NSF International

August 6, 2008

Plastic Pipe and Fittings Association
800 Roosevelt Road
Building C, Suite 312
Glen Ellyn, Illinois 60137

RE: Testing of Cross-linked Polyethylene Tubing to NSF/ANSI Standard 61
LAB REPORT #'s: J-00056621, J-00056620, J-00057146, J-00057147, J-00057148, J-00057149, J-00057150, J-00057151, J-00057152 and J-00057153

To whom it may concern,

NSF International has completed the testing and has summarized the test results for ten samples of Cross-linked Polyethylene Tubing to evaluate the long term extraction of t-butanol and methyl t-butyl ether (MTBE). To determine the long term extraction of these contaminants samples of cross-linked polyethylene tubing were conditioned for 16 days prior to the critical water collection on day 17. For these overtime exposures the water was also collected and analyzed on days 1, 2, 3, 8, 10, 21, 36, 49, 78 and 107. Analyzing water samples from days throughout the exposure was necessary to perform a regression analysis. The purpose of this review is to determine the point at which the t-butanol and MTBE extraction result would be lower than 13 and 12 ppb respectively.

Table 1 summarizes the normalized results for t-butanol and MTBE for Day 107. All samples tested for MTBE had normalized levels below 12 ppb by day 107. Of the samples tested for t-butanol, two of ten were below 13 ppb after the 107 day exposure.

Table 1. Day 107 normalized results for t-butanol and MTBE.

Sample	t-butanol (ppb)	MTBE (ppb)
Sample 1 - J-00056620	15	5.4
Sample 2 - J-00056621	†ND (10)	7.3
Sample 3 - J-00057146	21	†ND (0.3)
Sample 4 - J-00057147	55	†ND (0.3)
Sample 5 - J-00057148	21	8.8
Sample 6 - J-00057149	62	11
Sample 7 - J-00057150	34	0.47
Sample 8 - J-00057151	41	†ND (0.3)
Sample 9 - J-00057152	62	†ND (0.3)
Sample 10 - J-00057153	†ND (10)	†ND (0.3)

† Non-Detectable.

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Even though all MTBE samples were below 12 ppb by day 107 regression analyses were performed to determine which decay model (power or exponential) best predicts day 107 extraction results. In 9 of the 10 samples, the power model demonstrated the best fit based upon the highest coefficient of determination (r^2 value). Graphical results of the t-butanol and MTBE regression analyses can be found in Appendix A.

For the t-butanol samples that exceeded 13 ppb on day 107, the levels were extrapolated to determine the day when that level would be below 13 ppb based upon the model that was selected for the regression. Table 2 summarizes the results of these regression analyses.

Table 2. Results of the 107 day regression analyses performed on t-butanol samples.

Sample	r^2 value (Model)	Predicted day that t-butanol would reach 12 ppb
Sample 1 - J-00056620	0.99131 (Exponential)	97
Sample 2 - J-00056621	N/A	Level below 12 ppb by day 107
Sample 3 - J-00057146	0.97599 (Power)	241
Sample 4 - J-00057147	0.93866 (Power)	> 2 years
Sample 5 - J-00057148	0.99205 (Exponential)	112
Sample 6 - J-00057149	0.99724 (Exponential)	135
Sample 7 - J-00057150	0.91662 (Exponential)	137
Sample 8 - J-00057151	0.92825 (Power)	> 2 years
Sample 9 - J-00057152	0.86628 (Exponential)	147
Sample 10 - J-00057153	N/A	Level below 12 ppb by day 107

The model used was selected based on the best fit to either the power or exponential model. In 6 of the 10 samples the exponential model demonstrated the best fit. In the other 4 samples the power model demonstrated the better fit. The extraction and decay of t-butanol results vary by the amount of peroxide used, the age of the tubing, the cross-linking method and the variability that can be introduced during the manufacture of this material. Regression analysis indicates that the 8 samples reporting t-butanol levels above 13 ppb on day 107 would decay to below 13 ppb in as few as 97 days to a maximum of greater than 2 years.

If you have any further questions, please contact me at 734-913-5737.

Sincerely,

Clifton J. McLellan
Director of Toxicology Services
NSF International

Appendix A

Figure 1. PSF# J-57146 - MTBE

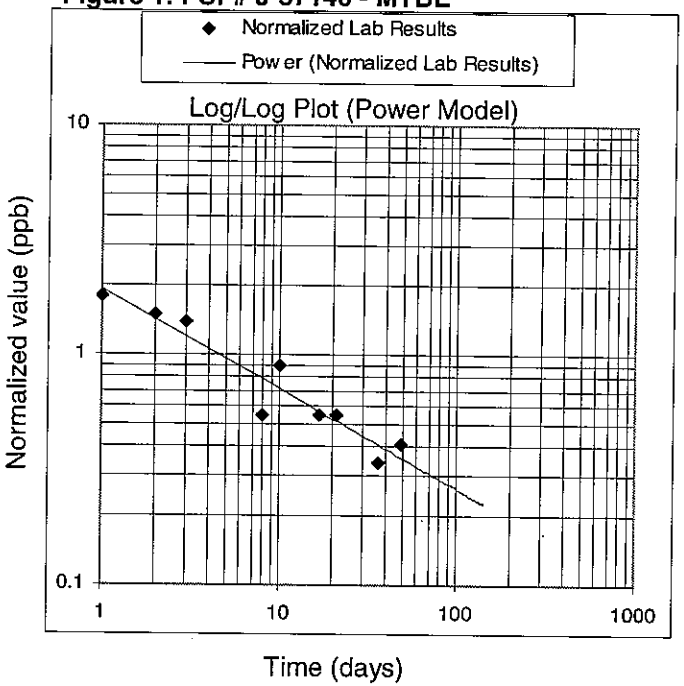

Figure 2. PSF# J-57146 – t-butanol

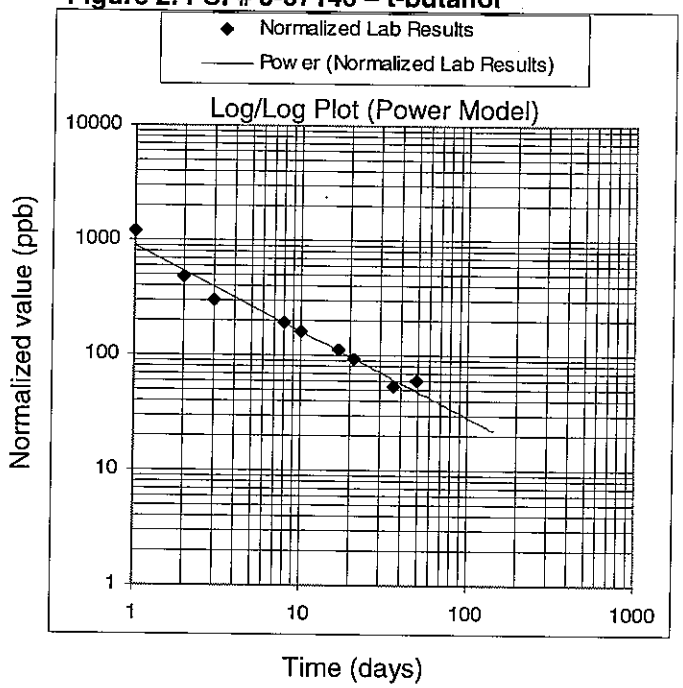

Figure 3. PSF# J-57147 - MTBE

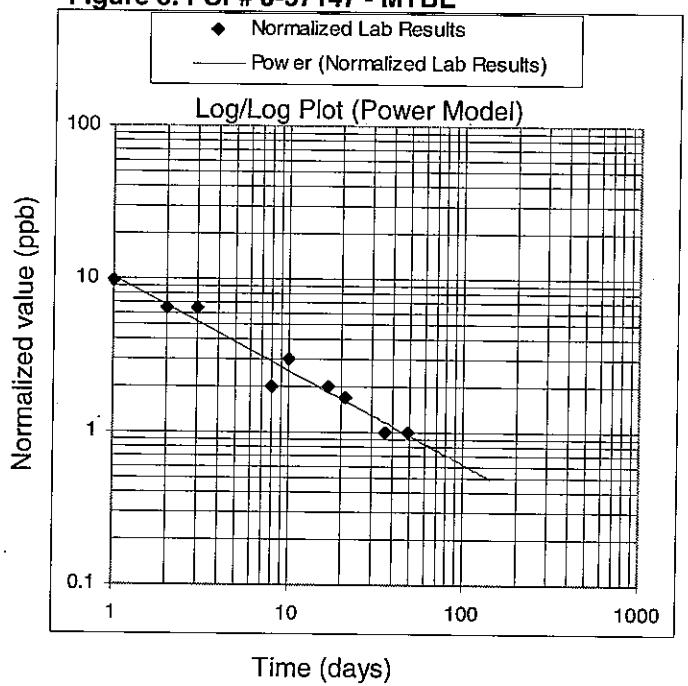

Figure 4. PSF# J-57147 – t-butanol

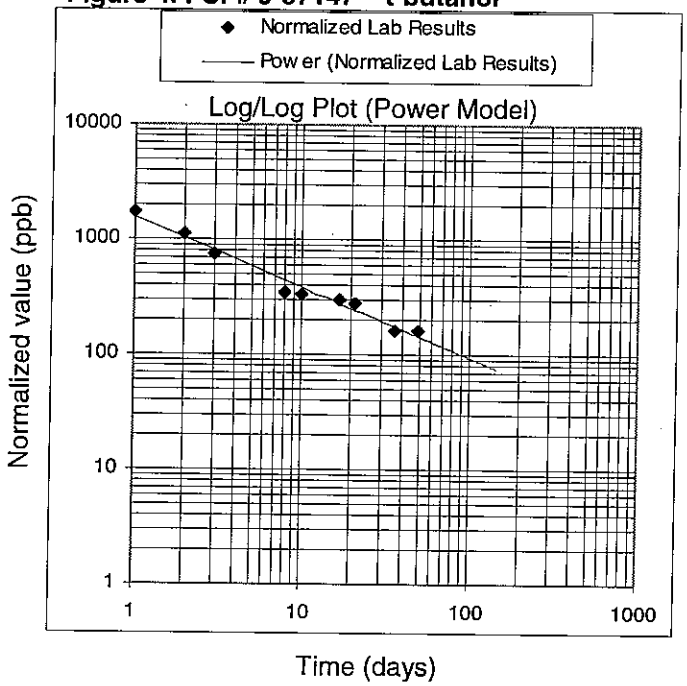

Figure 5. PSF# J-57148 - MTBE

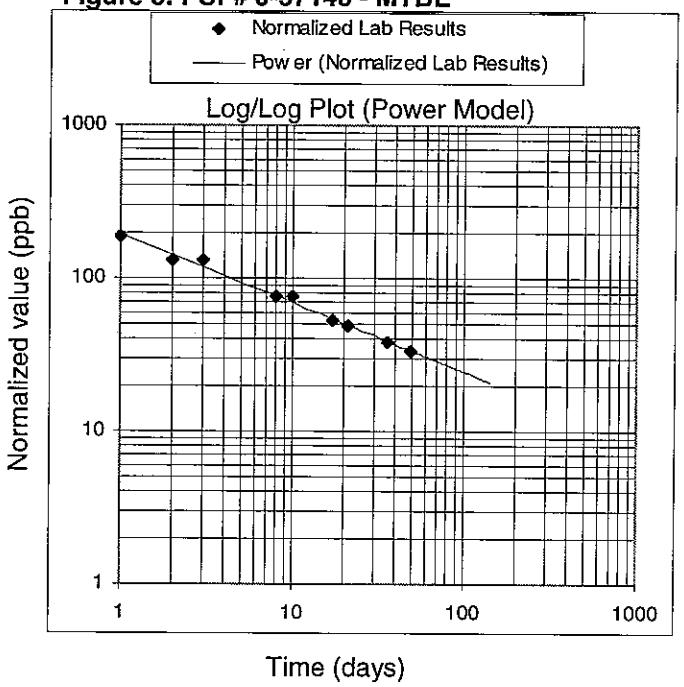

Figure 6. PSF# J-57148 – t-butanol

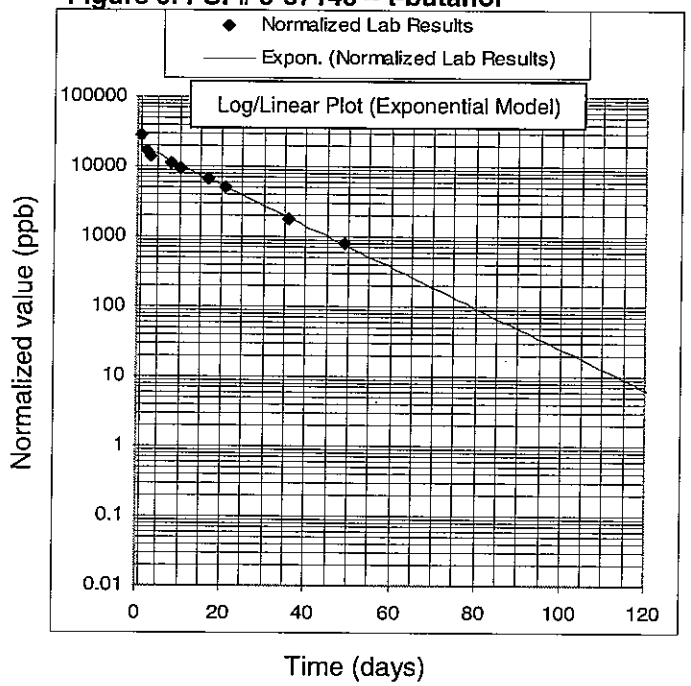

Figure 7. PSF# J-57149 - MTBE

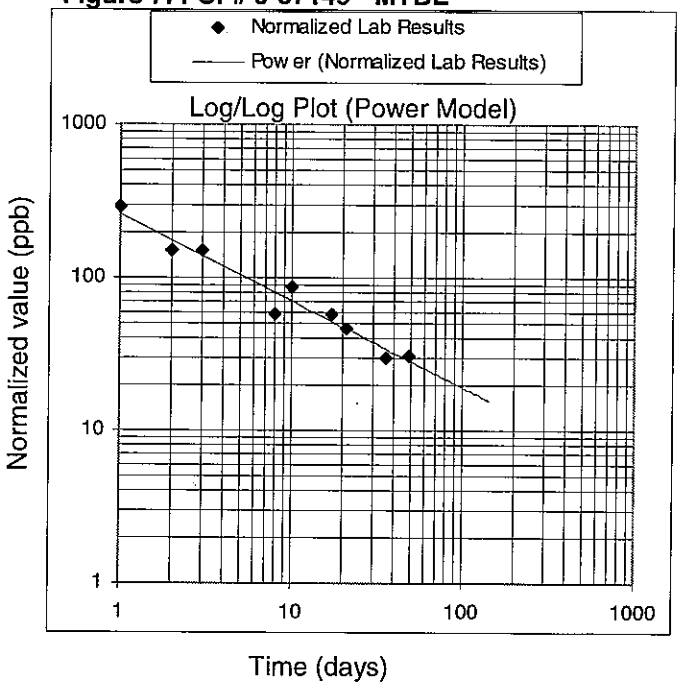

Figure 8. PSF# J-57149 – t-butanol

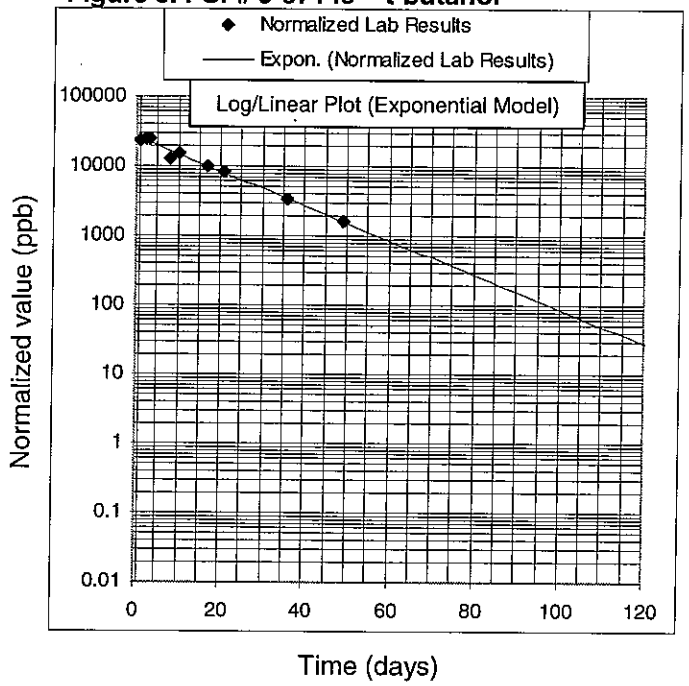

Figure 9. PSF# J-57150 - MTBE

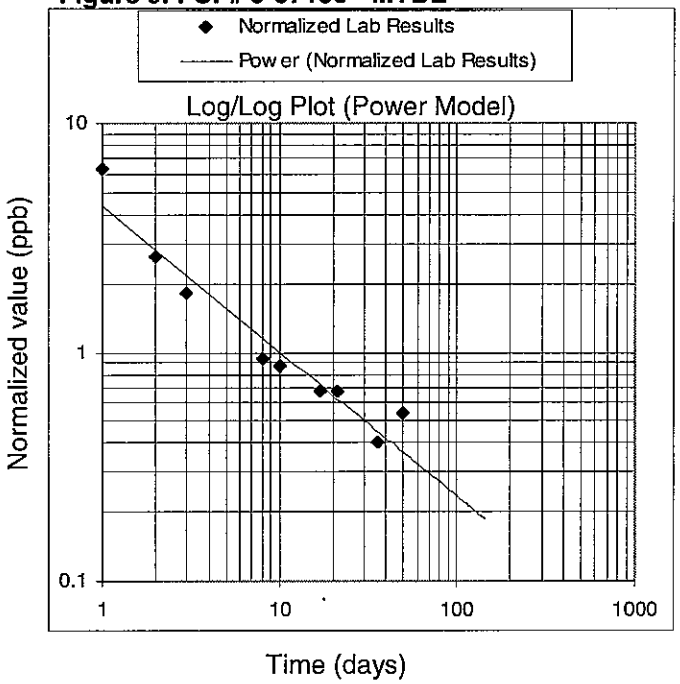

Figure 10. PSF# J-57150 – t-butanol

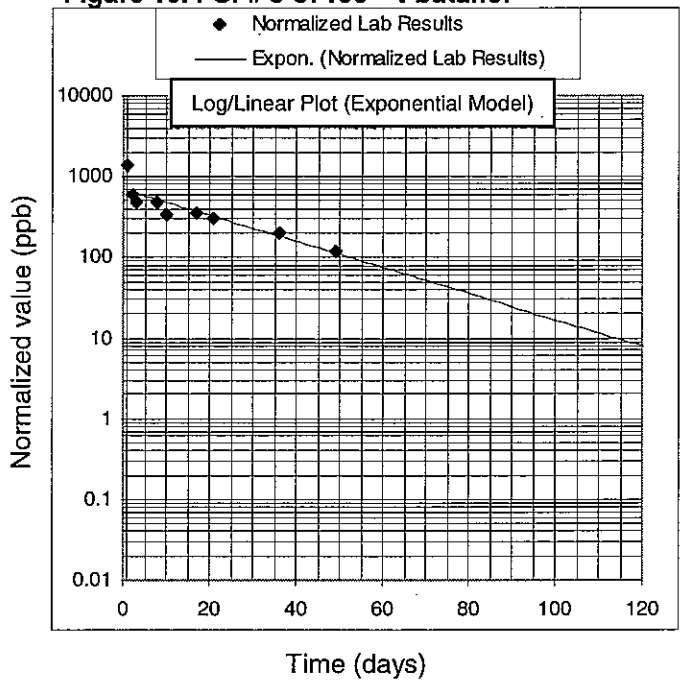

Figure 11. PSF# J-57151 - MTBE

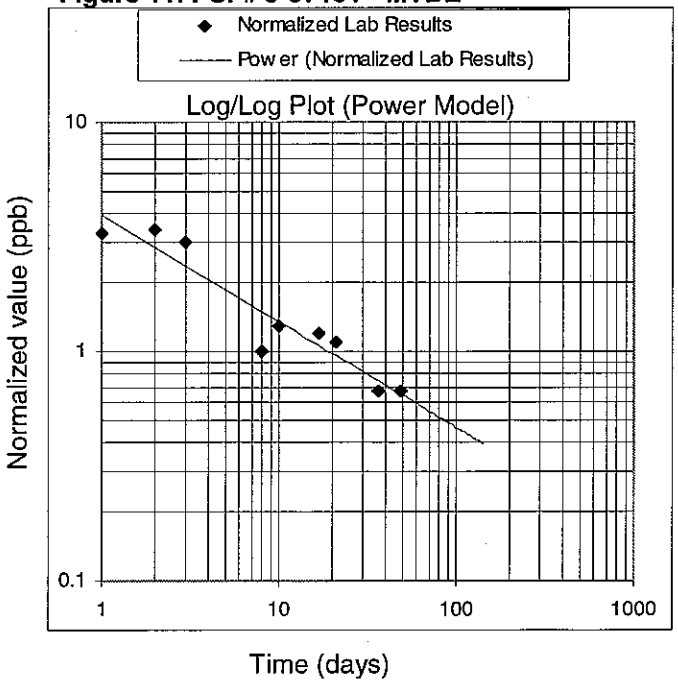

Figure 12. PSF# J-57151 – t-butanol

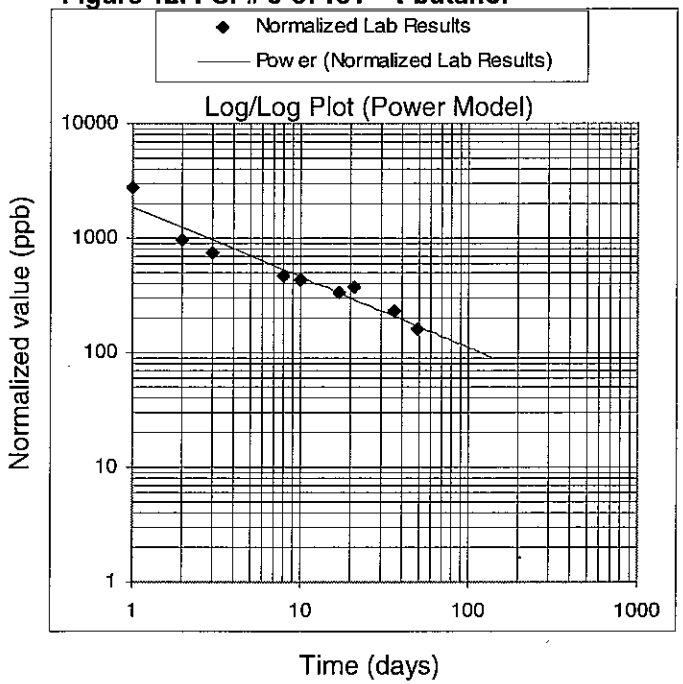

Figure 13. PSF# J-57152 - MTBE

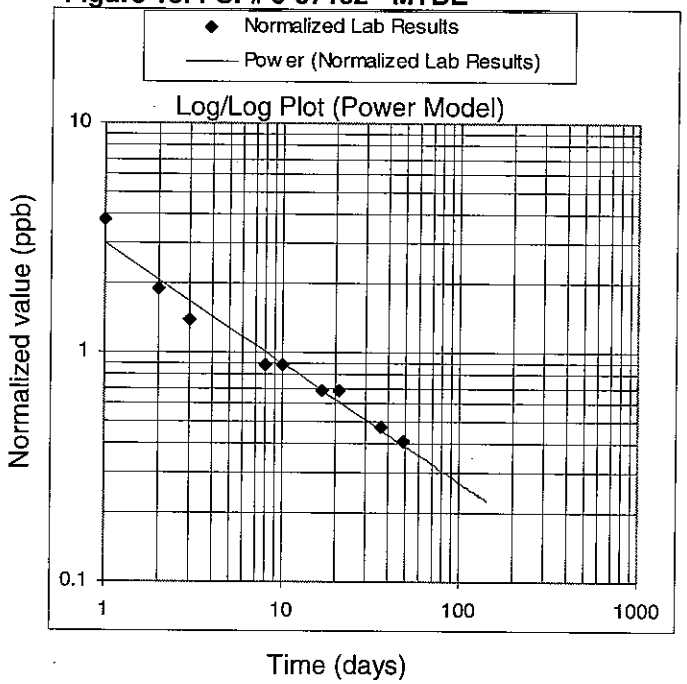

Figure 14. PSF# J-57152 – t-butanol

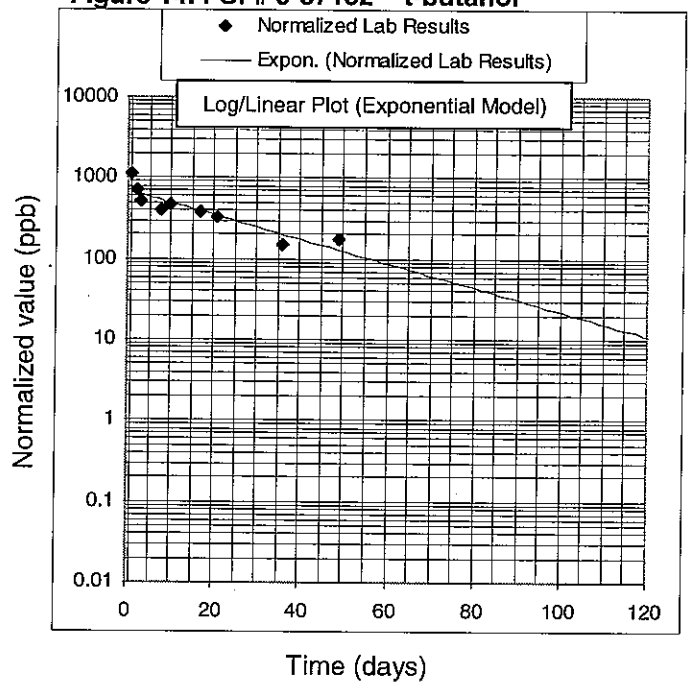

Figure 15. PSF# J-57153 - MTBE

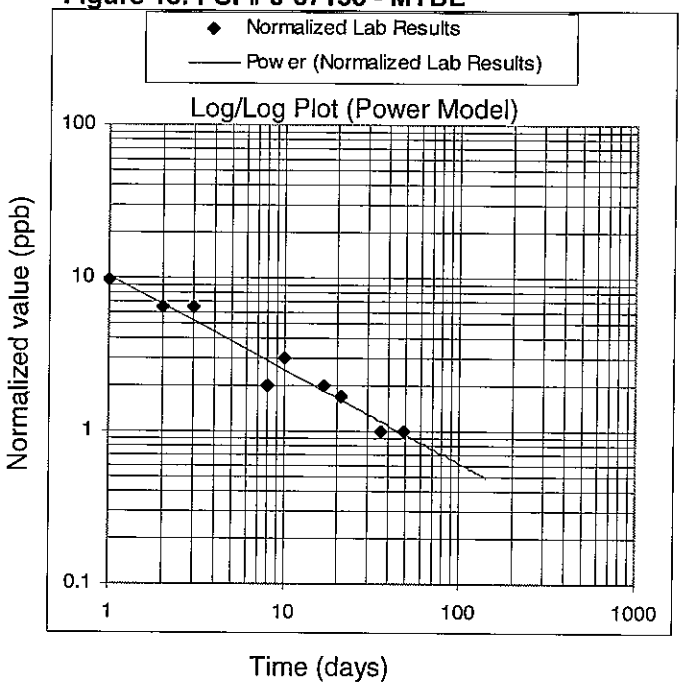

Figure 16. PSF# J-57153 – t-butanol

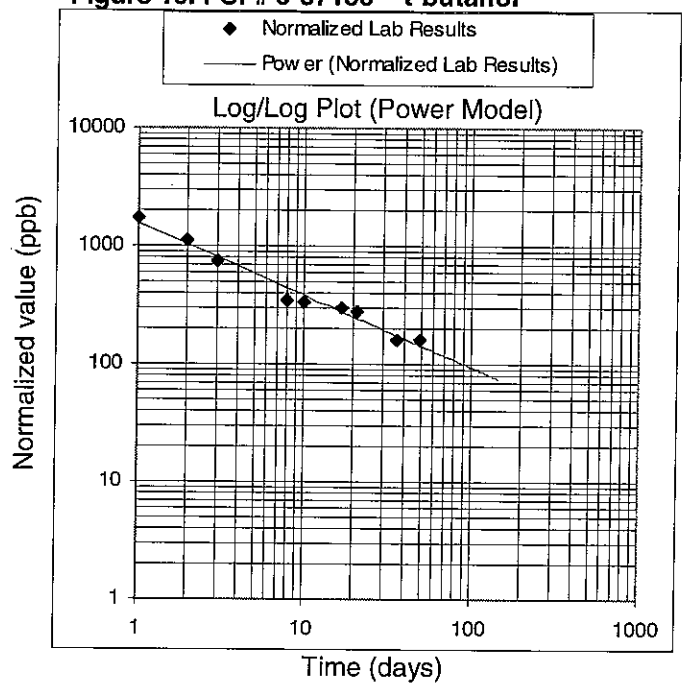

Figure 17. PSF# J-56220 - MTBE

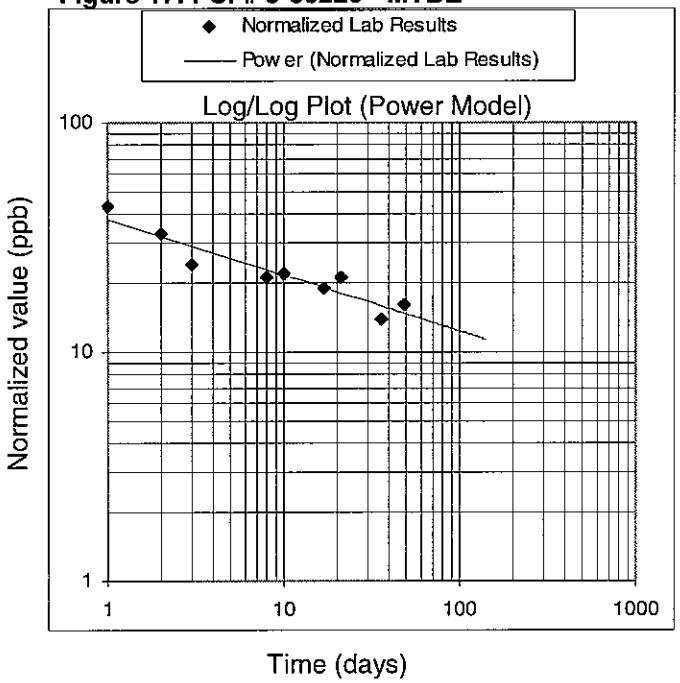

Figure 18. PSF# J-56220 – t-butanol

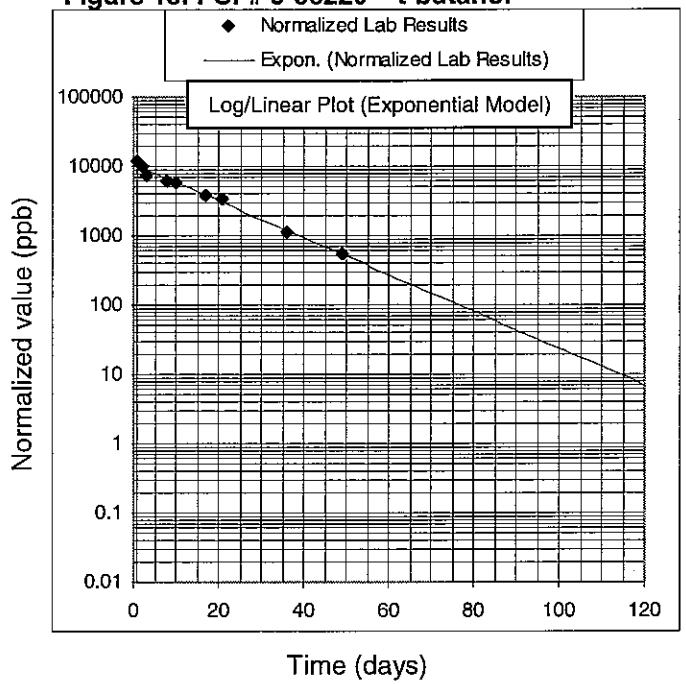

Figure 19. PSF# J-56221 - MTBE

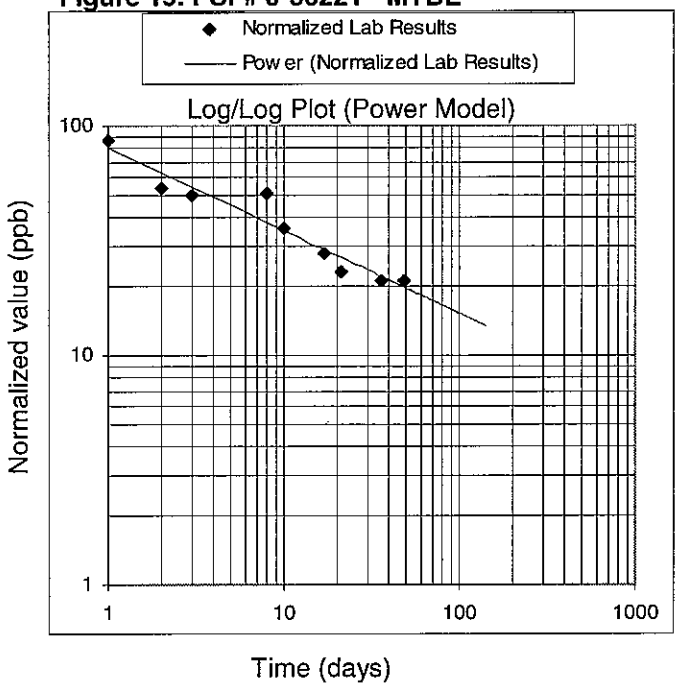
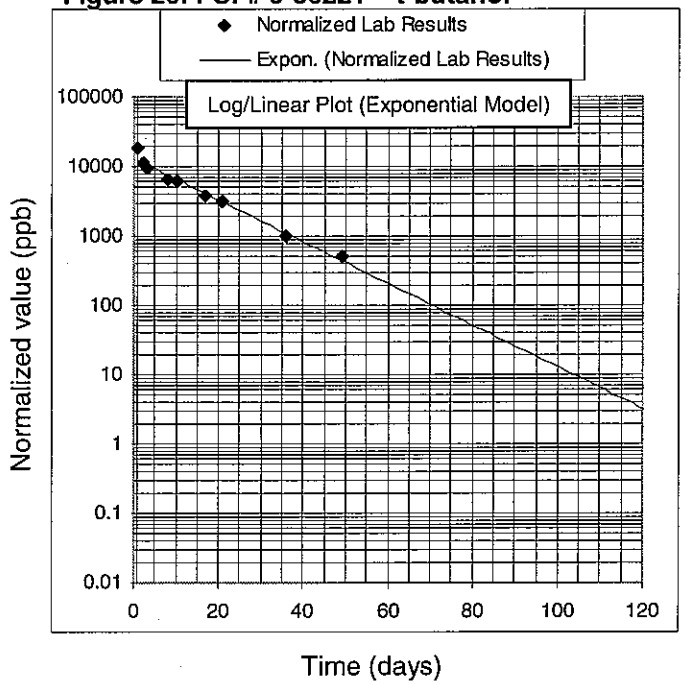
Figure 20. PSF# J-56221 – t-butanol