IPRO 341: Design and Global Market Analysis of a Tool Cabinet

IPRO It takes a team! INTERPROFESSIONAL PROJECTS PROGRAM

ILLINOIS INSTITUTE OF TECHNOLOGY

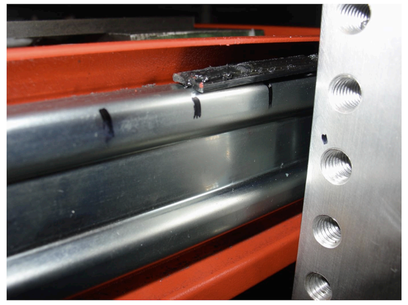
Side Mounted Slides

System Description

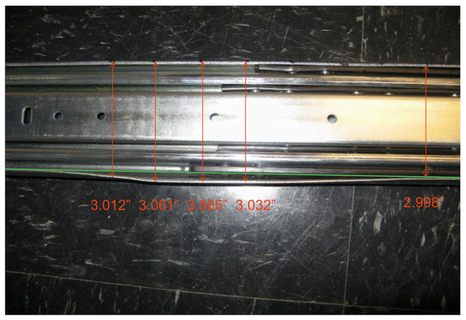
•First system tested (pictured right) used side mounted drawer slides purchased from an outside manufacturer.
•Two different sets of slides were tested. One heavy duty set for the 440 lb load, and another smaller set for the 220 lb load.
•It is important to note that this system only had VTW's patented locking systems mounted on the right side of the drawer, as opposed to both in the other system tested.

Results

220 lb Test:
•Slides failed after 680 cycles
•No significant deformation
•Plastic piece holding the bearings in place pulled out of the right slide, as seen below.

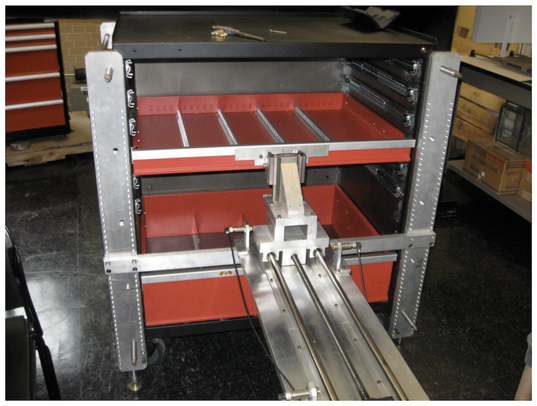


440 lb Test:
•Slides failed after 1186 cycles
•Left slide deformed significantly
•Servo motor could no longer extend the drawer completely.



The picture above shows the deformed slide with a scale (the green line represents where the bottom should be).

Mechanical Testing Team



Problem

Versatility Tool Works (VTW) would like to produce an industrial tool cabinet with drawers that can withstand a load of 440 lbs for 20,000 cycles. This has not yet been accomplished by VTW's competitors. Current systems are not capable of achieving this goal without modification.

Objectives

•Test cabinet systems to failure to determine lifespan. Test done with loads of 220 lbs and 440 lbs at the request of VTW
•Collect and analyze data to determine modes of failure
•Suggest and test improvements to design

Methodology

•Develop testing protocol to improve consistency and repeatability of tests
•Collect deformation measurements and strain gauge data
•Consult with design team to fabricate improvements

Recommendations

For side mounted slide system:
•Install locks on both sides
•Use slides with higher load rating for 440 lb test

For carriage slide system:
•Replace current bearings with ones rated for the calculated max load of approximately 500 lbs.

Conclusions

•Locking mechanism should always be included on both sides of drawer
•Based on test results, undercarriage design has more potential than side mounted slides
•Improved bearings should significantly increase lifespan of cabinet, as no other problems were observed

Testing Team
Robert VanKley
Kaisar Syzdykov
Thomas Kozmel
Taehoon Kim
Eric Hamann
Stephen Falk

Faculty Advisors:
William Maurer, MS
Dr. Sheldon Mostovoy

VTW VERSATILITY TOOL WORKS AND MANUFACTURING COMPANY, INC.

Carriage Slides

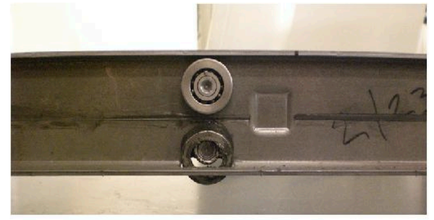
System Description

•Second system tested (pictured left) was an undercarriage design fabricated by VTW. The design this semester included recommendations made by last semester's IPRO team.
These include:
•Locking mechanism on both sides
•Reinforced guides

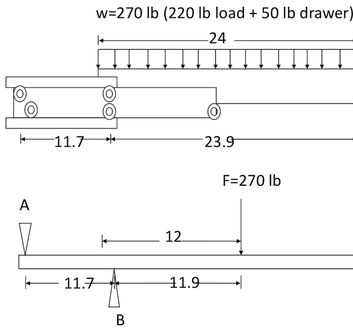
Results

220 lb Test:
•Completed 20,000 cycles
•One bearing failed
•No guide deformation

440 lb Test:
•Testing discontinued after 2445 cycles due to bearing failure
•Two failed bearings
-same bearing as 220 lb test plus one in the same position on opposite side



It was determined that the failed bearings were in the position receiving the highest load when the drawer was extended. The calculation was solved to determine the necessary load rating of the bearings.



Repeated for the 440 lb load:
A=498 lb, or 249 lb per wheel
B=988 lb, or 494 lb per wheel