Improving Scrap Rate on a Film Core Line

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Background

Teel is a leader in the extrusion of custom plastic film cores for the automotive film industry, and the importance of our plastic core operations to our business makes their continuous improvement a priority. Teel took advantage of a recent Yellow Belt Six Sigma course held on-site to improve the efficiency of one of our large diameter film core extrusion lines (called I12). A project stemming from the course involved the implementation of lean principles to improve the scrap rate of the line.

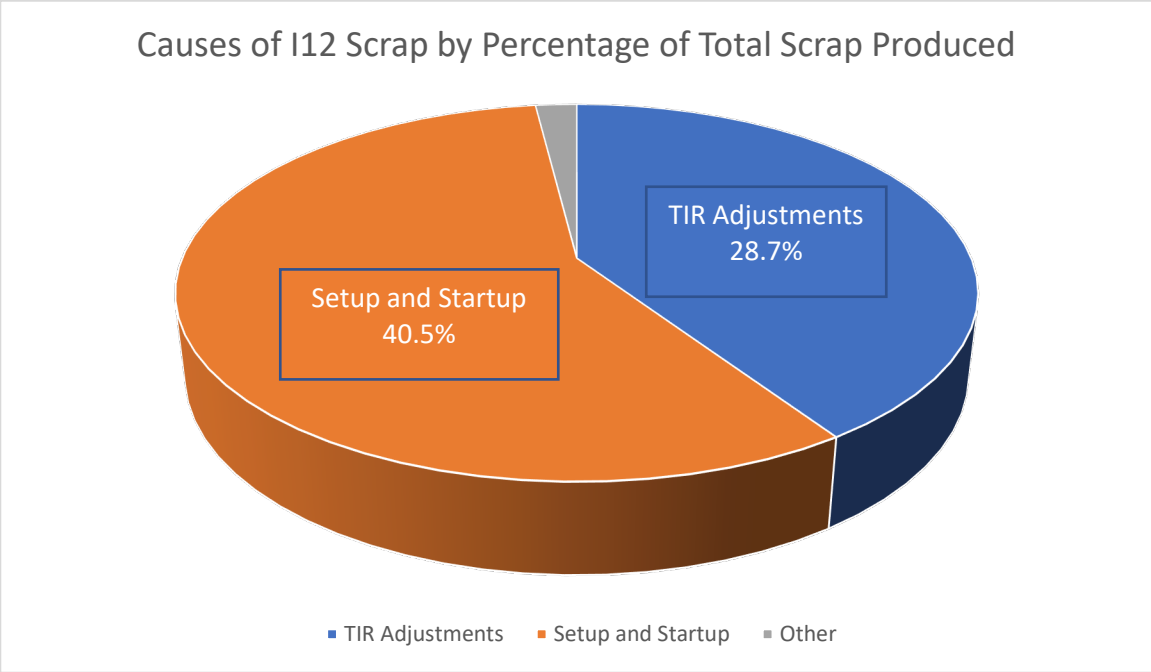
A team of Teel's engineers used the lean process DMAIC (define, measure, analyze, improve, and control) to evaluate I12's scrap production and deploy improvements. The goal was to reduce scrap production by 29.5% with the improved yield both increasing the capacity of the line and reducing the environmental impact.

Defining the Problem

For most of 2021, the scrap rate averaged higher than target. The large parts extruded on I12 require large quantities of plastic, slower running speeds, and tight tolerances, all factors that make it harder to control scrap. Previous projects aimed at improving the rate on I12 had initially been successful but had not been sustainable. The team taking the Yellow Belt class sought to apply the principles they had been learning and see if they could finally tackle it.

Large Diameter Core Extruded on I12

In initiating the project, the team conducted a study, collecting the scrap created on different areas of the line during a typical extrusion run and determining the causes. From examining one work order specifically, they identified TIR adjustments and startup work (including sizing and setup tooling) to be the primary factors contributing to excessive scrap.



Scrap Causes Discovered for the Work Order Examined During Teel's Scrap Study of I12

TIR (total indicator runout) is a term used in manufacturing cylindrical parts that refers to the difference between the maximum and minimum measurements along the surface of a part. The measure shows how much the part deviates from a number of dimensional attributes, such as roundness and straightness and is a measure of how far the part deviates from a perfect cylinder. As noted, the size of the I12 parts and slower line rate mean adjustments to TIR during production are slow to take effect. The tight tolerances create difficulty in getting them just right, and in turn increasing scrap.

Second, problems with the placement of initial tooling and incorrect sizing adjustments on startup also impacted scrap rate. One of the primary setup issues identified was difficulty in proper cooling setup involving the placement of spray rings in the appropriate locations. Spray rings are large metal rings located in the front of the cooling tank. They spray the hot parts with water as they run though the rings, serving

as an initial means of cooling and hardening parts into place. Different parts require different ring locations, and incorrect placement can contribute to scrap.

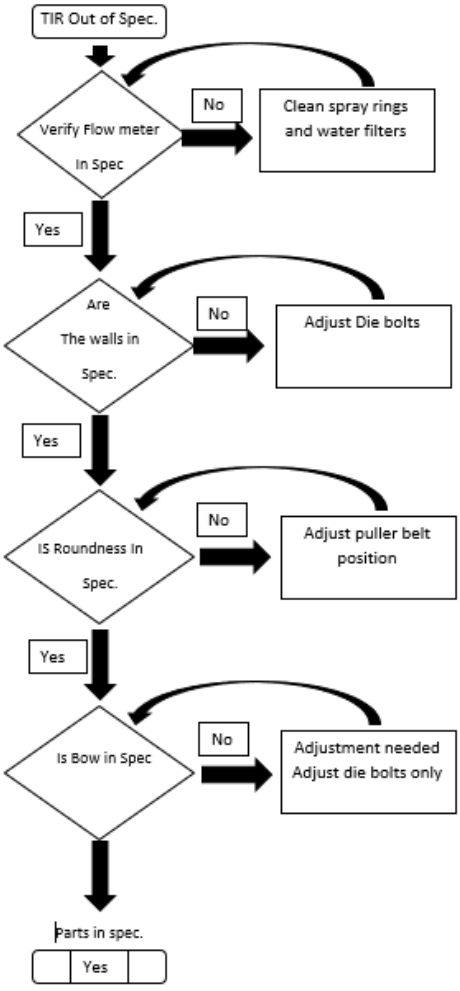
Implementing Improvements

After analysis, the team decided on several main approaches to improvement. First, they determined that increasing the standardization and precision of equipment placement at startup would help. One setup improvement was to use laser alignment technology during cooling tank installation. Another was to add information to the setup sheets used by technicians, including equipment position notes and flow parameters. Finally, a key standardization improvement was the development of metal quick-change plates onto which the spray rings could be affixed using pre-drilled holes. Instead of

Spray Rings on a Newly Developed Quick-Change Plate

requiring technicians to place each individual ring in the correct location, they are now added to plates that place the rings in the precise locations required for a given part. The quick-change plates increase accuracy by eliminating setup error, and they reduce labor time because they can be quickly removed as a unit and added as needed.

To address the TIR adjustment issue, the team decided to provide more helpful resources to operators during a run to help them make adjustments accurately and efficiently. This involved creating a TIR adjustment guide to be included on the line. Operators also received training on how to use the guide.



A Portion of the TIR Adjustment Guide

Results

After two runs of product with solutions implemented, the results are promising. Teel saw an average scrap rate better than the goal. Focused training will be provided to operators to ensure they continue to take advantage of the improvements. Because of the success of the changes made, the team suggested making similar improvements to other extrusion lines at Teel.

Conclusion

This project exemplifies the value of investing in a lean, continuous improvement mindset. The project increased efficiency in manufacturing the core line parts, reduced waste, and helped make an operator's job faster and more straightforward.