

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2018

DateRun: 08/29/2018

Experimenters: Vinh Tran, Othon Pagounes, Ted Kearney

ClientType: Cleaner Manufacturer

ProjectNumber: Project #1

Substrates: Aluminum, Ceramics, Plastic, Painted metal

PartType: Coupon

Contaminants: Dirt

Cleaning Methods: Manual Wipe

Analytical Methods: Gravimetric, Visual

Purpose: To evaluate the effectiveness of the Alpha Chemical Sample C formula against the Alpha Chemical Sample G formula and the Alpha Chemical Sample M formula on the removal of vehicle dirt.

Experimental Procedure: Twelve coupons per cleaner, three of each substrate, were pre weighed and had one half of a gram of Vehicle Dirt soil (45% lithium grease, 39% motor oil, and 16% bike dirt) distributed onto each coupon. The dirty weights were recorded before placing three coupons of the same substrate onto the Single Line Washing Unit (SLW) with Wypall X60 attached to each cleaning sled. The Wypall X60 reinforced wipe, along with the coupons, were treated with three sprays each and allowed to soak for 30 seconds before cleaning for 20 cycles (30 seconds of cleaning). Clean coupons were air dried at room temperature (68 F) before clean weights were recorded. For the second and third trial, the clean weight of the coupons became the new initial weights and the procedure was repeated.

## Results:

| First Trial   |                 |                          |                        |                 |                           |                                   |
|---------------|-----------------|--------------------------|------------------------|-----------------|---------------------------|-----------------------------------|
| Cleaner       | Substrate       | Initial wt. of cont. (g) | Final wt. of cont. (g) | % Cont. Removed | Average % Content Removed | Overall Average % Content Removed |
| Formulation C | Aluminum        | 0.5572                   | 0.0571                 | 89.75           | 90.69                     | 88.66                             |
|               |                 | 0.5272                   | 0.0329                 | 93.76           |                           |                                   |
|               |                 | 0.5709                   | 0.0653                 | 88.56           |                           |                                   |
|               | Ceramic         | 0.4985                   | 0.0552                 | 88.93           | 93.54                     |                                   |
|               |                 | 0.6009                   | 0.0260                 | 95.67           |                           |                                   |
|               |                 | 0.4792                   | 0.0191                 | 96.01           |                           |                                   |
|               | Acrylic Plastic | 0.4983                   | 0.1491                 | 70.08           | 84.71                     |                                   |
|               |                 | 0.5039                   | 0.0416                 | 91.74           |                           |                                   |
|               |                 | 0.4626                   | 0.0356                 | 92.30           |                           |                                   |
|               | Painted Steel   | 0.6802                   | 0.1630                 | 76.04           | 85.71                     |                                   |
|               |                 | 0.5338                   | 0.0381                 | 92.86           |                           |                                   |
|               |                 | 0.5578                   | 0.0657                 | 88.22           |                           |                                   |
| Formulation G | Aluminum        | 0.6341                   | 0.1540                 | 75.71           | 85.50                     | 89.49                             |
|               |                 | 0.5385                   | 0.0834                 | 84.51           |                           |                                   |
|               |                 | 0.7741                   | 0.0287                 | 96.29           |                           |                                   |
|               | Ceramic         | 0.4264                   | 0.0243                 | 94.30           | 92.35                     |                                   |
|               |                 | 0.4317                   | 0.0241                 | 94.42           |                           |                                   |
|               |                 | 0.3930                   | 0.0459                 | 88.32           |                           |                                   |
|               | Acrylic Plastic | 0.4622                   | 0.0620                 | 86.59           | 90.72                     |                                   |
|               |                 | 0.4447                   | 0.0267                 | 94.00           |                           |                                   |
|               |                 | 0.4147                   | 0.0349                 | 91.58           |                           |                                   |
|               | Painted Steel   | 0.4237                   | 0.0525                 | 87.61           | 89.38                     |                                   |
|               |                 | 0.4476                   | 0.0380                 | 91.51           |                           |                                   |
|               |                 | 0.4706                   | 0.0517                 | 89.01           |                           |                                   |
| Formulation M | Aluminum        | 0.4426                   | 0.1604                 | 63.76           | 77.02                     | 86.83                             |
|               |                 | 0.4330                   | 0.0401                 | 90.74           |                           |                                   |
|               |                 | 0.4409                   | 0.1033                 | 76.57           |                           |                                   |
|               | Ceramic         | 0.4999                   | 0.0555                 | 88.90           | 91.18                     |                                   |
|               |                 |                          |                        |                 |                           |                                   |

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|  |                 |        |        |       |       |  |
|--|-----------------|--------|--------|-------|-------|--|
|  |                 | 0.4054 | 0.0508 | 87.47 |       |  |
|  |                 | 0.5425 | 0.0153 | 97.18 |       |  |
|  | Acrylic Plastic | 0.4460 | 0.0650 | 85.43 | 87.80 |  |
|  |                 | 0.8490 | 0.1005 | 88.16 |       |  |
|  |                 | 0.7253 | 0.0740 | 89.80 |       |  |
|  | Painted Steel   | 0.5989 | 0.0277 | 95.38 | 91.30 |  |
|  |                 | 0.5306 | 0.0602 | 88.65 |       |  |
|  |                 | 0.5048 | 0.0512 | 89.86 |       |  |

## Second Trial

| Cleaner       | Substrate       | Initial wt. of cont. (g) | Final wt. of cont. (g) | % Cont. Removed | Average % Content Removed | Overall Average % Content Removed |
|---------------|-----------------|--------------------------|------------------------|-----------------|---------------------------|-----------------------------------|
| Formulation C | Aluminum        | 0.5960                   | 0.1114                 | 81.31           | 85.09                     | 89.99                             |
|               |                 | 0.4659                   | 0.0704                 | 84.89           |                           |                                   |
|               |                 | 0.5437                   | 0.0594                 | 89.08           |                           |                                   |
|               | Ceramic         | 0.5833                   | 0.0857                 | 85.31           | 91.87                     |                                   |
|               |                 | 0.4512                   | 0.0316                 | 93.00           |                           |                                   |
|               |                 | 0.4353                   | 0.0118                 | 97.29           |                           |                                   |
|               | Acrylic Plastic | 0.4116                   | 0.0304                 | 92.61           | 90.07                     |                                   |
|               |                 | 0.7992                   | 0.0872                 | 89.09           |                           |                                   |
|               |                 | 0.4871                   | 0.0560                 | 88.50           |                           |                                   |
|               | Painted Steel   | 0.7668                   | 0.0625                 | 91.85           | 92.93                     |                                   |
|               |                 | 0.6517                   | 0.0492                 | 92.45           |                           |                                   |
|               |                 | 0.6551                   | 0.0361                 | 94.49           |                           |                                   |
| Formulation G | Aluminum        | 0.4077                   | 0.0598                 | 85.33           | 87.74                     | 89.92                             |
|               |                 | 0.3313                   | 0.0313                 | 90.55           |                           |                                   |
|               |                 | 0.4364                   | 0.0552                 | 87.35           |                           |                                   |
|               | Ceramic         | 0.6995                   | 0.0690                 | 90.14           | 95.10                     |                                   |
|               |                 | 0.5333                   | 0.0147                 | 97.24           |                           |                                   |
|               |                 | 0.4497                   | 0.0094                 | 97.91           |                           |                                   |
|               | Acrylic Plastic | 0.3537                   | -0.0009                | 100.25          | 87.83                     |                                   |
|               |                 | 0.3825                   | 0.0523                 | 86.33           |                           |                                   |
|               |                 | 0.6503                   | 0.1501                 | 76.92           |                           |                                   |
|               | Painted Steel   | 0.5430                   | 0.0744                 | 86.30           | 89.02                     |                                   |
|               |                 | 0.6591                   | 0.0410                 | 93.78           |                           |                                   |
|               |                 | 0.6652                   | 0.0867                 | 86.97           |                           |                                   |
| Formulation M | Aluminum        | 0.5350                   | 0.0856                 | 84.00           | 86.18                     | 89.63                             |
|               |                 | 0.4857                   | 0.0363                 | 92.53           |                           |                                   |
|               |                 | 0.6904                   | 0.1241                 | 82.02           |                           |                                   |
|               | Ceramic         | 0.6457                   | 0.0416                 | 93.56           | 96.25                     |                                   |
|               |                 | 0.5218                   | 0.0174                 | 96.67           |                           |                                   |
|               |                 | 0.5278                   | 0.0078                 | 98.52           |                           |                                   |
|               | Acrylic Plastic | 0.4279                   | 0.0577                 | 86.52           | 87.71                     |                                   |
|               |                 | 0.8618                   | 0.1318                 | 84.71           |                           |                                   |
|               |                 | 0.8336                   | 0.0676                 | 91.89           |                           |                                   |
|               | Painted Steel   | 0.6027                   | 0.0881                 | 85.38           | 88.38                     |                                   |
|               |                 | 0.3882                   | 0.0502                 | 87.07           |                           |                                   |
|               |                 | 0.6463                   | 0.0473                 | 92.68           |                           |                                   |

## Third Trial

| Cleaner       | Substrate | Initial wt. of cont. (g) | Final wt. of cont. (g) | % Cont. Removed | Average % Content Removed | Overall Average % Content Removed |
|---------------|-----------|--------------------------|------------------------|-----------------|---------------------------|-----------------------------------|
| Formulation C | Aluminum  | 0.7645                   | 0.1112                 | 85.46           | 87.79                     | 90.26                             |
|               |           | 0.7817                   | 0.0938                 | 88.00           |                           |                                   |
|               |           | 0.6685                   | 0.0675                 | 89.90           |                           |                                   |

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|               |                 |        |        |       |       |       |
|---------------|-----------------|--------|--------|-------|-------|-------|
| Formulation G | Ceramic         | 0.6085 | 0.0410 | 93.26 | 94.61 | 92.67 |
|               |                 | 0.6831 | 0.0487 | 92.87 |       |       |
|               |                 | 0.5719 | 0.0131 | 97.71 |       |       |
|               | Acrylic Plastic | 0.9168 | 0.0962 | 89.51 | 89.88 |       |
|               |                 | 0.9596 | 0.0994 | 89.64 |       |       |
|               |                 | 0.7647 | 0.0727 | 90.49 |       |       |
|               | Painted Steel   | 0.5141 | 0.0397 | 92.28 | 88.74 |       |
|               |                 | 0.5444 | 0.0433 | 92.05 |       |       |
|               |                 | 0.7200 | 0.1305 | 81.88 |       |       |
|               | Aluminum        | 0.9838 | 0.0868 | 91.18 | 90.09 |       |
|               |                 | 0.6352 | 0.0951 | 85.03 |       |       |
|               |                 | 0.8353 | 0.0496 | 94.06 |       |       |
|               | Ceramic         | 0.7032 | 0.0274 | 96.10 | 96.48 |       |
|               |                 | 0.6089 | 0.0219 | 96.40 |       |       |
|               |                 | 0.6824 | 0.0208 | 96.95 |       |       |
| Formulation M | Acrylic Plastic | 0.8085 | 0.0499 | 93.83 | 88.16 | 91.97 |
|               |                 | 0.6471 | 0.0876 | 86.46 |       |       |
|               |                 | 0.8117 | 0.1284 | 84.18 |       |       |
|               | Painted Steel   | 0.5626 | 0.0218 | 96.13 | 95.94 |       |
|               |                 | 0.6154 | 0.0225 | 96.34 |       |       |
|               |                 | 0.6307 | 0.0293 | 95.35 |       |       |
|               | Aluminum        | 0.8710 | 0.1152 | 86.77 | 90.00 |       |
|               |                 | 0.8778 | 0.0787 | 91.03 |       |       |
|               |                 | 0.9550 | 0.0744 | 92.21 |       |       |
|               | Ceramic         | 0.4625 | 0.0248 | 94.64 | 96.00 |       |
|               |                 | 0.7093 | 0.0301 | 95.76 |       |       |
|               |                 | 0.5965 | 0.0144 | 97.59 |       |       |
|               | Acrylic Plastic | 0.7556 | 0.0672 | 91.11 | 89.57 |       |
|               |                 | 0.8318 | 0.0991 | 88.09 |       |       |
|               |                 | 0.7426 | 0.0778 | 89.52 |       |       |
|               | Painted Steel   | 0.5297 | 0.0609 | 88.50 | 92.32 |       |
|               |                 | 0.8171 | 0.0624 | 92.36 |       |       |
|               |                 | 0.7088 | 0.0277 | 96.09 |       |       |

Formulation C Overall Average Content Removed

|                 | Aluminum % | Ceramic % | Acrylic Plastic % | Painted Steel % |
|-----------------|------------|-----------|-------------------|-----------------|
| First Trial     | 90.69      | 93.54     | 84.71             | 85.71           |
| Second Trial    | 85.09      | 91.87     | 90.07             | 92.93           |
| Third Trial     | 87.79      | 94.61     | 89.88             | 88.74           |
| Trial Average % | 87.86      | 93.34     | 88.22             | 89.13           |
| Effective       | Yes        | Yes       | Yes               | Yes             |

Formulation G Overall Average Content Removed

|                 | Aluminum % | Ceramic % | Acrylic Plastic % | Painted Steel % |
|-----------------|------------|-----------|-------------------|-----------------|
| First Trial     | 85.50      | 92.35     | 90.72             | 89.38           |
| Second Trial    | 87.74      | 95.10     | 87.83             | 89.02           |
| Third Trial     | 90.09      | 96.48     | 88.16             | 95.94           |
| Trial Average % | 87.78      | 94.64     | 88.90             | 91.45           |
| Effective       | Yes        | Yes       | Yes               | Yes             |

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## Formulation M Overall Average Content Removed

|                 | Aluminum % | Ceramic % | Acrylic Plastic % | Painted Steel % |
|-----------------|------------|-----------|-------------------|-----------------|
| First Trial     | 77.02      | 91.18     | 87.80             | 91.30           |
| Second Trial    | 86.18      | 96.25     | 87.71             | 88.38           |
| Third Trial     | 90.00      | 96.00     | 89.57             | 92.32           |
| Trial Average % | 84.40      | 94.48     | 88.33             | 90.67           |
| Effective       | Yes        | Yes       | Yes               | Yes             |

## Trial Averages %

| Cleaner                             | Aluminum % | Ceramic % | Acrylic Plastic % | Painted Steel % | Overall % |
|-------------------------------------|------------|-----------|-------------------|-----------------|-----------|
| Alpha Chemical Sample C Formulation | 87.86      | 93.34     | 88.22             | 89.13           | 89.64     |
| Alpha Chemical Sample G Formulation | 87.78      | 94.64     | 88.90             | 91.45           | 90.69     |
| Alpha Chemical Sample M Formulation | 84.40      | 94.48     | 88.33             | 90.67           | 89.47     |

## Summary:

|                         |  |               |                    |                                     |                      |
|-------------------------|--|---------------|--------------------|-------------------------------------|----------------------|
| <b>Substrates:</b>      | Aluminum, Ceramics, Plastic, Painted metal |               |                    |                                     |                      |
| <b>Contaminants:</b>    | Dirt                                       |               |                    |                                     |                      |
| <b>Company Name:</b>    | <b>Product Name:</b>                       | <b>Conc.:</b> | <b>Efficiency:</b> | <b>Effective:</b>                   | <b>Observations:</b> |
| Alpha Chemical Services | Sample C Formulation                       | 100%          | 89.64              | <input checked="" type="checkbox"/> |                      |
| Alpha Chemical Services | Sample G Formulation                       | 100           | 90.69              | <input checked="" type="checkbox"/> |                      |
| Alpha Chemical Services | Sample M Formulation                       | 100           | 89.47              | <input checked="" type="checkbox"/> |                      |

## Conclusion:

Alpha Chemical Sample C Formulation, Alpha Chemical Sample G Formulation, and the Alpha Chemical Sample M Formulation are all effective in the removal and prevention of vehicle dirt from staying on multiple surfaces. The soil removal increased gravimetrically and visually after every trial of all three cleaners.