

## Laboratory Analysis Report



To whom it may concern,

We received a filter plugging complaint on the morning of January 16. Bloomington Bus Company reported that a number of buses in their fleet had experienced filter plugging issues and stalled buses. They stated that they had experienced these filter issues the night before where the buses would start but would only run for a small period of time before plugging filters. MEG Corp employees were sent to retrieve samples from the bus fleet. When they arrived it was found that 12 of 109 buses were experiencing problems, all of the buses experiencing problems were Thomas-MVPEF Flatnose busses with Caterpillar 3126 engines (of the 109 busses 20 were this model, none of the other 89 bus models had problems). These models of busses, unlike the conventional models in which the filter is attached to the engine and therefore receives heat, house the filter away from the engine and in essence keep the filter always at ambient temperatures. A sample was pulled from the supply tank and appeared to be clear and bright, water concentration came out to be 35 parts per million, which is a normal concentration for #2 diesel, and had cloud of -10 °F. A sample of fuel was extracted from the one of the buses on the lot. This fuel was cloudy (as to be expected for -25 degrees F), but still poured and showed no visible precipitate. The water concentration for this sample was found to be 28 ppm, with a cloud of 0° F, also normal for a ULSD #2.

There were three Filters that were collected from buses that were experiencing filter issues. When one of the filters was cut open the element was packed full of a wax substance. This substance was extracted from the filter and allowed to warm to room temperature, in where it became a liquid and would go into solution. This is common problem when the filters have been plugged with paraffin wax. When temperatures drop it is common for paraffin wax from the ULSD #2 fuel to drop out of solution causing filters to plug. This paraffin substance (commonly mistaken as glycerin), can cause filter plugging issues if it gets too cold or no Wax-Anti settling agent is added. (It was apparent that the substance on the filters was not a glycerin substance as elements of glycerin require upwards and over 100 degrees F in order to go back into solution, and this substance re-solvated at room temperature) It is our determination that paraffin wax dropout is the reason for the bus filters plugging.

We found that whatever was plugging the filters was not biodiesel, but a substance found in petroleum. We contacted the fuel supplier to determine if they had other customers having fuel related issues. The fuel supplier, which supplies 15 school districts with over 1000 buses in total, said that The Bloomington based Bus company was the only fleet that was experiencing filter plugging issues.