



SpectraCode, Inc.

1291 Cumberland Avenue, Suite B, West Lafayette, IN 47906-1385
(765) 463-7427 <http://www.spectracode.com>



RP-1 Polymer Identification System for Sorting Plastics

DESCRIPTION OF THE TECHNOLOGY

With support from the Environmental Protection Agency's (EPA) Small Business Innovation Research (SBIR) Program, SpectraCode, Inc., developed the RP-1 Polymer Identification System, a laser-based device that enables recyclers to easily identify and sort a wide range of plastics. The current technology for identifying dismantled plastic materials is slow and dependent on operator accuracy. SpectraCode's RP-1 is a new spectroscopic device that is capable of identifying the chemical composition of plastic parts at rates that could ultimately exceed 100 pieces per second (500 tons per day).

The RP-1 system is an industry-ready device for the manual, point-and-shoot identification of plastic components, feedstocks, and plastic scrap. The RP-1 device consists of a hand-held probe, which looks like a hair dryer, connected to a mobile console. The probe illuminates a solid object with a laser and collects the light scattered from the sample, much like a bar-code scanner. The device uses the principle of Raman spectroscopy to read the information encoded in the molecular structure of the plastic itself and thereby identify its chemical composition.

When a part is illuminated with the laser output of the probe, it causes the sample's molecules to vibrate. The

vibrations in turn cause the light to scatter in a pattern that is specific for each type of plastic. The scattered light is recorded and analyzed by a computer, which displays the result on a color monitor located on the console. The entire identification cycle requires less than 1 second. By eliminating the need to locate and read resin identification codes, a single RP-1 system could increase a worker's rate of manual sorting by more than a factor of four. The instrument is simple to use because it has no moving parts and does not require precleaning, processing, or precise positioning of the plastic waste material. The RP-1 uses SuperFocal imaging of the scattered light from the plastic waste to provide an unsurpassed depth of field (5 mm) that eliminates the need for precise sample alignment.

SIGNIFICANCE OF THE TECHNOLOGY

A number of industries are making advances to bring plastic products with high recycle content to market. To succeed, these initiatives need a reliable stream of recovered plastic feedstock. Polymers of different composition are incompatible when melted together. Therefore, cost-effective methods to sort plastics by individual polymer are needed. Because the RP-1 reduces the cost of plastics recycling and improves the purity of recovered product streams, it will help facilitate the recycling of billions of pounds of plastics that are being landfilled or inciner-

SBIR Impact

- ✦ SpectraCode has successfully developed and commercialized the RP-1, a laser-based device that is capable of identifying the chemical composition of plastic parts at rates that could exceed 100 pieces per second (500 tons per day).
- ✦ The RP-1 device will help facilitate the recycling of billions of pounds of plastics that are being landfilled or incinerated every year.
- ✦ The RP-1 system has added value to plastic recycling processes by reducing manpower costs and improving the purity of recovered product streams.
- ✦ SpectraCode's RP-1 currently is used for automotive component recycling and is slated for introduction as a new-parts process-control diagnostic by a major manufacturer of injection-molded plastic components.
- ✦ In 1998, *R&D Magazine* selected SpectraCode's device as one of the year's 100 most technologically significant products.



SpectraCode's RP-1 system is being used to identify the plastic backing on an automobile headlight. This technology can identify plastics so they can be sorted for recycling, including plastics that currently are impossible or difficult to sort.

ated every year due to the lack of accurate separation that is needed to avoid cross contamination during collection. This technology supports EPA's goal to reduce the quantity of waste requiring disposal.

Applications for which the RP-1 was designed include the screening of production and packaging waste and the identification and sorting of commercial and post-consumer plastic waste in community recycling centers and transfer stations. The RP-1 device can be used to sort a wide range of plastics. For example, it can be used to sort plastic components in cars, synthetic fiber resins in carpets, and a number of plastics used in the building and construction industry. It also can be used to sort plastic films such as those found in dry cleaning bags, shrink wrap, and packaging material. With simple user modification, SpectraCode's device can be used for manual process control as a probe for feedstock identity and purity.

COMMERCIALIZATION SUCCESS

SpectraCode installed RP-1 systems at two large-scale recycle facilities and in the Detroit Vehicle Recycling Development Center, a joint research facility of General Motors, Ford, and Chrysler. Ford Motor Company's automotive component operations, now known as Visteon, has supported development of the RP-1 and is

using the product in its recycling efforts. About 75 percent of the typical Ford vehicle is recyclable at the end of its working life, and the company believes that the RP-1 device will help increase that percentage in the future. SpectraCode is marketing the RP-1 to other automobile manufacturers and large-scale recyclers as well as plastic molders and resin formulators that can use the diagnostic capabilities of the RP-1 for process control.

AWARDS AND COMPANY HISTORY



In recognition of SpectraCode's technological achievement, the RP-1 device was named one of the 100 most technologically significant products and processes of 1998 by *R&D Magazine*. The RP-1 device was recognized as one of the Top 25 Technologies of 1998 by *Industry Week*.

The technology also earned SpectraCode the prestigious Tibbetts Award and Henry Ford Technology Award in 1999. SpectraCode, a research and manufacturing company with close ties to Purdue University, was founded in 1994. In its first year of incorporation, SpectraCode was awarded a Phase I SBIR award from EPA to support development of the RP-1. In 1995, EPA awarded the company a Phase II grant to continue developing and testing the technology.

What is the SBIR Program?

EPA's Small Business Innovation Research (SBIR) Program was created to assist small businesses in transforming innovative ideas into commercial products. The SBIR Program has two phases—Phase I is the feasibility study to determine the validity of the proposed concept and Phase II is the development of the technology or product proven feasible in Phase I. EPA also offers Phase II Options to accelerate the commercialization of SBIR technologies and to complete EPA's Environmental Technology Verification (ETV) Program. For more information about EPA's SBIR Program and the National Center for Environmental Research, visit <http://www.epa.gov/ncer/sbir>.