

The Value of Preventative Maintenance Optimization for Emergency Diesel Generators

By following Industry and Owner's Group guidelines, GSE DP Engineering saved \$225,000 to \$450,000 in recurring maintenance costs

Results At A Glance

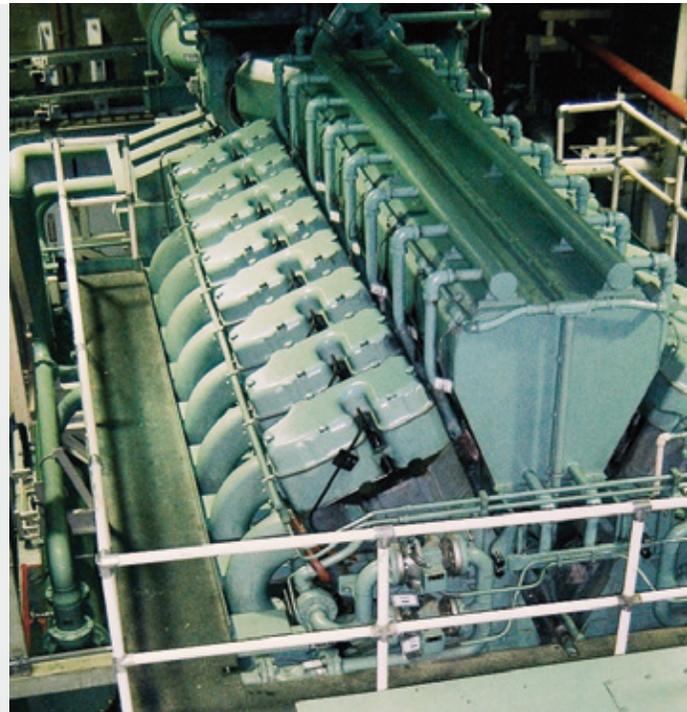
Facility: Commercial nuclear power generation station of approximately 2,400 Mwe with four emergency diesel generators.

Goal: To review past and current findings for degradation, out of tolerance, and failure in order to determine which preventative maintenances (PMs) may be justifiably modified in frequency and activity description — ultimately to save time and money.

Solution: GSE DP Engineering to perform limited review of emergency diesel generators (EDG) system preventative work orders over 12 to 18 years.

Result: Approximately 80 percent of the 47+ PM's per EDG (150 total) within the scope of the review were justifiably qualified to have the frequency extended.

Savings: Initial savings of \$225,280 and estimated future savings of \$450,000 approximately every six years.



The Situation

The Nuclear Power Plant requested a technical review by GSE DP Engineering as part of a PM optimization effort. We were asked to perform a limited review of preventative maintenance (PM) activities associated with four emergency diesel generators (EDG). The review focused on only those PMs with a frequency of three years and included historical performance over the last 18 years.

Based on preliminary discussions, the scope was to review past findings for degradation, out of tolerance, failure, etc., in order to determine which PMs could be justifiably modified in frequency and activity description, with the goal to identify areas of savings. A review of a small population of the 550-day frequency PMs were also added to the effort.

Methodology

The Industry Owner's Group for the nuclear facilities established the Preventative Maintenance Program (PMP) presently used by the utility on the EDG's approximately 15 years ago. In support of these efforts, GSE DP Engineering understood the necessary basis and definitions used to review the historical maintenance inspection data and conditions of approximately twenty engines utilized as standby safety related power sources at the multiple power plant sites. Further review of design and functional basis documents then allowed for a determination of component criticality and risk ranking. This was then factored into the process so that changes to the PM activities would not cause a degradation in reliability of the system.

We reviewed the Owner’s Group PMP relevant sections for Refueling Outage Inspections, and Three-year Outage Inspections, and performed the assessments that established the original requirement and basis for the scope and frequency of each PM. The program steps, basis, and definitions utilized by the Owner’s Group PMP were used as a template for the scope of this project.

Our Process

GSE DP collected data for the relevant 550-day/18 month and three-year PMs for the previous 18 years on all four of the plant sites’ EDGs as records were available. Over one thousand relevant work orders were identified and retrieved for this effort.

An aggressive review of the plant work orders tied to the PMs was performed with the intent of determining the results of each inspection over that period of time. This review documented performance, satisfactory, non-condemning, and condemning conditions, degradation, failures, and noted any effect on the EDG systems’ operational performance.

Outcomes and Estimated Savings

The level of detail and format of our results are available for review. The results were summarized for the plant where any performance frequency or detail change recommendations were made. Approximately 80 percent of the 47+ PMs per EDG (150 total) were justifiably qualified to have the frequency extended.

Our review of the data determined approximately 704 worker-HRS might be saved by adopting the new maintenance frequency.

Using the 704 worker-HRS multiplied by an arbitrary value of \$100/worker-HR translates to \$70,400 in savings for a single EDG. Since only 80 percent of the 3-year PMs reviewed could be justifiably pushed to a 6-year frequency, a reasonable savings of \$56,320 per EDG can be expected on a recurring basis. This equates to an initial savings of \$225,280 for all four EDGs every 6 years.

Major factors that affect estimating the possible savings are typically the number of PM’s chosen for review, the number of worker-hours for each PM, the frequency of the PM, and the number of EDG’s the PM’s are applicable to. An estimator tool is available upon request.

Non-documented additional savings such as warehouse stock price, planner time, scheduler time, work group review and brief time, operation clearance tag application and removal time, post work supervisor review time, work package closure time, and engineering trending review time would also be realized. These are not easily recovered from the work order packages and therefore are not quantified. Discussions with site personnel have estimated these costs to basically double the savings developed above. That would then increase the savings to approximately \$450,560 every six years.

About GSE DP Engineering

As part of GSE Solutions group, GSE DP Engineering supports operational excellence in the power industry. As an Engineer-of-Choice (EOC) provider, we leverage specialized, high value industrial engineering, design and implementation to create end-to-end solutions that reduce risk and optimize performance.

