ABSTRACT:

The life cycle analysis compared the environmental impact of a gasoline-powered passenger car with a catalytic converter to a gasoline-powered passenger car without a catalytic converter. In order to environmentally evaluate the catalytic converter, it was necessary not only to consider the emissions during the use phase, but the entire life of the product. All relevant materials and energy supplies were evaluated in detail for the catalytic converter. The goal of this life cycle was to compare the pollutants of a car with a catalytic converter, during extraction of materials and manufacturing of the product, to the pollutants of a car without a catalytic converter during use. The pollutants examined were carbon monoxide (CO), carbon dioxide (CO₂), hydrocarbons (HC), and nitrogen oxides (NOₓ). The main finding from this analysis was that even with the use of materials and processing, a catalytic converter decreases the overall pollutant emissions and the environmental score. The majority of pollutants for a car with a catalytic converter were caused by the use phase, not the extraction or processing. The environmental score was comprised of damages to human health, damages to ecosystem quality and damages to resources. The life cycle analysis indicated that the use of a catalytic converter decreases the damage to human health by almost half, and the ecosystem quality damage was decreased by more than half. There was no damage to resources without a catalytic converter, and the damages with a converter were so small that they were not a significant factor.

BIO:

Ms. Elizabeth Belcastro is a B.S/M.S. student in her fifth year at Virginia Tech in the Materials Science and Engineering department. She completed her B.S. degree in May 2011 and researched microwave curing of thin films on guitar wood substrates. She joined Dr. David Clark’s research team to complete her M.S., and is researching a life cycle analysis of a ceramic three-way catalytic converter.