Guidance for Acceptable Process Knowledge (APK)

Process knowledge generally refers to information that the generator possesses about a waste stream (e.g., how the waste was generated, what type of process/activity was involved, what the feed stocks to the process were, how the process might extract/remove or concentrate certain feedstocks into the products or the wastewaters, mass/balance studies of the process, what isotopes are present or are not present, etc.). At ORNL, process knowledge can be used for hazardous waste, PCB waste determinations and/or radiological waste determinations. Process knowledge can include historical data obtained from production operations, CERCLA remedial actions/investigations or R&D (research data on known levels of contaminants introduced into studies or contaminant levels reported in research). The RCRA regulations specifically provide that a generator may apply their knowledge of the hazardous characteristics of the waste in light of the materials or the processes used. For example, listed waste determinations explicitly require the generators knowledge of the waste generation process to determine if the resulting waste meets a listing description (knowledge that a solvent was used for its solvent properties including knowledge of the solvent composition before use, or that the waste is an unused commercial chemical product or is a regulated spill residue). Likewise, listed waste determinations can also be based a generator's process knowledge based on their application of the mixture or derived from rules and/or the contained in policy. Process knowledge can also be used at times to rule out certain RCRA characteristics, simply by knowledge of the waste form/matrix. A non-liquid waste can not exhibit the characteristic of corrosivity; an aqueous wastewater (with 99% water) can not be a flammable liquid, and an aqueous wastewater with <24% alcohol can not be a RCRA ignitable (D001) liquid. Additional situations where use of process knowledge is acceptable is when health and safety risks to personnel would result from sampling and analysis (including radioactive mixed wastes) and when the physical nature of the waste does not lend itself to representative sampling (such as debris).

The generation processes themselves will range from the simple (mop water from a non-contaminated office complex) to the extremely complex (wastewaters derived from a solvent extraction system supporting R&D). Documenting process knowledge at the waste item level generally requires less effort than at the waste stream (with heterogeneous waste items). Documenting process knowledge at the waste stream level requires a high level of knowledge of the process, the inputs, the outputs, and the overall fate of materials used in a process and can also involve documenting administrative controls put in place at the point of generation to ensure wastes exclude prohibited items or exclude certain regulated constituents. Administrative controls can vary, including purchasing and usage controls, or internal procedures, or limiting waste packaging by trained individuals.

Process knowledge that supports a "RCRA-regulated" determination can be less than that supporting a "not regulated" determination. For any "not regulated" determination, the process knowledge must be thorough and accurate and support the generator's claim - namely, that the waste is exempted or excluded, does not exhibit any characteristics, and is not a listed hazardous waste (including by application of the mixture or derived from rules and/or the contained in policy). Due to the low levels of the toxicity characteristic constituents under RCRA, use of process knowledge to support a "not regulated" determination can be risky. Process knowledge can, however, be used to reasonably rule out the presence of some toxic constituents (based on lack of presence/use in the process). Using of process knowledge to document compliance with the Duratek Waste Acceptance Criteria and/or the

UT-Battelle Waste Discharge Criteria (which utilizes a combination of RCRA limits and/or water quality limits) even more challenging.

Similarly, process knowledge supporting radiological waste characterization may include information on the process that generated the waste and may include previous radiological characterization data such as radiation protection surveys or prior radiological sampling and analysis results. Process knowledge for radiological characterization could include the general nature of the radiological activities involved, the nature of radioactivity present in the waste, the type and thickness (or density) of shielding material present, contamination type (fixed vs removable), what types of items are contaminated, etc. For most volumetrically contaminated radioactive waste, some type of sampling and analysis results should be part of the documented process knowledge.

The key to using process knowledge is to thoroughly understand and document the process: the feed materials, the chemistry and/or physics involved, the materials generated as products or byproducts, as well as the wastes. That evaluation should work to identify and resolve uncertainties and inconsistencies, as well as validate the generators level of process knowledge. That documented evaluation of the waste generating process should be conducted and verified periodically, usually annually or whenever the waste generating process changes (when new feeds or equipment are introduced, or processing steps change). When process knowledge includes generator supplied data (from nonapproved labs or nonapproved methods), any data limitations must be documented. For routinely generated wastes, process knowledge should include annual verification by sampling and analysis using approved samplers, methods and laboratories.

For RCRA and/or PCBs, APK is that level of knowledge where the generator can accurately support a "not regulated" vs a "regulated" determination. A RCRA-regulated determination includes compliance with the Land Disposal Restrictions and identification of underlying hazardous constituents requiring treatment when applicable. In the case of the Duratek Waste Acceptance Criteria and/or the UT-Battelle Waste Discharge Criteria, the acceptable process knowledge would also be that level of knowledge where the generator accurately determines what wastewaters can be discharged vs what wastewaters requires a variance including possibly managing RCRA-regulated containerized wastewaters appropriately. APK for radiological characterization is that level of knowledge that can define the isotopes present in the waste, defines the radioisotope ratios (distributions) for activity calculations, and can justify the appropriateness of methods chosen to calculate total activity.

- APK must be documented. This may be in the form of a research logbook, past analytical data, administrative controls that govern items either present or absent in the area of the waste generation, or other acceptable documentation with a good logic basis. The documentation must be traceable to the waste stream and/or waste package (container or tank) as appropriate.

- APK must be defensible. There must be sufficient pertinent material included to construct a chain of logic that adequately supports the APK. Examples: documentation that organics are not involved in the process generating the wastewater, documentation that the wastewater is identical to a process at another location (same type of once thru cooling discharge) that

has been determined by direct measurements to not have organics present, or documentation such as prior analytical results that showed organics levels would be below the level of concern based on computation or a worst case evaluation.

- APK must be available. There must be linkage to a logbook, documentation location, analytical work request number, defined file points, or a signed record/statement by the generator or knowledgeable contact, etc.

Often, partial process knowledge is available and can be used to limit the number of samples taken or limit the types of analyses needed for waste characterization purposes. Examples of limited process knowledge include: wastes where the only a limited number of contaminants (hazardous or radiological) are expected from a process (i.e., no RCRA pesticides or RCRA organics used or only certain isotopes used/expected). By using partial process knowledge to limit the number of samples and analyses, the total costs born by the generator for waste characterization can be reduced.