

General Motors Rescheduling Paint Booth Cleaning Reduces Solvent Use & VOC Emissions

The quality of an automobile's paint job is a major factor in a customer's decision on which vehicle to buy. So automakers work hard to keep the quality of the final finish high. Part of this effort involves preparing the vehicle for painting and then applying the paint correctly and well. A second, less obvious area of effort, involves the careful cleaning of paint spraying equipment each time the color of paint being applied is changed. This is necessary to insure that each vehicle of a given color is uniform and consistent. A third area involves careful cleaning of the paint booth (the area in which vehicles are painted) to prevent any stray drops or flakes of old paint from dropping onto subsequent paint jobs. The solvent used to clean the spray equipment between color changes also is used for cleaning portions of the spray booth. This solvent is generally referred to as "purge solvent."

One unintended side effect of cleaning with purge solvent is that the solvent readily evaporates into a form of air pollutant called Volatile Organic Compounds, or VOCs. These VOC emissions count against the manufacturer's permitted operating emission levels. And since cleaning contributes only indirectly to product quality, cleaning emissions are an attractive target for reductions in plant emission.

Bill Bennett, General Supervisor of Sanitation at General Motors Fairfax Assembly Plant, is responsible for that plant's paint booth cleaning activities. Bennett concluded that so long as the booths were cleaned well, some of the cleaning could take place less frequently. In March 1993 he initiated a new booth-cleaning schedule at the plant.

Prior to March, the entire paint booth was cleaned after every other day of production. Since then, only the sections of the main paint booths in which people work are cleaned every other day. The automated section of the painting operations are now thoroughly cleaned once a week.

"The automatic equipment is used for the easier jobs, so the transfer efficiency in those areas is better," Bennett explained. "That means more paint goes on the vehicles and less onto the booth. Also, we don't have to provide as clean and safe a working environment for robots."

The only modification that was required by the less frequent cleaning was increasing the size of the holes in the floor grating in the automated areas. The

larger holes were necessary to provide proper air flow rates and booth conditions with thicker paint accumulations on the grates.

"The booths where primer paint is applied and where paint defects are repaired also were switched from every-other-day to once-a-week cleaning. The primer is applied automatically and the repair area is a much lower volume operation, so once a week is fine," Bennett explained.

In addition to changing the cleaning frequency, Bennett and the on-site solvent supplier's representative began monitoring the amount of purge solvent used in each booth for both production and booth-cleaning. They shared this information with the painting and cleaning teams. This helped the teams identify the most efficient cleaning techniques. The data also provided an early warning if equipment problems resulted in increased use of purge solvent.

How much did all these changes reduce VOC emissions? In 1992, the Fairfax Assembly Plant used slightly more than a gallon of purge solvent for each vehicle produced. From April through June 1993, they averaged about 5/8 gallon.

"Neither of these numbers account for the fact that we recover two-thirds of the purge solvent we use," Bennett notes. "But even so, we've cut our emissions from purge solvent almost in half."

When the VOC emissions reductions achieved by solvent recycling and by reduced booth cleaning are combined, the result is impressive. In 1992, VOC emissions from purge solvent totaled 460 tons. The projected total for 1993 is 91 tons.

(Note: The constituents of purge solvent include: Dimethyl-benzene; 2-Propanone; 4-methyl-2-pentanone; Butyl ester acetic acid; Light aromatic solvent naphtha; Ethyl-benzene; hydrotreated heavy naphtha; 2-butanone; toluene, and 1butanol).