

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1998
 DateRun: 06/22/1998
 Experimenters: Jason Marshall
 ClientType: State Highway Department
 ProjectNumber: Project #1
 Substrates: Aluminum
 PartType: Coupon
 Contaminants: Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil
 Cleaning Methods:
 Analytical Methods: Gravimetric
 Purpose: Compare selected cleaners to current cleaner

Experimental Procedure: The 3 oils were selected in order to match the contaminants encountered by the client. Table 1 list CAS #s of the 3 oils and compares them to the client oils.
 Table 1 CAS #'s of Selected Oils.

| NAME | CAS # | GEAR OIL | TRACTOR | MOTOR |
|---------------------|------------|----------|---------|-------|
| Citgo Sliderite 220 | 64742-52-5 | | | |
| | 64742-01-4 | X | | |
| | 64742-62-7 | X | | |
| Citgo Cutting | 64741-89-5 | | X | |
| Oil 120 | 64742-65-0 | | X | |
| Citgo Cutting | 64742-65-0 | | X | |
| Oil 425 | 64741-88-4 | X | X | X |
| | 64741-89-5 | | X | |
| | 64742-54-7 | | X | X |

Each oil was applied to pre-weighed aluminum coupon. The coupons were placed in an oven for 20 minutes at 160 F. Coupons were allowed to cool to room temperature and weighed again. Three coupons were placed in each cleaner for two minutes with stir bar agitation at room temperature. Coupons were then rinsed in tap water for 30 seconds also at room temperature. Parts air dried and then weighed one more time.

SUBSTRATE MATERIAL: Al-202-6061 T-4
 CONTAMINANTS: Citgo Cutting Oils 425 & 120, Sliderite 220
 CONTAMINATING PROCESS USED: Applied the oils using a swab.

Results: All six of the chemistries cleaned very well. The Daraclean product had a dramatic increase in efficiency when compared to the previous trials. The other products tested were consistent with the results from the other trials. Table 2 lists the cleaning efficiencies from this trial and Table 3 compares results obtained in the other experiments.

Table 2. Cleaning Efficiencies from Trial 4

| | Safety Kleene | Soy Gold | SolSafe | Daraclean | SuperNeutral | Zep Dyna |
|----------|---------------|----------|---------|-----------|--------------|----------|
| Coupon 1 | 99.8 | 88.9 | 95.1 | 99.3 | 99.1 | 99.7 |
| Coupon 2 | 99.9 | 90.1 | 96.8 | 99.5 | 98.3 | 99.8 |
| Coupon 3 | 99.9 | 90.2 | 96.8 | 99.3 | 95.9 | 99.7 |
| Ave | 99.9 | 89.7 | 96.2 | 99.4 | 97.8 | 99.7 |

Table 3. Average Percent Removal From All Testing

| Trial # | ZEP Dyna | BioChem | SupNeut | Soy Gold | D-282 | D-232 | D-Greeze | Safety Kleene |
|---------|----------|---------|---------|----------|-------|-------|----------|---------------|
| 1 | 97.8 | 96.3 | 90.7 | 83.9 | 62.8 | 45.2 | 77 | NT |
| 2 | NT | NT | 89.5 | NT | 72 | 79.5 | NT | NT |
| 3 | 99.7 | 96.2 | 97.8 | 89.7 | 99.4 | NT | NT | 99.9 |

Summary:

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|---------------------------|---|---------------|--------------------|-------------------------------------|----------------------|
| Substrates: | Aluminum | | | | |
| Contaminants: | Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Safety Kleen Corporation | Premium Gold | 100 | 99.90 | <input checked="" type="checkbox"/> | current cleaner |
| AG Environmental Products | Soy Gold 1000 | 100 | 89.70 | <input checked="" type="checkbox"/> | |
| Bio Chem Systems | Solsafe 245 | 100 | 96.20 | <input checked="" type="checkbox"/> | |
| Magnaflux | Daraclean 282 | 100 | 99.40 | <input checked="" type="checkbox"/> | |
| Safe CleanUp Solutions | Super Neutral | 10 | 97.80 | <input checked="" type="checkbox"/> | |
| ZEP Manufacturing Company | Dyna 143 | 100 | 99.70 | <input checked="" type="checkbox"/> | current cleaner |

Conclusion:

Having compared the current cleaners to the client's suggested substitutions, it is apparent that there are several choices available. In making the switch, cleaning efficiency will remain the same as is evident from the percent removal of the tested cleaners.