

Objective :

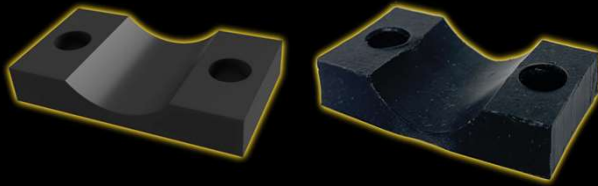
Test materials to find potential candidates for a no maintenance bushing to be used in Hyster-Yale Group 3.5 ton Forklifts.

Value Proposition :

HYG produces ~140,000 forklifts annually, each equipped with a mast bushing requiring regular lubrication. The current greasing process causes downtime and messes, particularly problematic in food or medical supply environments. Redesigning the bushing with a new material would reduce maintenance, prevent unscheduled downtime and contamination in sensitive environments.

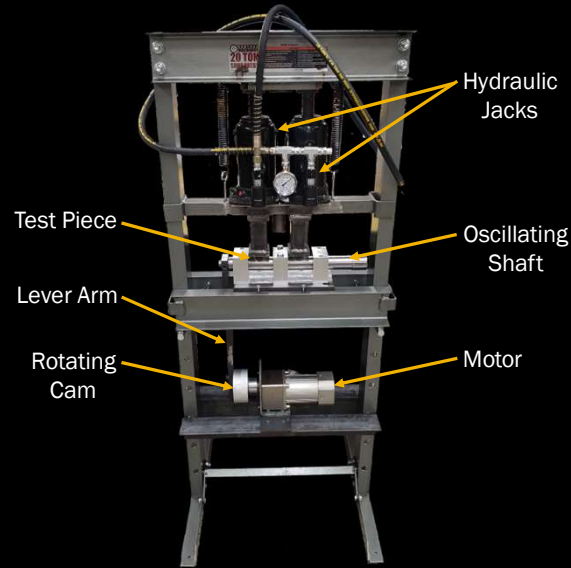
Materials Tested :

UHMW Polyethylene:

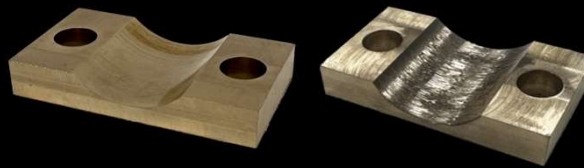


Benefits – No Oil, Solid lubricant
Cost - provided by manufacturer (\$20)
Source - Interstate Plastics
Result - Failure due to plastic deformation

The Testing Device :



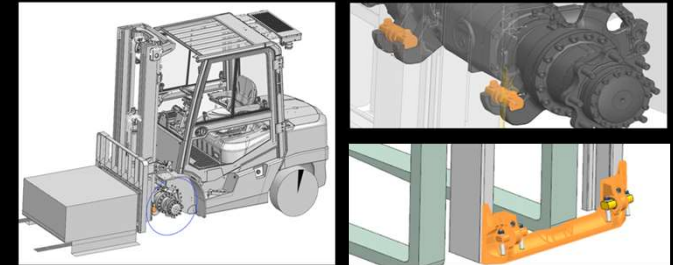
Oil Impregnated Bronze:



Benefits – Strong, Oil Impregnated
Cost - \$80 / sample
Source - McMaster-Carr
Result - Tested to ~50,000 cycles, extrapolated to passing result

Requirements and Validation :

- Material must be able to withstand a full load for a simulated 15,000 hours of use (85,000 cycles)
- Full load consists of 9150 lbs of force per bushing
- Simulated mast rotation of 12 degrees (6 degrees forward, 6 degrees back)
- Material must retain a thickness of at least 0.1 inches after testing is completed



Graphite Plugged Bronze:



Benefits – Inexpensive, Low Friction
Cost - \$50
Source - Ebay
Result - Tested to ~20,000 cycles, extrapolated to passing result

Acknowledgements:

Main Instructor: Mathew Swenson
 Student Advisor: Daniel Revard
 Client Contact: Oskar Peterson