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RP-1 Polymer Identification System : Recycler of Plastics

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RP-1 POLYMER IDENTIFICATION SYSTEM: RECYCLER OF PLASTICS

THE NEED

The need for recycling and recovering materials on the construction industry enhanced the effort to develop new technologies enabling to produce construction materials as a result of some mechanisms (refer to the [link](#)). However, it has been noticed that one of the primary obstacles in recycling is the lack of sufficient means to avoid cross contamination during collection. In particular, the new method to quickly and easily identify materials has been demanded in plastic industry due to the dramatic acceleration of plastic consumption in the last forty years. Thus, the industry urgently requires new technology for material-based recognition to avoid the contamination of recovered lots, and to perform the analyses that are necessary to certify the purity of the recycled product stream at critical points along the supply chain.

THE TECHNOLOGY

Polymers of different composition are incompatible when melted together, and a ton of mixed plastic is a ton of garbage. Being unable to instantly identify and separate post-consumer black plastics by resin type has presented a significant barrier to their wide-scale recycling. Black plastics, unlike light-colored plastics, are loaded with carbon. When an intense light source, such as a laser, is used to analyze them, this carbon causes black plastics to absorb light to such a degree that the material can heat up and emit light or even ignite. The signal from this luminescence or burning of the plastic, in turn, obscures its spectroscopic signature, making it difficult for sensors to accurately read the plastic's composition.



FIGURE 1 THE OPERATION OF RP-1 POLYMER IDENTIFICATION SYSTEM



SpectraCode's new technology enables the instant point-and-shoot identification of black plastics, extracting a definitive signature from most black plastics in half a second or less. This speed is achieved through a modified probe that uses a sampling technique SpectraCode calls distributed focusing. This technology, when used in conjunction with the company's RP-1 analysis system, can test black plastic samples at full laser power with no burning. The SpectraCode 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. When a sample is illuminated with the laser, 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 one second. Used with an automated system designed to trigger the probe when plastics are placed on a conveyor belt, the SpectraCode device is capable of identifying the chemical composition of plastic parts and scrap at rates of more than 100 pieces per second, or 500 tons per day. That means it could be used to screen commercial and post-consumer waste in factories, warehouses, recycling centers and scrap yards.



**FIGURE 2 THE CABINET OF RP-1 POLYMER IDENTIFICATION SYSTEM
(COURTESY OF SPECTRACODE INC.)**

BENEFITS

The RP-1 Polymer Identification System is very easy to use because it has no moving parts, and it does not require pre-cleaning or precise positioning of the plastic material. This system enables the instant point-



and-shoot identification of black plastics, extracting a definitive signature from most black plastics in half a second or less.

STATUS

In November of 1997, SpectraCode formally introduced the RP-1 in Chicago at the Annual Recycling Conference of the Society of Plastics Engineers. In March of 1998, the first commercial unit was delivered to Ford Motor Company. SpectraCode introduced its distributed focusing technology at the Annual Recycling Conference of the Society of Plastics Engineers. The technology is commercially available and SpectraCode is now accepting orders for delivery in the first quarter of 2001. Also, American Commodities Inc. has been using SpectraCode's RP-1 spectrograph and plans to have it fitted with the new distributed focusing technology.

In order to do real work, no more than 4 or 5 examples of each of 4 or 5 categories is needed. It takes less than 1 hr to build a library based on such a sample set. With conventional hand sorting of plastic pieces, holding the gun in one hand, the part in the other, a worker at Aurora Plastics has sorted 6,000 lbs in one day. Fixing the gun and adding a foot pedal switch to fire the laser, that maximum rose to 10,000. The semi automated sorting station is expected to have a throughput of as much as 20,000 lbs.

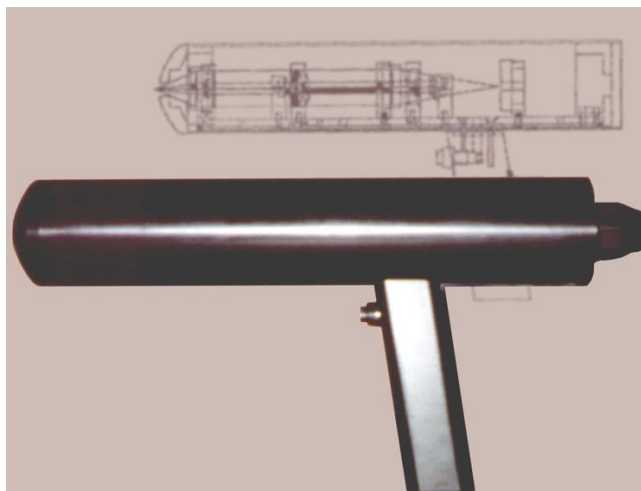


FIGURE 3 THE IMAGE OF GUN OF RP-1 POLYMER IDENTIFICATION SYSTEM (COURTESY OF SPECTRACODE INC.)

BARRIERS

The more supplement system which enables the efficiency of RP-1 Polymer system to increase is required in the future. Even though this system highly enhances the identification of black plastic compared to conventional system, It just takes longer (1 to 2 seconds rather than 0.01 seconds), and the rotating focus option must be used to avoid burning.



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New device brightens recycling efforts.

(<http://news.uns.purdue.edu/html4ever/9809.Grant.plastics.html>)

SpectraCode breaks black plastics recycling barrier.

(<http://www.purdue.edu/UNS/html4ever/010119.SpectraCode.recycle.html>)

Papers "The need for Rapid Materials Identification" and "Raman Background" Web sources:
<http://www.sperecycling.org/PDF%20Files/0859.PDF>

REVIEWERS

Peer reviewed as an emerging construction technology

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