

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2004
 DateRun: 05/11/2004
 Experimenters: Jason Marshall
 ClientType: Tool Manufacturer
 ProjectNumber: Project #1
 Substrates: Steel
 PartType: Coupon
 Contaminants: Oil
 Cleaning Methods: Vapor Degreasing
 Analytical Methods: Gravimetric, Visual
 Purpose: To conduct a preliminary evaluation of vapor degreasing on a supplied oil

Experimental Procedure: One cleaning product was selected from the previous trials based on results from immersion cleaning. The product was heated to boiling (71 C) in a laboratory scale vapor degreasing unit. Volume of solvent used was 235 ml. Vapors were condensed with ice water circulating through two sets of coils. Steel coupons were coated with Castrol Quench G oil (64742-55-8, 64742-65-0, 8052-42-4) using a hand held swab. The quench oil was then heated with a Master Appliance Heat gun at 300 F for 10 minutes. After cooling to room temperature, a second weighing was performed to determine the amount of soil that was added. Three coupons were cleaned in the degreaser using three methods: Immersion in the boiling solvent, cleaning in vapor zone followed by immersion in boiling solvent and cleaning in vapors alone. One coupon was coated with oil but not cleaned. It was suspended in the vertical position to determine how much oil was removed by gravity alone. At the end of cleaning, final weights were recorded and efficiency calculated.

Results: The solvent took about 5-6 minutes to reach boiling. After 8 minutes oil was observed to be dripping off at a steady rate. Between 13 and 15 minutes the oil appeared to be removed from the coupon surface. After 15 minutes there was a visual condensation cloud. At this point, the cover was removed and the part was immersed into the vapor zone. At 25 minutes cover was removed and two coupons were moved from the vapor zone into the liquid zone and then all coupons removed from the degreasing unit. The cover was replaced at this time. The coupon that was not cleaned lost just about half of the oil due to gravity. Two other solvents were heated to boiling in the vapor chamber and used to clean three coupons for 15 minutes.

| Cleaner | Initial wt | Final wt | % Removed | | |
|-----------|------------|----------|-----------|-------------------|--------|
| Solvon PB | 0.2771 | -0.0014 | 100.51 | Immersion | 15 |
| | 0.2319 | -0.0002 | 100.09 | Vapor & Immersion | 13 & 2 |
| | 0.1981 | 0.0005 | 99.75 | | |
| Solvon PB | 0.1155 | 0.051 | 55.84 | Drip | 15 |
| | 0.051 | 0.0002 | 99.61 | Vapor for coupon | 15 |

Vapor cleaning only

| Cleaner | Initial wt | Final wt | % Removed |
|----------------|------------|----------|-----------|
| Ensolv A | 0.1180 | 0.0005 | 99.58 |
| | 0.1307 | 0.0004 | 99.69 |
| | 0.1693 | 0.0009 | 99.47 |
| Metalnox M6960 | 0.1123 | 0.0011 | 99.02 |
| | 0.1167 | 0.0006 | 99.49 |
| | 0.0810 | -0.0003 | 100.37 |

Summary:

| | | | | | | |
|----------------------|----------------------|---------------|--------------------|-------------------------------------|------------------------------------|--|
| Substrates: | | Steel | | | | |
| Contaminants: | | Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: | |
| Poly Systems USA Inc | Solvon Kreussler PB | 100 | 99.81 | <input checked="" type="checkbox"/> | Vapor and Immersion/Vapor cleaning | |

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|-------------------------------|----------------|-----|-------|-------------------------------------|--|
| Enviro Tech International Inc | Ensolv A | 100 | 99.58 | <input checked="" type="checkbox"/> | |
| Kyzen Corporation | Metalnox M6960 | 100 | 99.63 | <input checked="" type="checkbox"/> | |

Conclusion:

Vapor degreasing with the three solvents appeared to be an effective method for cleaning. Additional testing will be done on other supplied contaminants.