



## Bacterial Pac-Men may gobble up paint pollution that bugs Detroit

Bugs are eating paint solvent at General Motors Corp.'s Bowling Green (KY) assembly plant. And it's not as absurd as it sounds. The bugs (actually mutant bacteria) represent Detroit's latest, and certainly most unusual, effort in a deadline-inspired campaign to clean up its paint shops. The more solvent the bacteria consume — before both eater and eatee turn into disposable sludge — the cleaner the facilities become.

**LIKE ITS COMPETITORS**, GM has been sniffing out fresh ways to comply with tough government requirements taking effect in 1987 to cut solvent emissions from the oil-based paints that give autos their shiny finish. The new rules, to be administered by the states, reflect a mandate from the U.S. Environmental Protection Agency that no more than 2.8 lbs. (1.3 kg) of solvent be released into the atmosphere per gallon (3.8L) of coating (minus the liquid) used. In other words, the paint shops must be as clean as they would be using water-based coatings. Unfortunately, water-based formulas don't provide a class-A finish. So Detroit has been scrambling to adopt other solutions. Among the most common: elaborately filtered, highly automated paint-spray booths; thicker paint formulas, applied by robots; and systems that incinerate or recover the polluting solvents.

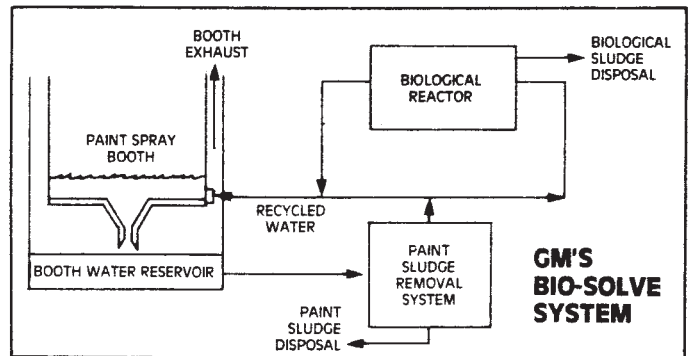
**NONE ARE PERFECT**, GM decided, and all are expensive; a new tack had to be taken. Enter *pseudomonas paucimobilis*, as the paint-eating bug is formally known. These bacterial Pac-Men are sipping on solvents in a pilot line called Bio-Solve at Bowling Green, where Chevrolet Corvettes are assembled. GM expects the test will show that, without environmental hazard, the single line can consume about 100 tons (90.7 t) of solvents yearly — roughly equal to the amount generated in painting 2,500 cars. That's not mass production, but enough to warrant larger, similar setups in the future.

**GM GOT INTERESTED IN THE** idea of biological solvent removal in 1978, after the petrochemical industry had tested it on various organic compounds, but not paint. It was known, though, that carbon — contained in paint solvent — is one of *pseudomonas paucimobilis*' essential nutrients. "So we took some paint solvents and used some bacteria to see if they'd eat the solvents," recalls Prakash N. Mishra, GM staff project engineer-plant engineering programs, advanced product and manufacturing engineering staff. "We found that they would." The automaker turned for developmental help to Flakt AB, a pioneer in biological solutions to solvent pollution. The Swedish painting-systems manufacturer made available its one-tenth-scale paint booth in Vaxjo, Sweden, to which a commercial bacteriological reactor for growing the bacteria was linked.

**BUT THE TEST RESULTS** didn't satisfy GM: The reactor wasn't up to snuff, it concluded. The automaker opted instead for a unit made by Dorr-Oliver Inc. (D-O), a subsidiary of Standard Oil Co. of Ohio. D-O Technical Manager-Bio-

logical Systems Paul M. Sutton explains the major differences between the two systems: "We're able to grow a lot more bacteria in a given unit volume; plus (Flakt) would have to enclose their system because they have to blow air through it to provide oxygen, thus actually stripping out the organic (solvent)." D-O avoids that by using liquid oxygen.

**HERE'S HOW THE D-O SYSTEM** works: Solvent stripped from the air by "scrubbers" into a stream of water travels in several steps to a biological reactor. There, the bacterial banquet begins. The water is mixed with the liquid oxygen and pumped into the bottom of a bed of bacteria-laden sand. Sustained by the solvent-containing mixture, the "bugs" grow. But the more coated they become by the mix, the "lighter" they get, gradually rising to the top of the tank. Then the bacteria flow through a sand-biomass separator, which removes them as sludge ("a fraction of 1% of the sludge we dispose of right now," says Mr. Mishra). So long, solvent. The cleansed sand, meanwhile, returns to the reactor to repeat the cycle. "What is happening," Mr. Mishra explains, "is the bacteria are using up the solvents as a food source, multiplying into more bacteria, and carbon dioxide is being given off — complete oxidation. It's similar to what happens at a municipal wastewater-treatment plant."



**BUT IS THE PROCESS** safe? Sludge is a preexisting problem. Does the use of bacteria create a new one? Suppliers of such synthetic mutants of natural organisms, "grown" at chemical farms on bran base, deny any hazard. "What we do is enhance a natural capability that was either there at a low level or latent," says Lois Davis, Salem (VA) plant manager of Sybron Corp., which has furnished the bugs to GM. Adds Dr. John Wireman, a member of a team of Wayne State University (Detroit) microbiologists hired by GM to study the technique: "There's no evidence whatsoever that there are any health hazards." But, he cautions, the WSU research is "far from finished."

**MEANWHILE, START-UP AND** continuity problems have hampered the Bowling Green project, forcing the EPA to delay a planned inspection. Still, says Mr. Mishra, GM is convinced Bio-Solve is the most promising solution to the solvent-pollution problem, even though the automaker doubts it will work with every paint, car model and painting system. "Compared with other favorable technologies," he says, "this appears to be the most economical — and by substantially large numbers." □ —*Patricia LaNoue Stearns*