

Structural Integrity Monitoring, CAT 793 Haul Truck

ALBANIA, LA GUAJIRA, COLOMBIA / STRUCTURAL

CHALLENGE

The operator's CAT 793D haul truck fleet was undergoing comprehensive structural overhauls, with cracks repaired and sections replaced, yet chassis frames were not reaching their expected operating life between interventions. The operator needed to know how many hours a repaired chassis could run before fatigue cracks recurred, and where to focus weld quality and inspection effort.

APPROACH

Mincka instrumented the chassis with ten strain gauge rosettes and an onboard data acquisition system, recording more than 200 hours of strain data at 1,000 Hz during normal mine operations. A laser-scanned CAD model and a calibrated finite element model, integrated with the truck's onboard operating data, extended the measured stress history to sixteen fatigue-sensitive points across the frame. Fatigue life and crack growth were then assessed to BS 7608, with damage categorised by operating mode, road condition, payload and speed to isolate what drives fatigue.

OUTCOME

The assessment gave the operator a quantified baseline of 20,000 to 34,000 operating hours before fatigue cracks recur at the critical chassis joints, turning overhaul planning from estimate into engineering. It then defined the levers that extend that life: weld quality control during repair, protecting the up to 80 % of fatigue life defective welds can erase; revised crack inspection criteria that act before rapid propagation; and targeted road, payload and speed management in the highest-damage zones, with a pathway to permanent onboard monitoring and real-time remaining-life prediction across the fleet.

CAPABILITIES APPLIED

- STRUCTURAL HEALTH MONITORING
- FATIGUE ASSESSMENT
- SENSOR INSTRUMENTATION
- LIFE EXTENSION