DESIGNING AN ADJUSTABLE LOAD TOWER FOR FORKLIFT TESTING

Jordan Smith1, Kailey Diaz1, Zach Oropesa1, Zachary Chilian1
The Hyster-Yale Group
1Department of Mechanical Engineering, University of Washington

INTRODUCTION

• During R&D testing, the Hyster-Yale Group (HYG) forklifts are exercised on a test course which involves lifting a load onto and off of a platform at a specific height.
• Currently, HYG uses static load towers at a fixed height (see Figure 1).
• When a new test height is needed, HYG engineers need to manufacture a completely new tower, costing the company a lot of time, money, and materials.
• By switching to an adjustable load tower design, HYG will be able to improve the efficiency of their load testing.

We need to design an adjustable latching mechanism for a new load tower at the Hyster Yale Group so that its height can be easily manipulated by forklifts during R&D testing yet still capable of supporting up to 5000 kg loads.

CRITICAL REQUIREMENTS & SPECS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height Range</td>
<td>2-5 m</td>
</tr>
<tr>
<td>Resolution</td>
<td>152.4 mm (6 in)</td>
</tr>
<tr>
<td>Time to Adjust</td>
<td>≤ 2 Hours</td>
</tr>
<tr>
<td>Weight Capacity</td>
<td>≥ 5000 kg</td>
</tr>
<tr>
<td>Load Dimensions</td>
<td>1.22x1.52 m (4x5’)</td>
</tr>
<tr>
<td>Safety Factor</td>
<td>3-5</td>
</tr>
</tbody>
</table>

Table 1. Engineering Specifications

ACKNOWLEDGEMENTS

The authors thank our industry mentor, Ryan Daugherty, and faculty supervisor, Eli Patten, for their guidance on this project.

REFERENCES

RESULTS & VALIDATION

• Our FEA analysis proved the design was capable of supporting 5000kg with a safety factor of 3.7.

CONCLUSION & FUTURE WORK

• Design successfully allows easy upwards and downwards height adjustment with a safety factor of 3.7.
• Still needs further validation testing using an actual forklift to test lateral misalignment and tilting effects at 5m.
• For further development, we recommend a secondary Scott Russell pin mechanism for extra security.