

# Splits Hopkinson Apparatus Device

Joie Vittetow, Joshua Clark, Lee Bowen  
Faculty Advisor and Client: Dr. Jenn-Terng Gau  
Mechanical Engineering



NORTHERN ILLINOIS UNIVERSITY

College of Engineering and  
Engineering Technology

## Abstract

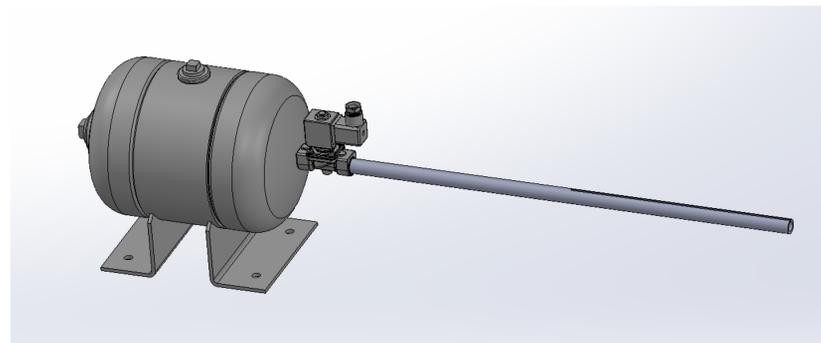
The Split-Hopkinson Apparatus Device issue of the incident bar projecting multiple hits in a system where it is to receive only one hit. There are multiple factors that contribute to causing this issue, which lead to many designs for different parts of the device implicated into the project. For the project, there were five different designs made for multiple parts of the Split-Hopkinson Apparatus Device. The designs include redesigning a high pressure air tank and its operational features, a gun barrel along with its mount, and an enclosure for safety and sample catching.

## Introduction

A Split-Hopkinson Pressure Bar apparatus is a device used to dynamically test material properties for constructing constitutive models and can be used for high strain rate deformation research and experiments. The Split-Hopkinson apparatus can be used to help determine material constants such as Young's modulus and mechanical stress in dynamic conditions. The main focus of this project will be on the striker launching module. Once the pressure from the tank is released for the striker's first impact, the pressurized air continues to come out of the tank causing a repeated impacting motion that causes false data points to be collected.

## Methods and Materials

The parts that were improved and created was the enclosure, barrel mount, barrel, and air tank.



## Results

With the updates to the Split-Hopkinson apparatus the device will see the data collected in the experiments to have a higher accuracy in the measurements. This is a direct result of fixing the prior problems in the device that were coming from outdated parts that have been updated on the device. Also will have a easier use of the system with the enclosure as the specimen that is being tested will be collected inside of the enclosure which will also reduce any data collection error.

## Discussion

With these improvements NIU Engineering students now have the ability to test and acquire the dynamic response of materials at high strain rates.

## Conclusion

The Split-Hopkinson apparatus is a highly sophisticated and advanced material sampling equipment for compressive and tensile testing. The launching module is divided into three main portions; the pressure tank, the pressure release, and the gun barrel. Each portion requires a redesign and replacement. The main focus for the pressure tank is to properly mount into position and condense the size as only 300 max psi is required. The focus for the pressure release is to control the release of pressure from a safe distance at a high flow rate to reach the 100 m/s required velocity

## Acknowledgements

Acknowledgement to the client and faulty advisor, Dr. Jenn-Terrg Gau, for all the help and information he has given and the extra funding he had provided for the project. The team would like to say thanks to the TA, Aayush Patel, for guiding and answering any questions in a timely manner.