

# Chemical Engineering Thesis Defense

## DECARBONIZATION OF STEEL AND COMPARATIVE ANALYSIS WITH ALTERNATIVE MATERIALS

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### Abstract

The purpose of this study was to comprehend the GWP, cost variability, and competitiveness of steel with rising carbon taxes. Aluminum, glass fiber composite, and carbon fiber composite were chosen as competing materials. In order to compare the aforementioned factors, the GWP of several processes to produce steel, aluminum, and fiber composites was examined. Cost analyses of various methods were also carried out to determine their viability. Energy consumption data for each of the paths under consideration were taken from the literature for the study. To get the consistent GWP for traditional and decarbonized scenarios, the required energy is multiplied with GWP of corresponding energy source (natural gas or electricity). Even after accounting for the carbon tax and the weight-reduction factor, the results show that steel still has the lowest production costs, followed by aluminum, while fiber composites remain the most costly. EAF- steel and secondary aluminum has least GWP followed by H<sub>2</sub>-DRI steel and NG-DRI steel with CCS. The state of art technology for glass fiber reinforced composite also emits less CO<sub>2</sub> but the cost of production is still high. Carbon fiber reinforced composite emits most carbon dioxide and is least economical.



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