CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2000
DateRun:	02/07/2000
Experimenters:	Jason Marshall, Nicole Vayo
ClientType:	Chemical Light mfr
ProjectNumber:	Project #1
Substrates:	Liquid
PartType:	Part
Contaminants:	Phthalates
Cleaning Methods:	
Analytical Methods:	Light Meter
Purpose:	To identify a methodology for determining contamination levels of cleaning solution and rinse waters.
Experimental Procedure:	SUBSTRATE MATERIAL: Liquid-(water) CONTAMINANTS: Activator compound (75-65-0, 131-11-3, 7722-84-1); Phthalate (84-74-2)

Results:

Two series of fluorescing standards were made using the two components of the chemical lights. One set of standards were diluted up to 100 ml with DI water in beakers. The second set was added to 100 ml in beakers. Each standard was stirred with a glass rod prior to recording light intensity. Table 1 lists the standards used for evaluation.

Table 1. Standard Chemical Light Mixtures

SET 1	%Contaminant	1	2.5	5	10	25	50	100
Set 2	# Drops	1	2	3	4	5	X	X

For Set 1, a DI blank was placed into a black light chamber. The SPER Light Meter probe was placed into the chamber and the light intensity was recorded in foot candles. Set 1 standards were placed one at a time into the chamber in the exact place as the blank. Light intensity readings were made from the same place every time. Readings were then measured in a dark room with no black light chamber. Analysis was performed at two sites on the beaker for Set 1, the side and the top, and only one site for Set 2, the top.

A final visual observation was made using the black light chamber. Set 1 standards were all placed into the chamber and the coloring of the mix was observed. The four client supplied wash/rinse water samples were also analyzed in this manner to determine relative levels of contamination.

After recording all readings of the two sets of standards, correlation factors were determined using Microsoft Excel LINEST function. From this data, graphs were made to illustrate light meter readings versus the amount of contaminant in the standard. The data from Set 1 was best represented by the readings taken from inside the black light chamber. The correlation was found to be 0.9740 (1.0 being ideal). When the Natural Log of the values were taken, the readings from side of the beaker outside the chamber yielded the highest correlation, 0.9921. Table 2 lists the Light Meter readings and the corresponding correlations. Figure 1 shows the natural log of the data along with the Best Fit line based on the LINEST calculations.

Table 2. SET 1 Readings

Inside Chamber			
Outside	Chamber		
Contaminant Reading Side	Top Reading		
% by vol	Inside	Side	Top
0	0.12	2.13	0.51
1	0.21	1.75	0.92
2.5	0.23	2.03	0.99
5	0.32	1.92	1.14
10	0.25	2.31	1.42
25	0.36	3.06	2.40
50	0.51	4.30	4.00
100	1.20	13.58	14.83
Correlation	0.97	0.96	0.96
LN Correlation	0.932	0.99	0.97

For Data Set 2, the readings taken from the top of the beakers outside the chamber yielded the highest correlation, 0.9971. Table 3 and Figure 2 show the data and correlations for Data Set 2.

Table 3. Set 2 Data

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Contaminant	Inside	Outside Top
# Drops*	Reading	Reading
0	0.19	0.07
1	0.24	0.1
2	0.26	0.12
3	0.23	0.14
4	0.31	0.16
5	0.49	0.18
Correlation	0.839	0.997
* 1 drop	0.047 ml	

Visual observations of both sets of data revealed that the higher the contaminant concentration was the more yellow the solution was. Table 4 lists the observations made for both sets of standards. Of the four client supplied samples, two were identified to contain low levels of contamination. However, the amount of fluorescing was far less than the 1 drop sample from the Second Set. This may relate to a low volume of contaminant in the solution, but before concluding such, a fresh sample should be evaluated to eliminate the time variable (sample has been sitting for over a month).

Table 4. Visual Inspection of Fluorescence

SAMPLE	OBSERVATION
Set 1	
1	Green glow
2.5	Green glow, yellow globs
5	Green, yellow glow-yellow ring on bottom
10	Green, yellow glow- thin yellow ring on bottom and top
25	Green, yellow glow-layers of each, more green than yellow
50	Yellow glow, small green ring in middle
100	Yellow glow, small thin green ring on top
Set	
2, 1-5 drops	Green glow, slight increase in intensity as number of drops increases
Basket	Green glow, no yellow, particulate matter floating
Water Wash	Green glow-faint
Water Rinse	No color
DI Rinse	No color

Summary:

Conclusion: The use of black light fluorescence was found to be a possible way for method for determining the contamination levels of rinse/wash water. Using a light meter may aid in determining the quantitative levels of contaminants in these solutions.