

Discerning Recent and Historical Spill Material using European Standard EN 15522-2:2020

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Industries such as refineries, bulk fuel stations, pipelines, railways, and service stations all process various petroleum products. It is not uncommon for these industries to be associated with multiple ownerships due to acquisitions made for commercial reasons. Accidental spills of petroleum are not uncommon and may be associated with equipment failure, negligence, operator error, inadequate inspection and maintenance of facilities and accidents. During remediation, differing petroleum products may be discovered. Where there exist memoranda of understanding or contract clauses limiting liability for historical impacts, or where adjacent properties have contributed to subsurface contamination, forensic analysis may be employed to differentiate spill material.

Typically, spill material is analyzed for total petroleum hydrocarbons using the Canada Wide Standard (PHC-BTEX, F1 – F4). However, the short retention times and poor chromatographic resolution obtained are not adequate for forensic investigations. Even higher resolution chromatographic data may lead to erroneous conclusions as to whether contamination is from the same source or not. In contrast the EN method, developed through the OSINET forum (Bonn Agreement), involves analysis of up to 144 compounds to provide diagnostic ratios. All data is normalized resulting in the ability to generate weathering plots.

For this case study, we compared the EN method with other techniques such as chromatogram comparisons and chemometric analysis (PCA and agglomerative hierarchical clustering). Analyses were performed on product, LNAPL and contaminated soil samples. We observed that high resolution chromatographic data followed by PCA analyses gave misleading information when compared with the EN method. The EN method revealed clear distinctions between current and historic spill material

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Dr. Birkholz has over forty years of practical experience in analytical chemistry, research, environmental and human toxicology, and business. Major industrial clients, include: transportation, oil and gas, petrochemical, mining, waste management, and pulp and paper. He has proven a valuable resource to industry, governments, consultants, educational institutions, health care professionals, and the legal profession; offering expertise in sampling, chemical analyses, data interpretation, toxicology, industrial problem solving, and forensic analyses. Dr. Birkholz is currently an adjunct professor with the University of Alberta in Edmonton (Faculty of Pharmacy and Pharmaceutical Sciences). He has given numerous oral presentations at national and international conferences and has over 37 publications and is currently a member of the oil spill identification network of experts within the Bonn Agreement (Bonn-OSINET).