# CLEANING LABORATORY EVALUATION SUMMARY

| | |
|---|---|
| SCL #: | 2002 |
| DateRun: | 10/23/2002 |
| Experimenters: | Jason Marshall |
| ClientType: | Metal |
| ProjectNumber: | Project #1 |
| Substrates: | Aluminum |
| PartType: | Part |
| Contaminants: | Oil |
| Cleaning Methods: | Ultrasonics |
| Analytical Methods: | Goniometry, OSEE |
| Purpose: | To evaluate two parts using OSEE and contact angle goniometry. |

Experimental Procedure:

Two cleaned parts were analyzed using OSEE and contact goniometry.
Background
OSEE: Optically Stimulated Electron Emission or PEE, Photo Electron Emission is based on the principle that metals and certain surfaces emit electrons upon illumination with ultraviolet (UV) light. These electrons can be collected, measured as current, converted to a voltage and digitally displayed. A surface contaminant will either enhance or attenuate this signal, depending on it own photo emissive nature. While OSEE will not identify a contaminant, it is a good comparative tool to determine the degree of contamination. This method is best suited for thin films (oils, etc.) and not particulate matter (dust, for example).

Goniometry: Like OSEE, laser or optical contact angle goniometry is the measurement of a secondary effect to extrapolate surface cleanliness. A small drop of deionized water is placed on the substrate of interest. A light is shown to reflect the droplet's interface with the surface. Usually, the higher the contact angle (that is, the height of the bubble), the greater the contamination. Conversely, water dropped on a clean surface generates a much smaller, flatter contact angle. An example of this effect is noticeable after waxing and then washing a car; the remaining wax acts as a contaminant and the residual water on the surface of the car 'bubbles up.' The technique is limited in that only the cleanliness under the tiny drop is measured so that several readings must be taken. Flat surfaces are more conducive to accuracy with this method.
OSEE readings were taken on five of the six sides for the smaller part (part 1) and on all six sides for the larger part (part 2). Five readings were recorded on each side. Overall averages were calculated for each of the two cleaned parts and the dirty part as well.
Contact angle measurements were taken from four of six sides for both cleaned parts. Eight readings were made for Part 1 and 7 for Part 2. Average values were calculated and compared.

Oil- Blaser Swisslube Inc Blasocut 2000 Universal (64742-52-5, 68608-26-1, 61790-44-1, 61791-12-6, 61789-76-9, 8016-28-2, 61788-66-7)

Results:

Table 1 lists the OSEE readings for all three parts

| OSEE Readings | | | |
|---|---|---|---|
| | Dirty | BCS Cleaned | Evercycle Cleaned |
| Side 1 | 267 | 984 | 483 |
| | 258 | 959 | 498 |
| | 283 | 896 | 494 |
| | 295 | 515 | 459 |
| | 323 | 531 | 597 |
| Side 2 | 277 | 656 | 392 |
| | 230 | 982 | 471 |
| | 310 | 805 | 430 |
| | 291 | 536 | 406 |
| | 268 | 983 | 484 |
| Side 3 | 274 | 982 | 494 |
| | 309 | 721 | 547 |
| | 316 | 555 | 594 |
| | 290 | 984 | 404 |
| | 284 | 508 | 574 |
| Side 4 | 262 | 793 | 284 |
| | 294 | 848 | 269 |

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| | | | |
|---|---|---|---|
| | 300 | 895 | 304 |
| | 289 | 513 | 361 |
| | 327 | 939 | 326 |
| Side 5 | 227 | 529 | 481 |
| | 224 | 295 | 300 |
| | 278 | 265 | 367 |
| | 220 | 951 | 348 |
| | 211 | 707 | 245 |
| Side 6 | | | 416 |
| | | | 525 |
| | | | 199 |
| | | | 301 |
| | 276 | 733 | 416 |

Table 2 lists the measured contact angle for the two cleaned parts.

Table 2. Contact Angle Measurements

| BCS | Evercycle | |
|---|---|---|
| 69 | 72 | |
| 68 | 72 | |
| 70 | 64 | |
| 59 | 63 | |
| 65 | 62 | |
| 67 | 73 | |
| 72 | 72 | |
| 68 | | |
| 67 | 68 | Average |

Summary:

| **Substrates:** | Aluminum | | | | |
|---|---|---|---|---|---|
| **Contaminants:** | Oil | | | | |
| **Company Name:** | **Product Name:** | **Conc.:** | **Efficiency:** | **Effective:** | **Observations:** |
| BCS Company | Ultra Blue 100 | 5 | 0.00 | ☑ | |
| CAE Cleaning Technologies - No Longer Exists | Evercycle UCI - For Comparative Purposes Only | 3 | 0.00 | ☑ | |

Conclusion:

Contact angle measurements of both parts resulted in nearly identical readings. The BCS cleaned part had an average angle of 67 and the Evercycle cleaned part had an average angle of 68. No difference in cleanliness can be found using this methodology. OSEE measurements resulted in higher values for the BCS cleaned part than for the Evercycle part. The dirty part had a lower reading than both cleaned parts. From this comparison, the results would suggest that the BCS cleaned part was cleaner than the Evercycle part. The BCS part had an average OSEE reading of 733, the Evercycle part reading was 416 and the dirty part had a reading of 276.