

Project Title: Product Packing Repair Project
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Area: Mechanical Engineering
Sponsor: BF Goodrich

The BF Goodrich plant in Woodburn Indiana assists their parent company Michelin Group, which is a major manufacturer of tires in the United States. The BF Goodrich Woodburn plant produces SUV and light truck tires. Currently, they make 11,000 tires a day, but can make up to 18,000 tires a day if needed.

At BF Goodrich, making tires is like making a wedding cake. First, various types of rubber layers are made that can include materials such as metal or textile fibers. Next, these layers are cut and added to one another, then baked to end up with the final product. One such layer of their tires includes the inner lining which consists of rubber coated fibers. This layer helps the tire expand and contract with air pressure changes due to its composite material structure which has threads aligned concentrically around the wheel. When this layer is manufactured and rolled prior to the tire baking, it has a nylon fabric packing material that is used to separate the layers and prevent them from sticking. This can be related to the wax paper method that's used to prevent individual layers of a fruit roll-up from sticking together.

The quality of the nylon packing material degrades over time. A major part of this includes material wrinkles and frays. At first glance these imperfections appear to be a benign issue, however, BF Goodrich recognized that they pose an issue to the quality of their product and in extreme cases could factor into tire failure. Thus, in the past, BF Goodrich constructed a repair station to eliminate packing material defects. However, they noted that this current repair station is ergonomically poor, labor intensive, and inefficient.

Therefore, BF Goodrich submitted a senior design project request to Purdue University Fort Wayne. The requirements for this design include an apparatus that is capable of removing frays, wrinkles, and debris, as well as measuring the material to ensure it has an acceptable length (150 yards or 200 yards), and a width that is within an acceptable range. Some limitations for this project include a 2-semester time limit, a \$5,000 budget, a power supply with a max of 460 volts, and the ability to transport the prototype to the BF Goodrich facility if necessary. A few parameters for this project include: single employee operation, discharge of static, an available floorspace of 68 by 90 inches, and a daily repair of more than 14 rolls per 12-hour shift.