

Real World Accuracy of XRF Instruments in the Cash for Gold Industry

By Gordon Howes

The surge in gold prices over the last few years has resulted in numerous XRF instruments being sold into this new industry Cash for Gold. In the past pawn brokers were basically the only game in town for the public to sell their jewellery and precious metals. Jewellers on the other hand, regularly deal with small precious metal refiners directly. Many of these refiners have used XRF instruments for a number of years. XRF instruments are fast, easy to use and precise.

Comparison of Gold Analysis Techniques

Technique	Versatility	Sample size	Accuracy	Limitations	Equipment Cost
Fire Assay	Only gold	~ 250 mg	0.02%	Modifications for Ni and Pd	Moderate \$50,000
ICP	Complete analysis	~20 mg	0.1%	-	High \$150,000
XRF	Complete analysis	Non-destructive	0.1 - 0.5%	Surface layer, flat samples	Moderate \$25,000+
Touchstone	Only gold	Almost non-destructive	1-2%	Unsuitable for high carat and white golds	Low \$100
Electronic Pen	Only gold	Non-destructive	4-8%	Not consistent	Low \$200
Density	Only gold	Non-destructive	Poor	Only for binary alloys	Low \$500

The combination of the lure of high profits and the inherent characteristics of XRF instruments has result in a vast number of Cash for Gold type businesses opening in most cities. You see the signs every where, many sites are just simple

collection sites using either chemical or conductivity measurements to assay gold but many more serious businesses interested in maximizing their profits have purchased XRF instruments. In Toronto in the last few years we have seen this market move from one XRF to over ten.

The question of concern to every XRF user and gold seller is how accurate is this instrument? Most manufacturers can supply standards for calibration with their instrument but the question becomes how accurate are these standards and who are they traceable to? Standards that are traceable to just the instrument manufacturer have little value in a legal situation. Folio Instruments obtained a set of yellow gold standards from Calmetrics. Calmetrics had the original fire assay performed by the Canadian Mint and checked by the Polish Mint confirming the results. Understanding that these are world leaders in their field and 3rd party companies with no bias towards any one manufacturer these standards are considered the paradigm and bench mark for the industry to meet.

These standards were then given to each end user and their personnel ran both the 14Kt and 18Kt standards one time on their instrument. No one was given any prior notice of the testing and there were no adjustments to the instruments and analysis times were left as is by the end user. Certainly this is not the most scientific approach but this is a real world approach.

Absolute Results

Given	CMI 900	Oxford 980	Fischer Xdal	Fischer Xan	Spectro Midex
75.28 +/-0.3	75.45	75.14	75.63	75.14	75.42
58.81 +/-0.3	58.98	58.60		58.37	58.67
Difference					
18Kt	+ 0.17	- 0.14	+ 0.35	- 0.14	+ 0.14
14Kt	+ 0.17	+ 0.19		-0.44	+ 0.14

Instruments used within the industry can be broken into two groups: low resolution prop counter bench top and high resolution pin or silicon drift detector bench top instruments. It should be noted that the CMI 900 is a prop

counter instrument but as shown here is an effective tool for measuring yellow gold. For clients interested in other precious metals like platinum and palladium a high resolution system like the Oxford 980 would give the best performance. The data also shows that the price of a instrument has less to do with performance and the importance of calibration standards. In the high resolution group the least expensive instrument offered the best performance.