

## Quantitative Condition Monitoring of In-use Oils by FTIR Spectroscopy

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### Quantitative FTIR Condition Monitoring

Fluid Life operates three laboratories, two in Canada (Edmonton, AB and Brantford ON) and one in Minneapolis MN and has provided lubricant analysis services and reliability solutions for asset intensive industries for over 30 years. In the field of commercial lubricant analysis and condition monitoring, FTIR spectroscopy is extensively used as an automated fingerprint-based survey technique; largely for screening and trending of qualitative changes in lubricant quality parameters such as moisture, glycol, soot, oxidation, antioxidants and wear additives. It is an automated means of screening a large number of oil samples, in part to determine if additional quantitative confirmatory analyses are required, typically ASTM AN or BN determinations to provide relevant quantitative information as to the quality and status of the oil. AN and BN analyses, are however, problematic in that they are slow, expensive and generate a substantial chemical waste stream. It has been clear to Fluid Life for some time that if FTIR methodology were available to carry out such analyses, it would provide a means of increasing efficiency and enhancing our service mix to clients. This possibility initially presented itself in the form of neat oil FTIR-based BN determinations (1). However, after extensive development and testing of this approach, it was concluded that chemometric PLS-based direct FTIR BN determinations were inadequate in terms of accuracy and reproducibility and incapable of dealing with the variability in, and the variety of mineral oils we processed. As a consequence, Fluid Life investigated a more rigorous approach developed by Thermal-Lube in conjunction with McGill University (2). Their turnkey FTIR COAT (Continuous Oil Analysis and Treatment) system is based on the use of stoichiometric reactions similar to those used by the ASTM titrimetric methods.



**Figure 1.** COAT system used for the FTIR determination of ASTM-identical AN and BN results for in-use mineral oils.