Reverse Engineering a Face Milling Cutter for Optimum Performance

Overview
New Era Machine performs specialized milling operations. Their original 16” cutter was designed improperly and was damaging the workpieces and the cutter itself. The New Era Company wanted a left and right handed versions of a fully functional 16” diameter cutter body. They also wanted left and right handed versions of the cartridges that go into the body and hold the cutter inserts as well as a left handed version of a wiper insert cartridge to provide a good surface finish to the workpiece. After calculating optimum cutter geometries, a set of 2D drawings and 3D models for each of the desired parts were made.

Objectives
To produce a detailed design document describing the geometry of a face milling with workable and acceptable geometries. The final deliverables were 2D drawings and 3D models of a new left and right handed cutter body, left and right handed cutter cartridges, and a left handed wiper cartridge.

Approach
• First the team researched the topic and terminology of milling operations to understand the concepts
• Next the team began to take measurements of the 16” faulty cutter and the functional 12” cutter to determine the clearances and angles.
• Made a 3D model of the current cutter body and cartridges in SoildWorks.
• Reported the findings to the sponsor and decided that a new redesigned cutter and cartridges should be made.
• Gage R & R was conducted to show that measurements taken by different operators were accurate and contained minor variability.
• 3D model of the new redesigned cutter and parts were made in SoildWorks.
• After modelling was done 2D drawings were created for sponsor for fabrication.
• An assembly model was created to show how the new cutter will look when it is fabricated.
• Left and right hand models and drawings were created as sponsor desired.

Outcomes
• The sponsor will save money in the form replacing worn out inserts.
• Manufacturing/production times will be reduced drastically since both milling feed rate can now be increased and finishing operations will be done in one run.
• The project will reduce the set up time and machine time that our sponsor currently had with the old cutter.