Modified Tire Lifting Aid

Overview
A manual tire lifting aid was previously designed using a modified engine hoist. A system consisting of a pneumatic cylinder and air motor was adapted to power these movements. Manual valves were used to control the components.

Objectives
Create a pneumatically powered system that safely, easily, and reliably lifts a 100lbs tire in a timely manner.

Approach
- A site visit was made to the tire testing facility in Akron, Ohio
- It was found that Bridgestone wanted an easily mobile pneumatically device
- Concepts were generated for the up and down movement of the arm, rotation of the head, and the control system
- Calculations were done to size the pneumatic components and prevent tipping
- A Gast 120in-lbs air motor was chosen to power the rotation of the head. It was attached to the existing gearbox using a 6:1 chain drive, and was controlled by a log splitter valve
- A Parker 4" Air cylinder was chosen to power the movement of arm. It was controlled by a three way valve coupled with a flow control valve
- A SolidWorks model was created during the design process
- FEA on the component brackets was performed using SolidWorks Cosmos Express
- A prototype was fabricated.
- Testing was performed to insure the final design would not tip, to rate the speed of the machine, and to rate the lifting capabilities

Outcomes
- At 100psi, the machine can lift a tire wheel assembly weighing 80 lbs unaided
- With light force, an operator can “help” the machine lift a tire weighing up to 120lbs with 100psi inlet pressure
- The machine can lift a tire from the ground to a maximum mounting position in 1 min 50sec
- The machine will help reduce strain injuries, and will allow tires to be mounted on testing machines more quickly