS WHEN THERE ARE REPETITIVE INDENTATIONS OR MARKS ON THE BEARING RACEWAYS, OFTEN CAUSED BY ELECTRICAL CURRENTS PASSING THROUGH THE BEARINGS . THIS PHENOMENON CAN LEAD TO PREMATURE BEARING FAILURE AND SHOULD BE ADDRESSED BY IMPLEMENTING PROPER GROUNDING AND INSULATION MEASURES TO PREVENT ELECTRICAL CURRENTS FROM FLOWING THROUGH THE BEARINGS. DRIVES ARE ONE OF THE LEADING CAUSES OF SHAFT CURRENT .



FLUTING OF BEARING



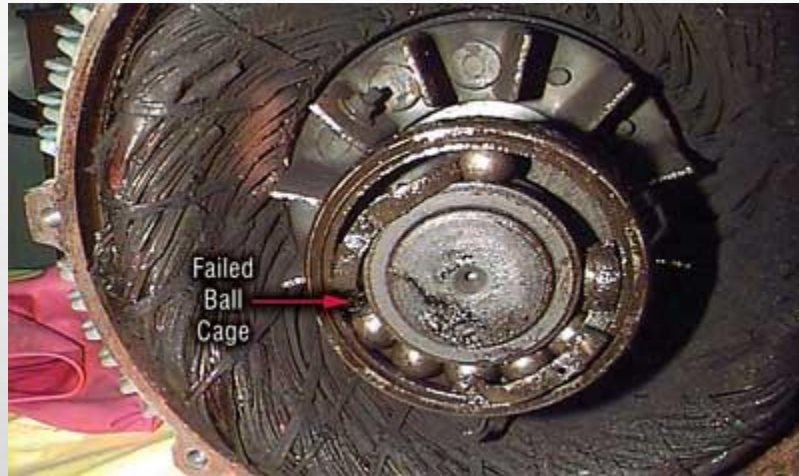
BEARING FAILURE



BEARING SCORCHED



BEARING FAILED BALL CAGE



TRAINING AND CERTIFICATION FOR VIBRATION ANALYSIS

- VIBRATION INSTITUTE
- UDEMY ONLINE
- MOBIUS
- RELIABILITY
- FPA
- OTHERS ON INTERNET

MAINTENANCE RECOMMENDATIONS & OVERVIEW

- **EVALUATE THE PROPER PROCEDURES FOR YOUR FACILITY AND EQUIPMENT**
 - REPEATABLE – SET A WEEKLY, MONTHLY, QUARTERLY SCHEDULE – **ASK ME ABOUT A.I. MAINTENANCE SCHEDULES!**
 - ACHIEVABLE – MAKE SURE YOU CAN CONSISTENTLY MEET THE SCHEDULE
 - CONSIDER OUTSOURCING ITEMS YOU CANNOT CONSISTENTLY GET TO.
 - MEASURABLE – WRITE DOWN AND SAVE THE RESULTS!
 - ACTIONABLE – PRIORITIZE CRITICAL / HIGH DOLLAR / LONG LEAD TIME EQUIPMENT





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QUESTIONS & COMMENTS

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