

## Waste Plastics to Fuel

More and more cities are banning single-use plastic grocery bags because they are hard to recycle and represent a large volume of slow-to-decompose landfill waste as well as contribute to a considerable amount of pollution. In fact, as of 2008, all plastics counted together made up approximately 12% of municipal solid waste in the United States. But what that plastic waste could be recovered and turned into something useful? ISTC researchers B.K. Sharma and Kishore Rajagopalan collaborated with the United States Department of Agriculture (USDA) to convert plastic bags into fuel.

The team collected high-density polyethylene (HDPE) bags from local retailers and fed them into a pyrolysis unit to yield plastic crude oil (PCO). They then distilled the PCO (plastic crude oil), giving rise to gasoline and two types of diesel. These were analyzed and compared against conventional petroleum-derived diesel fuel standards. After adding antioxidants to their products, they fell within nearly all specifications of the conventional petroleum diesel standards. In fact, the team's HDPE (high-density polyethylene)-derived fuels were superior to conventional petroleum diesel in terms of lubricity and derived cetane number, which relates to the fuel's ignition quality. The researchers concluded that plastic-derived diesel can be safely and efficiently blended into petroleum diesel fuel, while minimizing landfill waste. This research was funded in part as a seed grant from the Illinois Hazardous Waste Research Fund.



After successfully converting plastic bags to fuel, Sharma and Rajagopalan went a step further to look at converting low-value plastics into gasoline and diesel. While the best options for plastic are reducing production, reusing, and recycling, some plastics are made (for a variety of reasons) that cannot be recycled and are destined for landfill. These plastics are called low-value plastics, and in those cases, the better alternative would be to make fuel from the plastic instead of having it end up in landfill. Often low-value plastics are made of several plastic polymers which have different melting and thermal depolymerization temperatures. Therefore, Sharma and Rajagopalan are working on optimizing the pyrolysis and depolymerization process for these types of plastics in order to produce an alternative fuel source.

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### Meet the Scientists

- B.K. Sharma
- Kishore Rajagopalan
- Jennifer Deluhery

### Publications

- [Production, Characterization, and Fuel Properties of Alternative Diesel Fuel from Pyrolysis of Waste Plastic Grocery Bags](#)



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