

Black Rock City 2004 Oil Drip Update: Results and Management Recommendations

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Summary

Ninety-nine randomly selected vehicles were sampled for the presence of dripping oil at the 2004 Burning Man Event as a follow-up to similar surveys conducted during the 2002 and 2003 events. Five vehicles (5%) were observed to be dripping oil. The 2004 results continued a downward trend in the percentage of vehicles with oil drips from 16% to 5% from 2002 to 2004. This decline appeared to be associated with two factors: 1) after 2002, the Burning Man organization increased the participants' awareness of this issue and 2) the percentage of vehicles classified in poor condition during the surveys has declined from 13% to 8.5% since 2002. Statistical analysis of the data indicated that vehicle condition was strongly correlated with leaking vehicles.

The peak number of vehicles at the event was about 17,936 based upon counts of the numbers of participants per vehicle. Based upon the 17,936 vehicle estimate, about 906 vehicles dripped oil during the 2004 event. The total quantity of oil deposited on the playa was about 10.6 gallons. This is substantially less than the 2,432 dripping vehicles and 28.5 gallons of oil estimated for the 2002 event and 1,738 dripping vehicles and 20.4 gallons of oil for the 2003 event. Natural processes associated with seasonal wetting of the playa surface, vaporization and photo-degradation of the oil molecules are considered capable of rapidly removing this quantity of oil from the environment.

Introduction

Random surveys were conducted of a sample of the vehicles at the Burning Man event for the presence of oil leaks starting in 2002. The surveys were initiated to respond to concerns expressed in the appeals of the Burning Man permit that *each* of the thousands of vehicles at the event was dripping large amounts of oil onto the surface of the playa resulting in significant damage to the environment. The results of the 2002 and 2003 surveys as well as details on the methodology for the 2004 survey are contained in the BLM file document: "Black Rock City 2002 and 2003 Oil Drip Survey; Results and Management Recommendations". The previous surveys found 16% and 11% of vehicles exhibiting leaks in 2002 and 2003 respectively and that these leaks were related to vehicle condition.

Methods

The methodology was the same as that used in 2003 and described in the previously referenced 2002/2003 report. One hundred random point locations were generated within the polygon that encompasses the street grid for Black Rock City. Data were collected for 99 vehicles on Friday, September 3rd and Saturday, September 4th, 2004 by two BLM interns and a volunteer who has participated in the survey for all three years.

For each sampled vehicle the following information was collected:

- Number of days the vehicle had been parked at its location
- Type of vehicle
- Condition of vehicle
- Location and size of any oil drips

The total number of vehicles at the event was estimated from the noon population counts provided by Black Rock City LLC to BLM and a 2003 survey of the number of participants per vehicle conducted by BLM. This information was supplemented by a limited 2004 survey of the number of participants per vehicle to verify that the 2003 estimate of participants per vehicle was appropriate for use in 2004.

Results

Field inspection of 99 vehicles revealed a total of 5 oil spots associated with 5 vehicles. Three of the 5 spots were one inch diameter or less. Drip information is summarized in Table 1.

Table 1: 2004 Survey

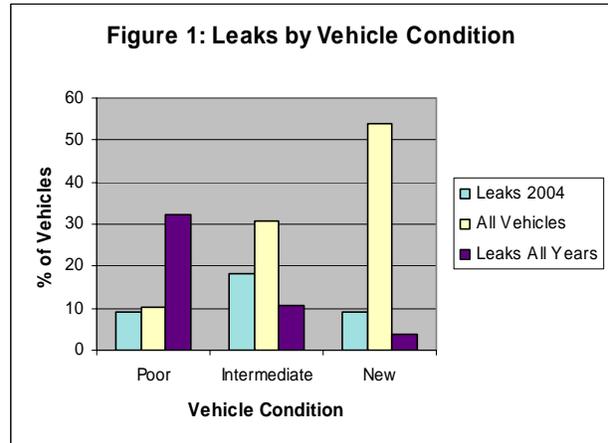
Vehicle #	Days in Place	Vehicle Condition	Vehicle Type	Drip Location	Drip Size (Diameter in inches)
2	1	Intermediate	Car	Transmission	1
54	4	Poor (Beater)	Car	Engine	2
58	6	Intermediate	Commercial	Engine	5
73	3	New	Motor home	Engine	1
91	4	not collected	Motor home	Engine	1

There was no discernable relationship between drips and vehicle condition in 2004. This result was in contrast to the statistically significant¹ inverse relationship observed for the combined data for all three surveys (Figure 1). This was probably due to the small sample of vehicles with leaks in 2004. There also appeared to be no meaningful relationship between oil drips and vehicle type or the number of days vehicles had been parked and drip size which was consistent with the 2002 and 2003 surveys.

¹ Statistical significance is defined as less than a 5% chance that the observed variation among averages could occur by chance.

Other observations:

- The owners of 2 of the 5 vehicles with drips had placed materials under their vehicles to catch the dripping oil.
- Most of the participants interviewed expressed support for the effort to inventory and take measures to decrease oil drips from vehicles.

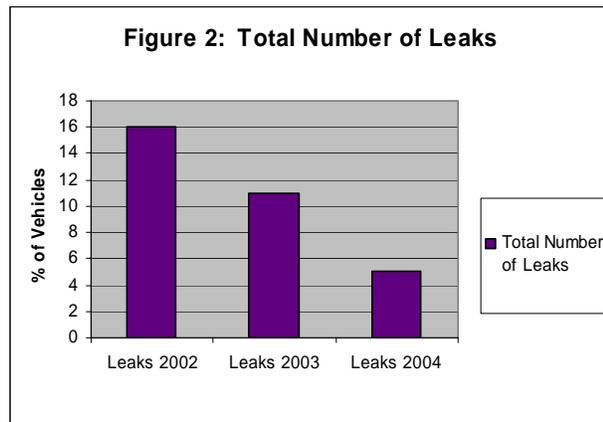


The maximum number of vehicle at the event was estimated at $17,936 \pm 380$ (95% confidence interval) based on population census data and number of occupants per vehicle surveys. The estimated number of participants per vehicle was 1.89 ± 0.04 in 2003. A much smaller survey in 2004 estimated 1.94 ± 0.16 occupants per vehicle which was not statistically different from the 2003 estimate. Therefore the 2003 estimate was used in calculations. The median number of occupants per vehicle was 2 for both years. The peak number of vehicles in Black Rock City occurred on Saturday when the “Man” was burned.

The projected total number of vehicles dripping oil in 2004 was 906 ± 19 based upon the observation that 5.05% of sampled vehicles dripped oil. A total of 10.6 ± 0.2 gallons of oil was deposited on the playa based on the assumption of 0.3 ounces of oil per day for each leaking vehicle.

Trends

Surveys from 2002 to 2004 show a decline in the percentage of vehicles dripping oil from 16% in 2002, 11% in 2003 and 5% in 2004. This decline is shown in Figure 2: A statistical analysis of correlation and trend analysis of this data showed the decline to be statistically significant.



The data for the 2002 to 2004 surveys were also evaluated for trends in oil drips related to vehicle condition or vehicle type. During the survey period the percentage of vehicles assigned to the “beater” or poor category declined from 13% to 8.5% as shown in the dark bars on Figure 3. This decline was statistically significant. Trends for new and intermediate condition vehicles were not statistically significant.

The relationship between the percentage of vehicles dripping oil and vehicles in the “beater” or poor condition category was also examined for the 2002 to 2004 period

(Figure 4). There was a strong correlation² (0.997) between these two variables (a value of 1.0 indicates perfect correlation). This relationship between poor condition vehicles and leaks was also statistically significant.

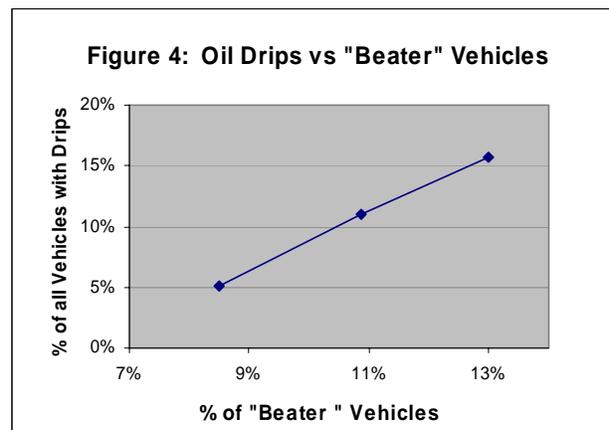
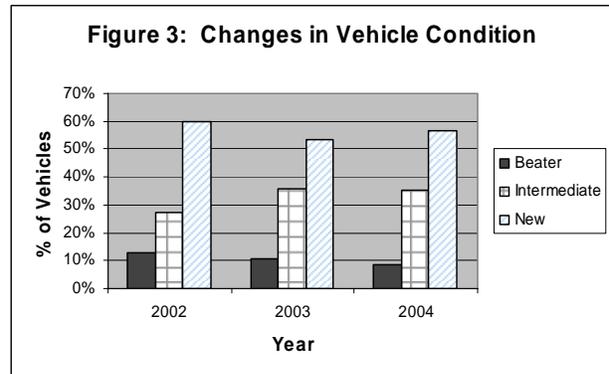
Discussion

The percentage of surveyed vehicles with oil drips declined from 16% to 5% during the 2002 to 2004 period. This occurred during a period when the population of participants and vehicles increased by about 13 percent. The estimated number of vehicles with oil drips declined from 2,432 in 2002 to 906 in 2004 with a related decline in the amount of oil deposited on the surface of the playa from 28.5 gallons to 10.6 total gallons. As discussed in the 2002-2003 oil drip report, oil deposition at these levels would be likely to quickly disperse and chemically degrade to levels that are not harmful to natural resources.

The decrease in the number of vehicles dripping oil appeared to be related to two factors. Since 2002, the event organizers have actively educated participants about oil leaks on their web-site. During both 2003 and 2004 surveyors observed tarps and cardboard sheets under vehicles with oil leaks specifically placed there to catch the drips. This was an indication that at least a portion of the participants read and understood the web based message on oil contamination. The second factor was the observed decrease in the number of vehicles in poor condition. The decline in the proportion of poor condition vehicles was closely correlated with the decrease in vehicles dripping oil for the 2002 to 2004 period.

Recommendations

1. Retain the stipulation related to oil drips in future permits (Stipulation #24 in the 2004 permit).
2. Encourage Black Rock City LLC (the Burning Man Permittee) to:
 - a. Continue its public outreach efforts via its website and other means.



² Statistical correlation is a measure of the strength of the association between variables. Correlation values range from -1 when variables are inversely related to 1 where variables are positively related.

- b. Inspect for oil drips as part of its Art Car permitting process.
 - c. Reduce the number of vehicles in poor condition at the event.
3. Discontinue yearly oil drip surveys. Conduct another survey no sooner than 2006.
4. Place more emphasis on BLM surveys of vehicle counts, participants per vehicle, vehicle type, vehicle condition and waste water leaks from trailers and recreational vehicles.

Follow Up Research Needs

The oil drip surveys addressed only one part of the issue related to oil on the playa. Additional work is needed to confirm that oil drips are dispersed by the fluctuating water table and other means described in the 2002/2003 report and are ultimately volatilized, thus posing no risk to on- or off-site water tables. A start in determining this could be accomplished through the creation and monitoring of oil spots of known volume.

Studies that focus on the biological systems associated with the playa are needed, including inventories of what species are present and how recreational events potentially affect their life cycles and habitats.