3. Emission Calculations

Several different emission calculation methodologies were utilized to estimate potential emissions from AVX processes. These procedures include: material mass balance, engineering estimates, AP-42 emission factors, and permit limits. The following sections provide a brief description of emission calculations. Complete documentation is contained in Appendix C.

3.1 Material Mass Balance Calculations

A number of emissions, especially VOC from solvent use, were estimated using mass balance calculations. For emission calculations based on actual solvent usage data, potential emissions were calculated from 2006 usages plus 15 percent. Calendar year 2006 is representative of current material usage.

As discussed previously, emissions from solvent usage vary from 100% loss to either 10% or 20% loss, depending on the material. The emission factors are based on material usage to meet product specifications, rework, and waste recovery. Manufacturing to viscosity specifications (when including rework and waste), less than 1% by weight of many solvents is lost from the balance (See Appendix G). For this renewal application, AVX is electing to continue to use the more conservative 10% and 20% loss factors previously established between AVX and DHEC for the Slip, Metals, and Metallization departments.

Solvent emissions from CMAP have been calculated based on a maximum amount of slip and metal paste used per machine based on a conservative application rate of 70 kg/day/machine. AVX estimates that 70% of the slip used in the buildup process is applied to the chips since and 15% returns back as material reclaim. Of the 70% applied to the chips, 1% is emitted at the machines fugitive and 0.05% is emitted as a fugitive after production (green chip area). The average VOC content of slip is 30.32%, as determined from a sampling of typical slip formulations. A February 26, 2009 source test demonstrated that a 5,000 acfm adsorber/desorber and thermal oxidizer control system achieves an overall control efficiency of

99.5%. It is estimated that 85% of the organic material in the slip, successfully applied to the plates, enters the control system. However, the CMAP machines cannot operate 24 hours per day, 7 days per week. CMAP is a batch process and not continuous. Between batches, the machines are cleaned, doctor blades calibrated, screens changed and aligned, plates loaded/unloaded, raw material changed out, etc. Also, the facility runs multiple job orders within a batch. The job orders typically do not fill up a machine. For example, January through July of 2010, the fill percentage ran approximately 80%. In other words, 20% of a machine was empty. Therefore, a maximum worse-case operation ratio of 32/48 hours has been used to estimate potential emissions.

Once the move of capacitor manufacturing from the original manufacturing location (old MB1) to the new manufacturing building is complete, AVX will have 24 CMAP machines in operation. For 2010, two CMAP machines will remain in MB1 until the medical qualification process is complete, which will allow the relocation of these machines. In anticipation of this application, sufficient inventory was produced that these machines should be idle through the 2010 qualification process. The machines need to remain online in the event that inventory is depleted before the qualification process is complete. AVX has requested an operating limit of 864 hours per year to limit emissions from these two machines. This is based on a conservative need with 2 machines operating 24 hours per day, 3 days per month, for 6 months.

Solvent emissions from the termination department were calculated based on the amount of termination paste used, its solvent content, minus the amount collected for reclaim or as waste. A worst case termination paste was used to estimate the maximum amount of VOC emitted. A 20% emission factor was used for the cleaning solvent emissions.

Lastly, the dicer emissions were calculated on a mass balance basis. The amount of material collected in the baghouse was measured and the amount emitted is back calculated from the amount of material collected in the baghouse and the control efficiency.

3.2 AP-42 Emission Factors

The USEPA AP-42, Volume I, Fifth Edition was used as a source of emission factors where material balance or other emission estimation methodologies were not applicable or available. Particulate matter emissions were determined using AP-42, Chapter 11 Mineral Products Industry emission factors for cement bin loading. It was assumed that the particle size of cement is similar to that of the ceramic materials processed in Raw Materials. Emissions from the boiler and emergency generators were estimated from the maximum firing rate, annual fuel use and emission factors from AP-42, for Natural Gas-Fired Small Boilers and for Uncontrolled Gasoline and Diesel Industrial Engines, respectively. Similarly, electroplating emissions were calculated based on emission factors and guidance provided in AP-42, Chapter 12 Metallurgical Industry Electroplating.

3.3 Other Emission Sources

Potential emissions for the groundwater air stripping tower were provided by Arcadis. Emissions were estimated using a modeling system as part of a design to install a like-for-like replacement of the larger stripping tower.