PROJECT PROFILE

STATIC FEA – PORTABLE PILE DRIVER

CLIENT CHALLENGES

Our client manufactures and provides construction services to a wide region of western North America. Our client designed a revolutionary new excavator mounted pile driver design that required engineering analysis to verify safe design and adherence to codes. Palladium was retained to perform strength analysis of the new design using Finite Element Analysis (FEA) methods. The new design incorporates an attachment bracket that allows for +/-20 º side tilt and +/-30 º forward/backward tilt. The purpose is to accommodate field terrain conditions that may arise.

SOLUTION

Palladium was retained for our expertise in the FEA analysis field. The following tasks were performed to successful project completion:

- Research to determine codes and standards applicable to the design.
- Creation of an FE model of the portable excavator-mounted pile driver based on the Autocad drawings provided by the client.
- Application of load cases on the FE model that simulate actual work conditions.
- Linear static analysis was initially applied in this project. Different load cases were analyzed based on the various geometry conditions that represent all of the loading conditions for the pile driver. In all, 5 geometry conditions were analyzed with the largest pile, hammer and follower always in the top position representing the worst load case.
- Analysis and results were prepared for a report to the client with conclusions that evaluated the design based on materials used, FOS, and FEA results.

PROJECT HIGHLIGHTS

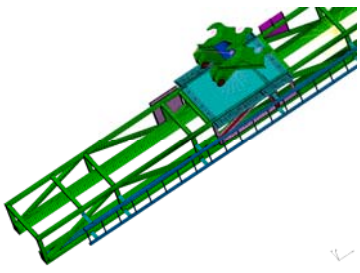
Palladium delivered the project within time and budget due to:

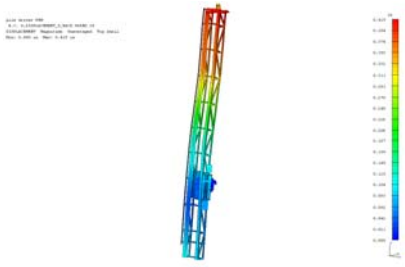
- Previous experience developing FE models that incorporate simplifications that will not affect the validity of the results.
- Extensive previous FEA analysis experience.

Minimal change to the pile driver design enabled the client to:

- Ensure a safely designed product.
- Minimize costs.
- Retain use of existing pile driver prototypes.
- Minimize impact to the product development schedule.

Based on the static analysis, calculated stresses were found to be below the yield strength of the materials. However, due to the Dynamic nature of the real world loading conditions Palladium recommended further Dynamic Fatigue FEA work to establish guidelines for the safe operational lifespan of the pile driver attachment.





PROJECT PROFILE

DYNAMIC FEA – PORTABLE PILE DRIVER

CLIENT CHALLENGE

Our client manufactures and provides construction services to a wide region of western North America. Our client designed a revolutionary new excavator mounted pile driver design that required engineering analysis to verify safe design and adherence to codes. Palladium was retained to perform strength analysis of the new design using Finite Element Analysis (FEA) methods. Based on a static analysis performed by Palladium, calculated stresses were found to be below the yield strength of the materials. However, due to the Dynamic nature of the real world loading conditions Palladium recommended further Dynamic Fatigue FEA work to establish guidelines for the safe operational lifespan of the pile driver attachment.

SOLUTION

Palladium was retained for our expertise in the Dynamic FEA analysis field. The following tasks were performed to successful project completion:

- Application of Dynamic load cases on the FE model that simulate actual work conditions.
- Dynamic Fatigue analysis was applied in this project. Different load cases were analyzed based on the various geometry conditions that represent all of the loading conditions for the pile driver. In all, 5 geometry conditions were analyzed with the largest pile, hammer and follower always in the top position representing the worst load case.
- Analysis and results were prepared for a report to the client with conclusions that evaluated the design based on materials used, FOS, Fatigue Life and FEA results.
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PROJECT HIGHLIGHTS

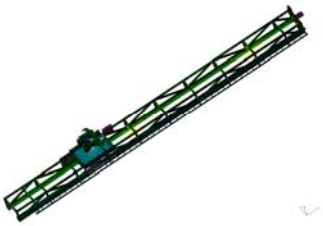
Palladium delivered the project within time and budget due to:

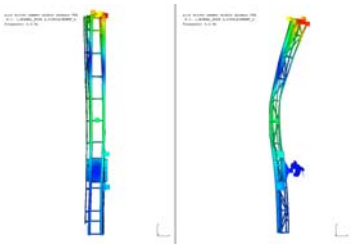
- Previous experience developing FE models that incorporate simplifications that will not affect the validity of the results. Palladium was able to utilize the FE model from the previous Static analysis.
- Extensive previous Dynamic FEA analysis experience.

Minimal change to the pile driver design enabled the client to:

- Ensure a safely designed product.
- Minimize costs.
- Retain use of existing pile driver prototypes.
- Minimize impact to the product development schedule.

Dynamic analysis showed that the pile driver structure exhibits fairly low dynamic amplification of assumed static loads, resulting in satisfactory stress levels. Side impact of the hammer during pile hammering at an angle does not generate significant stress in the structure. Predicted fatigue damage index has its maximum value around 0.35, which gives around 3 safety factor to failure in fatigue, therefore fatigue failure is unlikely. Life calculation confirms that pile driver will endure min. 4,050,000 operational cycles.





PROJECT PROFILE

TORQUE FEA – PORTABLE PILE DRIVER

CLIENT CHALLENGE

Palladium was retained to perform strength analysis of a new portable excavator-mounted pile driver design using Finite Element Analysis (FEA) methods. The new design incorporates an attachment bracket that allows for +/-20 º side tilt and +/-30 º forward/backward tilt. The purpose is to accommodate field terrain conditions that may arise.

Based on additional usage information supplied by the client, a Torque analysis was required to simulate a real world drilling operation.

SOLUTION TO THE PROBLEM

To utilize the FE model from the previous Static analysis of the portable excavator-mounted pile driver to apply Torque load cases on the model that simulate actual work conditions. To analyse results and prepare a report for the client with conclusions that will evaluate the design based on materials used, FOS, and FEA results.

PROJECT HIGHLIGHTS

Linear Static analysis was applied in this project. Different load cases were analyzed based on the various geometry conditions that represent all of the loading conditions for the pile driver. In all, 5 geometry conditions were analyzed with the largest Drilling Torque applied in the top position representing the worst load case.

Based on the Static Torque analysis …