

Auto-Al Scrap Material Flow Analysis with Compositional Projections



The aluminum industry is experiencing major growth in the transportation sector. Aluminum is being added to vehicles annually to allow for better fuel economy and emission reduction. This is a commendable initiative but this increase in demand must be sustained. A dynamic material flow analysis model aimed at projecting the future trends of aluminum recovery efforts will prepare secondary aluminum recyclers for the change the market will experience as a result of aluminum intensive vehicles. Paring this with a real-time analysis of Twitch composition as processed today from old scrap of recent decades in comparison to what metallic recovery yards will process in decades to come will start to give a holistic picture to an increasingly dynamic industry.

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Phase 1: Document current day data on automotive scrap flow, model it, and predict the future influence of aluminum intensive vehicles (AIVs) on scrap market. A dynamic material flow analysis (dMFA) was conducted to evaluate the different material collection paths AIVs can take at end of life while mixing with non-AIVs during recycling. An understanding of the manufacturing process and joining methods utilized was required to model the future life cycle of AIVs. Interviews with the dismantlers ultimately determined the fate of the added aluminum used for body-in-white and door components. This set the baseline for the projection study with other factors becoming critical such as the weighted average of aluminum content reaching end of life across the market as well as determining a reasonable component-material breakdown for various vehicle segments. This study was conducted as a function of time and its influence on the weight of aluminum per vehicle.

Phase 2: Monitor the compositional variations in Twitch as a function of region and processing parameters (two distinct sorting technologies) and project the effect of AIVs on the Twitch composition. A real-time, automated scrap characterization device was utilized so a representative number of samples could be analyzed in order to determine the average Twitch composition as a function of region and processing parameters. This analysis acted as the compositional basis for the present-day vehicles reaching end of life. This data will aid in current sorting efforts and act as a starting point for the aforementioned dMFA for the auto-shred component of the study. Scenario-based dMFA's will be used to predict the future composition of the aluminum auto-shred scrap stream. Such factors considered were the degree of dismantling and the capabilities of developing sorting system technology. A model of the current status for the ELV processing industry was developed to compliment the baseline composition determined so then the impact of the added automotive aluminum can be assessed and the processing considerations varied.

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