Introduction

The objective of the study was to create a calibration to measure moisture, ash, protein and fat content in fish fillets based on laboratory data provided by the National Institute of Water and Atmospheric Research (NIWA) of New Zealand.

Instrumentation

The MultiScan S3000 Food Analyser is a Near Infrared Transmission spectrometer equipped with a rotating sample cup. The instrument uses a diode array spectrometer to scan the wavelength region 720-1100nm at a resolution of 10nm. The instrument scans the sample ten times and average of the sub scans in the final predicted result.

Sampling Technique

30 samples of fish fillets were minced and analysed in the MultiScan S3000 using a 15 mm deep cell in order to acquire the spectral data. Then, each sample went through laboratory methods to retrieve their moisture, ash, protein and fat content.

The laboratory data was combined with the spectral data taken with the MultiScan S3000 and a Partial Least Square (PLS) regression was performed to develop a calibration for each component.

Results

Figure 1 shows the result for the spectral data of the 30 samples of fish fillets.
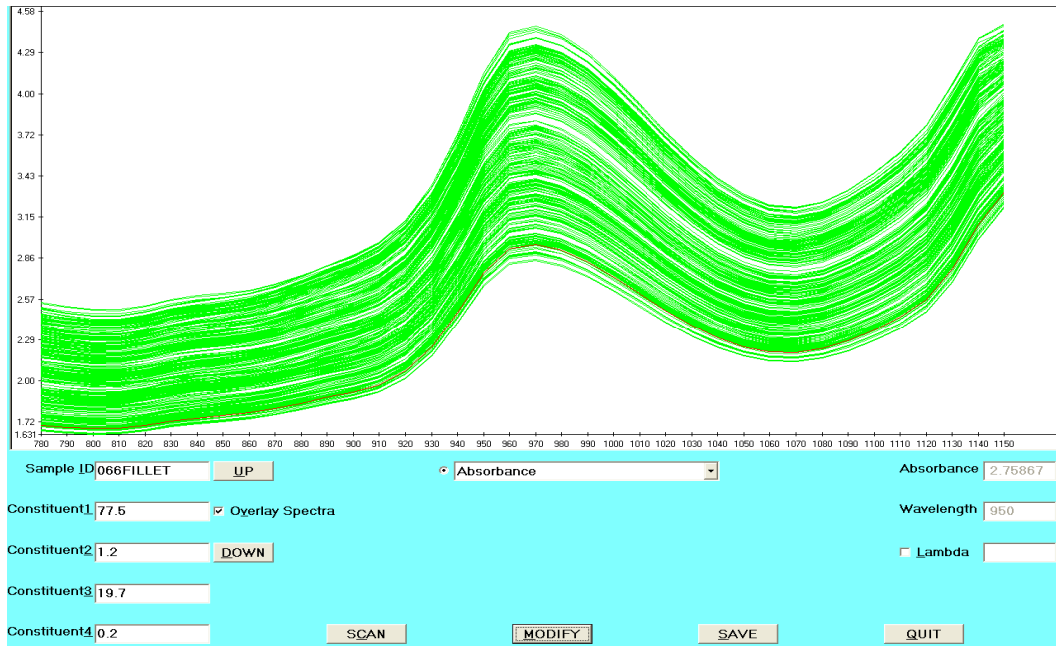

Figure1 – NIT spectra of fish fillets

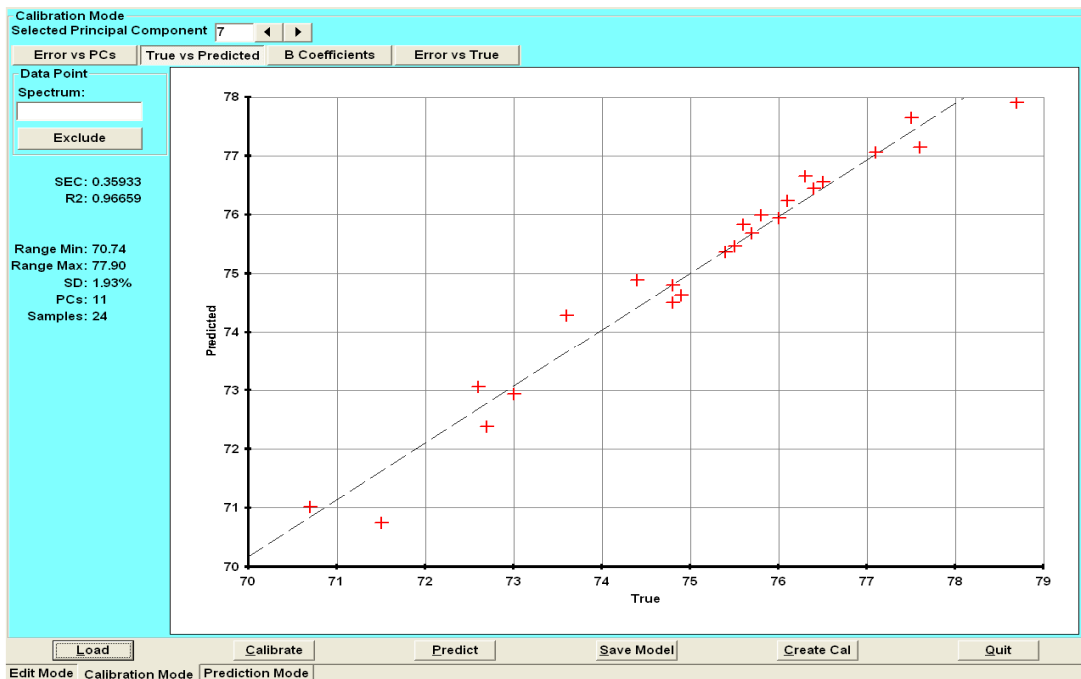Figures 2, 3, 4 and 5 represent the calibration curve for moisture, ash, protein and fat respectively.
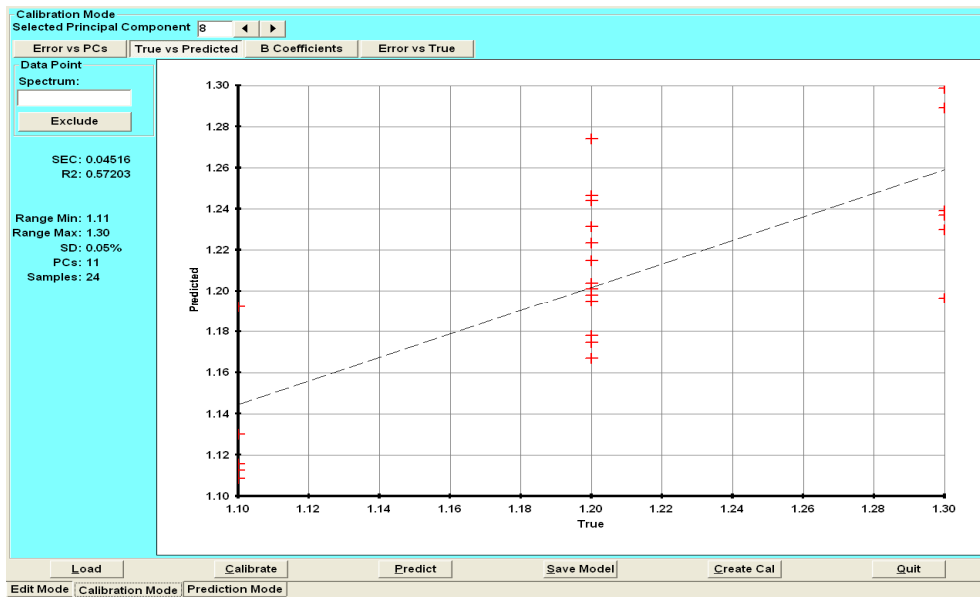

Figure 2 – Moisture Calibration Curve
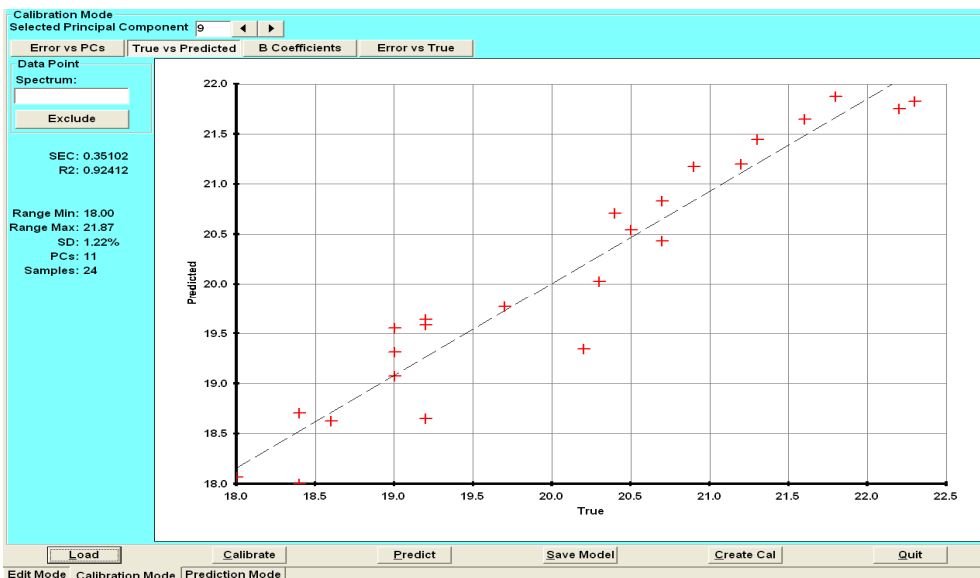
Figure 3 – Ash Calibration Curve

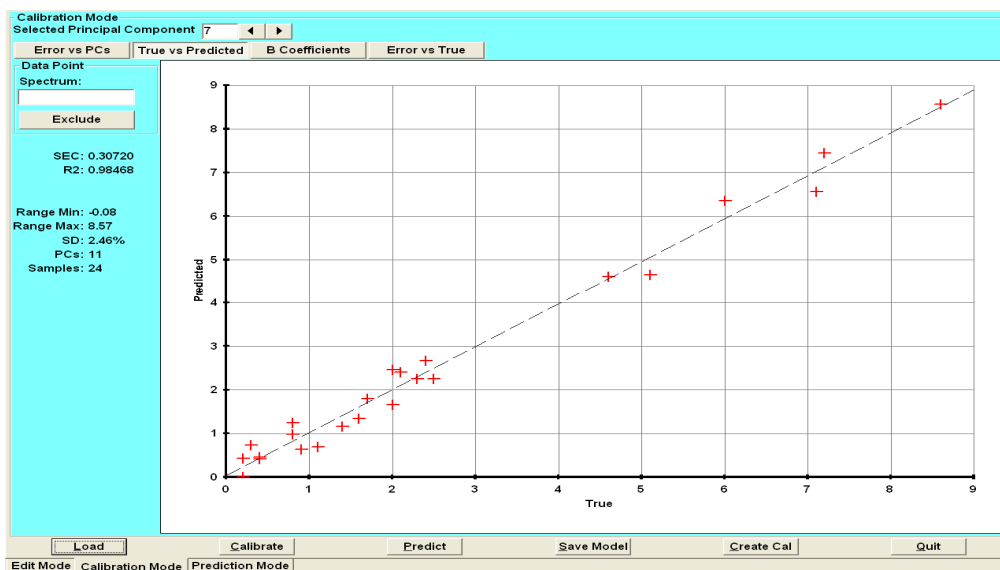Figure 4 – Protein Calibration Curve

Figure 5 – Fat Calibration Curve

From the laboratory data, we found 6 outliers which were removed from the calibration. These outliers may be due to errors in the laboratory methods or packing sample in the MultiScan S3000 cell.

Figures 2 and 5 show very good correlation for moisture and fat presenting R^2 values of 0.96 and 0.98 respectively and giving a standard error of calibration (SEC) of 0.4%.

The range for ash content is very narrow as shown on figure 3, between 1% and 1.3%, therefore the SEC is low (0.05) even though the correlation is 0.57.

The protein calibration also presents a good correlation with R^2 = 0.92 with a SEC of 0.4%.

Conclusion

The data presented above shows that the MultiScan S3000 can be calibrated to laboratory methods for moisture, ash, protein and fat analysis within 0.4% error in fish fillets.