



## PDQ: Tracking Down a Vehicle

*P*oking around an auto junkyard can now be considered a scientific expedition . . . when it involves a new database that treats automotive paint like a fingerprint. Called the Paint Data Query, or PDQ, this database uses records of automotive paint samples analyzed to pinpoint the manufacturer, make, model, and year of a suspect vehicle.

A National Institute of Justice (NIJ)-funded collaborative effort between the Royal Canadian Mounted Police (RCMP) and the Federal Bureau of Investigation (FBI), PDQ takes the analysis of a paint sample and, like AFIS (Automated Fingerprint Identification System), compares it to its database of known samples. PDQ then generates a hit list of possible makes, models, and years, including whether the vehicle is a car or truck; the plant where the vehicle was manufactured; and the chemical and structural analysis of the sample.

In addition, the software for the PDQ program is free, with one condition. User agencies supply street samples—paint samples taken from junkyards or crime scenes—to the FBI or the RCMP for analysis and inclusion in the PDQ database. Samples from crime scenes are accepted provided the source of the sample has been validated with a vehicle identification number.

According to Lynne Lamoureux, PDQ project team supervisor of the RCMP Forensic Laboratory's Chemistry Section in Ottawa, Ontario, the PDQ project has been under way since 1996. It was built on the RCMP's original vehicle paint chip database, developed 25 years ago.

"It [the original database] was the same type of thing," Lamoureux says. "It was a collection of paint samples, the individual layers of which were analyzed by infrared spectroscopy. The data were stored on the RCMP mainframe until the moment came when the database took up too much space. The project was 'kicked off' the mainframe, but in 1993 a program was developed to run on a PC."

While an RCMP programmer worked on developing the PC-based program, a group of forensic scientists from the United States and Canada, who were members of the Scientific Working Group for Materials Examination

(SWGMAT), decided that something needed to be done to help investigators solve hit-and-run accidents. Requests for proposals were sent out, and though a number of proposals were returned, development costs were in the millions of dollars. However, an RCMP representative to SWGMAT mentioned that the RCMP was already working on a vehicle paint sample database with an estimated development cost of less than \$1 million.

Now in its fourth year, with funding from NIJ through the Office of Law Enforcement Standards, PDQ contains more than 9,000 paint systems encompassing more than 33,000 layers in a database that can differentiate vehicles based on the paint's chemistry, color, and the number and sequence of layers. (A paint system is composed of a number of distinct paint layers.) PDQ uses the data from such methodologies as microscopic examination, infrared spectroscopy, and topcoat color verification. It also utilizes the Munsell® numbering system to assign a color to undercoats.

The database includes most domestic and foreign manufacturers and most of the vehicles marketed in North America after 1973. More than 60 percent of the samples have come from the street. The rest were submitted by manufacturers. To add to the database, in 1998 the RCMP developed agreements with the German Forensic Science Institute and the Japanese National Police Agency. These agreements provided for the use of PDQ in Europe and Japan in exchange for data and samples collected from the European Economic Community and Japan. This resulted in an additional 1,500 samples a year. By 1999, PDQ had been accepted as the database standard by 22 European countries, all of which agreed to annually provide data and samples. This kind of international cooperation has made PDQ the only worldwide, comprehensive database of automotive paint.

In the United States, PDQ is used by city, county, and State laboratories. In exchange for the database, agencies are required to collect 60 street samples annually. The FBI coordinates the U.S. samples; Lamoureux and her team of four scientists coordinate those collected in Canada.

"In the beginning, we relied heavily on manufacturers to supply us with the finished product," Lamoureux says. "Manufacturers tend to be reluctant to give away the recipe of their paints, so we do the analysis and rely on our infrared data. We still rely on the manufacturers for samples, but we also collect street samples from the vehicles themselves. These street samples help to 'check' the information and samples provided by the manufacturer."

PDQ was instrumental in solving a Washington State hit-and-run accident, Lamoureux says. Investigators did not have the PDQ database in-house and so faxed their laboratory's analytical data to the RCMP. The result was a hit on a Canadian manufacturing plant that was a joint venture between General Motors and Suzuki. Produced at the plant are the GM Tracker, the Suzuki Sidekick, and four other models. PDQ gave investigators all six models within a range of six model years (1994–1999).

The investigators then enlisted the help of the media, which put out a call for information. They struck pay dirt when a body shop employee who was working on a damaged Sidekick read about the investigation and called the police. Subsequently, the owner of the vehicle was questioned by investigators. She admitted she was the owner and driver of the suspect vehicle.

Lamoureux adds that it is important to clear a case very quickly because people involved in hit-and-runs tend to get their cars repainted. "If a car is repainted, it depends on how the repainting is done," she says. "If the vehicle is completely sanded down to the metal, you could not prove it was the same one. You also have to be careful in your investigation. In the Washington case, the unknown paint sample had the same structure as the suspect vehicle but it also had the same structure as every other nonrepainted white Suzuki Sidekick and GM Tracker in the city. PDQ does not narrow the search down to one specific vehicle."

Agencies interested in using PDQ must be trained by the RCMP or the FBI. Once training is completed, they

receive a CD-ROM that includes spectral data derived from infrared analysis, a text-based search tool, a series of manuals, and a code book for the various vehicle makes and models. The CD-ROM is updated every 6 months.

"The manuals tell you which vehicles are in the database and which ones are not," Lamoureux says. "Because we don't have every make, model, and year, we ask agencies to try to target those holes when they collect samples. Our requirement is that agencies or lab systems collect 60 samples every year, but that may change. In the beginning, we only had 14 agencies using PDQ. But now we've trained 50 agencies in the U.S. and all the labs in Canada, and interest is growing. We have tons of samples, so we're being a little picky so we can fill the holes in the database. As we train more agencies, we may change the number of samples we require. This is a decision that will probably be made by SWGMAT in conjunction with the RCMP and the FBI."

Agencies have to pay for a Munsell color system, which is a book of color chips with numbers assigned to each color. The Munsell system allows investigators to compare the chips to a sample of the undercoats and assign a number to it that corresponds with the PDQ database. Agencies also must buy the Sadtler SearchMaster, a program that searches for the spectral data for each layer.

***For more information about the PDQ database and its components, call 888-841-5111 in the United States or 613-998-6044 in Canada. Or, e-mail Lynne Lamoureux at [Lynne.Lamoureux@rcmp-grc.gc.ca](mailto:Lynne.Lamoureux@rcmp-grc.gc.ca).***



This article was reprinted from the Spring 2000 edition of *TechBeat*, the award-winning quarterly newsmagazine of the National Law Enforcement and Corrections Technology Center system, a program of the National Institute of Justice under Cooperative Agreement #96-MU-MU-K011, awarded by the U.S. Department of Justice.

Analyses of test results do not represent product approval or endorsement by the National Institute of Justice, U.S. Department of Justice; the National Institute of Standards and Technology, U.S. Department of Commerce; or Aspen Systems Corporation. Points of view or opinions contained within this document are those of the authors and do not necessarily represent the official position or policies of the U.S. Department of Justice.

The National Institute of Justice is a component of the Office of Justice Programs, which also includes the Bureau of Justice Assistance, Bureau of Justice Statistics, Office of Juvenile Justice and Delinquency Prevention, and Office for Victims of Crime.

**The National Law Enforcement and  
Corrections Technology Center System  
Your Technology Partner**  
**[www.justnet.org](http://www.justnet.org)**  
**800-248-2742**