

## MONITORING THE CONCENTRATIONS OF $\text{Co}^{+2}$ , $\text{Ni}^{+2}$ , $\text{Cu}^{+2}$ & $\text{Fe}^{+2}$ IONS IN A PROCESS STREAM



### The Process

A cobalt recovery plant required a continuous on-line monitoring of a number of its process streams, which involved the monitoring of low levels of  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Cu}^{+2}$ , and  $\text{Fe}^{+2}$ .

### Detection Method

An on-line UV/VIS diode array spectrophotometer was applied to this application, measuring absorbance spectrum from 190-800nm with a 1nm resolution. The cobalt, nickel, copper and iron ions all show unique absorbance spectra. The intensity of these spectra can be correlated to the concentration of these ions in the process stream(see figure 1). Ab-

sorbance values at certain wavelengths were correlated via a multi component calibration method to the metal ions concentrations.

### Interfering spectral features

All the mentioned above ions show interfering UV/Visible and SWNIR absorbance features. A full spectrum detector, such as a diode array, is therefore essential.

### Quantitative determination

Process samples were collected and analyzed by the laboratory (atomic absorption technique). It was important to use samples that spanned the complete concentration dynamic range. The accuracy of the laboratory measurement determined the accuracy of the on-line measurement. The process samples were then inserted in the analyzer's flow cell, the absorbance spectra of the standards were measured, and calibration and evaluation methods were developed. Once developed, no re-calibration was required. Only occasional blanking of the system on water was need(the system can be set for auto blanking). The Run-time-on-line software was then used to continuously monitor the process water stream and output the concentration values to a 4-20mA output, or alternatively output it through the serial port communication protocol.

### Advantages:

- Wavelength reproducibility - no moving parts
- Flexibility in selecting the optimal set of wavelengths to monitor.
- Fast response
- No sample preparation

Figure. 1: Absorbance spectra , see table 1 for details.

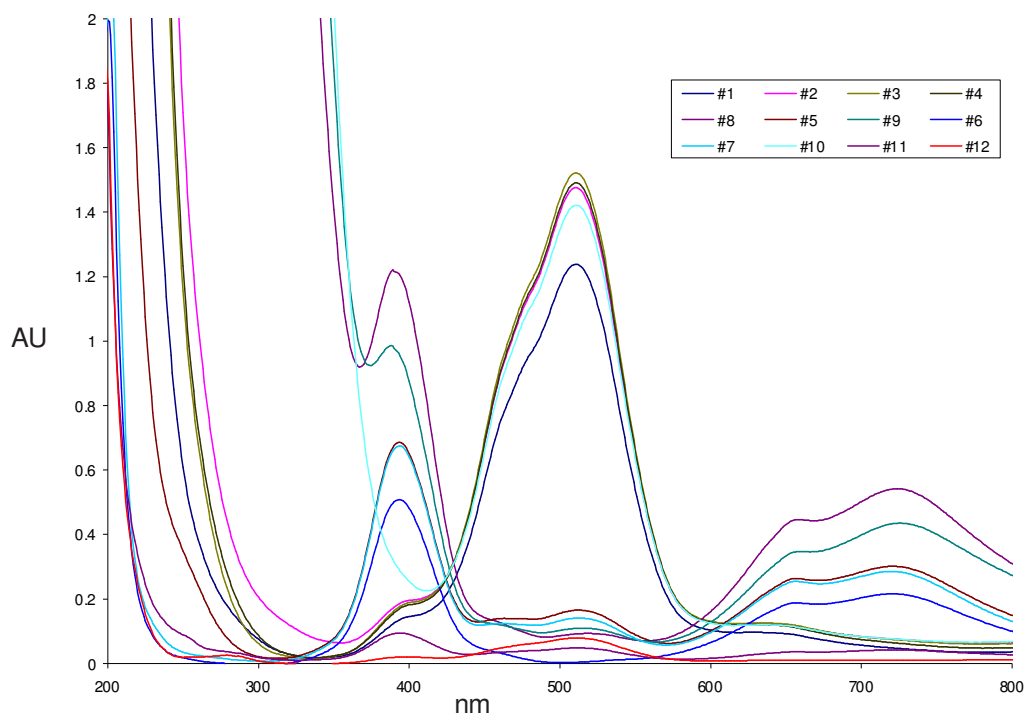


Table 1: Samples composition lab vs Diode Array in gr/l

	<b>Co<sup>+2</sup></b>		<b>Ni<sup>+2</sup></b>		<b>Cu<sup>+2</sup></b>		<b>Fe<sup>+2</sup></b>	
	lab	OMA	lab	OMA	lab	OMA	lab	OMA
1.	69.76	69.60	5.92	4.00	0.02	0.00	0.00	0.00
2.	84.40	84.20	4.03	5.70	0.50	0.50	0.02	0.02
3.	85.25	85.30	6.80	5.70	0.27	0.30	0.00	0.00
4.	83.95	84.00	5.35	5.40	0.06	0.04	0.00	0.00
5.	8.76	9.00	49.34	48.20	0.44	0.45	0.00	0.00
6.	0.05	0.00	33.80	28.90	0.00	0.01	0.00	0.00
7.	7.70	7.50	44.26	45.70	0.07	0.02	0.00	0.00
8.	4.01	4.00	72.61	70.20	2.20	2.20	1.99	2.00
9.	4.73	5.00	57.86	55.80	2.69	2.70	1.69	1.70
10.	76.65	76.40	2.90	5.40	0.49	0.50	0.79	0.80
11.	2.66	2.40	6.29	5.20	0.00	0.06	0.01	0.01
12.	4.10	4.00	0.49	1.20	0.00	0.00	0.00	0.00



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Product Brief - **OMA-300** Publication #P952510  
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