APPLIED SCIENCE INTERNATIONAL SUCCESS STORY

KWINANA BOILER DEMOLITION

Perth, Australia, 2010

Structural and Seismic Analysis for Demolition Planning

The demolition of the boiler structure at Kwinana Power Plant by CMA Contracting was a complex undertaking. The boiler was connected to a turbine house responsible for supplying power to 20% of the city of Perth, Australia. The steel structure housed two large boilers each weighing 1,500 tons, was a 120 feet high, and had a plan area of about 10,000 square feet.


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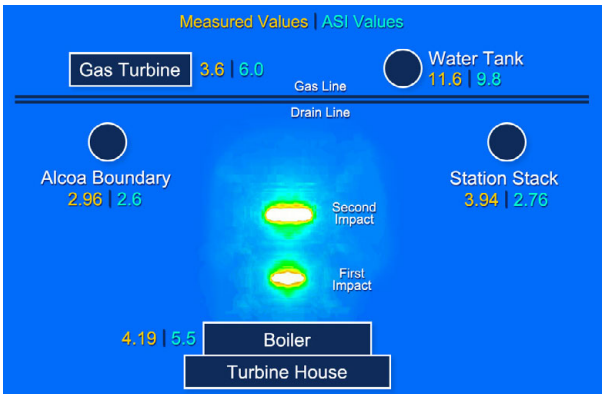
The boiler had to be removed carefully without affecting nearby sensitive structures or the turbine house it was attached to. To help achieve their goals, CMA tasked Applied Science International (ASI) to perform nonlinear dynamic analysis of the structure to ensure the safety and cost-effectiveness of their demolition plan. Using the original construction drawings, ASI's engineering team modeled the edifice using Extreme Loading® for Structures (ELS) and analyzed three different demolition scenarios, including one that involved implosion using explosives. CMA chose a scenario that involved the systematic weakening of the structure followed by a pulling force to cause the structure to roll to the ground.

Multiple refinements were carried out by ASI on the chosen scenario to ensure that the direction of failure was exactly as needed. The dynamic forces in all structural members were calculated to ensure no member would fail sooner or later than expected. The nonlinear dynamic analysis was carried out under the effect of both its own weight and the lateral pulling force. Engineers used ELS to model different scenarios of weakened beams, columns, and connections as well as additional struts and braces used to induce the failure of the structure in the required direction. In each scenario, ASI was able to determine the force required to bring about the boiler's collapse.

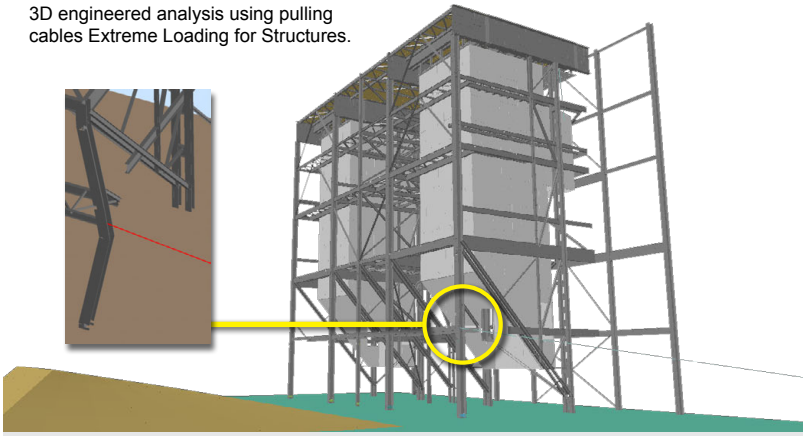
CMA planners were very concerned with the ground vibrations accompanying demolitions and the impact those might have on sensitive infrastructure nearby. Also, CMA needed greater insight into the final footprint of the debris pile and whether or not there was a risk of detaching debris impacting neighboring gas lines. To address these concerns ASI's team performed extensive seismic analysis to ensure that the impact of the structure with the ground would not exceed the allowable limits. ELS analysis and accompanying videos allowed CMA decision makers to address safety concerns and determine the footprint for the debris.



Comparison of actual ground vibration values versus ASI analysis.

The project was completed successfully at the end of February, 2010 when the demolition went exactly as planned. The pulling force, the direction of failure, the footprint of the debris, and the seismic vibrations were all in close agreement with the values presented by ASI engineers and scientists.

3D engineered analysis using pulling cables Extreme Loading for Structures.



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