Creating a Dynamic Performance Baseline for Army Tactical Power Generators Using Motion Amplification®
Part 2—Addressing Mechanical Looseness at the Engine-Generator Adapter

RDI TECHNOLOGIES

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Industry:
Defense Depot, US Army

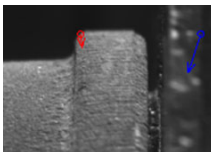
THE CHALLENGE

The PATRIOT Missile Defense System (MDS) relies on a stable electrical power source for peak performance. During initial testing of the 15 kW/400 Hz Advanced Medium Mobile Power Sources (AMMPS), structural resonance was identified as the cause of stator weld fractures, leading to catastrophic generator failures. To address this, the Integrated Fires Mission Command (IFMC) developed a stiffening and damping kit to mitigate the resonance issue.

However, it was critical to ensure the consistent installation of the kit and validation of its effectiveness in real-world conditions. IFMC needed a reliable method to verify the repeatability of the kit installation, confirm its performance in post-production operations, and guarantee maximum generator efficiency during combat operations.

THE SOLUTION

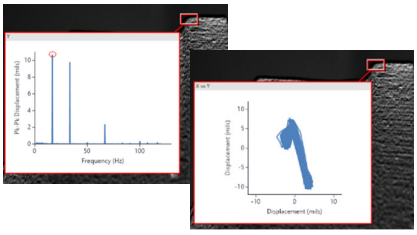
The normal operating baseline established by Cintel service technician David Aebischer, using the Iris M™ System and Motion Amplification® software, played a crucial role not only in validating production assets but also in identifying and characterizing additional defects. During the analysis of spectrum, waveform, and orbit data collected from production assets, Cintel personnel noted one particular set exhibited significantly elevated spectrum values at 0.5x TS and 1x TS on the X-axis, and at 0.5x TS, 1x TS, and 2x TS on the Y-axis.



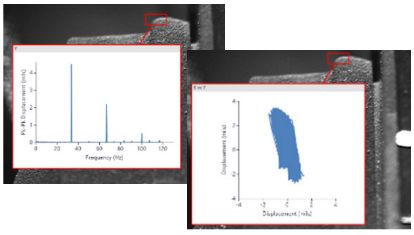
Additionally, the orbit plot revealed an abnormal "Tomahawk" shape, indicative of a pivoting motion that was confirmed in the amplified video. David used the RDI Phase Map and Phase Marker functions to demonstrate that the engine adapter and generator were moving out of phase. He then conducted a series of tests under the same conditions with varying torque values, showing that increased clamping force mitigated the mechanical looseness. Retests on other production assets using phase markers revealed early-stage mechanical looseness in most cases. This led to new procedures to apply the increased torque value across the fleet, ensuring enhanced operational stability.

THE RESULTS

- **Motion Amplification® (MA) established a dynamic performance baseline for each PATRIOT generator, enabling precise evaluation and monitoring.**
- **MA baseline allowed Cintel to detect, assess, and quantify a mechanical looseness issue, which was responsible for excessive vibration in the 15 kW/400 Hz generator.**
- **Cintel's analysis supported by MA data**:
  - drove **an improved installation process for the engine adapter.**
  - created **new dynamic baseline parameters to ensure early detection of potential failures.**



Pre-treatment RDI Motion Amplification® Plots for Y axis spectrum show elevated values for 1 x TS, 2 x TS, and ½ x TS. Orbit plot shows abnormal shape.



Post-treatment RDI Motion Amplification® Plots for Y axis spectrum show values returned to normal baseline values and orbit plot returned to normal shape after increasing torque value on engine adapter bolts.

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