Overview
Stanley Black and Decker assembles screwdriver bit retail cases under the DeWalt brand name. The cases contain screwdriver bit holders and other assortments of tools and attachments. In order to improve on ergonomic issues, capture cost savings, and increase capacity and throughput, Black & Decker has requested the development of an automated bit-insertion process. They have also requested the incorporation of different levels of automation according to cost and implementation.

Objectives
Stanley Black & Decker requests that the team design and produce a working prototype to demonstrate how bits will be inserted into the sub trays automatically. The team will also be required to submit drawings and/or CAD models of the mechanism. Other requirements include a cost analysis describing the savings incurred by the implementation of the mechanism into the current process and a Bill of Materials (BOM) with a cost up.

Approach
• The team set up an initial conference call to obtain details of the requirements and the current process. A brainstorming session followed to generate possible solutions.
• A Vertical-Press method was determined as the best solution and conceptualized in CAD.
• Black and Decker project representatives visited Penn State to provide bit samples and case samples. The Vertical-Press solution was shared as our solution to the problem.
• The team researched parts and devices to provide automation. Pneumatic actuators, air flow controls, solenoids, and a PLC controller were chosen to provide the motion to the prototype.
• Various parts were machined using CNC machines and the bit feeder mechanism was rapid prototyped. A program for the PLC controller was developed to control the actuators in the correct series and timing.
• The prototype was assembled and tested for fit and function. Errors were troubleshooted as they occurred based on various test runs until prototype was able to produce filled holders.
• Results were validated by running multiple cycles, and bit positions in the holder were evaluated for correctness.

Outcomes
• The sponsor will save $36,910 per year as a result of a full scale implementation of this project (61 days payback).
• Throughput would be reduced from 15 seconds to 12 seconds per holder without manual labor.