

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2016  
 DateRun: 02/28/2016  
 Experimenters: Abigail Giarrosso, Catherine York, Sabrina Apel  
 ClientType: General  
 ProjectNumber: Project #1  
 Substrates: Aluminum, Brass, Stainless Steel  
 PartType: Coupon  
 Contaminants: Cutting/Tapping Fluids  
 Cleaning Methods: Immersion/Soak  
 Analytical Methods: Gravimetric  
 Purpose: To eliminate the use of N-Propyl Bromide in cleaning operations

Experimental Procedure: Four cleaners and water were tested at room temperature on aluminum, brass, and stainless-steel coupons to evaluate how the soil Water Soluble Coolant was cleaned. Preweighed coupons were coated with the supplied water-soluble coolant using a handheld swab and weighed a second time to determine the amount of soil added. Each cleaner was put in a beaker and three coupons were immersed into the solution for 5 minutes. The coupons were then stood upright to air dry for 15 minutes and then placed on a tray. There was no rinse. Once dry, final weights were measured and efficiency calculated for each coupon cleaned.

| Cleaner         | Substrate | Initial Wt. | Final Wt. | % Removed |
|-----------------|-----------|-------------|-----------|-----------|
| Fluosolv CX     | Aluminum  | 21.5772     | 21.5739   | 100.00    |
|                 | Aluminum  | 21.5349     | 21.5378   | 99.10     |
|                 | Aluminum  | 21.6684     | 21.6696   | 99.45     |
|                 | Brass     | 69.4517     | 69.4550   | 98.95     |
|                 | Brass     | 69.6130     | 69.6169   | 98.75     |
|                 | Brass     | 69.5385     | 69.5414   | 98.87     |
|                 | Stainless | 63.8961     | 63.9071   | 96.27     |
|                 | Stainless | 63.8697     | 63.8800   | 96.00     |
|                 | Stainless | 60.1002     | 60.1027   | 98.86     |
| Fluosolv NC     | Aluminum  | 21.1991     | 21.1999   | 99.58     |
|                 | Aluminum  | 21.0506     | 21.0582   | 96.38     |
|                 | Aluminum  | 21.1746     | 21.1748   | 99.89     |
|                 | Brass     | 49.5343     | 49.5343   | 100.00    |
|                 | Brass     | 69.3302     | 69.3311   | 99.54     |
|                 | Brass     | 69.4374     | 69.4378   | 99.83     |
|                 | Stainless | 59.1227     | 59.1229   | 99.91     |
|                 | Stainless | 59.5738     | 59.5769   | 98.45     |
|                 | Stainless | 63.9180     | 63.9203   | 99.02     |
| Honeywell PF    | Aluminum  | 21.4827     | 21.4858   | 98.63     |
|                 | Aluminum  | 21.6229     | 21.6266   | 98.73     |
|                 | Aluminum  | 21.5751     | 21.5774   | 99.14     |
|                 | Brass     | 49.4182     | 49.4233   | 98.66     |
|                 | Brass     | 49.5324     | 49.5373   | 98.52     |
|                 | Brass     | 49.4790     | 49.4839   | 98.03     |
|                 | Stainless | 58.9560     | 58.9729   | 94.72     |
|                 | Stainless | 58.9477     | 58.9590   | 95.65     |
|                 | Stainless | 61.8864     | 61.8946   | 96.47     |
| Honeywell PF-2A | Aluminum  | 21.4982     | 21.4984   | 99.91     |
|                 | Aluminum  | 21.0955     | 21.0965   | 99.57     |
|                 | Aluminum  | 21.6888     | 21.6899   | 99.39     |
|                 | Brass     | 69.4463     | 69.4497   | 98.83     |

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|       |           |         |         |        |
|-------|-----------|---------|---------|--------|
|       | Brass     | 49.5428 | 49.5449 | 98.87  |
|       | Brass     | 49.4977 | 49.4996 | 99.27  |
|       | Stainless | 59.5287 | 59.5315 | 98.84  |
|       | Stainless | 63.8418 | 63.8866 | 83.21  |
|       | Stainless | 63.8993 | 63.8914 | 100.00 |
| Water | Aluminum  | 21.4546 | 21.4588 | 98.63  |
|       | Aluminum  | 21.5363 | 21.5391 | 99.17  |
|       | Aluminum  | 21.4912 | 21.4962 | 98.46  |
|       | Brass     | 49.5400 | 49.5442 | 98.79  |
|       | Brass     | 49.5310 | 49.5340 | 99.00  |
|       | Brass     | 49.5260 | 49.5291 | 99.25  |
|       | Stainless | 60.9681 | 60.9729 | 98.60  |
|       | Stainless | 59.0497 | 59.0526 | 98.99  |
|       | Stainless | 62.9084 | 62.9395 | 87.19  |

Summary:

| <b>Substrates:</b>             | Aluminum, Brass, Stainless Steel |               |                    |                                     |                      |
|--------------------------------|----------------------------------|---------------|--------------------|-------------------------------------|----------------------|
| <b>Contaminants:</b>           | Cutting/Tapping Fluids           |               |                    |                                     |                      |
| <b>Company Name:</b>           | <b>Product Name:</b>             | <b>Conc.:</b> | <b>Efficiency:</b> | <b>Effective:</b>                   | <b>Observations:</b> |
| NuGeneration Technologies, LLC | FluoSolv CX                      | 100           | 98.47              | <input checked="" type="checkbox"/> |                      |
| Honeywell                      | Solstice PF with N2              | 100           | 97.61              | <input checked="" type="checkbox"/> |                      |
| NuGeneration Technologies, LLC | FluoSolv NC 786                  | 100           | 99.17              | <input checked="" type="checkbox"/> |                      |
| Honeywell                      | Solstice PF-2A with N2           | 100           | 97.54              | <input checked="" type="checkbox"/> |                      |

Conclusion:

All five chemistries evaluated efficiently removed the water-soluble coolant from all three types of substrates. Although Solstice 2A quantitatively was the least efficient, there was more visible soil on the coupons cleaned with water. Water would be classified as the least efficient cleaner despite quantitative evidence. Interactions with stainless substrate removed less soil than other substrates. The most efficient cleaner would be the Fluosolv NC with 99.17% efficiency. All chemistries were successful cleaners.