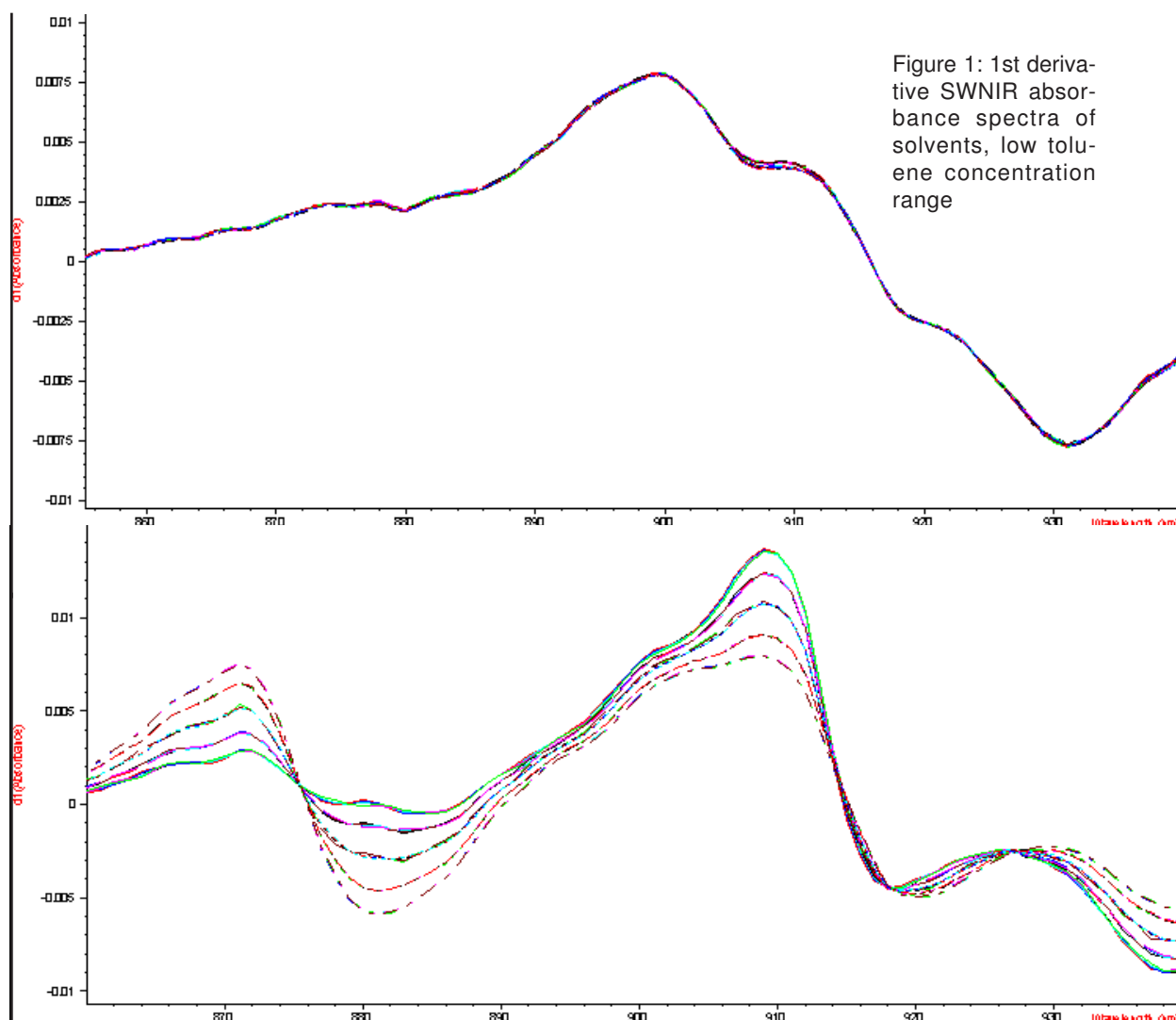


## SOLVENT STREAMS CONTAINING METHANOL, TOLUENE, NAPHTA AND WATER; BY AN ON-LINE SWNIR 1<sup>ST</sup> DERIVATIVE ABSORBANCE TECHNIQUE

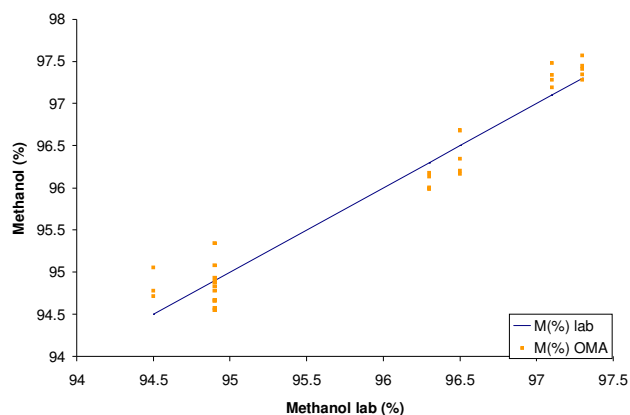
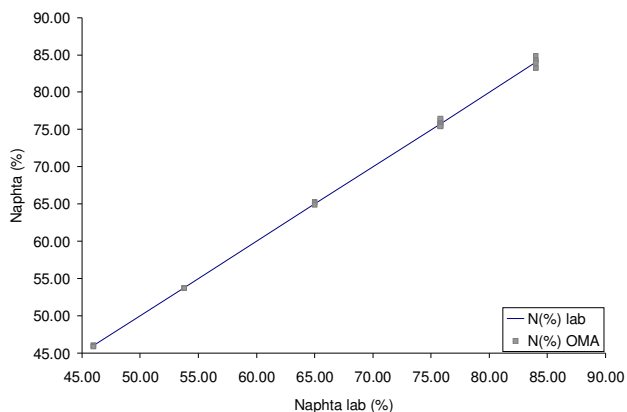
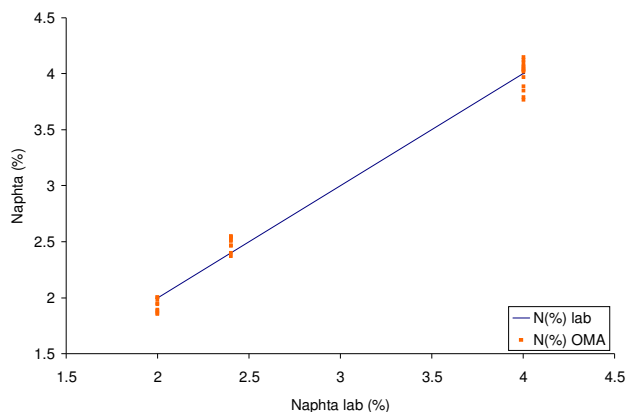
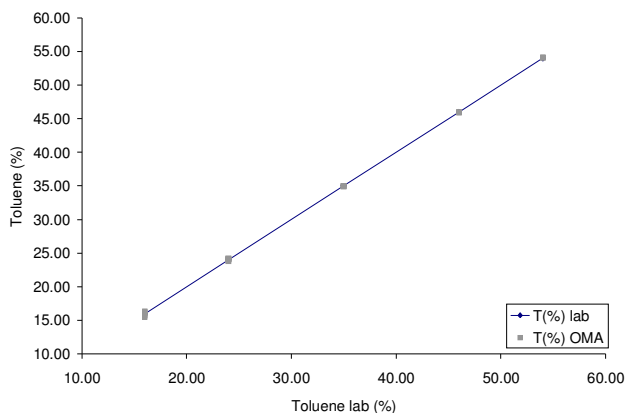
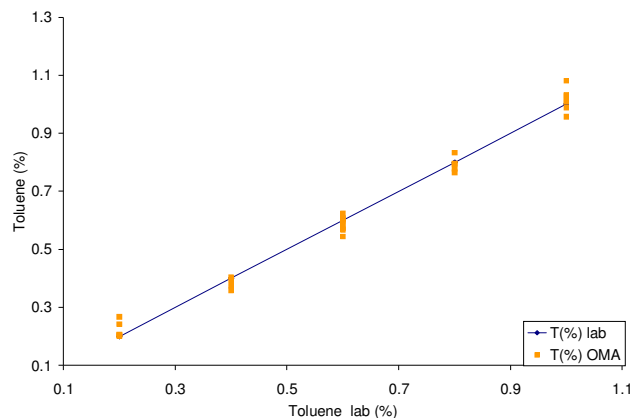
A chemical plant needed to monitor the concentrations of three components in a solvent stream, namely methanol, toluene and naphtha. The selected analytical technique was 1st derivative SWNIR absorbance spectroscopy. The NIR, rather than the UV spectral range, was preferred, in spite of the fact that both toluene and naphtha show distinct UV features because the concentrations in this particular application were high and an ATR type probe would have been required. A more cost effective solution would be to simply utilize the SWNIR range where the absorbancies are low enough to be measured by an in-situ or flow through cell. In addition, the methanol, which does absorb in the SWNIR range but not in the UV, could now be monitored as well.

All three components have overlapping features and hence a multi-components algorithm is required. Various analysis methods were considered and it was concluded that 1st derivative absorbance gave the best fit. Two different streams were monitored differing in composition, in one the toluene scale was 0-1% , in the other 10-60% . This resulted in the need for two different analysis methods, both utilizing 1st derivative spectroscopy. Wavelength range varied slightly and naturally other standards were used in the method development. Figure 1 shows the 1st derivative spectrum of the low Toluene concentration range, figure 2 shows the high toluene concentration range.



## Results

The graphs below show the fit between lab and diode array 1st derivative analyses results



## Method's accuracy

### Low Toluene range

Analyte Name	Std.Dev.
Toluene (%)	0.03
Naphta (%)	0.11
Methanol (%)	0.25

### High Toluene range

Analyte Name	Std.Dev.
Toluene (%)	0.21
Naphta (%)	0.38
Methanol (%)	0.21

## On-Line monitoring of solvent streams:

The OMA-300, a diode array process spectrophotometer, was used to continuously measure the 1st derivative absorbance spectra of the solvent stream. The spectrum was instantaneously analyzed via either the low or high toluene analysis methods to give the concentration of the individual components and output the results to the 4-20mA output. The switching between methods was done either manually, by loading a different method onto the analyzer's computer, or automatically, when a relay was opened to signal a change in stream type.



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