



PNEUMATIC PASS-THRU IMPACT WRENCH

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Abstract

Tools are essential to human existence as we know it today. These physical objects with specific properties enable us to complete certain tasks that would otherwise be impossible, at the very least, more difficult. Modern tools include hand tools, power tools, and even large, stationary machinery. Pneumatic (or air powered) tools have been omnipresent in the industrial and manufacturing setting, offering more power to weight, greater durability, and higher operating safety compared to electric powered equivalents.

One popular pneumatic tool is the air ratchet. This tool uses a small turbine to convert compressed air into rotational mechanical energy that develops a torque to drive mechanical fasteners via standard hex sockets. Some limiting factors for this tool are its low torque, low RPM's (rotational speed), and high air consumption (CFM or cubic feet per minute). A similar tool that offers remedy to this torque and speed issue is the air impact wrench. Like the air ratchet, it uses a small air turbine to drive mechanical fasteners via interchangeable sockets. Unlike the air ratchet, it features a mechanism that employs the conservation of energy. For the major portion of one revolution, the drive (turbine side) is separated with a rotating mass from the final output shaft. At the very end of that revolution, the rotating mass is engaged to the final output shaft, transferring its rotational inertia as an impact to the fastener. A higher final torque is achieved with the use of the impact mechanism, but at the cost of a larger tool that has a cumbersome gun configuration, unusable in many tight positions that mechanics and service engineers encounter.

Objective

The objective of Panther Pneumatics' design project is to combine the ergonomic and versatile package of the air ratchet with the torque and rotational speed of the air wrench. An additional feature, making this final product completely unique, is the use of pass-through sockets, enabling the operator to drive nuts on infinite length studs and bolts.

Goals

- **Design and manufacture a mechanical device which exhibits the desired features of multiple existing tool technologies**
- **Meet or exceed industry standard tool performance specs. (torque, RPM's, CFM, etc...)**
- **Evaluate collected data and computational studies to optimize the design**
- **Manufacture the final design as a fully functional product**