

Chapter V

Conclusion & Recommendations

Semi quantitative analysis on four types of HDD motors was successfully carried out. It is a very useful technique in providing a snapshot for the outgassed compounds and their amount. Outgassing analysis at 85 °C for 3 hours showed compounds outgassed from the motors were acrylates, methacrylates, alcohol and hydrocarbon used in the adhesive applied in the motor assembly. The compounds that outgassed the highest amount were identified to be HEMA, IBM and THFA.

A full quantification method was established for these compounds by constructing their calibration curve. Calibration curve for HEMA was constructed at a high range, 10 to 50 µg and the R^2 obtained was 0.9967. IBM calibration curve was constructed for 2.0 to 10.0 µg and the R^2 obtained was 0.984. Calibration curve for THFA ranges from 2µg to 20 µg with great linearity obtained i.e. R^2 at 0.9999.

Examination on the accuracy of the calibration curves by using 25 µg of HEMA, 10 µg THFA and 5 µg IBM. Average relative error for HEMA, THFA and IBM showed at 4%, 8% and 7%. To evaluate the accuracy of semi quantitative analysis, these compounds were quantified by using 1 µg deuterated hexadecane. Averagely, relative error for HEMA, THFA and IBM showed at 56%, 54% and 17%.

In applying the semi quantitative method, the control of the peak area of hexadecane-d34 standard in every sample is critical. Table 15 shows hexadecane-d34

standard area used for quantification of all samples in this experiment. Variations were observed in the peak area within five samples run and among the groups of sample runs.

	A	B	C	D
Sample 1	60341695	59898496	70819067	63149702
Sample 2	65393378	66414194	71375073	68909932
Sample 3	65276759	68649201	71165446	73097555
Sample 4	65164427	67073506	70952389	74565120
Sample 5	65334738	66807025	65171309	75021579
Average Peak Area	64302199	65768484	69896657	70948778
Stdev	2215604	3389465	2649994	4981600
% RSD	3	5	4	7

Overall Peak Area (n=20)

Average	67729030
Stdev	4268650
% RSD	6

Table 15. Peak Area of Semi Quantitative Standard deuterated hexadecane-d34

A recommended way to reduce the variation is to establish a calibration curve for hexadecane-d34 and use it for quantification of all compounds. This will avoid errors due to variations of standard injected into the adsorbent tube and at the same time, variations from one batch to another batch of analysis.

Calibration of HEMA at a high amount showed an asymmetric peak shape. Thus it is recommended to reduce the amount of analytes going into the GC. One way to do this is to increase the split ratio of the GC. An alternative is to shorten the sampling time.

Future work is to map the outgas profile of the prime motors by using a different sampling time at a certain time interval. The information obtained can then be correlated to the outgas level of the motors obtained from HDD level. Further to this, the analysis on HDD carbon filter will help in tracing the fate of the outgassed compounds.