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	☑	Vapor and Immersion/Vapor cleaning

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Enviro Tech International Inc	Ensolv A	100	99.58	☑	
Kyzen Corporation	Metalnox M6960	100	99.63	☑	

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