

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2008  
 DateRun: 06/19/2008  
 Experimenters: Jason Marshall, Shweta Bansal  
 ClientType: Tool Manufacturer  
 ProjectNumber: Project #1  
 Substrates: Steel  
 PartType: Coupon  
 Contaminants: Lubricating/Lapping Oils  
 Cleaning Methods: Ultrasonics  
 Analytical Methods: Gravimetric

Purpose: To evaluate top products on the third supplied cutting fluid using ultrasonic cleaning.

Experimental Procedure: The top six products were selected from the previous lab trial. Each product was diluted to 5% using DI water in 600 ml glass beakers. Solutions were heated to 130 F and immersed in a heat bath in a Branson 40 kHz ultrasonic tank. Products were degassed for five minutes.

Eighteen preweighed steel coupons were coated with the ChemSearch Aerolex Plus moly dry film lubricant by spraying the contaminant onto the surface. Coupons were weighed a second time to determine the amount of soil added. Three coupons were immersed into each product and cleaned for 5 minutes using ultrasonic agitation. Following cleaning, coupons were rinsed for 15 seconds in tap water at 120 F and dried using air blow off for 30 seconds at room temperature. Final weights were recorded, and efficiencies were calculated.

Results: The aqueous products had difficulty removing the lubricant. One product had moderate success removing over 40% of the contaminant as determined by gravimetric analysis. The others had negative calculated removal even though the coupons showed visual signs of being cleaner. Visual estimates were made for lubricant removal in addition to the traditional gravimetric values.

The table lists the amount of soil added, the amount remaining after cleaning, the efficiency for each coupon cleaned and the visually estimated level of removal.

| Cleaner              | Initial wt | Final wt | % Removed | Visual Estimate | Average Estimate |
|----------------------|------------|----------|-----------|-----------------|------------------|
| M Aero               | 0.0637     | 0.0843   | -32.34    | 30              |                  |
|                      | 0.0345     | 0.0382   | -10.72    | 40              |                  |
|                      | 0.0313     | 0.0593   | -89.46    | 30              | 33.33            |
| Polyspray Jet 790 xs | 0.0325     | 0.0504   | -55.08    | 35              |                  |
|                      | 0.0435     | 0.0696   | -60.00    | 50              |                  |
|                      | 0.0421     | 0.0533   | -26.60    | 50              | 45.00            |
| Metalnox M6310       | 0.0352     | 0.0298   | 15.34     | 30              |                  |
|                      | 0.0451     | 0.0409   | 9.31      | 50              |                  |
|                      | 0.0405     | 0.0475   | -17.28    | 50              | 43.33            |
| Daraclean 282 GF     | 0.0376     | 0.0347   | 7.71      | 50              |                  |
|                      | 0.0371     | 0.0344   | 7.28      | 50              |                  |
|                      | 0.0442     | 0.0453   | -2.49     | 45              | 48.33            |
| Micro 90             | 0.0696     | 0.0510   | 26.72     | 50              |                  |
|                      | 0.0468     | 0.0187   | 60.04     | 65              |                  |
|                      | 0.0413     | 0.0208   | 49.64     | 60              | 58.33            |
| Luminox              | 0.0447     | 0.0946   | -111.63   | 20              |                  |
|                      | 0.0328     | 0.0569   | -73.48    | 40              |                  |
|                      | 0.0412     | 0.0627   | -52.18    | 40              | 33.33            |

Summary:

|                         |  |                          |               |                    |                          |
|-------------------------|--|--------------------------|---------------|--------------------|--------------------------|
| <b>Substrates:</b>      |  | Steel                    |               |                    |                          |
| <b>Contaminants:</b>    |  | Lubricating/Lapping Oils |               |                    |                          |
| <b>Company Name:</b>    |  | <b>Product Name:</b>     | <b>Conc.:</b> | <b>Efficiency:</b> | <b>Effective:</b>        |
| Church & Dwight Co Inc. |  | Armakleen M Aero         | 5             | -44.17             | <input type="checkbox"/> |

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|                                    |                                      |   |        |                                     |  |
|------------------------------------|--------------------------------------|---|--------|-------------------------------------|--|
| US Polychem Corporation            | Polyspray Jet 790 XS                 | 5 | -47.23 | <input type="checkbox"/>            |  |
| Kyzen Corporation                  | Metalnox M6310 (For Comparison Only) | 5 | 2.46   | <input type="checkbox"/>            |  |
| Magnaflux                          | Daraclean 282 GF                     | 5 | 4.17   | <input type="checkbox"/>            |  |
| International Products Corporation | Micro 90 Conc.                       | 5 | 45.47  | <input checked="" type="checkbox"/> |  |
| Alconox Inc                        | Luminox                              | 5 | -79.10 | <input type="checkbox"/>            |  |

Conclusion:

A follow up test will be conducted on this soil with additional products. The six products from this trial will still be used on the fourth soil.