

less subject to questions, and inherently would be more precise. Furthermore, NIOSH, the scientific literature, and the MSHA laboratory tests indicate that DPM, on average, is approximately 60 to 80% elemental carbon, firmly establishing EC as a valid surrogate for DPM.

Some commenters opposing a change in the surrogate stressed that the mix of EC + OC (to equal TC) is highly variable. Some commenters questioned the use of EC as a surrogate for DPM because the EC:TC ratio varies with each engine and EC is emitted from other sources. Other commenters, noting that a specific mine in the 31-Mine Study had an EC:TC ratio of 85%, stated that there is no perfect way to monitor DPM using surrogates.

MSHA agrees that the EC:TC ratio can vary significantly, not only from mine to mine but also within a mine, depending on equipment configuration and usage. MSHA also agrees that there is no perfect way to precisely quantify DPM. Using EC as a surrogate, however, results in a much more accurate assessment of miners' exposures to DPM than using TC. MSHA seeks information and data on the appropriateness of 1.3 as the factor to convert EC to TC, and an interim EC limit of 308 micrograms.

As part of the settlement agreement, MSHA agreed that the Agency will issue citations for violations of the interim exposure limit only after MSHA and NIOSH are satisfied with the performance characteristics of the SKC sampler and the availability of practical mine worthy filter technology, and MSHA has had the opportunity to train inspectors, conduct baseline sampling and provide compliance assistance at underground metal and nonmetal mines using diesel-powered equipment. MSHA will continue consulting with NIOSH, industry and labor representatives on the performance of the SKC sampler and the availability of practical mine-worthy filter technology.

MSHA trained the Metal and Nonmetal district health specialists and industrial hygienists on diesel particulate sampling in Beckley, West Virginia in September 2002. These individuals returned to their respective districts and trained MSHA compliance specialists on diesel particulate sampling. MSHA has completed the compliance assistance baseline sampling. As part of its compliance assistance efforts, MSHA personnel were available during the baseline sampling to provide guidance to mine operators on sampling procedures.

Additionally, MSHA trained members of the mining industry on conducting DPM sampling and made that training

available to industry personnel at compliance assistance workshops following the Outreach Seminars on Diesel Particulate Rules for Underground Metal and Nonmetal Mines. These seminars and workshops were conducted at nine cities during September and October 2002.

MSHA and NIOSH have reviewed the performance characteristics of the SKC sampler and are satisfied that it accurately measures exposures to DPM. Results of the 31-Mine Study demonstrated that the SKC submicron impactor removed potential interferences from mineral dust from the collected sample. MSHA concluded in its findings in the study, however, that:

No reasonable method of sampling was found that could eliminate interferences from oil mist or that would effectively measure DPM levels in the presence of ETS with TC as the surrogate.

Furthermore, MSHA has found that use of elemental carbon eliminates potential sample interference from drill oil mist, tobacco smoke, and organic solvents.

Some industry commenters stated that the sampling and analytical processes are too new for regulatory use. According to these commenters, SKC recently changed the impactor, and NIOSH should test the new SKC sampler and evaluate its comparability to the model used in the 31-Mine Study. One of these commenters stated that the shelf life of the prior sampler affected TC measurements by adsorbing OC from the polystyrene assembly onto the filter media and increasing TC measurement. Some commenters also stated that there are significant back-order and manufacturing delays for samplers and that operators who sample alongside MSHA need ample notice to have enough samplers available.

MSHA purchased many of the initial production runs of these samplers to conduct its compliance assistance baseline sampling. Once the initial orders were filled, the sampler became more widely available.

Prior to the 31-Mine Study, MSHA had determined the deposit area of the sample filter to be 9.12 square centimeters with a standard deviation of 3.1 percent. During the initial phases of the 31-Mine Study, it became apparent that the variability of the deposit area was greater than originally determined. The filter area is critical to the concentration calculation. The filter area (square centimeters) is multiplied times the results of the analysis (micrograms per square centimeter) to get the total filter loading (micrograms). While individual filter areas could be

measured, it is more practical to have a uniform deposit area for the calculations. As a result, NIOSH and MSHA consulted with SKC to develop an improved filter cassette design. SKC, in cooperation with MSHA and NIOSH, then modified the DPM cassette following the 31-Mine Study.

The modification was limited to replacing the foil filter capsule with a 32-mm ring. This was done to give a more uniform deposit area (8.04 square centimeters) and to accommodate two 38-mm quartz fiber filters in tandem (double filters). These double filters are assembled into a single cassette along with the impactor. The 32-mm ring gives a filter deposit area of 8.04 square centimeters, with negligible variability. The 38-mm filters also eliminate cassette leakage around the filters. These modifications were completed and incorporated into units manufactured after November 1, 2002. Because the design of the inlet cyclone, impaction nozzles, the impaction plate and the flow rate did not change, the modifications to the filter assembly did not alter the collection or separation performance of the impactor. Throughout the compliance baseline sampling, the impactor has been a consistent and reliable sampling cassette.

Tandem filters were used in the oil mist and ANFO interference evaluations. The top filter collects the sample and the bottom filter is a "dynamic blank." The dynamic blank provides a unique field blank for each DPM cassette. The proposed use of elemental carbon as a surrogate would resolve the commenter's concern about shelf life and OC out-gassing on the filter. Shelf life and OC out-gassing are issues relative to organic carbon measurements. These two issues do not apply to an elemental carbon measurement. Once the cassettes have been preheated, during manufacturing, there is no source, other than sampling, to add elemental carbon to the sealed cassette filters.

In the ANPRM, MSHA asked questions on three topics relating to DPM sampling and analysis:

#### (1) Interferences

In response to the question on interferences when EC is used as the surrogate, some commenters stated that interferences were thoroughly discussed in the final rule preamble and that reasonable practices to avoid them were stipulated in the rule itself. According to these commenters, this problem should not be revisited in this rulemaking.